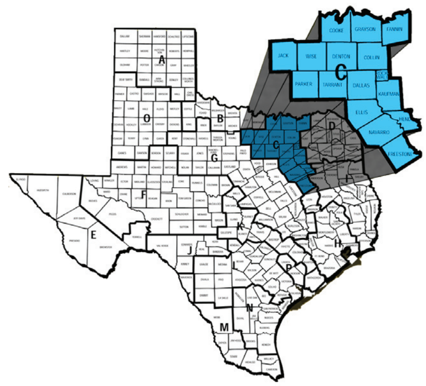
# 2011 Region C Water Plan

Volume 1 of 3
Main Report

October 2010




Freese and Nichols, Inc.

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Cooksey Communications, Inc.

# 2011 Region C Water Plan

October 2010

Prepared for

## Region C Water Planning Group

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Region C
Water Planning Group

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October 2010

Prepared for

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NTD08492

# 2011 REGION C WATER PLAN

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# REGION C WATER PLANNING GROUP

*Senate Bill One Third Round of Regional Water Planning - Texas Water Development Board*



To the readers:

This water plan represents the culmination of four years of cooperative work by the Region C Water Planning Group, water suppliers, varied interest groups and technical consultants to figure out how we can meet the projected water needs of our region. This regional water plan reflects the best information available at this time, and the plan will be updated in coming years to reflect changes in projected population growth and water demand, new water supplies that become available, and other future changes.

As you read this water plan, the Region C Water Planning Group would like you to keep in mind the following points:

- While the plan shows that there would be significant shortages over the planning period if nothing were done to develop new water supplies, all of these shortages can be avoided through the development of the water management strategies in the plan.
- Conservation and reuse strategies are the first strategies considered to meet projected shortages. Together these strategies combine to provide 25% of future water supplies. The level of conservation and reuse is far beyond that of any other region in the state.
- This plan details the cooperative efforts among major water providers in the region to efficiently develop future water sources.
- Diligent efforts were made to solicit input from every Region C Water User Group (as defined by the Texas Water Development Board) to be included in this plan.
- The report represents planning level analyses of the recommended water management strategies. Additional studies and design will be needed prior to the implementation of strategies.
- Region C Water Planning Group has no authority to regulate water supplies or implement water management strategies. Water management strategies for the region will be implemented by the respective water providers.
- This planning effort has been funded by the Texas Water Development Board and follows the Regional Planning Guidelines and Rules set forth by TWDB.
- Information from this plan will be combined with other regional reports to formulate the 2011 State Water Plan.

The 2011 Region C Water Plan presents a comprehensive overview of the water supply issues in the region. It will take a concerted effort to continue to conserve and preserve our valuable water resources for the future. We appreciate your contributions to these efforts as we work together in keeping our region a desirable place to work and live.

Sincerely,

James M. Parks, Chairman
Region C Water Planning Group

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**2011 REGION C WATER PLAN**

**OCTOBER 2010**

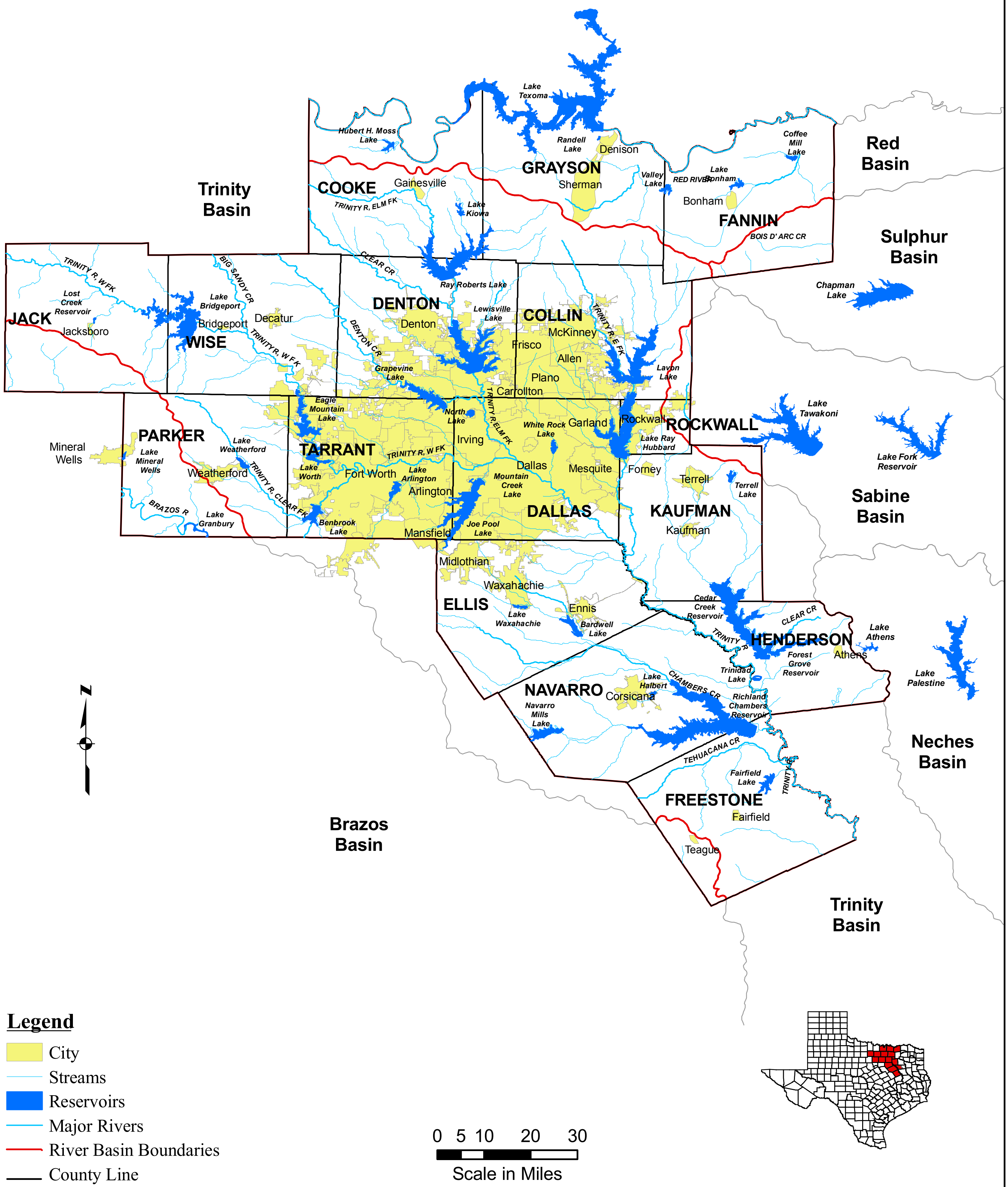
# Executive Summary

This report presents the *2011 Region C Water Plan* developed in the third round of the Senate Bill One regional water planning process. Region C covers all or part of 16 North Central Texas counties, as shown in Figure ES.1. The Region C water plan was developed under the direction of the 19-member Region C Water Planning Group. This regional water plan was adopted by the Region C Water Planning Group on September 13, 2010.

The *2011 Region C Water Plan* includes the following chapters:

1. Description of Region C
2. Population and Water Demand Projections
3. Analysis of Water Supply Currently Available to Region C
4. Identification, Evaluation and Selection of Water Management Strategies
    - 4A. Comparison of Current Water Supply and Projected Water Demand
    - 4B. Water Conservation and Reuse
    - 4C. Methodology for Evaluation and Selection of Water Management Strategies
    - 4D. Evaluation of Major Water Management Strategies
    - 4E. Recommended Water Management Strategies for Wholesale Water Providers
    - 4F. Recommended Water Management Strategies for Water User Groups by County
    - 4G. Texas Water Development Board Required Tables
    - 4H. Summary of Special Studies
5. Impacts of Recommended Water Management Strategies
6. Water Conservation and Drought Management Recommendations
7. Description of How the Regional Water Plan is Consistent with Long-Term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources
8. Unique Stream Segments, Unique Reservoir Sites, and Legislative Recommendations
9. Infrastructure Funding Recommendations
10. Plan Approval Process and Public Participation

**Figure ES.1**
**Region C and Major Outside Water Supplies**
**Currently Used in Region C**



This Executive Summary focuses on current water needs and supplies in Region C, the projected need for water, the identification and selection of recommended water management strategies, the costs and impacts of the selected strategies, and county summaries for each county in the region. Other elements of the plan are covered in the main text and the appendices.

## *ES.1 Current Water Needs and Supplies in Region C*

As of the 2000 census, the population of Region C was 5,254,722, which represented 25.2 percent of Texas' total population. The estimated population as of 2008 was 6,347,000, an increase of 21 percent in eight years. The two most populous counties in Region C, Dallas and Tarrant, have 65 percent of the region's population. Region C is heavily urbanized, with 81 percent of the population located in cities with populations in excess of 20,000 people.

### Physical Setting

Most of Region C is in the upper portion of the Trinity River Basin, with smaller parts in the Red, Brazos, Sulphur, and Sabine River Basins. Figure ES.1 shows the major streams in Region C. Precipitation increases from west to east in the region. The average runoff in the region also increases from the west to the east, while evaporation is higher to the west. These patterns of rainfall, runoff, and evaporation result in more abundant water supplies in the eastern part of Region C than in the west.

There are thirty-four major reservoirs in Region C with conservation storages in excess of 5,000 acre-feet. These reservoirs and others outside of Region C provide most of the region's water supply. Aquifers in the region include the Trinity, Woodbine, Carrizo-Wilcox, Nacatoch, and Queen City.

### Water Use

Water use in Region C has increased significantly in recent years, primarily in response to increasing population and municipal demand. The regional water use in the year 2006 was 1,404,535 acre-feet. It is interesting to note that Region C, with over 25 percent of

Texas' population, had only 8.2 percent of the state's water use in 2006. About 90 percent of the current water use in Region C is for municipal supply.

### Current Sources of Water Supply

Over 90 percent of the water use in Region C is supplied by surface water, but groundwater can be an important source of supply, especially in rural areas. Most of the surface water supply in Region C comes from major reservoirs, including reservoirs in the region and reservoirs outside of Region C that supply water for the region. The Trinity aquifer is the largest source of groundwater in Region C, with the Woodbine, Carrizo-Wilcox and other minor aquifers are also used. The current use of groundwater is close to or greater than the long-term reliable supply available in some parts of Region C.

Over half of the water used for municipal supply in Region C is discharged as treated effluent from wastewater treatment plants, making wastewater reclamation and reuse a potentially significant source of water supply for the region. Reuse supplies are increasing rapidly in Region C, with several major projects recently completed or under development. It is clear that the reuse of treated wastewater will be a significant source of future water supplies for the region.

### Water Providers in Region C

Water providers in Region C include 41 wholesale water providers and 357 water user groups. In 2006, the three largest wholesale water providers in Region C (Dallas Water Utilities, Tarrant Regional Water District, and North Texas Municipal Water District) provided 85 percent of the water used in the region. Cities and towns provide most of the retail water service in Region C.

## *ES.2 Projected Need for Water*

### Population Projections

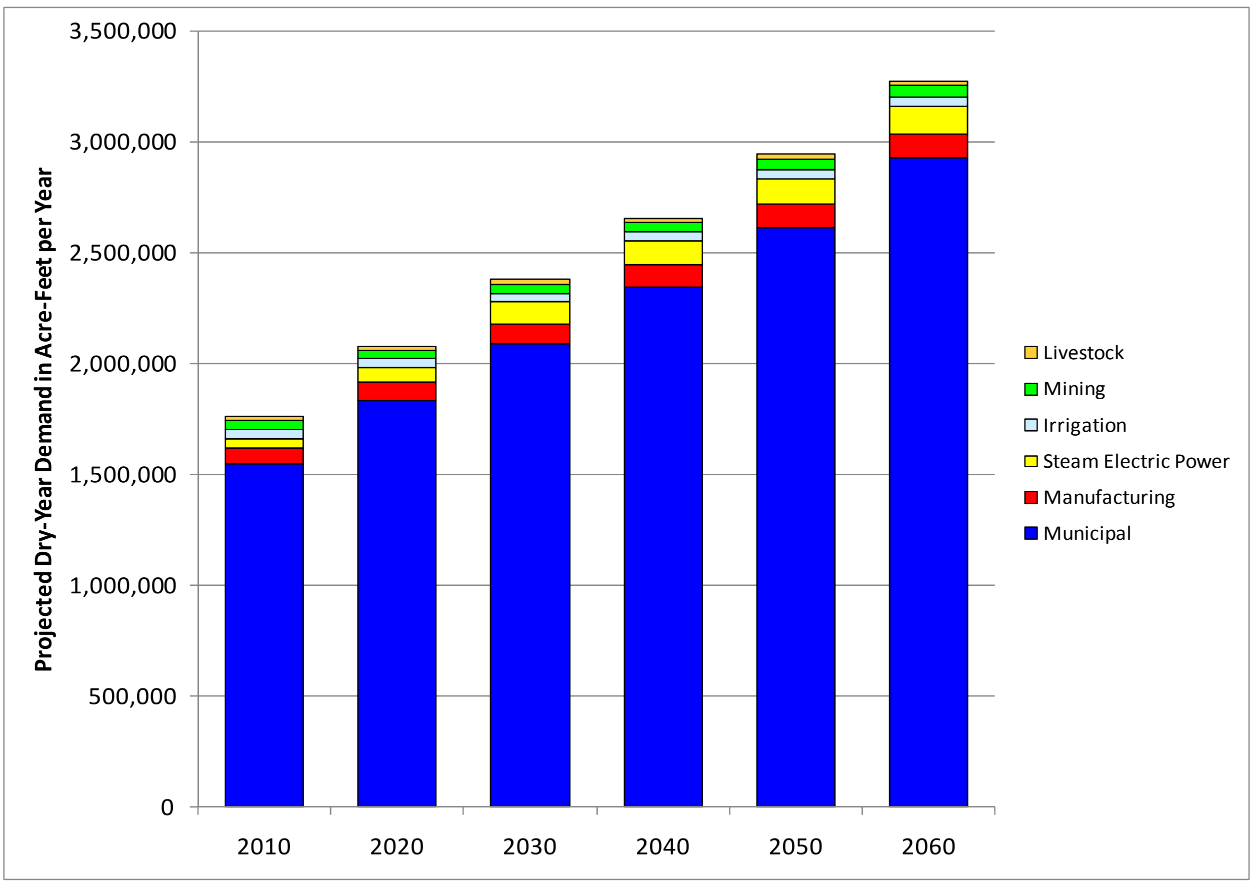
The population of Region C is projected to grow from 5,254,722 in the year 2000 to 9,171,650 in 2030 and 13,045,592 in 2060. These projections have been approved by the Texas Water Development Board, as required by TWDB planning guidelines. This projection reflects a substantial slowing in the rate of growth that has been experienced in

Region C over the last 50 years. The distribution of the projected population by county and city is discussed in Chapter 2.

## Demand Projections

Figure ES.2 shows the projected dry-year demands for water in Region C, which total 2.4 million acre-feet per year in 2030 and 3.3 million acre-feet per year in 2060. As has been the case historically, municipal demands are projected to make up the majority of the water use in Region C. These projected demands are about 1.2 percent lower than the projections in the *2006 Region C Water Plan*, due primarily to a reduction in projected steam electric power demands. Dry-year demands are significantly higher than normal year demands, especially for municipal use (because of increased lawn irrigation use). Normal-year demands in Region C might be 10 to 15 percent lower than dry year demands.

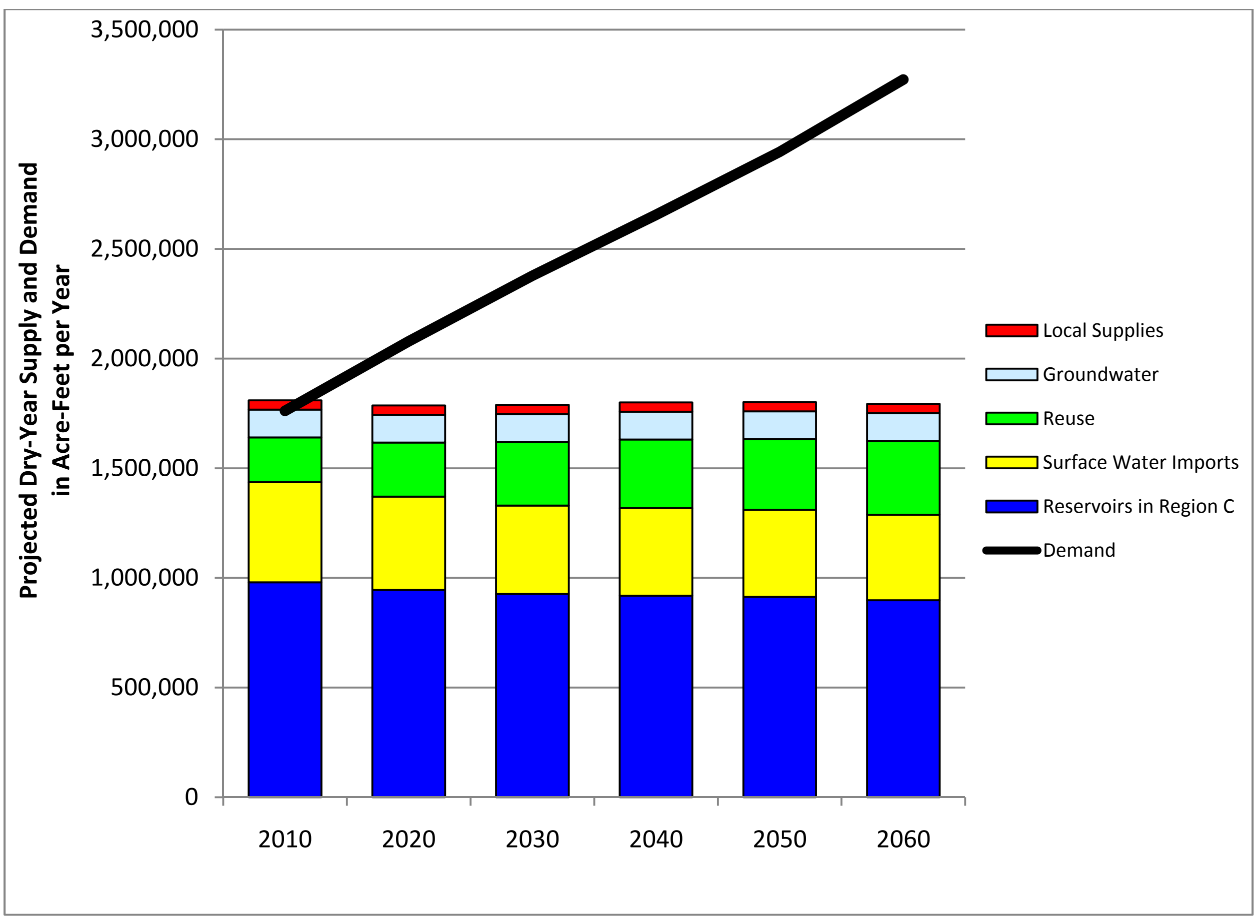
**Figure ES.2**
**Projected Region C Demands**



## Comparison of Supply and Demand

Figure ES.3 shows a comparison of supplies currently available to Region C and projected demands. Currently available supplies are almost constant over time at 1.8 million acre-feet per year, as sedimentation in reservoirs is offset by increases in reuse supplies due to increased return flows. With the projected 2060 demand of 3.3 million acre-feet per year, the region has a shortage of 1.5 million acre-feet per year by 2060. Meeting the projected shortage and leaving a reasonable reserve of planned supplies beyond projected needs will require the development of significant new water supplies for Region C over the next 50 years.

**Figure ES.3**
**Comparison of Currently Available Supplies and Projected Demands**



### Socio-Economic Impacts of Not Meeting Projected Water Needs

The Texas Water Development Board has conducted an analysis of the socio-economic impacts of not meeting the projected demands in Region C. The analysis indicates that a severe drought occurring in a single year would:

- Reduce the projected 2060 population by 244,179, a reduction of nearly 2%
- Reduce the projected 2060 employment by 546,676
- Reduce the projected income in 2060 by over $61 billion.

The lost income and tax revenues from failing to take steps to provide sufficient water for the projected growth in Region C are over $64 billion for a single year. A drought lasting several years would have an even greater impact on the region.

## ES.3 Identification and Selection of Water Management Strategies

The Region C Water Planning Group identified and evaluated a wide variety of potentially feasible water management strategies in developing this plan. Water supply availability, costs and environmental impacts were determined for conservation and reuse efforts, the connection of existing supplies, and the development of new supplies. Almost every strategy suggested to the region during the planning process was analyzed.

As required by TWDB regulations, the evaluation of water management strategies was an equitable comparison of all feasible strategies and considered the following factors:

- Evaluation of quantity, reliability, and cost of water delivered and treated
- Environmental factors
- Impacts on other water resources and on threats to agricultural and natural resources
- Other factors deemed relevant by the planning group (including consistency with the plans of water providers in the region)
- Consideration of interbasin transfer requirements and third party impacts of voluntary redistributions of water.

### Water Conservation and Reuse

The Region C Water Planning Group considered the municipal water conservation strategies suggested as best management practices by the Conservation Implementation

Task Force and recommended a water conservation program for Region C that accomplishes the following:

- Including the 277,000 acre-feet per year of conservation built into the demand projections (for low flow plumbing fixtures and efficient power plants), a total conservation and reuse supply of 1.2 million acre-feet per year by 2060, 36 percent of the region's demand without conservation.
- A reduction in dry-year per capita municipal use for the region (after crediting for reuse) from 197 gpcd in 2000 to less than 140 gpcd by 2020.

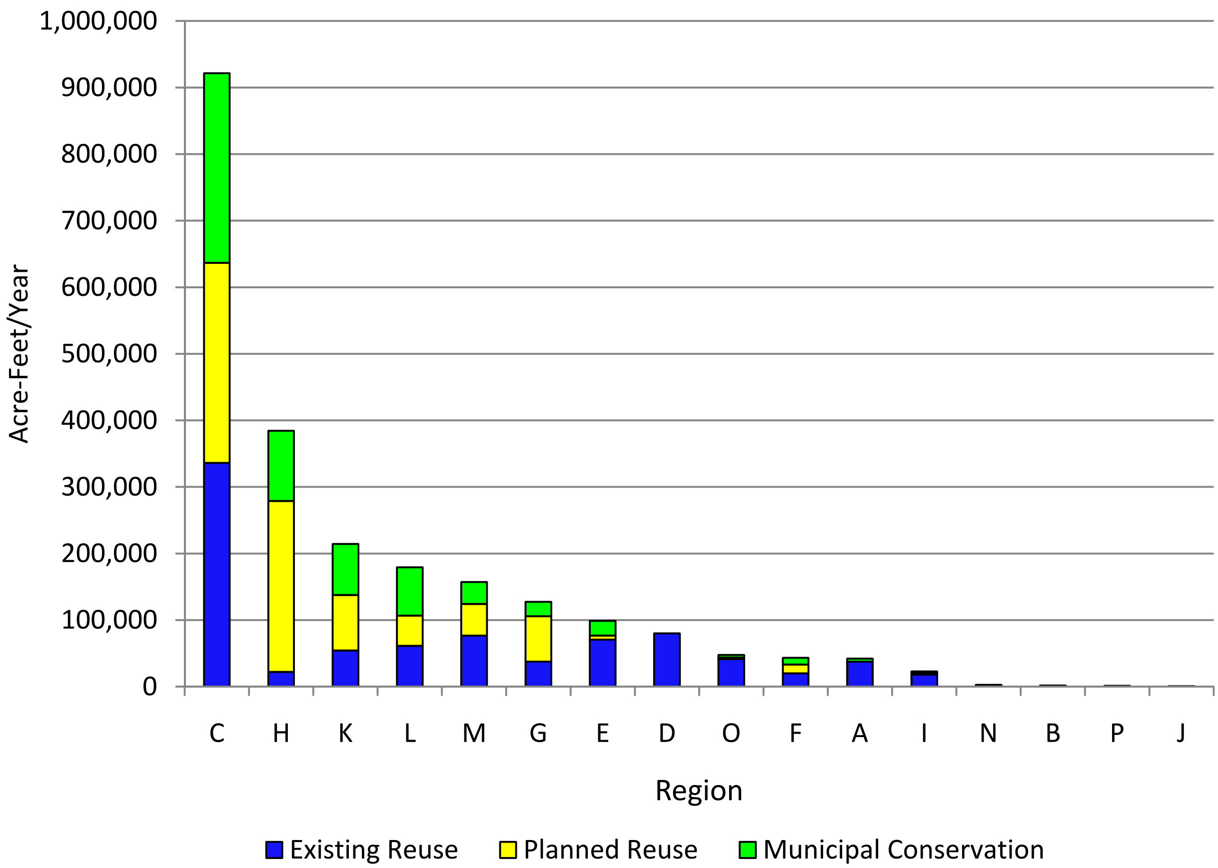
The Region C Water Plan includes notable conservation and reuse efforts. Figure ES.4 shows the planned supplies from reuse and municipal conservation for Region C based on the *2011 Region C Water Plan* and for other planning regions based on the Texas Water Development Board Regional Planning Database (DB12). With about 25 percent of the state's population, Region C has 40 percent of the planned supplies from reuse and municipal conservation. Chapter 6 includes a more detailed discussion of conservation and reuse for the region.

### Recommended Water Management Strategies

Table ES.1 lists the major recommended water management strategies for Region C. (Major water management strategies are those supplying over 60,000 acre-feet per year or involving the construction of a reservoir.) Figure ES.5 shows the location of the recommended major water management strategies, which will provide 1.75 million acre-feet per year in new supplies for the region. In total, the Region C plan includes water management strategies to develop 2.21 million acre-feet per year of new supplies, for a total available supply of 3.98 million acre-feet per year in 2060. The supply is about 22 percent greater than the projected demand, leaving a reasonable reserve to provide for difficulties in developing strategies in a timely manner, droughts worse than the drought of record, greater than expected growth, and supply for needs beyond this planning horizon.

Figure ES.6 shows the comparison of supply and demand for Region C with the development of new supplies. Figure ES.7 shows the makeup of the 3.98 million acre-feet per year of supplies proposed to be available to the region by 2060. Slightly over one third of the supply is already available to the region from surface water and groundwater in

**Figure ES.4**
**Planned 2060 Reuse and Municipal Conservation Supplies by Region**




2010; a quarter is developed from conservation and reuse efforts, a quarter is from the connection of existing supplies, and 16 percent is from the development of new reservoirs.

The plan includes only three major new reservoirs (compared to more than 25 developed to supply water for Region C over the last 60 years.)

## Cost of the Proposed Plan

Most of the new supplies for Region C will be developed by the major wholesale water providers in the region. Table ES.2 shows the amount of new supply proposed for the five largest wholesale water providers in Region C and the cost to develop that supply. The total cost of implementing all of the water management strategies in the plan is $19.1 billion. The specific recommended water management strategies recommended for wholesale water providers and water user groups are discussed in sections 4E and 4F of the report.

## County Summaries

There are summaries of the plan for each county at the end of this executive summary.

**Table ES.1**
**Recommended Major Water Management Strategies for Region C**

| Strategy | Supplier | Supply (Ac-Ft/Yr) | Supplier Capital Cost |
|---|---|---|---|
| Toledo Bend Reservoir | NTMWD | 200,000 | $1,239,762,000 |
| | TRWD | 200,000 | $1,937,420,000 |
| Marvin Nichols Reservoir | NTMWD | 174,840 | $830,894,000 |
| | TRWD | 280,000 | $2,371,116,000 |
| | UTRWD | 35,000 | $225,628,000 |
| TRWD Integrated Pipeline | TRWD | 179,000* | $702,008,000 |
| Lower Bois d'Arc Creek Reservoir | NTMWD | 123,000 | $615,498,000 |
| Oklahoma Water | NTMWD | 50,000 | $208,624,000 |
| | TRWD | 50,000 | $441,548,000 |
| | Irving | 25,000 | $194,825,000 |
| | UTRWD | 15,000 | $96,083,000 |
| Lake Palestine | DWU | 111,776 | $887,954,000 |
| New Lake Texoma (Blend) | NTMWD | 113,000 | $336,356,000 |
| Wright Patman Lake - Raise Flood Pool | DWU | 112,100 | $896,478,000 |
| TRWD Wetlands | TRWD | 105,500 | $212,416,000 |
| Tawakoni Pipeline | DWU | 77,994 | $496,243,000 |
| Lake Ralph Hall and Reuse | UTRWD | 52,437 | $286,401,000 |
| Main Stem Trinity River Pump Station | DWU and NTMWD | 41,029 | $142,567,000 |
| **Region C Total** | | **1,766,676** | **$12,121,821,000** |

* The TRWD Integrated Pipeline is not a new supply to the region and is not included in the Region C Total supply.

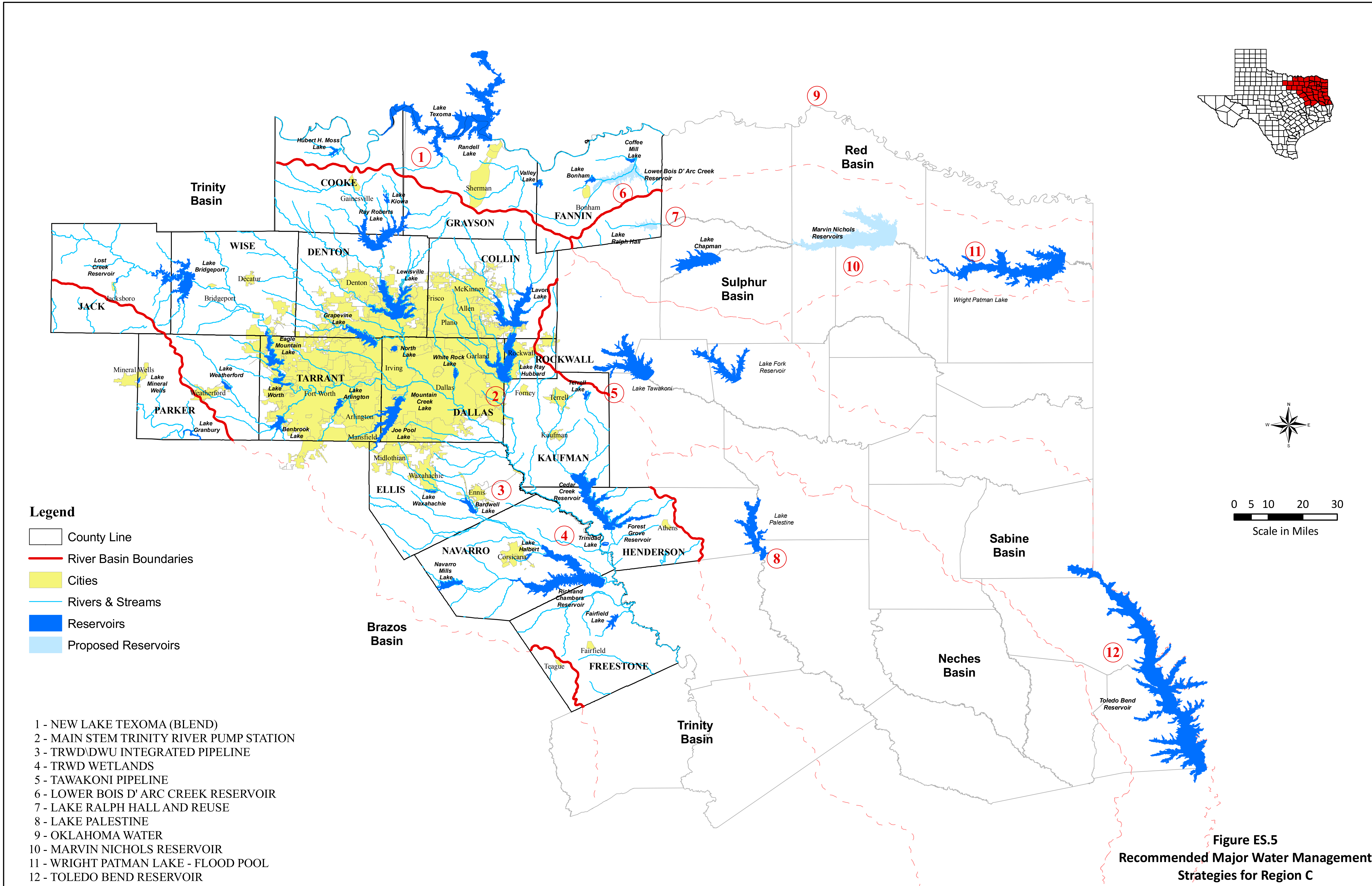



**Figure ES.5**
**Recommended Major Water Management Strategies for Region C**

**Figure ES.6**
**Supply and Demand for Region C with the Development of New Supplies**

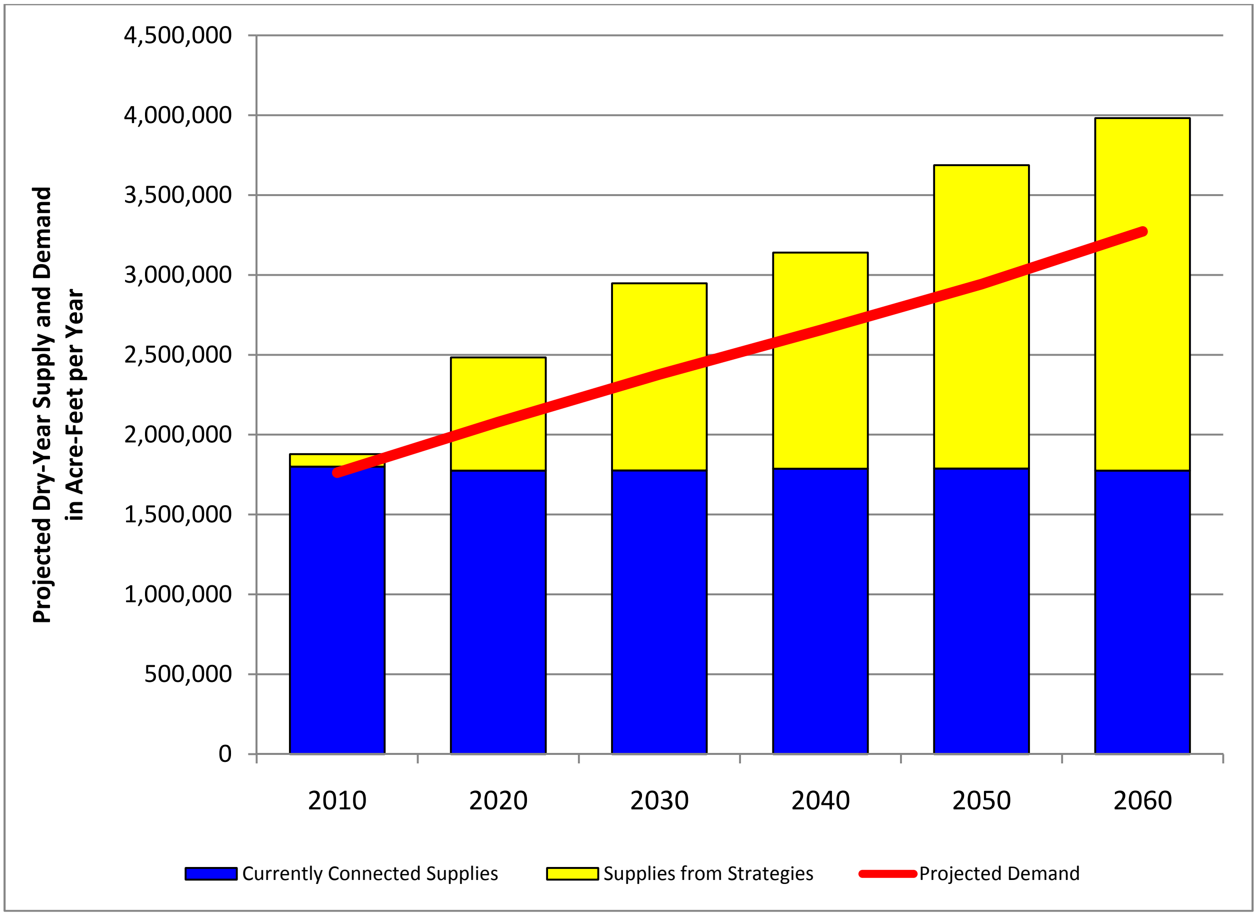


**Figure ES.7**
**Sources of Water Available to Region C as of 2060**

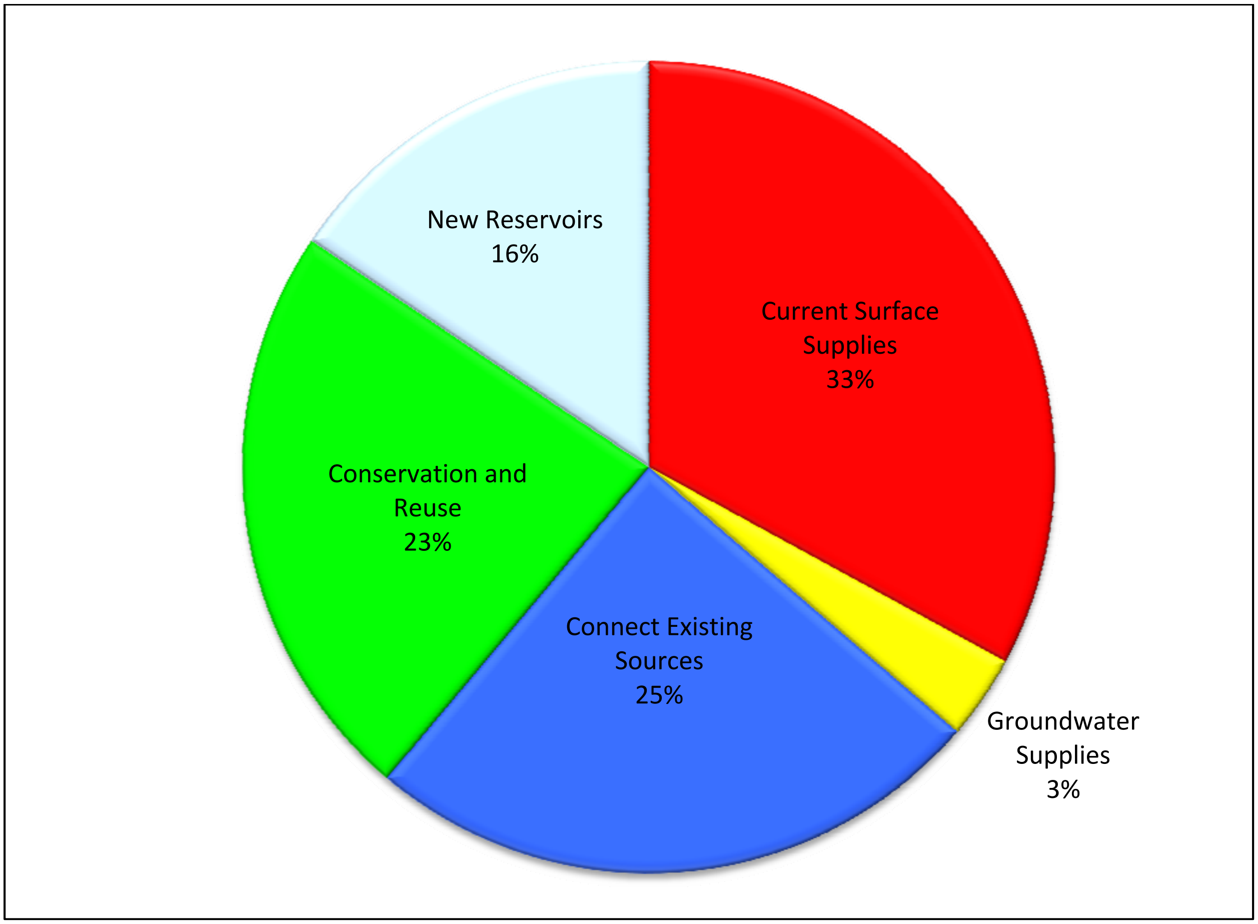


**Table ES.2**
**2060 Supplies for the Largest Wholesale Providers and for Region C**

| Wholesale Water Provider | Supplies Available in 2060 from Current Sources [(a)] | Supplies Available in 2060 from New Strategies[(a)] | Total Supplies Available in 2060[(a)] | % of Total Supply from Conservation and Reuse | Cost of Strategies (Millions) |
|---|---|---|---|---|---|
| Dallas Water Utilities | 548,580 | 559,802 | 1,108,356 | 22.1% | $3,836 |
| Tarrant Regional Water District | 508,333 | 626,185 | 1,134,518 | 18.2% | $4,735 |
| North Texas Municipal Water District | 421,405 | 631,862 | 1,053,267 | 24.4% | $5,266 |
| City of Fort Worth | 278,645 | 340,031 | 618,676 | 14.4% | $1,056 |
| Trinity River Authority | 125,822 | 116,441 | 242,263 | 35.8% | $186 |
| Upper Trinity Regional Water District | 56,025 | 137,990 | 194,015 | 26.3% | $1,129 |
| Greater Texoma Utility Authority | 19,560 | 63,736 | 83,296 | 6.0% | $240 |
| **Total for Region C[(c)]** | **1,774,509** | **2,207,790[(b)]** | **3,982,299[(b)]** | **23.3%[(b)]** | **$19,088** |

Notes:

(a) Some supplies are used by more than one supplier. For example, TRWD supplies water to TRA and Fort Worth, DWU supplies water to UTRWD, etc.

(b) These values are estimated.

(c) Total for Region C is not a sum of the numbers above. It includes other providers as well. Some supplies serve multiple suppliers.

# COLLIN COUNTY


COLLIN COUNTY COURTHOUSE

***2000 Population:*** 491,774

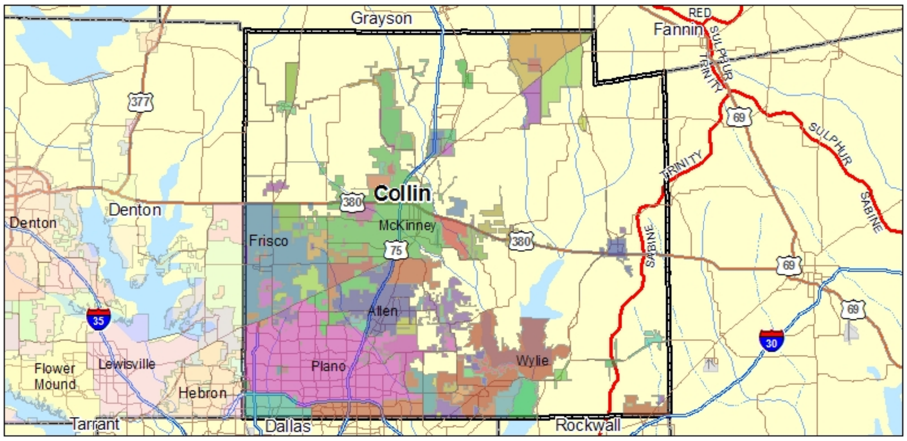
***Projected 2060 Population:*** 1,938,067

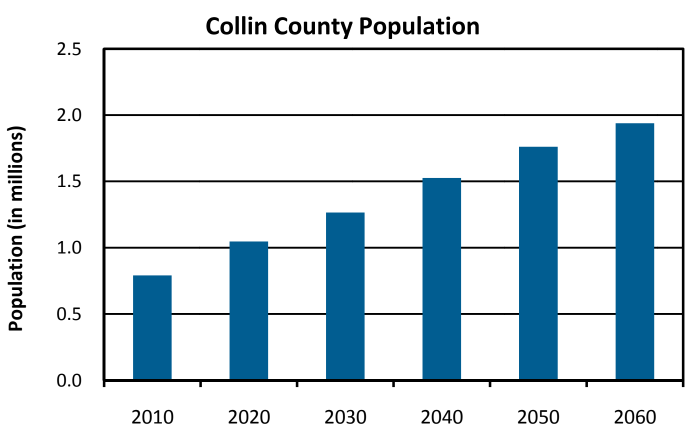
***County Seat:*** McKinney

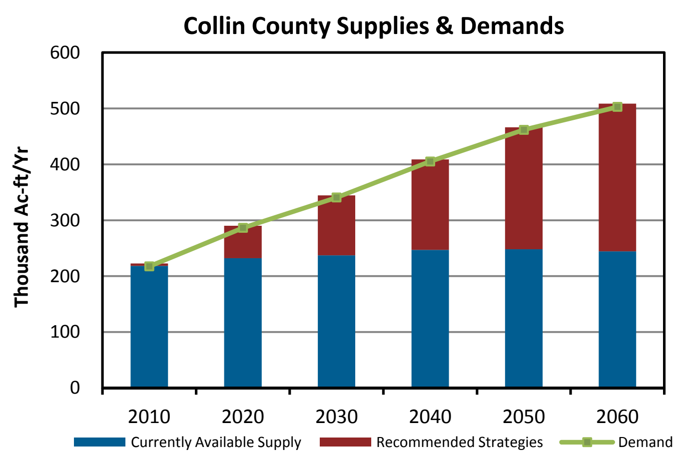
***Economy:*** Government/services; manufacturing; retail and wholesale

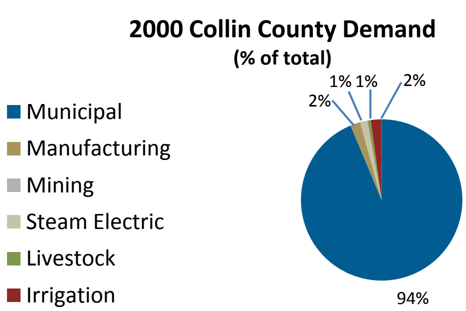
***River Basin(s):***

- Trinity (94%), Sabine (6%)

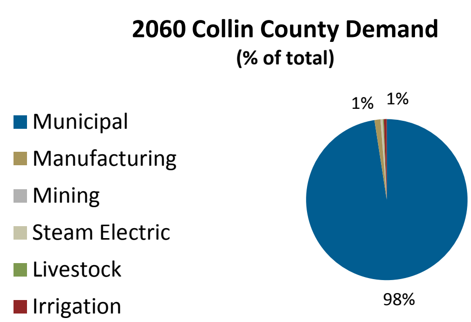



**Total=138,306 acre-feet**




**Total= 502,770 acre-feet**

| WATER USER GROUP | 2060 COLLIN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Allen | 27,694 | NTMWD | Additional NTMWD supplies |
| Anna | 12,568 | Trinity and Woodbine Aquifers, NTMWD (Collin-Grayson Municipal Alliance) | Supplemental wells, Additional NTMWD supplies (CGMA) |
| Blue Ridge | 2,782 | Woodbine Aquifer | Supplemental wells, NTMWD supplies |
| Caddo Basin SUD [a] | 1,541 | NTMWD | Additional NTMWD supplies |
| Celina [a] | 36,293 | Trinity and Woodbine Aquifers, UTRWD | Supplemental wells, Additional UTRWD supplies, NTMWD Supplies |
| Culleoka WSC | 2,506 | NTMWD (through Princeton) | Additional NTMWD supplies (through Princeton) |
| Dallas [a] | 20,005 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| Danville WSC | 2,306 | NTMWD (through McKinney) | Additional NTMWD supplies (through McKinney) |
| East Fork SUD [a] | 1,802 | NTMWD | Additional NTMWD supplies |
| Fairview | 6,593 | NTMWD | Additional NTMWD supplies |
| Farmersville | 5,041 | NTMWD | Additional NTMWD supplies |
| Frisco [a] | 54,480 | NTMWD | Additional NTMWD supplies, Direct reuse |
| Garland [a] | 0 | NTMWD | Additional NTMWD supplies |
| Hickory Creek SUD [a] | 29 | Woodbine Aquifer (Region D) | None |
| Josephine [a] | 660 | NTMWD | Additional NTMWD supplies |
| Lavon WSC [a] | 3,596 | NTMWD | Additional NTMWD supplies |
| Lowry Crossing | 551 | NTMWD (through Milligan WSC) | Additional NTMWD supplies (through Milligan WSC) |
| Lucas | 4,537 | NTMWD | Additional NTMWD supplies |
| Marilee SUD [a] | 1,360 | Trinity Aquifer, Grayson County Water Supply Project | Supplemental wells, Additional Grayson County WSP |
| McKinney | 102,157 | NTMWD | Additional NTMWD supplies |
| Melissa | 16,570 | Woodbine Aquifer, NTMWD (Collin-Grayson Municipal Alliance), NTMWD (through McKinney) | Supplemental wells, Additional NTMWD supplies (CGMA), Treated water supply line from NTMWD |
| Milligan WSC | 183 | NTMWD | Additional NTMWD supplies |
| Murphy | 8,556 | NTMWD | Additional NTMWD supplies |
| Nevada | 5,226 | NTMWD (through Nevada WSC) | Additional NTMWD supplies (through Nevada WSC) |
| New Hope | 3,148 | NTMWD (through North Collin WSC) | Additional NTMWD supplies (through North Collin WSC) |
| North Collin WSC | 2,005 | NTMWD | Additional NTMWD supplies |
| Parker | 19,338 | NTMWD | Additional NTMWD supplies |
| Plano [a] | 75,921 | NTMWD | Additional NTMWD supplies |

| WATER USER GROUP | 2060 COLLIN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [B] |
|---|---|---|---|
| Princeton | 16,130 | NTMWD | Additional NTMWD supplies |
| Prosper [a] | 13,498 | Woodbine Aquifer, NTMWD, UTRWD | Supplemental wells, Additional NTMWD supplies, Additional UTRWD supplies |
| Richardson [a] | 10,359 | NTMWD | Additional NTMWD supplies |
| Royse City [a] | 4,307 | NTMWD | Additional NTMWD supplies |
| Sachse [a] | 1,362 | NTMWD | Additional NTMWD supplies |
| Saint Paul | 1,848 | NTMWD | Additional NTMWD supplies |
| South Grayson WSC [a] | 225 | Trinity and Woodbine Aquifers | Supplemental wells, NTMWD and GTUA supplies (CGMA), Grayson County Water Supply Project |
| Weston | 12,702 | Woodbine Aquifer | Supplemental wells, NTMWD supplies |
| Wylie [a] | 12,052 | NTMWD | Additional NTMWD supplies |
| County-Other | 504 | Trinity and Woodbine Aquifers, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Irrigation | 2,995 | Direct reuse, Other and Trinity Aquifers, Local supplies, DWU | Supplemental wells |
| Livestock | 884 | Other Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 6,115 | Woodbine Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Mining | 341 | Local supplies, NTMWD | Additional NTMWD supplies |
| Steam Electric Power | 2,000 | NTMWD | Additional NTMWD supplies |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.


***2000 Population:*** 36,363

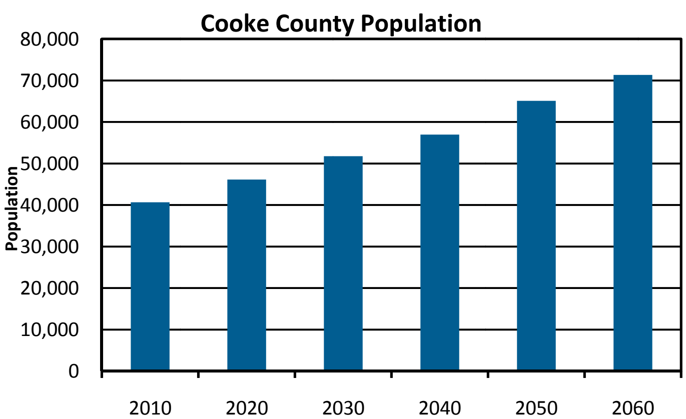
***Projected 2060 Population:*** *71,328*

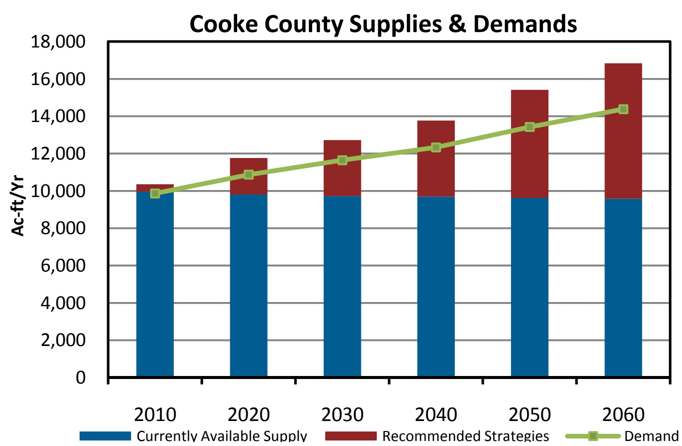
***County Seat:*** Gainesville

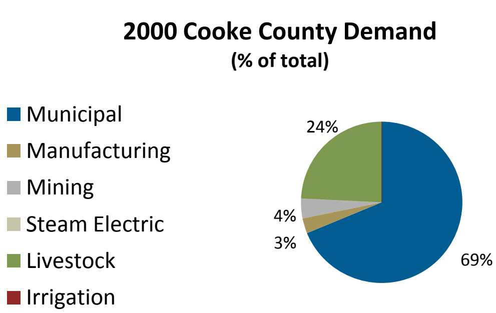
***Economy:*** *Oil, agribusiness, tourism, manufacturing*

***River Basin(s):***

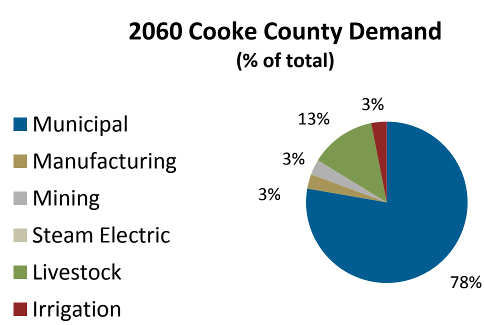
- *Trinity (67%), Red (32%)*


**Total=7,270 acre-feet**




**Total= 14,381 acre-feet**

| WATER USER GROUP | 2060 COOKE CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bolivar WSC [a] | 285 | Trinity Aquifer | Supplemental wells, UTRWD supplies, Cooke County Water Supply Project |
| Gainesville | 5,522 | Trinity Aquifer, Moss Lake | Supplemental wells, Overdraft Trinity Aquifer (2010), Cooke County Water Supply Project (raw water delivery and water treatment) |
| Kiowa Homeowners WSC | 947 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| Lindsay | 160 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| Muenster | 414 | Trinity Aquifer | Supplemental wells, Develop Muenster Lake supply |
| Two Way SUD [a] | 11 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Valley View | 1,714 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| Woodbine WSC [a] | 902 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| County-Other | 1,222 | Trinity, Woodbine, and Other Aquifers | Supplemental wells, Cooke County Water Supply Project |
| Irrigation | 444 | Trinity and Other Aquifers, Direct reuse (Gainesville), Local supplies | Supplemental wells, Overdraft of Trinity Aquifer (2010), Cooke County Water Supply Project, Additional reuse |
| Livestock | 1,898 | Trinity Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 421 | Trinity Aquifer, Gainesville | Supplemental wells, Muenster Lake, Cooke County Water Supply Project |
| Mining | 441 | Trinity Aquifer, Local supplies | Supplemental wells, Overdraft Trinity Aquifer (2010), Reuse, Cooke County Water Supply Project |
| Steam Electric Power | 0 | None | None |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.


***2000 Population:*** *2,218,774*

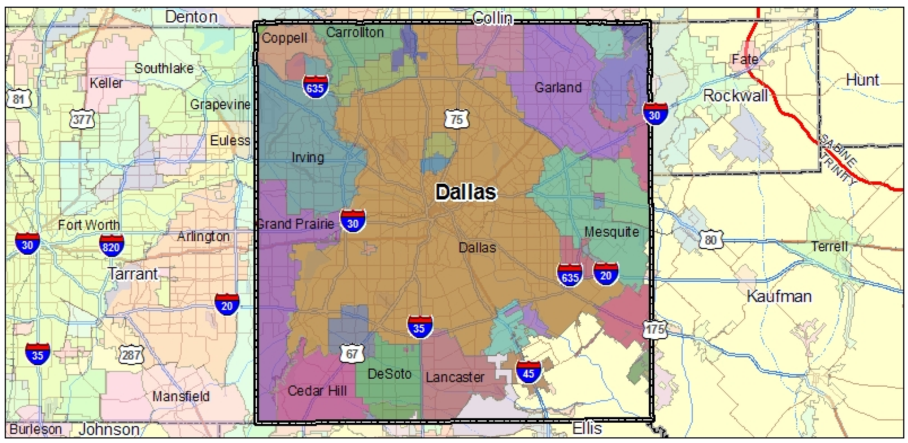
***Projected 2060 Population:*** *3,695,125*

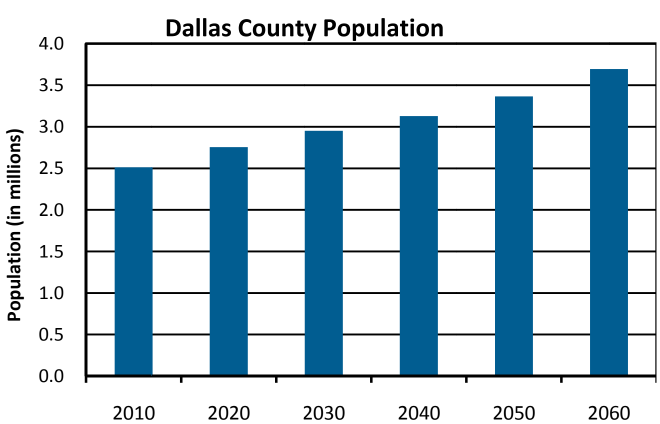
***County Seat:*** *Dallas*

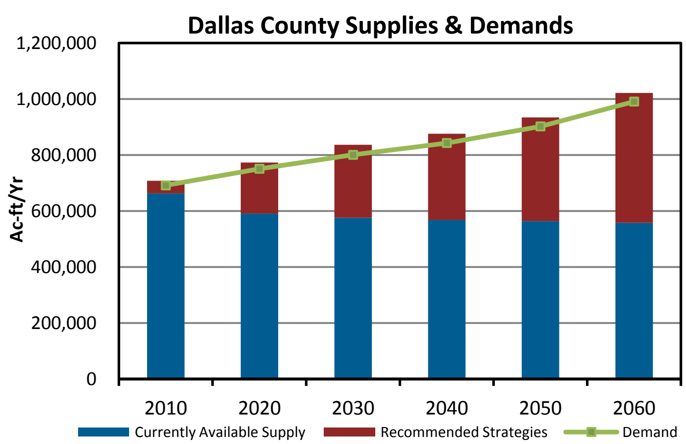
***Economy:*** *Telecommunications, transportation, manufacturing, government/services.*

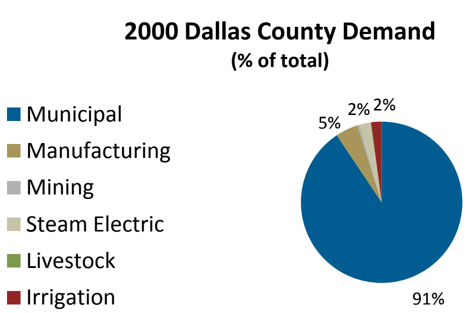
***River Basin(s):***

- Trinity (100%)

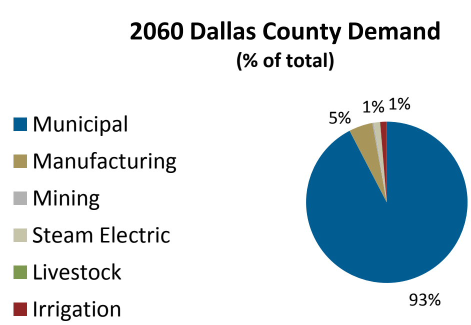



**Total=623,535 acre-feet**




**Total= 991,021 acre-feet**

| WATER USER GROUP | 2060 DALLAS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Addison | 12,218 | DWU | Additional DWU supplies |
| Balch Springs | 3,028 | Dallas County WCID #6 (from DWU) | Additional DCWCID #6 (from DWU) |
| Carrollton [a] | 10,946 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Cedar Hill [a] | 17,270 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Cockrell Hill | 668 | DWU | Additional DWU supplies |
| Combine [a] | 188 | Combine WSC (from DWU) | Additional Combine WSC (from DWU) |
| Combine WSC [a] | 373 | DWU | Additional DWU supplies |
| Coppell [a] | 11,157 | DWU | Additional DWU supplies |
| Dallas [a] | 539,023 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| Dallas Co. WCID #6 | Balch Springs | DWU | Additional DWU supplies |
| Desoto | 18,271 | DWU | Additional DWU supplies |
| Duncanville | 7,356 | DWU | Additional DWU supplies |
| East Fork SUD [a] | 132 | NTMWD | Additional NTMWD supplies |
| Farmers Branch | 14,945 | DWU | Additional DWU supplies |
| Garland [a] | 42,190 | NTMWD | Additional NTMWD supplies |
| Glenn Heights [a] | 1,820 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU |
| Grand Prairie [a] | 38,514 | Trinity Aquifer, DWU, Fort Worth (TRWD), Joe Pool Lake (for Irrigation) | Supplemental wells, Additional DWU supplies, Additional Fort Worth supplies, Midlothian (TRWD), Mansfield (TRWD), Arlington (TRWD) |
| Highland Park | 4,319 | Dallas County Park Cities MUD | None |
| Hutchins | 3,497 | DWU | Additional DWU supplies |
| Irving | 78,126 | DWU, Lake Chapman | Additional DWU supplies, Direct reuse, Oklahoma (Lake Hugo), Chapman booster pump station (w/ NTMWD), Princeton pump station expansion |
| Lancaster | 9,363 | DWU, Rockett SUD | Additional DWU supplies and new delivery point, Additional Rockett SUD |
| Lewisville [a] | 1 | DWU | Additional DWU supplies, WTP expansions, New WTP |
| Mesquite [a] | 34,530 | NTMWD | Additional NTMWD supplies |
| Ovilla [a] | 630 | DWU | Additional DWU supplies |
| Richardson [a] | 24,984 | NTMWD | Additional NTMWD |
| Rockett SUD [a] | 616 | Midlothian (TRA), TRA from TRWD | Additional TRA from TRWD, WTP expansions |
| Rowlett [a] | 17,236 | NTMWD | Additional NTMWD supplies |
| Sachse [a] | 4,384 | NTMWD | Additional NTMWD supplies |

| WATER USER GROUP | 2060 DALLAS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [B] |
|---|---|---|---|
| Sardis-Lone Elm WSC [a] | 7 | Trinity Aquifer | Supplemental wells, Rockett SUD (TRA from TRWD), Overdraft Trinity Aquifer (2010) |
| Seagoville [a] | 4,180 | DWU | Additional DWU supplies |
| Sunnyvale | 4,618 | NTMWD | Additional NTMWD supplies |
| University Park | 8,030 | Dallas County Park Cities MUD | None |
| Wilmer | 2,563 | Trinity Aquifer, Hutchins (DWU) | Supplemental wells, Additional Hutchins (DWU) |
| Wylie [a] | 209 | NTMWD | Additional NTMWD supplies |
| County-Other | 47 | Trinity and Woodbine Aquifers, DWU | Supplemental wells |
| Irrigation | 13,087 | Other Aquifer, DWU, Indirect Reuse (TRA), Direct Reuse (DWU), Local supplies, Joe Pool Lake (Grand Prairie) | Supplemental wells, Additional DWU supplies, Additional TRA reuse (Las Colinas) |
| Livestock | 482 | Woodbine Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 46,983 | DWU, NTMWD, Irving (Lake Chapman), Reuse, Trinity and Woodbine Aquifers | Additional NTMWD supplies, Additional DWU supplies, Supplemental wells |
| Mining | 3,030 | Trinity, Woodbine, and Other Aquifers, DWU, Local supplies | Supplemental wells, Additional DWU supplies |
| Steam Electric Power | 12,000 | NTMWD, DWU, Mountain Creek Lake, Run of River | Additional NTMWD supplies, Additional DWU supplies, Reuse (TRA) |

[a] WUG is in multiple counties

[b] Water conservation is a strategy for every municipal user group.

***2000 Population:*** *432,976*

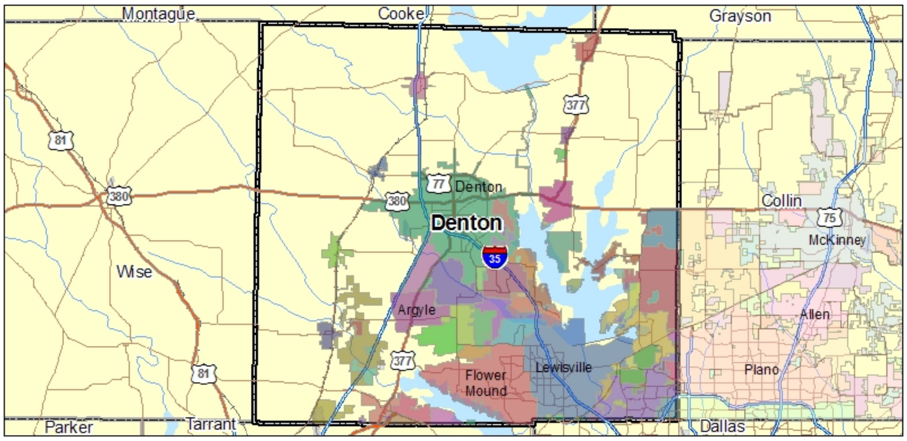
***Projected 2060 Population:*** *1,839,507*

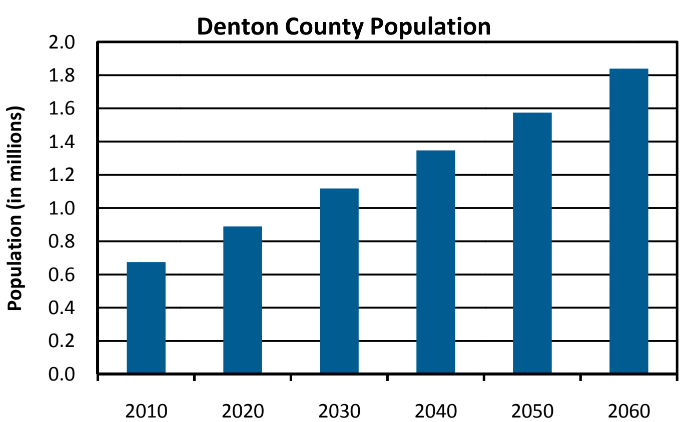
***County Seat:*** *Denton*

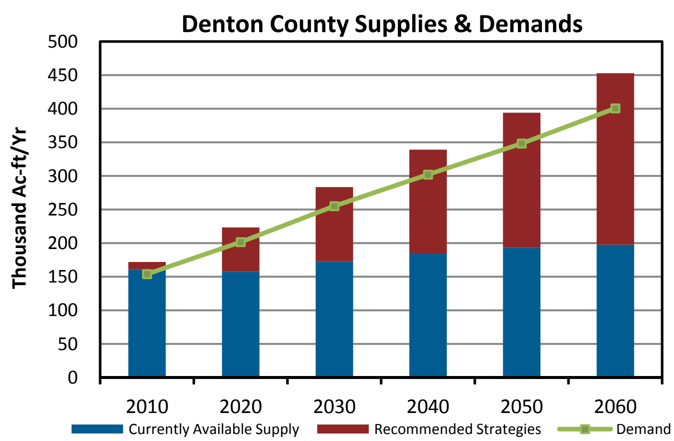
***Economy:*** *Industry; tourism; government/services*

***River Basin(s):***

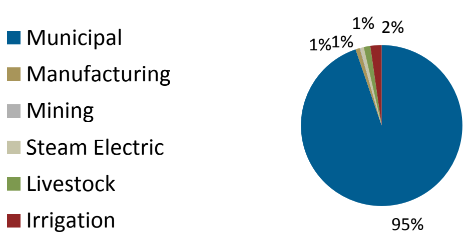
– Trinity (100%)



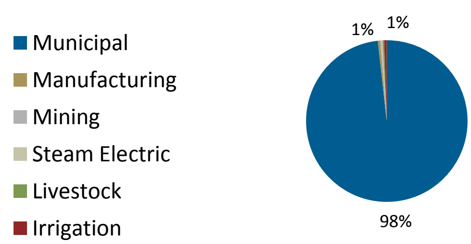




**2000 Denton County Demand**
**(% of total)**




**Total=93,982 acre-feet**

**2060 Denton County Demand**
**(% of total)**




**Total= 400,618 acre-feet**

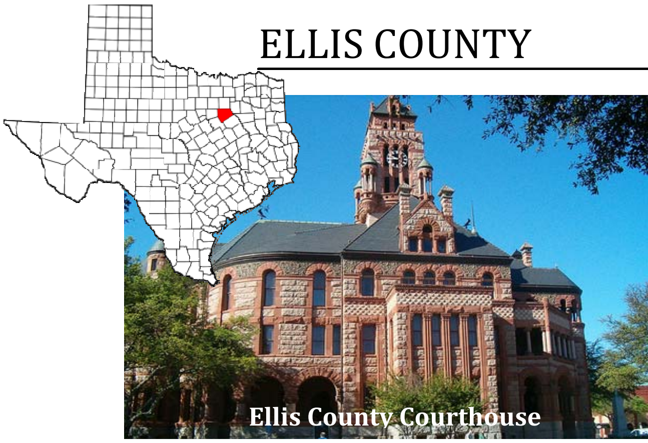
| WATER USER GROUP | 2060 DENTON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Argyle | 5,827 | Argyle WSC | Additional Argyle WSC |
| Argyle WSC | 1,212 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Aubrey | 3,285 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Bartonville | 1,042 | Bartonville WSC | Additional Bartonville WSC |
| Bartonville WSC | 466 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Bolivar WSC [a] | 13,504 | Trinity Aquifer | Supplemental wells, UTRWD supplies, Cooke County Water Supply Project |
| Carrollton [a] | 16,686 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Celina [a] | 4,384 | Trinity and Woodbine Aquifers, UTRWD | Supplemental wells, Additional UTRWD supplies, NTMWD supplies |
| Coppell [a] | 283 | DWU | Additional DWU supplies |
| Copper Canyon | 740 | Bartonville WSC | Additional Bartonville WSC |
| Corinth | 6,845 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Cross Roads | 1,230 | Mustang SUD | Additional Mustang SUD |
| Dallas [a] | 8,270 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| Denton | 98,275 | Lake Ray Roberts, Lake Lewisville, Direct reuse, Indirect reuse, DWU | Additional DWU supplies, Additional WTP capacity |
| Denton County FWSD #1 | 3,894 | UTRWD, Lewisville (DWU) | Additional UTRWD supplies, Additional Lewisville supplies (DWU) |
| Double Oak | 692 | Bartonville WSC | Additional Bartonville WSC |
| Flower Mound | 32,085 | DWU, UTRWD | Additional DWU and UTRWD supplies |
| Fort Worth [a] | 33,069 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| Frisco [a] | 34,280 | NTMWD | Additional NTMWD supplies, Direct reuse |
| Hackberry | 326 | Trinity Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Hebron | 109 | Carrollton (DWU) | Additional Carrollton (DWU) |
| Hickory Creek | 1,405 | Lake Cities MUA | Additional Lake Cities MUA |
| Highland Village | 4,274 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Justin | 3,551 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Krugerville | 613 | Mustang SUD | Additional Mustang SUD |
| Krum | 1,066 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Lake Dallas | 1,680 | Lake Cities MUA | Additional Lake Cities MUA |

| WATER USER GROUP | 2060 DENTON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES (B) |
|---|---|---|---|
| Lewisville [a] | 33,612 | DWU | Additional DWU supplies, New WTP and WTP expansions |
| Lincoln Park | 234 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Little Elm | 8,321 | Woodbine Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies, Additional groundwater |
| Mustang SUD | 6,949 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Northlake | 3,197 | Woodbine Aquifer, Fort Worth (TRWD), UTRWD | Supplemental wells, Additional Fort Worth (TRWD), Additional UTRWD supplies |
| Oak Point | 2,868 | Mustang SUD | Additional Mustang SUD |
| Pilot Point | 2,335 | Trinity Aquifer | Supplemental wells, Additional Trinity Aquifer, UTRWD supplies |
| Plano [a] | 2,176 | NTMWD | Additional NTMWD supplies |
| Ponder | 3,448 | Trinity Aquifer | Supplemental wells, UTRWD supplies |
| Prosper [a] | 6,749 | Woodbine Aquifer, NTMWD, UTRWD | Supplemental wells, Additional NTMWD supplies, Additional UTRWD supplies |
| Roanoke | 7,013 | Trinity Aquifer, Fort Worth (TRWD) | Supplemental wells, Additional Fort Worth (TRWD) |
| Sanger | 4,033 | Trinity Aquifer, Bolivar WSC | Supplemental wells, Additional Bolivar WSC |
| Shady Shores | 604 | Lake Cities MUA | Additional Lake Cities MUA |
| Southlake [a] | 1,306 | Fort Worth (TRWD) | Additional Fort Worth (TRWD) |
| The Colony | 9,087 | Trinity Aquifer, DWU, Plano (NTMWD) | Supplemental wells, Additional DWU supplies, Additional Plano (NTMWD) |
| Trophy Club | 4,306 | Trinity Aquifer, Fort Worth (TRWD) | Supplemental wells, Additional Fort Worth (TRWD) |
| County-Other | 18,169 | Other, Trinity, and Woodbine Aquifers, UTRWD, Fort Worth (TRWD) | Supplemental wells, Additional groundwater, Additional UTRWD supplies, Additional Fort Worth supplies |
| Irrigation | 2,108 | Woodbine Aquifer, DWU, Direct reuse | Supplemental wells, Additional direct reuse (TRA), Additional Groundwater |
| Manufacturing | 1,880 | Trinity Aquifer, Denton (treated water and direct reuse), DWU, NTMWD, UTRWD | Supplemental wells, Additional groundwater, Additional Denton supplies, Additional DWU supplies, Additional NTMWD supplies, Additional UTRWD supplies |
| Livestock | 1,235 | Trinity and Woodbine Aquifers, Local supplies | Supplemental wells |
| Mining | 751 | Trinity Aquifer, Local supplies, UTRWD | Supplemental wells, Additional Groundwater supplies, Additional UTRWD supplies |
| Steam Electric Power | 1,144 | Denton (direct reuse) | Additional Groundwater supplies |

[a] WUG is in multiple counties

[b] Water conservation is a strategy for every municipal user group.

# ELLIS COUNTY




***2000 Population:*** *111,360*

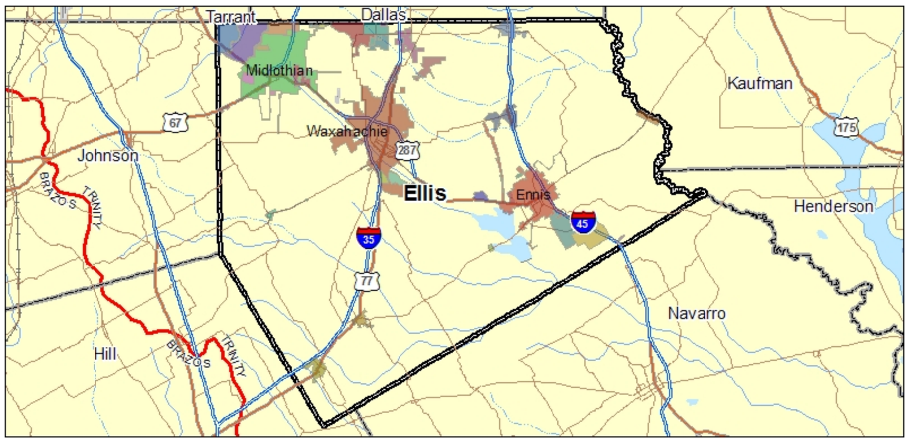
***Projected 2060 Population:*** *471,317*

***County Seat:*** *Waxahachie*

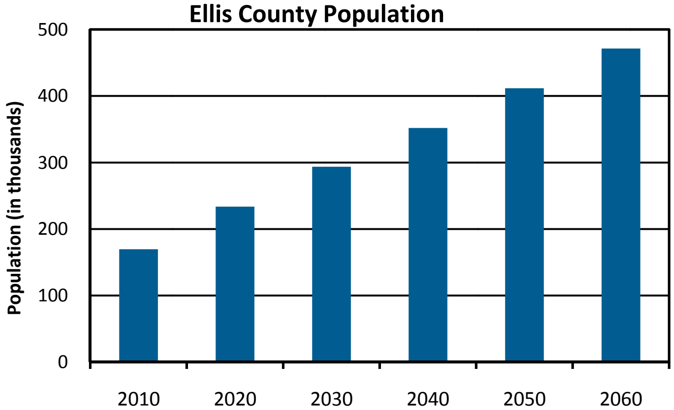
***Economy:*** *Cement, steel production; warehousing and distribution; government/services*

***River Basin(s):***

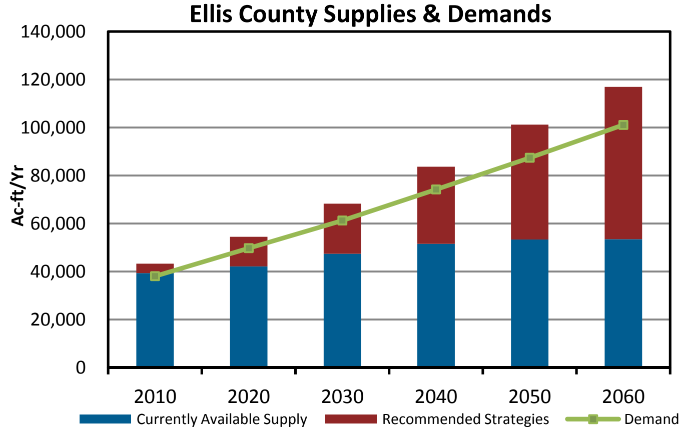
– Trinity (100%)



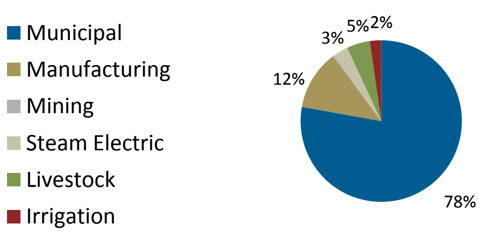

**Ellis County Population**




**Ellis County Supplies & Demands**

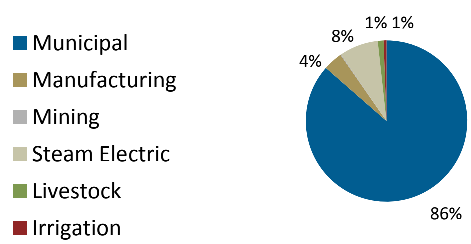



**2000 Ellis County Demand**
**(% of total)**




**Total=25,469 acre-feet**

**2060 Ellis County Demand**
**(% of total)**



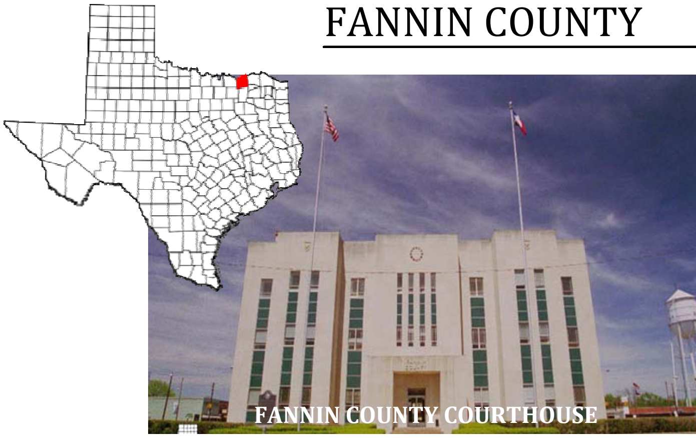

**Total= 101,095 acre-feet**

| WATER USER GROUP | 2060 ELLIS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bardwell | 248 | Woodbine Aquifer and Desalination | Supplemental wells, Ennis (TRWD through TRA) |
| Brandon-Irene WSC [a] | 15 | Lake Aquilla (Aquilla WSD) | None |
| Buena Vista-Bethel SUD | 4,180 | Trinity Aquifer, Waxahachie (TRWD through TRA) | Supplemental wells, Additional Waxahachie supplies, Overdraft Trinity Aquifer (2010) |
| Cedar Hill | 10 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Community Water Company [a] | 304 | Ennis | Additional Ennis |
| Ennis | 11,308 | Lake Bardwell (TRA), TRWD (through TRA), Direct reuse | Indirect reuse (TRA), Additional TRWD, WTP expansions |
| Ferris | 700 | Woodbine Aquifer, Rockett SUD | Supplemental wells, Rockett SUD |
| Files Valley WSC | 309 | Aquilla WSD (Lake Aquilla) | Ellis County Water Supply Project |
| Glenn Heights [a] | 1,014 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU |
| Grand Prairie [a] | 1,842 | Trinity Aquifer, Fort Worth (TRWD), Joe Pool Lake (irrigation), DWU | Supplemental wells, Midlothian (TRWD), Additional DWU, Mansfield (TRWD), Arlington (TRWD), Additional Fort Worth |
| Italy | 489 | Trinity and Woodbine Aquifers | Supplemental wells, Waxahachie (TRWD through TRA) |
| Johnson County SUD [a] | 122 | Mansfield (TRWD), Other supplies in Region G | Additional Mansfield, Grand Prairie |
| Mansfield [a] | 2,850 | TRWD | WTP expansions, New WTP, Additional TRWD supplies |
| Maypearl | 272 | Trinity and Woodbine Aquifers | Supplemental wells, Waxahachie (TRWD through TRA) |
| Midlothian | 15,206 | TRA (Joe Pool Lake) | TRWD (through TRA), WTP expansions, New WTP |
| Milford | 122 | Woodbine Aquifer, Files Valley WSC (Lake Aquilla) | Supplemental wells |
| Mountain Peak WSC [a] | 2,452 | Trinity Aquifer, Midlothian | Supplemental wells, Additional Midlothian, Overdraft Trinity Aquifer (2010), New wells |
| Oak Leaf | 640 | Glenn Heights, Rockett SUD (TRWD) | Additional Glenn Heights, Additional Rockett SUD |
| Ovilla [a] | 2,355 | DWU | Additional DWU |
| Palmer | 342 | Woodbine Aquifer | Supplemental wells, Rockett SUD |
| Pecan Hill | 285 | Rockett SUD | None |
| Red Oak | 5,986 | Woodbine Aquifer, Rockett SUD, DWU | Supplemental wells, Additional Rockett SUD, Additional DWU |

| WATER USER GROUP | 2060 ELLIS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Rice WSC [a] | 338 | Ennis, Corsicana | Additional Ennis, Additional Corsicana |
| Rockett SUD [a] | 8,704 | Midlothian, TRWD (through TRA) | Additional TRWD (through TRA), WTP expansions |
| Sardis-Lone Elm WSC [a] | 4,010 | Trinity Aquifer | Supplemental wells, Overdraft Trinity Aquifer (2010), Rockett SUD |
| Venus | - | Midlothian (TRWD) | Additional Midlothian (TRWD) |
| Waxahachie | 21,341 | Lake Bardwell (TRA), Lake Waxahachie, TRWD (through TRA), Reuse, Rockett SUD | Additional TRWD (through TRA), Additional reuse, Water plant expansions |
| County-Other | 1,955 | Other, Trinity, and Woodbine Aquifers, Ennis, Waxahachie, TRWD | Supplemental wells, Rockett SUD, Additional Ennis, Additional Waxahachie, Additional Woodbine Aquifer |
| Irrigation | 583 | Trinity Aquifer, Local supplies, Reuse | New wells in Woodbine Aquifer, Supplemental wells |
| Livestock | 1,183 | Woodbine Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 3,912 | Trinity and Woodbine Aquifers, Midlothian, Waxahachie, Ennis | Supplemental wells, Additional Ennis, Additional Midlothian, Additional Waxahachie |
| Mining | 140 | Woodbine Aquifer | Supplemental wells |
| Steam Electric Power | 7,878 | Ennis direct reuse, Ennis, Midlothian | Additional Midlothian, TRA direct reuse, Waxahachie |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

# FANNIN COUNTY




***2000 Population:*** *31,242*

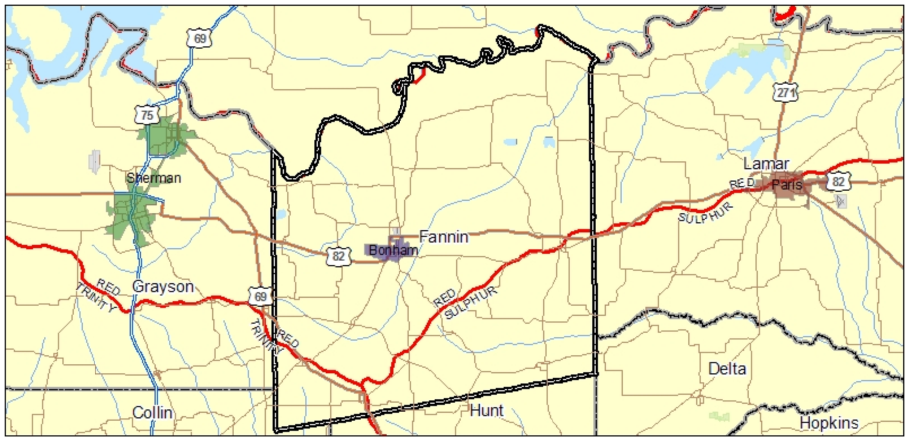
***Projected 2060 Population:*** *86,970*

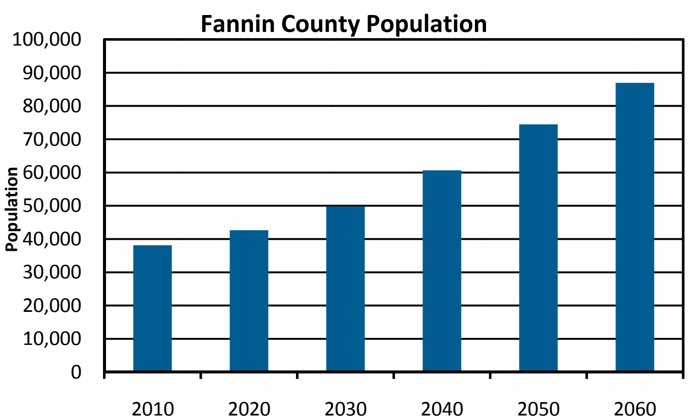
***County Seat:*** *Bonham*

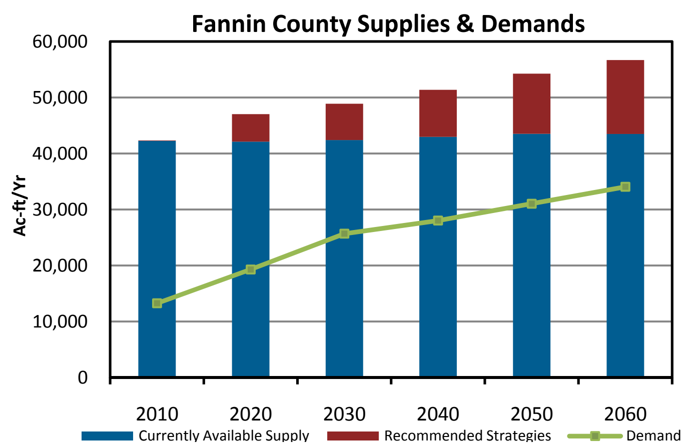
***Economy:*** *Communications; agriculture; government/services; petroleum distribution; tourism; varied manufacturing*

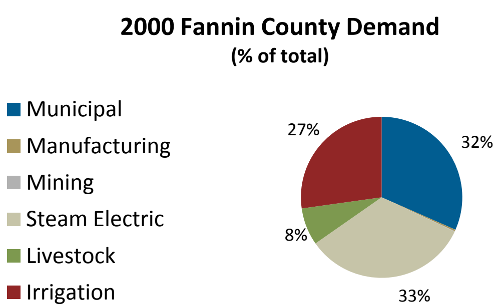
***River Basin(s):***

– Trinity (5%), Red (71%), Sulphur (23%)

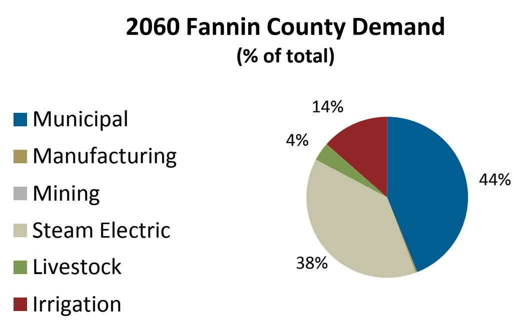



**Total=16,935 acre-feet**




**Total= 34,063 acre-feet**

| WATER USER GROUP | 2060 FANNIN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bonham | 7,253 | Lake Bonham (NTMWD Treatment) | Fannin County Water Supply Project, WTP expansion |
| Ector | 107 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Hickory Creek SUD [a] | 38 | Woodbine Aquifer (Region D) | None |
| Honey Grove | 856 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Ladonia | 1,055 | Trinity Aquifer | Supplemental wells, Lake Ralph Hall |
| Leonard | 1,299 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| North Hunt WSC [a] | 70 | Woodbine Aquifer | Supplemental wells |
| Savoy | 109 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Southwest Fannin County SUD [a] | 1,420 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Trenton | 1,550 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Whitewright [a] | 8 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| County-Other | 1,202 | Woodbine and Trinity Aquifers, Run-of-river, Lake Bonham | Supplemental wells, Fannin County Water Supply Project |
| Irrigation | 4,608 | Other Aquifer, Red River | Supplemental wells |
| Livestock | 1,270 | Woodbine and Trinity Aquifers, Local supplies | Supplemental wells |
| Manufacturing | 114 | Lake Bonham | None |
| Mining | 12 | Run-of-river | None |
| Steam Electric Power | 13,092 | Woodbine Aquifer, Lake Texoma | Supplemental wells |

[a] WUG is in multiple counties

[b] Water conservation is a strategy for every municipal user group.


***2000 Population:*** *17,867*

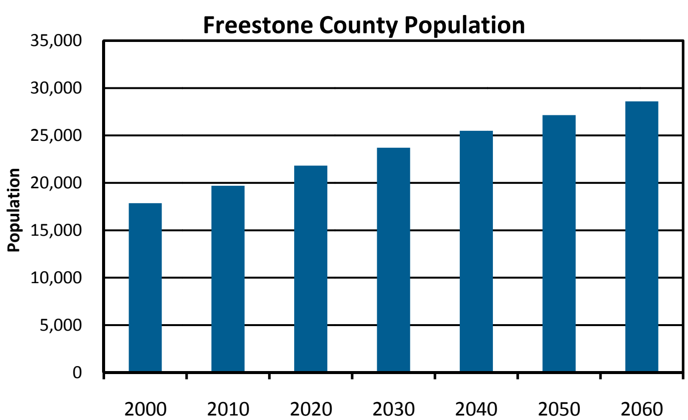
***Projected 2060 Population:*** *28,593*

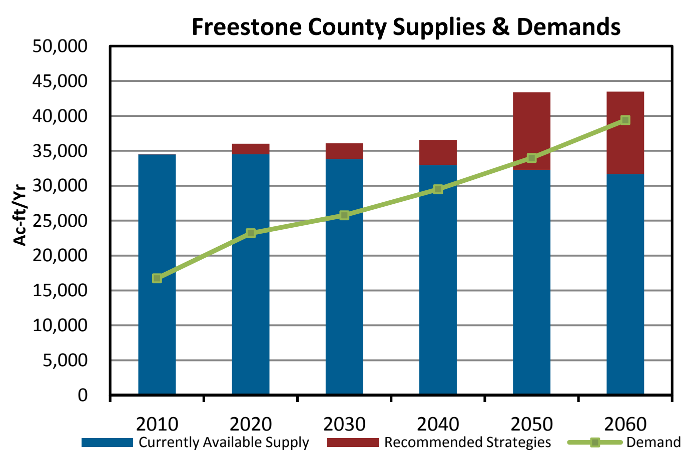
***County Seat:*** *Fairfield*

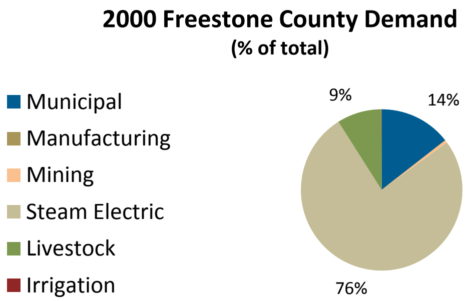
***Economy:*** *Natural gas, mining, electricity generating plants, agriculture.*

***River Basin(s):***

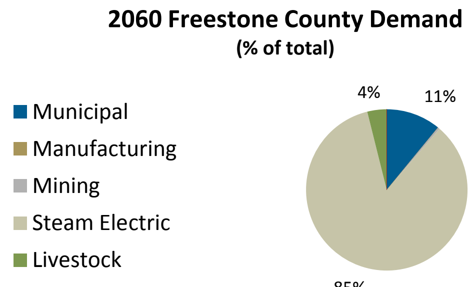
– Trinity (89%), Brazos (11%)


**Total= 17,107 acre-feet**

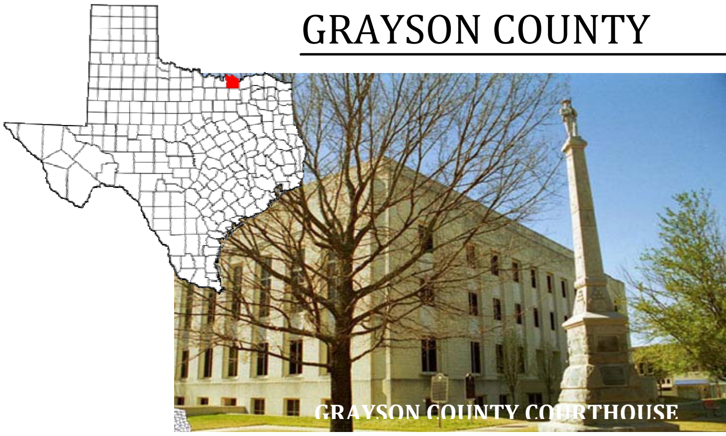



**Total= 39,396 acre-feet**

| WATER USER GROUP | 2060 FREESTONE CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Fairfield | 1,588 | Carrizo-Wilcox Aquifer | New WTP, TRWD, Additional Carrizo-Wilcox Aquifer, Supplemental wells |
| Flo Community WSC [a] | 19 | Carrizo-Wilcox Aquifer | Supplemental wells |
| Freestone County-Irrigation | 8 | Carrizo-Wilcox Aquifer, Local supplies | Supplemental wells |
| Freestone County-Livestock | 1,528 | Carrizo-Wilcox, Other, and Queen City Aquifers, Local supplies | Supplemental wells |
| Freestone County-Manufacturing | 0 | None | None |
| Freestone County-Mining | 149 | Carrizo-Wilcox Aquifer, Local supplies | Supplemental wells |
| Freestone County-Other | 1,229 | Carrizo-Wilcox Aquifer, Run-of-river, TRWD | Additional water from TRWD, Supplemental wells |
| Freestone County-Steam Electric Power | 33,398 | Carrizo-Wilcox Aquifer, Lake Fairfield, Lake Livingston (upstream diversion), TRWD | Supplemental wells, Additional water from TRWD through TRA, TRA reuse |
| Teague | 982 | Carrizo-Wilcox Aquifer | Supplemental wells, Additional Carrizo-Wilcox Aquifer |
| Wortham | 495 | Bistone Municipal Water Supply District (Carrizo-Wilcox Aquifer in Limestone County) | Corsicana, TRWD (through TRA), WTP expansion/rehabilitation |

[a] Freestone County portion only
[b] Water conservation is a strategy for every municipal user group

# GRAYSON COUNTY




***2000 Population:*** *110,595*

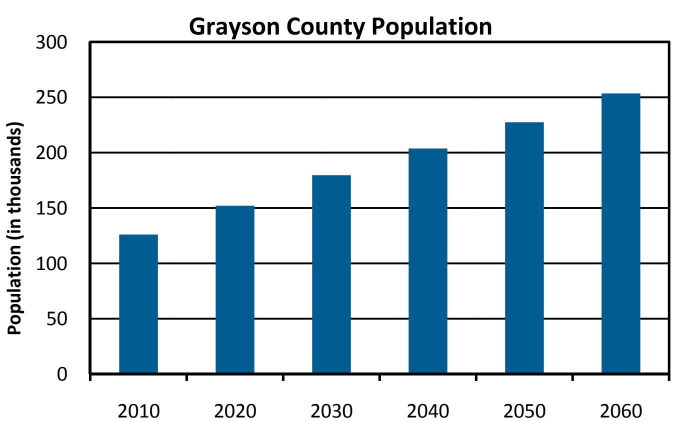
***Projected 2060 Population:*** *253,568*

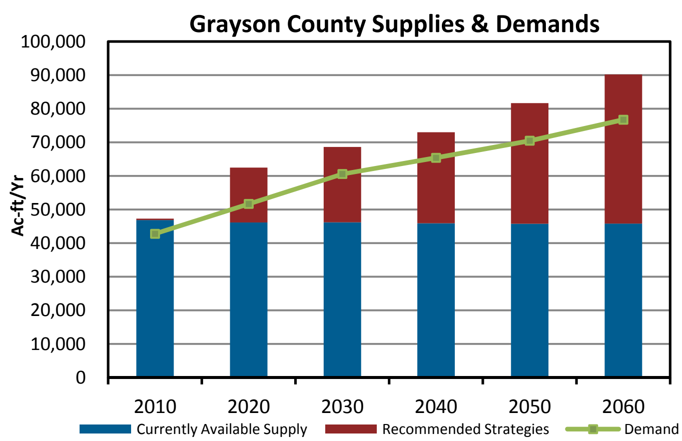
***County Seat:*** *Sherman*

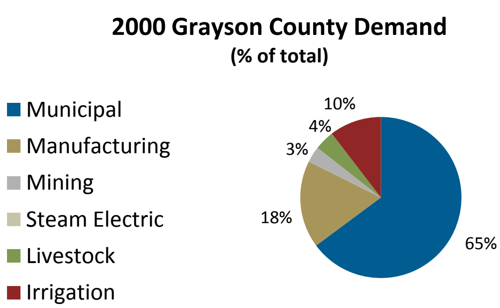
***Economy:*** *Manufacturing, distribution and trade; tourism; mineral production.*

***River Basin(s):***

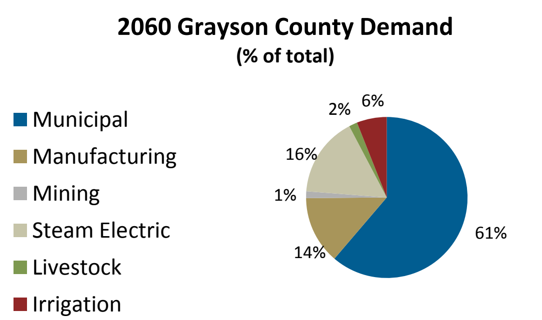
– Trinity (36%), Red (64%)


**Total=32,478 acre-feet**




**Total= 76,742 acre-feet**

| WATER USER GROUP | 2060 GRAYSON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bells | 493 | Trinity and Woodbine Aquifers | Supplemental wells, Grayson County Water Supply Project |
| Collinsville | 899 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Denison | 6,875 | Trinity and Woodbine Aquifers, Randell Lake, Lake Texoma | Supplemental wells, Water treatment plant expansion and additional Lake Texoma, infrastructure improvements |
| Gunter | 1,149 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Howe | 588 | Woodbine Aquifer, Collin-Grayson Municipal Alliance (GTUA & NTMWD) | Supplemental wells, Additional Collin-Grayson Municipal Alliance |
| Luella WSC | 1,365 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Marilee SUD [a] | 672 | Trinity Aquifer, Grayson County Water Supply Project | Supplemental wells, Additional Grayson County Water Supply Project |
| Pottsboro | 1,976 | Woodbine Aquifer, Denison | Supplemental wells, Grayson County Water Supply Project |
| Sherman | 19,804 | Trinity and Woodbine Aquifers, Lake Texoma (GTUA) | Supplemental wells, Grayson County Water Supply Project |
| South Grayson WSC [a] | 672 | Trinity and Woodbine Aquifers | Supplemental wells, Grayson County Water Supply Project, Collin-Grayson Municipal Alliance (GTUA & NTMWD) |
| Southmayd | 703 | Trinity Aquifer, Monarch Water Company (Woodbine Aquifer) | Supplemental wells, Woodbine Aquifer, Grayson County Water Supply Project |
| Southwest Fannin County SUD [a] | 46 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Tioga | 757 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Tom Bean | 448 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Two Way SUD [a] | 1,497 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Van Alstyne | 3,549 | Trinity and Woodbine Aquifers, Collin-Grayson Municipal Alliance (GTUA & NTMWD) | Supplemental wells, Additional Collin-Grayson Municipal Alliance |
| Whitesboro | 1,635 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Whitewright [a] | 1,411 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Woodbine WSC [a] | 13 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| County-Other | 2,461 | Other, Trinity, and Woodbine Aquifers, Sherman, Denison, Red River Authority | Supplemental wells, Grayson County Water Supply Project |

| WATER USER GROUP | 2060 GRAYSON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [B] |
|---|---|---|---|
| Irrigation | 4,616 | Woodbine Aquifer, Local supplies, Lake Texoma | Supplemental wells |
| Livestock | 1,297 | Woodbine Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 10,444 | Woodbine Aquifer, Local supplies, Sherman, Howe (Collin-Grayson Municipal Alliance – GTUA & NTMWD), Denison | Supplemental wells, Grayson County Water Supply Project, Additional Howe, Additional Dension |
| Mining | 1,046 | Trinity and Woodbine Aquifers | Supplemental wells |
| Steam Electric Power | 12,326 | Sherman [GTUA (Lake Texoma)] | Additional Lake Texoma (GTUA) |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.


***2000 Population:*** *51,984*

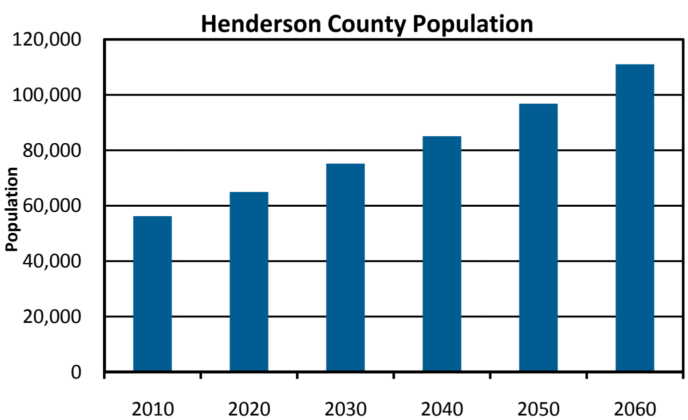
***Projected 2060 Population:*** *111,026*

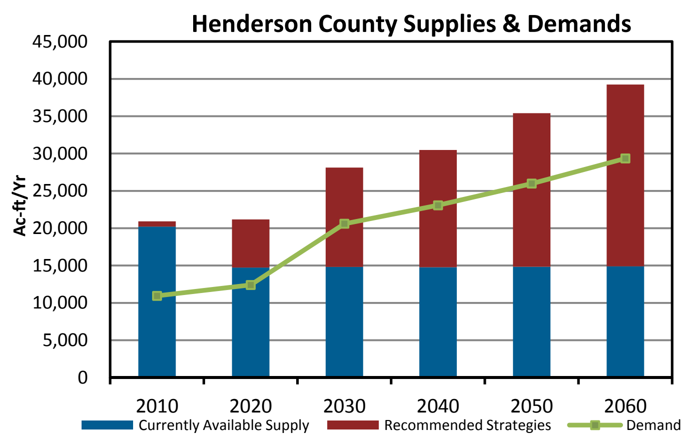
***County Seat:*** *Athens*

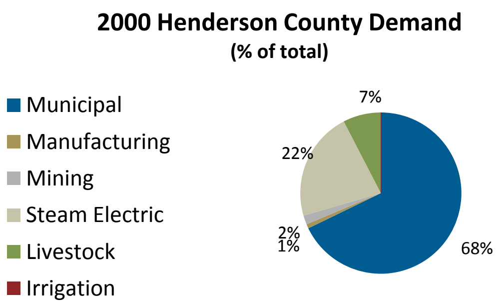
***Economy:*** *Agribusiness; manufacturing; minerals; tourism.*

***River Basin(s):***

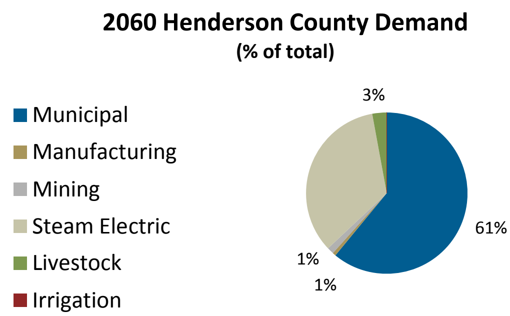
- Trinity (61%), Sabine (39%)


**Total=11,244 acre-feet**




**Total= 29,342 acre-feet**

| WATER USER GROUP | 2060 HENDERSON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGTIES [c] |
|---|---|---|---|
| Athens [a] | 6,306 | Carrizo-Wilcox Aquifer, Athens MWA (Lake Athens) | Supplemental wells, Additional Athens MWA supplies |
| Bethel-Ash WSC [a] | 342 | Carrizo-Wilcox Aquifer | Supplemental wells |
| East Cedar Creek FWSD | 2,777 | TRWD | Additional TRWD supplies, WTP expansions |
| Eustace | 137 | Carrizo-Wilcox Aquifer | Supplemental wells |
| Gun Barrel City | 2,720 | East Cedar Creek FWSD (TRWD), Mabank (TRWD) | Additional East Cedar Creek FWSD, TRWD supplies, Water Treatment Plant |
| Log Cabin | 141 | Carrizo-Wilcox Aquifer | Supplemental wells |
| Mabank [a] | 184 | TRWD sources | Additional TRWD supplies, WTP expansions |
| Malakoff | 434 | Carrizo-Wilcox Aquifer, TRWD | Supplemental wells |
| Payne Springs | 220 | Carrizo-Wilcox Aquifer | Supplemental wells, Additional Carrizo-Wilcox Aquifer |
| Seven Points | 385 | West Cedar Creek MUD (TRWD) | Additional West Cedar Creek MUD supplies |
| Tool | 695 | West Cedar Creek MUD (TRWD) | Additional West Cedar Creek MUD supplies |
| Trinidad | 190 | Trinidad City Lake | None |
| Virginia Hill WSC | 364 | Carrizo-Wilcox Aquifer | Supplemental wells |
| West Cedar Creek MUD [a] | 2,753 | TRWD | Additional TRWD supplies, Water Treatment Plant expansions |
| County-Other [b] | 246 | Carrizo-Wilcox Aquifer, Other Aquifer, TRWD | Supplemental wells |
| Irrigation [b] | 0 | Carrizo-Wilcox Aquifer, Direct reuse, Local supplies | Supplemental wells |
| Livestock [b] | 854 | Carrizo-Wilcox Aquifer, Other Aquifer, Queen City Aquifer, Local supplies | Supplemental wells |
| Manufacturing [b] | 195 | Carrizo-Wilcox Aquifer, Athens | Supplemental wells, Additional Athens supplies |
| Mining | 399 | Carrizo-Wilcox Aquifer, TRWD | Supplemental wells |
| Steam Electric Power [b] | 10,000 | Lake Trinidad | TRWD supplies |

[a] WUG is in multiple counties
[b] Region C only
[c] Water conservation is a strategy for every municipal user group.

# JACK COUNTY




JACK COUNTY COURTHOUSE

***2000 Population:*** *8,763*

***Projected 2060 Population:*** *12,415*

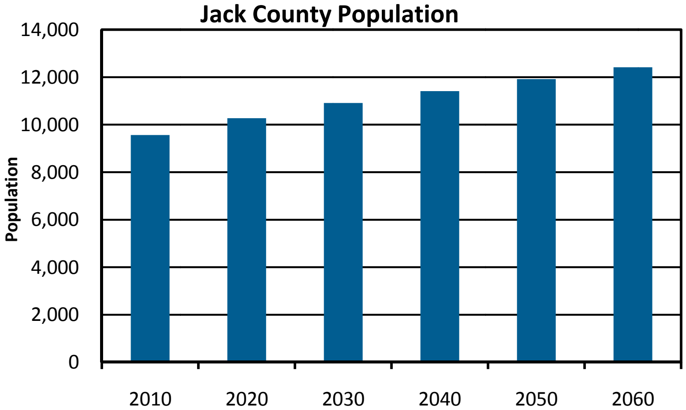
***County Seat:*** *Jacksboro*

***Economy:*** *Petroleum production, oil-field services, livestock, manufacturing tourism.*

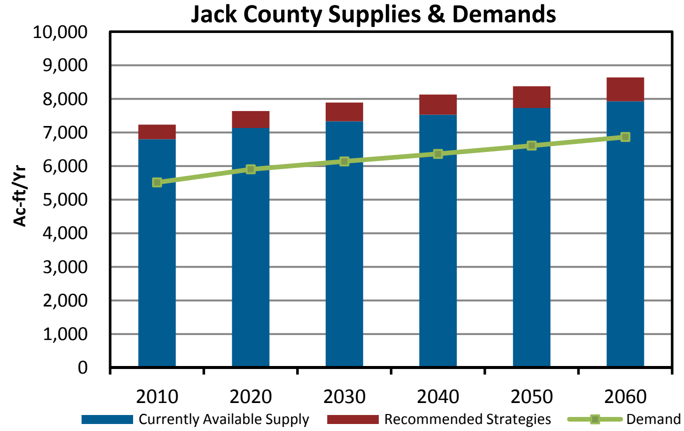
***River Basin(s):***

– Trinity (71%), Brazos (29%)

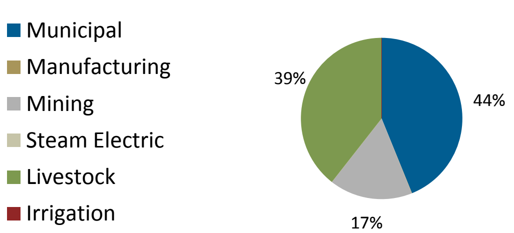

**Jack County Population**




**Jack County Supplies & Demands**

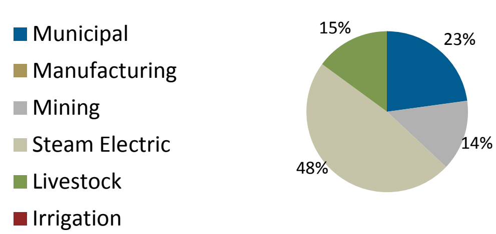



**2000 Jack County Demand**
**(% of total)**




**Total=2,600 acre-feet**

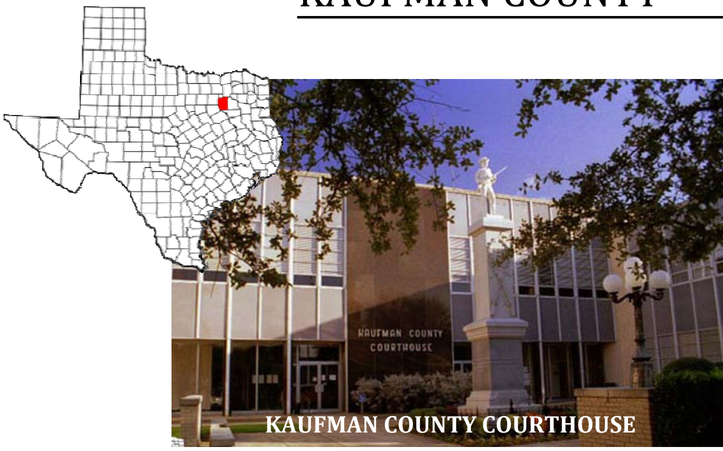
**2060 Jack County Demand**
**(% of total)**




**Total= 6,867 acre-feet**

| WATER USER GROUP | 2060 DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [a] |
|---|---|---|---|
| Bryson | 94 | Graham through Fort Belknap WSC | None |
| Jacksboro | 680 | Lost Creek/ Jacksboro System | None |
| County-Other | 793 | Other and Trinity Aquifers, Jacksboro (Lost Creek/Jacksboro System) | Supplemental wells, Additional Lost Creek/Jacksboro System |
| Irrigation | 0 | Other Aquifer, Local supplies, Indirect reuse, Direct reuse | Supplemental wells, Jacksboro Indirect reuse to mining |
| Livestock | 1,025 | Other Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 2 | Jacksboro (Lost Creek/Jacksboro System) | None |
| Mining | 973 | Other Aquifer, Local supplies | Supplemental wells, Lost Creek/Jacksboro System, Reuse (Jacksboro) |
| Steam Electric Power | 3,300 | TRWD | None |

[a] Water conservation is a strategy for every municipal user group.




***2000 Population:*** *71,313*

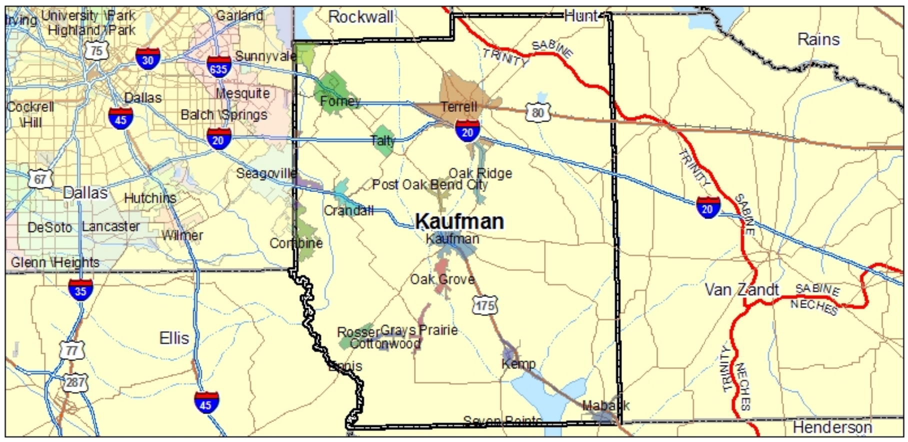
***Projected 2060 Population:*** *349,385*

***County Seat:*** *Kaufman*

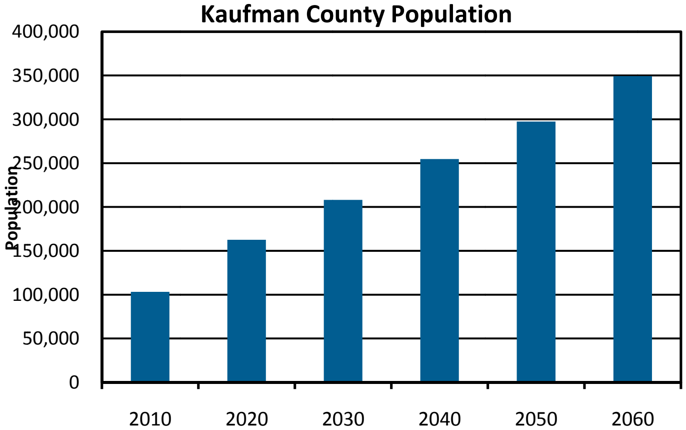
***Economy:*** *Manufacturing; government/services*

***River Basin(s):***

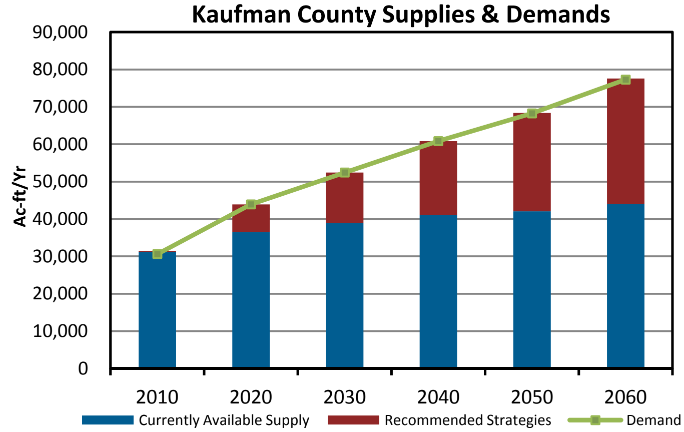
- Trinity (95%), Sabine (5%)



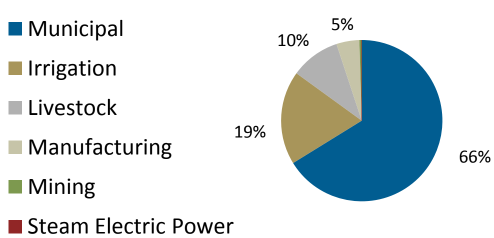

## Kaufman County Population




## Kaufman County Supplies & Demands

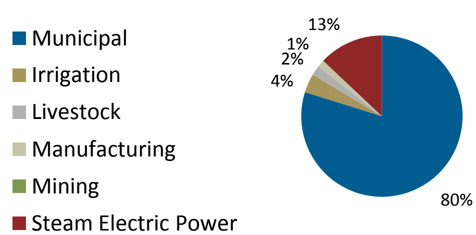



**2000 Kaufman County Demand**
**(% of total)**




**Total=15,523 acre-feet**

**2060 Kaufman County Demand**
**(% of total)**




**Total= 77,308 acre-feet**

| WATER USER GROUP | 2060 KAUFMAN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Ables Springs WSC [a] | 1,828 | SRA (through MacBee SUD) | NTMWD supplies (connect to Tawakoni WTP and additional capacity) |
| College Mound WSC | 2,623 | NTMWD | Additional NTMWD supplies |
| Combine [a] | 447 | Combine WSC (DWU) | Additional Combine WSC (DWU) |
| Combine WSC [a] | 1,189 | DWU | Additional DWU supplies |
| Crandall | 2,362 | NTMWD | Additional NTMWD supplies, DWU (through Seagoville) |
| Forney | 7,048 | NTMWD, Garland reuse (for SEP) | Additional NTMWD supplies |
| Forney Lake WSC [a] | 2,014 | NTMWD | Additional NTMWD supplies |
| Gastonia-Scurry WSC | 2,255 | NTMWD | Additional NTMWD supplies |
| High Point WSC [a] | 939 | Forney and Terrell (NTMWD) | Additional NTMWD supplies (through Forney and Terrell) |
| Kaufman | 3,029 | NTMWD | Additional NTMWD supplies |
| Kemp | 296 | TRWD | Additional TRWD supplies |
| Mabank [a] | 1,323 | TRWD | Additional TRWD supplies, Water Treatment Plant expansion |
| MacBee WSC [a] | 94 | SRA | None |
| Mesquite [a] | 2 | NTMWD | Additional NTMWD supplies |
| Oak Grove | 283 | North Kaufman WSC from NTMWD through Terrell and Kaufman | Additional North Kaufman WSC supplies |
| Post Oak Bend City | 982 | Rose Hill SUD (NTMWD) | Additional Rose Hill SUD supplies |
| Scurry | 186 | Gastonia-Scurry SUD (NTMWD) | Additional Gastonia-Scurry SUD supplies |
| Seagoville [a] | 11 | DWU | Additional DWU supplies |
| Talty | 4,948 | NTMWD (through Gastonia-Scurry WSC and Talty WSC [Kaufman County Other]) | Additional NTMWD supplies |
| Terrell | 24,643 | NTMWD | Additional NTMWD supplies |
| West Cedar Creek MUD [a] | 3,180 | TRWD | Additional TRWD supplies, Water Treatment Plant expansions |
| County-Other | 2,020 | Nacatoch Aquifer, NTMWD, TRWD | Additional NTMWD supplies, Additional TRWD supplies, Supplemental wells |
| Irrigation | 2,916 | Cedar Creek Lake (TRWD), NTMWD, Direct reuse, Local supplies, Nacatoch and Trinity Aquifers | Additional NTMWD supplies, Supplemental wells |
| Livestock | 1,545 | Local supplies, Nacatoch and Woodbine Aquifers | Supplemental wells |
| Manufacturing | 1,061 | NTMWD (through Terrell, Forney, and Kaufman) | Additional NTMWD supplies |
| Mining | 84 | Local supplies | None |
| Steam Electric Power | 10,000 | Reuse from Garland (through Forney) | Forney (NTMWD), TRA reuse |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group

***2000 Population:*** *45,124*

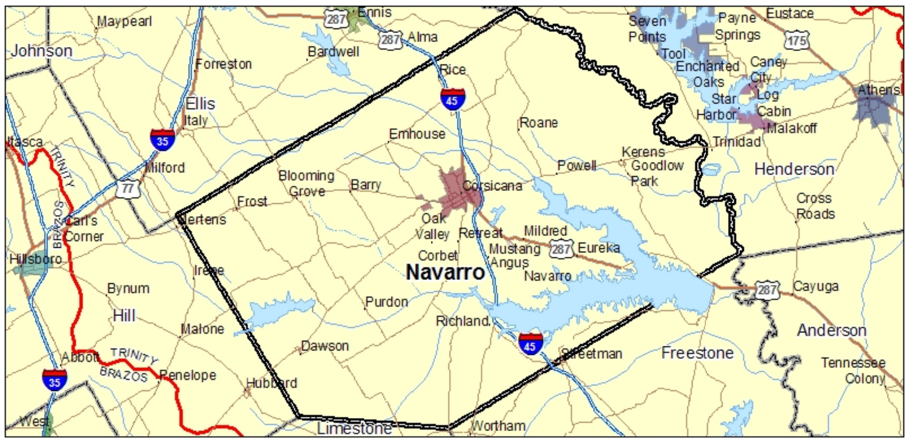
***Projected 2060 Population:*** *89,638*

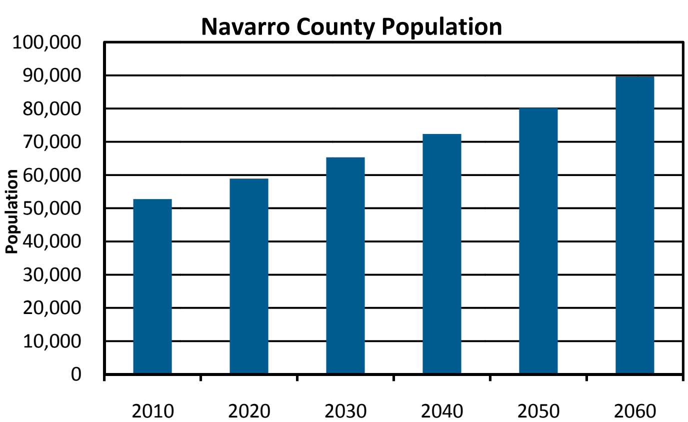
***County Seat:*** *Corsicana*

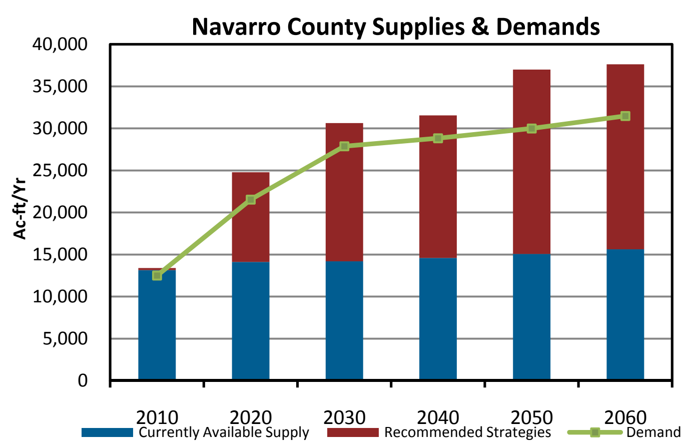
***Economy:*** *Manufacturing; agribusinesses; oil-field operations, distribution.*

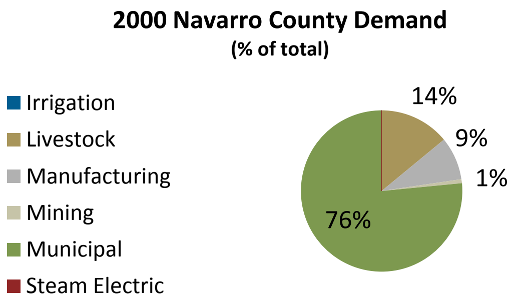
***River Basin(s):***

- Trinity (100%)

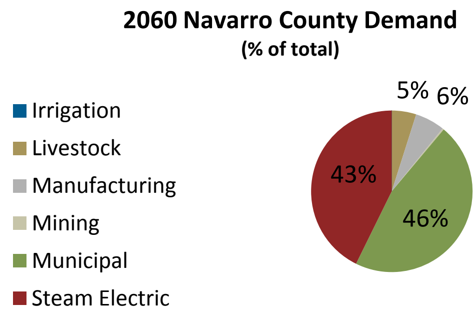



**Total=11,007 acre-feet**




**Total= 31,482 acre-feet**

| WATER USER GROUP | 2060 DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Blooming Grove | 150 | Corsicana | Additional Corsicana supplies, New well in Trinity Aquifer |
| Brandon-Irene WSC [a] | 36 | Aquilla WSD (Lake Aquilla, Region G) | None |
| Chatfield WSC | 1,655 | Corsicana | Additional Corsicana supplies |
| Community Water Company (Navarro Co. Only) [a] | 366 | Corsicana | Additional Corsicana supplies |
| Corsicana | 7,518 | Navarro Mills Reservoir, Lake Halbert/ Richland-Chambers | New pump station and WTP (Lake Halbert/Richland-Chambers), WTP expansions, TRWD supplies (Richland-Chambers Reservoir), Raw water for SEP |
| Dawson | 238 | Corsicana | Additional Corsicana supplies, New Water Treatment Plant |
| Frost | 63 | Corsicana, Woodbine Aquifer | Supplemental wells |
| Kerens | 436 | Corsicana | Additional Corsicana supplies |
| M E N WSC | 621 | Corsicana | Additional Corsicana supplies |
| Navarro Mills WSC | 754 | Corsicana | Additional Corsicana supplies, New well in Woodbine Aquifer |
| Rice | 463 | Rice WSC (from Ennis and Corsicana) | Additional Rice WSC supplies |
| Rice WSC [a] | 2,009 | Ennis, Corsicana | Additional Ennis supplies, Additional Corsicana supplies |
| County-Other | 229 | Corsicana, TRWD, Woodbine Aquifer | Additional Corsicana supplies, Additional TRWD supplies, supplemental wells |
| Irrigation | 0 | Local supplies | None |
| Livestock | 1,543 | Carrizo-Wilcox, Nacatoch, and Other Aquifers, Local supplies | Supplemental wells |
| Manufacturing | 1,872 | Corsicana, TRWD | Additional Corsicana supplies, Additional TRWD supplies |
| Mining | 89 | Carrizo-Wilcox and Nacatoch Aquifers | Supplemental wells |
| Steam Electric Power | 13,440 | None | Corsicana supplies |

[a] WUG is in multiple counties

[b] Water conservation is a strategy for every municipal user group.


***2000 Population:*** *88,495*

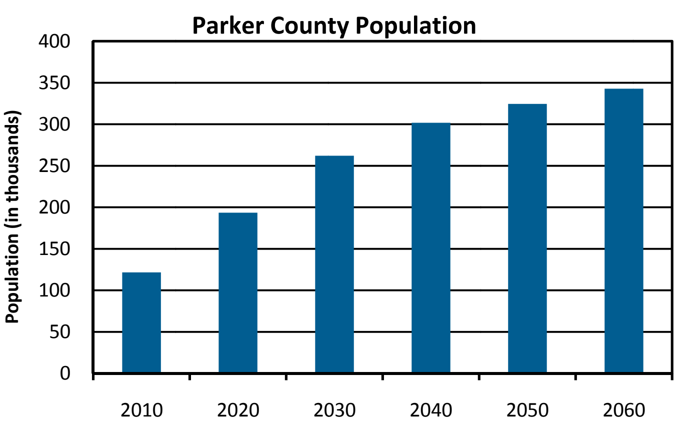
***Projected 2060 Population:*** *342,887*

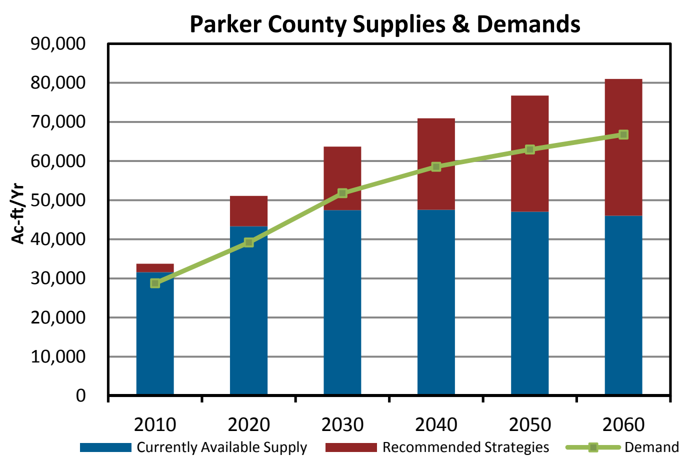
***County Seat:*** *Weatherford*

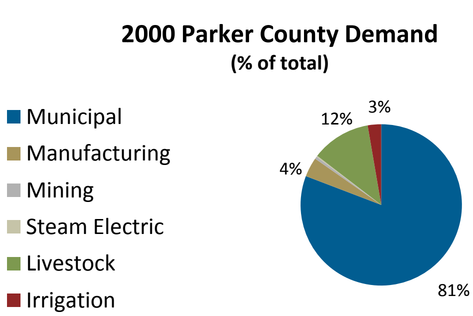
***Economy:*** *Agribusiness; manufacturing; government/services.*

***River Basin(s):***

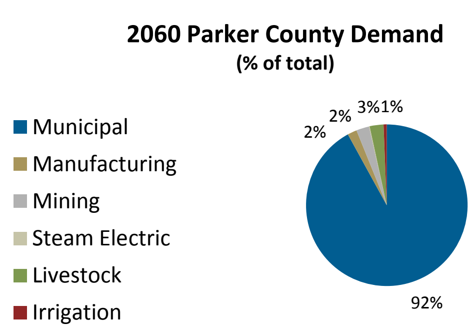
– Trinity (53%), Brazos (47%)


**Total=15,617 acre-feet**

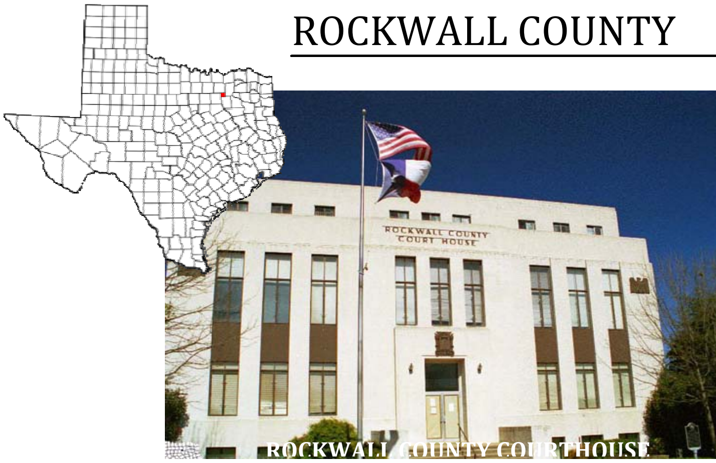



**Total= 66,771 acre-feet**

| WATER USER GROUP | 2060 PARKER CO. DEMANDS (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Aledo | 2,213 | Trinity Aquifer | Supplemental wells, Fort Worth (TRWD) supplies |
| Annetta | 416 | Trinity Aquifer | Supplemental wells, Weatherford (TRWD) supplies |
| Annetta South | 147 | Trinity Aquifer | Supplemental wells, Weatherford |
| Azle [a] | 811 | TRWD | WTP expansions |
| Cresson [a] | 151 | Trinity Aquifer (Bluebonnet Hills WSC) | None |
| Fort Worth [a] | 30,423 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| Hudson Oaks | 867 | Trinity Aquifer, Weatherford (TRWD) | Supplemental wells, Additional Weatherford supplies |
| Mineral Wells [a] | 726 | Palo Pinto County WCID #1 | See Brazos G Region Plan. |
| Reno | 337 | Trinity Aquifer, Springtown (TRWD), Walnut Creek SUD (TRWD) | Supplemental wells, Additional Springtown supplies, Additional Walnut Creek SUD supplies |
| Sanctuary | 478 | Walnut Creek SUD (TRWD) | Additional Walnut Creek SUD supplies |
| Springtown | 1,272 | Trinity Aquifer, TRWD | Supplemental wells, Additional TRWD supplies, New WTP, WTP expansions, New wells |
| Walnut Creek SUD [a] | 6,990 | TRWD | Additional TRWD supplies, New WTP, WTP expansions, transmission expansions |
| Weatherford | 10,741 | Lake Weatherford, TRWD | Additional TRWD supplies, WTP expansions |
| Willow Park | 1,855 | Trinity Aquifer | Supplemental wells, Weatherford (TRWD) supplies, Fort Worth (TRWD) supplies |
| County-Other | 3,996 | Trinity Aquifer, Other Aquifer, Mineral Wells (Palo Pinto County WCID #1), Weatherford (Lake Weatherford and TRWD) | Supplemental wells, Additional Weatherford supplies, New WTP and BRA supplies (Region G) |
| Irrigation | 422 | Trinity Aquifer, Local supplies, Direct reuse | Supplemental wells |
| Livestock | 1,856 | Trinity Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 1,248 | Trinity Aquifer, Mineral Wells (Palo Pinto County WCID #1), Weatherford (Lake Weatherford and TRWD) | Supplemental wells, Additional Weatherford supplies |
| Mining | 1,720 | Trinity Aquifer, Local supplies, Brazos River Authority | Supplemental wells |
| Steam Electric Power | 102 | Weatherford (Lake Weatherford) | Additional Lake Weatherford |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

# ROCKWALL COUNTY




***2000 Population:*** *43,080*

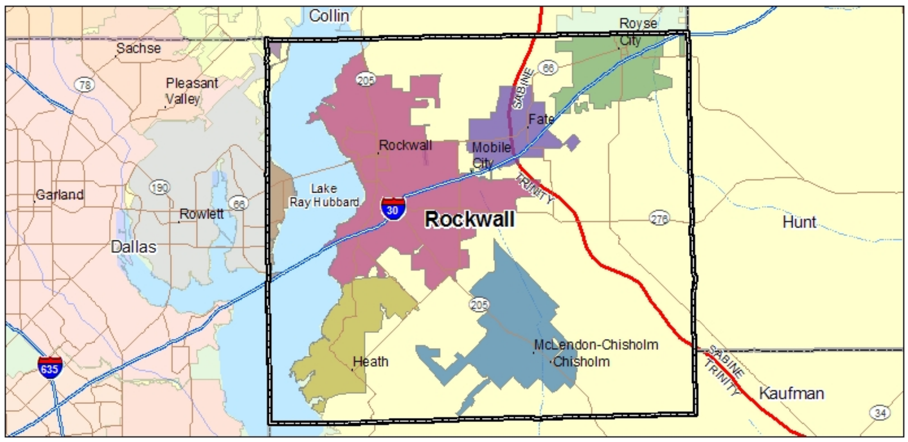
***Projected 2060 Population:*** *232,186*

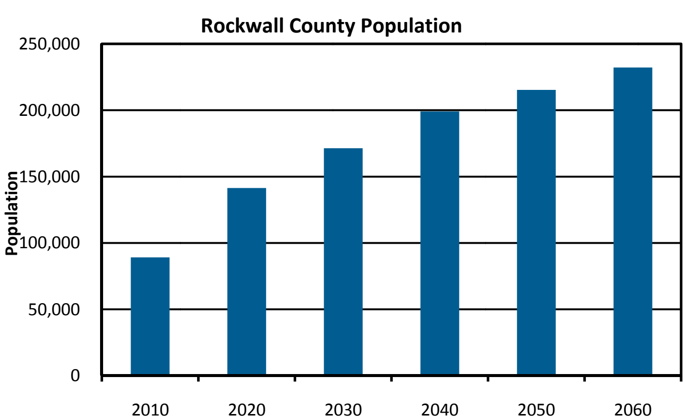
***County Seat: Rockwall***

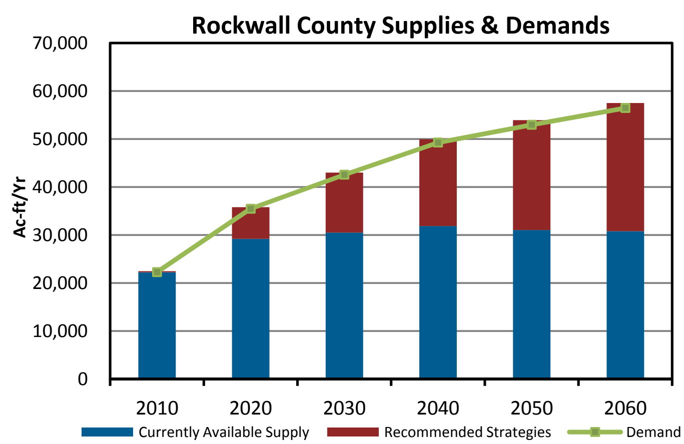
***Economy: Industry***

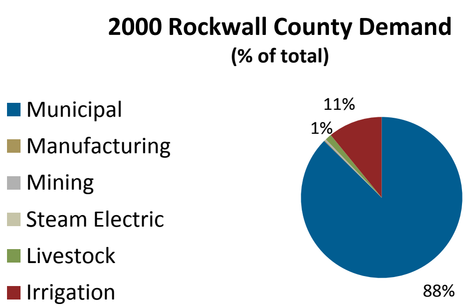
***River Basin(s):***

– Trinity (76%), Sabine (24%)

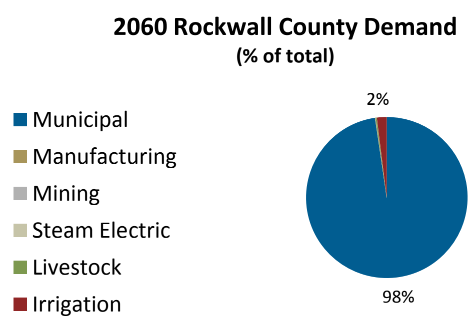


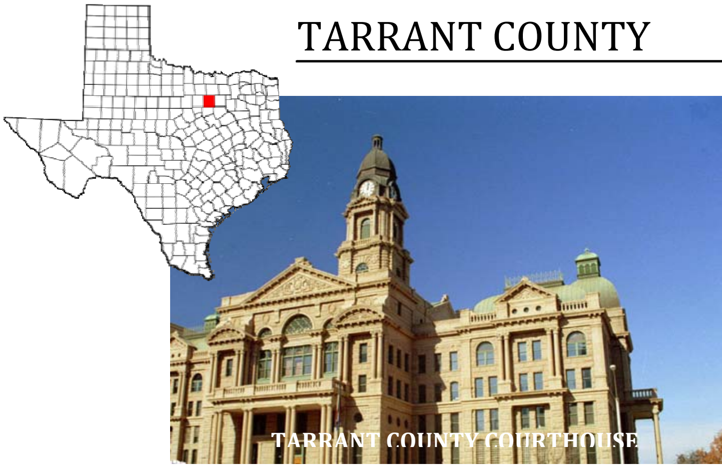

**Total=10,350 acre-feet**




**Total= 56,463 acre-feet**

| WATER USER GROUP | 2060 ROCKWALL CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Blackland WSC [a] | 1,410 | NTMWD | Direct connection to NTMWD, Additional NTMWD supplies |
| Cash SUD [a] | 231 | NTMWD | Additional NTMWD supplies, |
| Dallas [a] | 6 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| East Fork SUD [a] | 8 | NTMWD | Additional NTMWD supplies |
| Fate | 6,945 | NTMWD | Additional NTMWD supplies |
| Forney Lake WSC [a] | 2,014 | NTMWD | Additional NTMWD supplies |
| Heath | 5,980 | NTMWD | Additional NTMWD supplies |
| High Point WSC [a] | 105 | NTMWD (through Forney and Terrell) | Additional NTMWD supplies (through Forney and Terrell) |
| Lavon WSC | 1,419 | NTMWD | Additional NTMWD supplies |
| McLendon-Chisholm | 467 | NTMWD (through High Point WSC & RCH WSC) | Additional NTMWD supplies |
| Mount Zion WSC | 421 | NTMWD | Additional NTMWD supplies |
| RCH WSC | 912 | NTMWD | Additional NTMWD supplies, Direct connection to NTMWD |
| Rockwall | 25,826 | NTMWD | Additional NTMWD supplies |
| Rowlett [a] | 1,458 | NTMWD | Additional NTMWD supplies |
| Royse City [a] | 7,214 | NTMWD | Additional NTMWD supplies |
| Wylie [a] | 340 | NTMWD | Additional NTMWD supplies |
| County-Other | 383 | Other Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Irrigation | 1,125 | NTMWD, Direct Reuse, DWU | Additional DWU supplies |
| Livestock | 131 | Other Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 35 | NTMWD (through Rockwall and Royse City) | Additional NTMWD supplies |
| Mining | 33 | Local supplies | None |
| Steam Electric Power | 0 | None | None |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.




***2000 Population:*** *1,446,219*

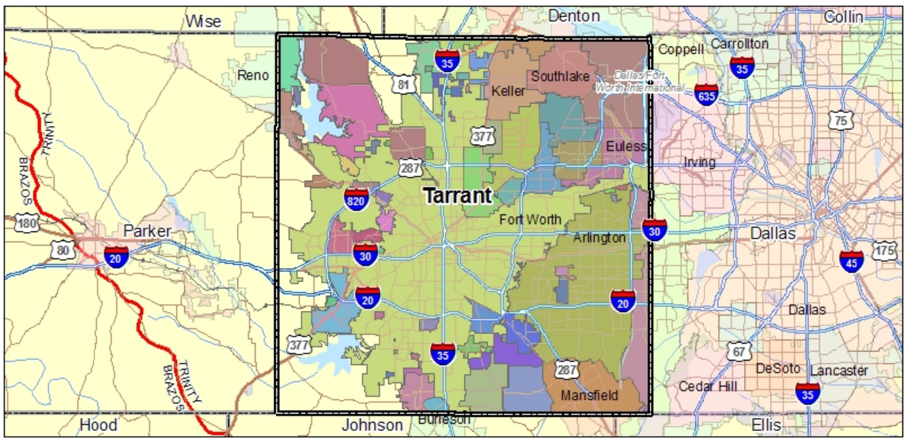
***Projected 2060 Population:*** *3,353,509*

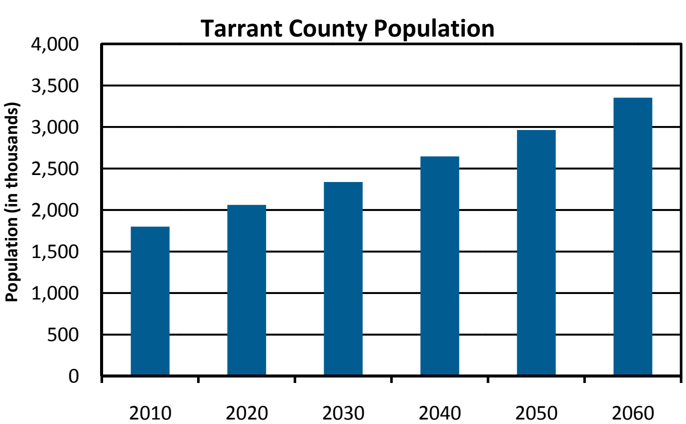
***County Seat:*** *Fort Worth*

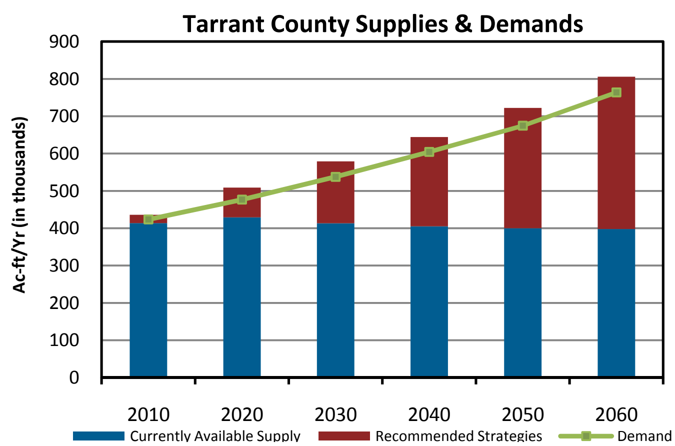
***Economy:*** *Tourism; manufacturing*

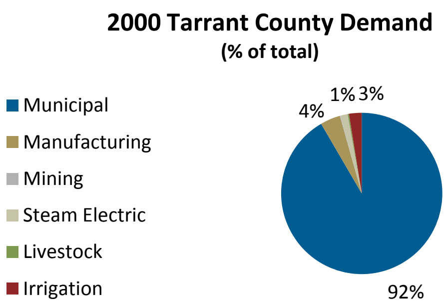
***River Basin(s):***

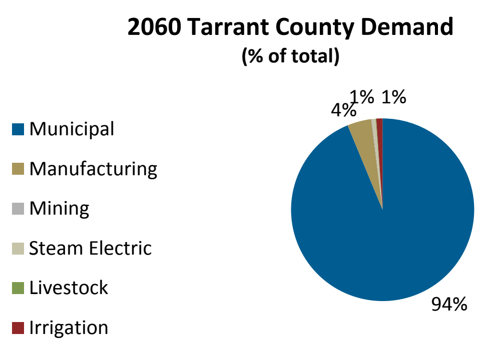
– Trinity (100%)




**Total=331,066 acre-feet**

**Total= 763,750 acre-feet**

| WATER USER GROUP | 2060 TARRANT CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Arlington | 92,008 | TRWD, Lake Arlington | WTP expansions, Additional TRWD supplies, Direct reuse (Fort Worth) |
| Azle [a] | 6,049 | TRWD | WTP expansions |
| Bedford | 11,246 | TRA (TRWD), Trinity Aquifer | Supplemental wells, Additional TRA (TRWD) supplies |
| Benbrook | 11,254 | TRWD, Trinity Aquifer | WTP expansions, Additional TRWD supplies, Supplemental wells |
| Bethesda WSC [a] | 3,501 | Fort Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Arlington (TRWD), Supplemental wells |
| Blue Mound | 283 | Trinity Aquifer | Supplemental wells |
| Burleson [a] | 1,967 | Fort Worth (TRWD) | Additional Fort Worth supplies |
| Colleyville | 9,064 | Trinity Aquifer, TRA (TRWD) | Supplemental wells, Additional TRA |
| Community WSC [a] | 419 | TRWD | Additional TRWD supplies |
| Crowley | 4,322 | Fort Worth (TRWD), Trinity Aquifer | Additional TRWD supplies, Supplemental wells |
| Dalworthington Gardens | 884 | Fort Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Edgecliff | 428 | Fort Worth (TRWD) | Additional Fort Worth supplies |
| Euless | 11,448 | TRA (TRWD), Trinity Aquifer | Supplemental wells, Additional TRA supplies, Direct reuse (Fort Worth) |
| Everman | 747 | Fort Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Forest Hill | 2,008 | Fort Worth (TRWD) | Additional Fort Worth supplies |
| Forth Worth [a] | 417,660 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| Grand Prairie [a] | 7,969 | DWU, Fort Worth (TRWD), Trinity Aquifer, Joe Pool Lake (for irrigation) | Additional DWU supplies, Supple-mental wells, Additional Fort Worth supplies, Midlothian (TRWD), Mansfield (TRWD), Arlington (TRWD) |
| Grapevine | 19,625 | DWU, Indirect reuse, TRA (TRWD), Lake Grapevine | Additional TRA supplies |
| Haltom City | 8,324 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Haslet | 2,682 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Hurst | 7,486 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Johnson County SUD [a] | 1,154 | Mansfield (TRWD), Other supplies in Region G | Additional Mansfield, Grand Prairie |
| Keller | 11,380 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Kennedale | 1,992 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells, Additional Trinity Aquifer |
| Lake Worth | 1,344 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells, new wells |

| WATER USER GROUP | 2060 TARRANT CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Lakeside | 846 | Trinity Aquifer | Supplemental wells, Additional Trinity Aquifer |
| Mansfield [a] | 33,673 | TRWD | Additional TRWD supplies, WTP expansions, New WTP |
| North Richland Hills | 16,022 | Fort Worth (TRWD), TRA (TRWD), Trinity Aquifer | Supplemental wells, Additional Fort Worth supplies, Additional TRA supplies |
| Pantego | 672 | Trinity Aquifer | Supplemental wells, Arlington (TRWD) supplies, Fort Worth (TRWD) supplies |
| Pelican Bay | 359 | Trinity Aquifer | Supplemental wells, Azle (TRWD) |
| Richland Hills | 1,580 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| River Oaks | 923 | TRWD | Additional TRWD supplies |
| Saginaw | 4,885 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Sansom Park Village | 615 | Forth Worth (TRWD), Trinity Aquifer | Supplemental wells |
| Southlake [a] | 10,549 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Watauga | 3,388 | North Richland Hills (Fort Worth from TRWD) | Additional North Richland Hills supplies |
| Westover Hills | 268 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Westworth Village | 519 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| White Settlement | 3,253 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| County-Other | 3,241 | TRWD, Trinity Aquifer | Additional TRWD supplies, Supplemental wells |
| Irrigation | 8,417 | Local supplies, Trinity Aquifer, Indirect reuse, Direct reuse, TRWD | Additional reuse, Additional TRWD supplies, Supplemental wells |
| Livestock | 803 | Local supplies, Trinity Aquifer | Supplemental wells |
| Manufacturing | 32,457 | TRWD | Additional TRWD supplies |
| Mining | 1,036 | Local supplies, TRWD, Trinity Aquifer | Supplemental wells |
| Steam Electric Power | 5,000 | Run-of-River supplies, TRWD | Additional TRWD supplies, Reuse |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.


***2000 Population:*** *48,793*

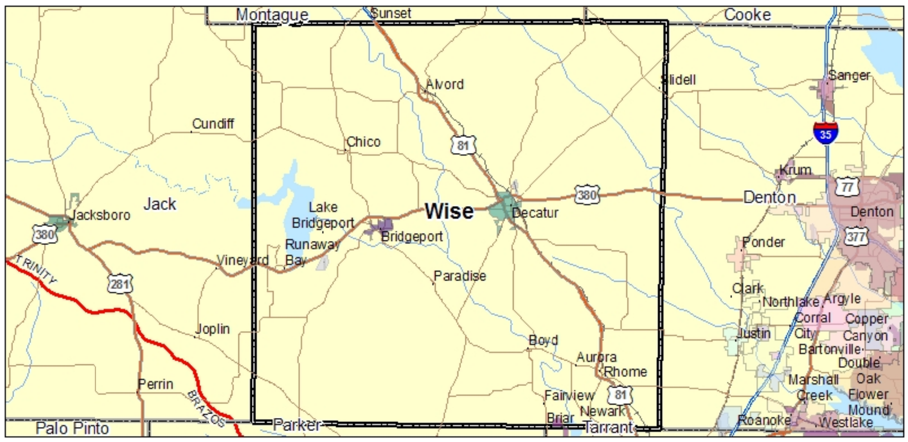
***Projected 2060 Population:*** *170,071*

***County Seat:*** *Decatur*

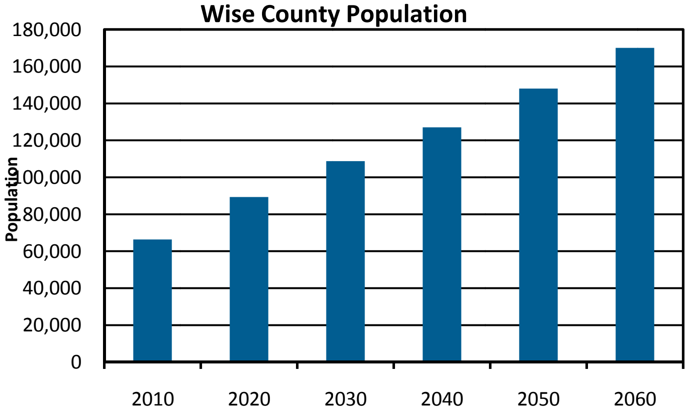
***Economy:*** *Petroleum; sand and gravel; agribusiness*

***River Basin(s):***

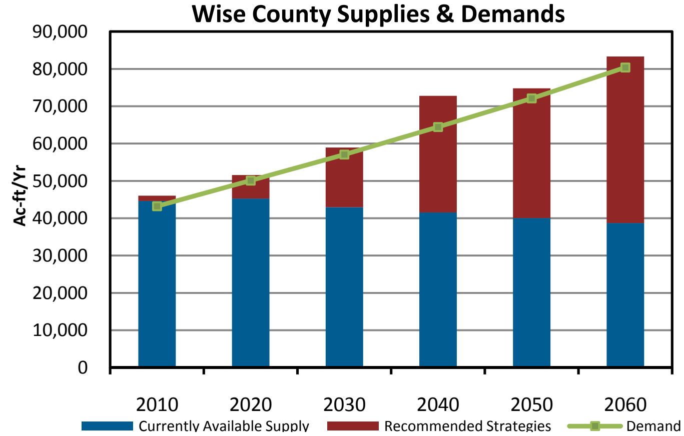
– Trinity (100%)



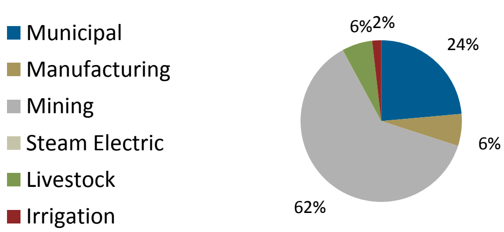

## Wise County Population




## Wise County Supplies & Demands

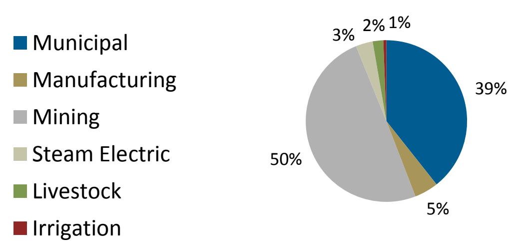



**2000 Wise County Demand**
**(% of total)**




**Total=28,067 acre-feet**

**2060 Wise County Demand**
**(% of total)**




**Total= 80,392 acre-feet**

| WATER USER GROUP | 2060 WISE CO. DEMAND (AC-FT/YR0 | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Alvord | 287 | Trinity Aquifer | Supplemental wells, TRWD supplies |
| Aurora | 338 | Trinity Aquifer | Supplemental wells, TRWD sources (from Walnut Creek SUD through Rhome) |
| Bolivar WSC [a] | 918 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project, UTRWD supplies |
| Boyd | 459 | Trinity Aquifer, Walnut Creek SUD (TRWD) | Supplemental wells, Additional Walnut Creek SUD supplies |
| Bridgeport | 4,444 | TRWD | Additional TRWD supplies, WTP expansions |
| Chico | 495 | Trinity Aquifer, West Wise SUD (TRWD) | Supplemental wells, Additional West Wise SUD supplies |
| Community WSC [a] | 16 | TRWD | Additional TRWD supplies |
| Decatur | 5,385 | Wise County WSD (TRWD) | Additional Wise County WSD, New WTP, WTP expansions |
| Fort Worth [a] | 7,936 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| New Fairview | 579 | Trinity Aquifer | Supplemental wells, TRWD (from Walnut Creek SUD through Rhome) |
| Newark | 787 | Trinity Aquifer | Supplemental wells, TRWD (from Walnut Creek SUD through Rhome) |
| Paradise | 202 | Walnut Creek SUD (TRWD) | Additional Walnut Creek SUD |
| Rhome | 3,369 | Trinity Aquifer, Walnut Creek SUD (TRWD) | Supplemental wells, Additional Walnut Creek SUD supplies |
| Runaway Bay | 608 | TRWD | Additional TRWD supplies, WTP expansion |
| Walnut Creek SUD [a] | 932 | TRWD | Additional TRWD supplies, New WTP, WTP expansions, transmission expansions |
| West Wise SUD | 756 | TRWD, Walnut Creek SUD (TRWD) | Additional TRWD supplies, New or expanded WTP |
| County-Other | 4,103 | TRWD supplies, Trinity Aquifer | Supplemental wells |
| Irrigation | 502 | Trinity Aquifer, Local supplies, TRWD sources | Supplemental wells |
| Livestock | 1,714 | Trinity Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 3,858 | Other Aquifer, TRWD | Supplemental wells, Additional TRWD supplies |
| Mining | 39,656 | Trinity Aquifer, Reuse, Run-of-River, TRWD | Supplemental wells, Additional reuse, Additional TRWD supplies |
| Steam Electric Power | 2,748 | TRWD | Additional TRWD supplies |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

## Introduction

In 1997, the 75th Texas Legislature passed Senate Bill One, legislation designed to address Texas water issues. Senate Bill One put in place a grass-roots regional process to plan for the future water needs of all Texans. To implement this process, the Texas Water Development Board created 16 regional water planning groups across the state and established regulations governing regional planning efforts. The results of the first round of the Senate Bill One planning effort for Region C can be found in the 2001 *Region C Water Plan* (1). The regional plans from each of the 16 regions were compiled by the Texas Water Development Board into the State Water Plan, *Water for Texas – 2002*.

In 2001 and 2007, the Texas Legislature passed Senate Bill Two and Senate Bill Three, respectively. These bills included the funding mechanisms to continue the regional water planning effort, which is to be updated every five years. Senate Bill Two provided the funding for the first update to the regional water plans which produced the *2006 Region C Water Plan* (2). Senate Bill Three provided the funding for this update to the regional water plans.

This report gives the results of the latest round of planning for Region C. Figure I.1 is a map of Region C, which covers all or part of 16 counties in North Central Texas. As Figure I.1 shows, Region C includes all of Cooke, Grayson, Fannin, Jack, Wise, Denton, Collin, Parker, Tarrant, Dallas, Rockwall, Kaufman, Ellis, Navarro, and Freestone Counties and the part of Henderson County that is in the Trinity Basin. The area covered by Region C is the same as in the first and second rounds of Senate Bill One planning.

(1) Numbers in parentheses match references listed at the end of each chapter and in Appendix A.

The regional water planning groups created pursuant to Senate Bill One are in charge of the regional planning process. Each regional planning group includes representatives of 11 designated interest groups. Table I.1 shows the members of the Region C water planning group and the interests they represent. The Region C Water Planning Group hired a team of consultants to conduct technical analyses and prepare the regional water plan under the supervision of the planning group. The consulting team for Region C included Freese and Nichols, Inc., Alan Plummer Associates, Inc., CP&Y, Inc., and Cooksey Communications, Inc.

Texas Water Development Board planning guidelines require the regional water plan to include the following ten sections:

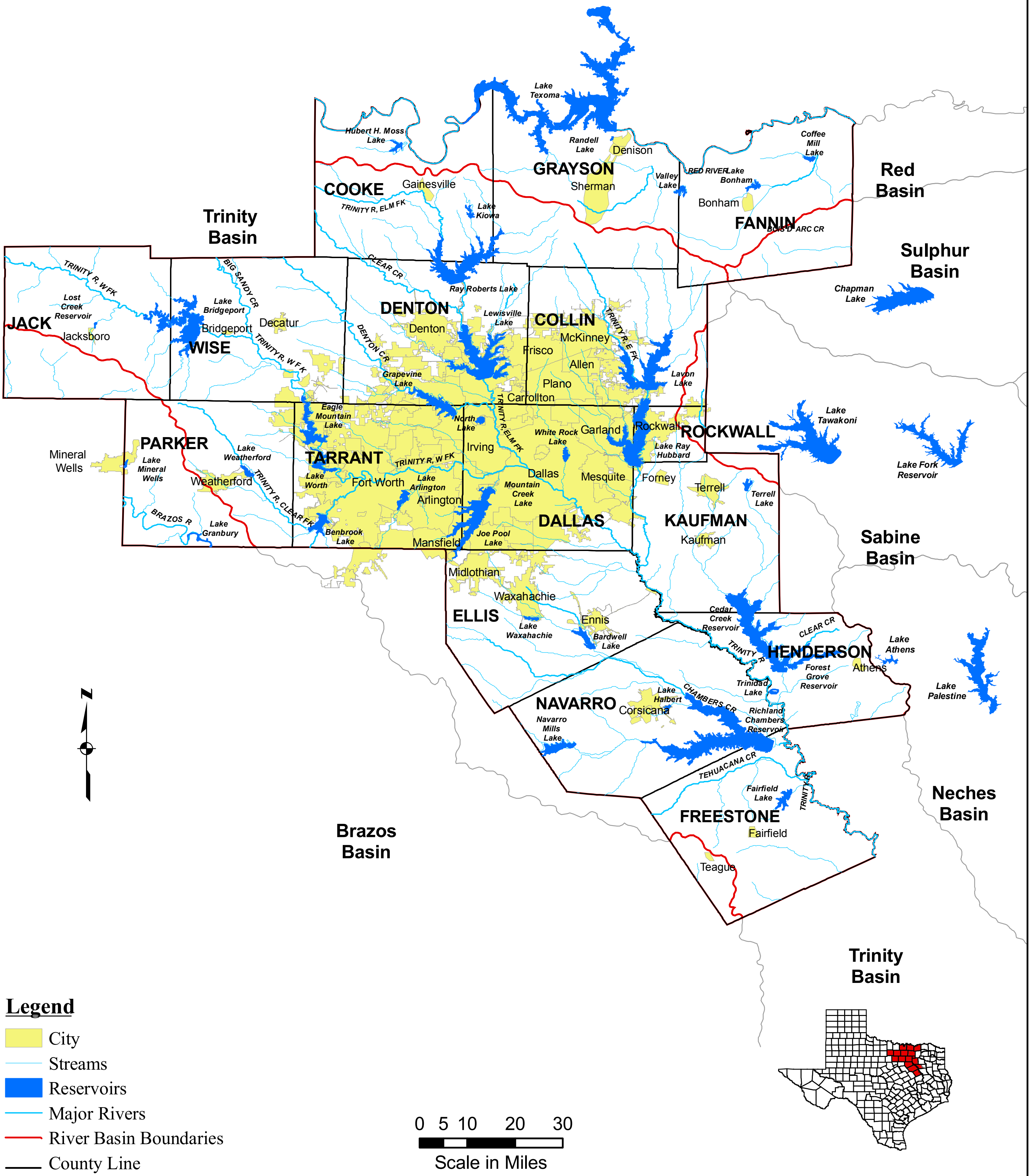
1. Description of Region C
2. Population and Water Demand Projections
3. Analysis of Water Supply Currently Available to Region C
4. Identification, Evaluation, and Selection of Water Management Strategies
5. Impacts of Selected Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas
6. Water Conservation and Drought Management Recommendations
7. Description of How the Regional Water Plan Is Consistent with Long-Term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources
8. Unique Stream Segments, Unique Reservoir Sites, Regulatory, Legislative, Administrative, and Other Recommendations
9. Water Infrastructure Funding Recommendations
10. Adoption of Plan and Public Participation

In addition to the ten required sections, this report also includes appendices providing more detailed information on the planning efforts.

**Table I.1**
**Members of the Region C Water Planning Group**

| Member | Interest |
|---|---|
| Jim Parks, Chairman | Water Districts |
| Jody Puckett, Vice Chair | Municipalities |
| Russell Laughlin, Secretary | Industry |
| Steve Berry | Environmental Interests |
| Bill Ceverha | Public |
| Jerry Chapman | Water Districts |
| Frank Crumb | Municipalities |
| Bill Lewis | Small Business |
| G.K. Maenius | Counties |
| Howard Martin | Municipalities |
| Jim McCarter | Water Utilities |
| Paul Phillips | Municipalities |
| Gary Spicer | Electric Generating Utilities |
| Bob Scott | Environmental Interests |
| Connie Standridge | Water Utilities |
| Jack Stevens | Water Districts |
| Danny Vance | River Authorities |
| Mary Vogelson | Public |
| Tom Woodward | Agricultural Interests |

# Figure I.1
# Region C and Outside Water Supplies Designated as Special Water Resources for Use in Region C



# 1. Description of Region C

Table 1.1 shows historical populations for the counties in Region C [3, 4, 5] from 1930 through 2008. Table 1.1 also shows the estimated total population for the region for the same period, including only the portion of Henderson County located in Region C. Figure 1.1 is a plot of the historical population for Region C. The population of the region has grown from 987,925 in 1930 to 6,347,326 in 2008. From 1940 through 2008, the region's population has increased at a compounded rate of 2.7 percent per year. The increase of 1,092,604 people (20.8 percent) in the eight year period from 2000 through 2008 indicates that the area is still growing rapidly.

As of 2008, Region C included 26 percent of Texas' total population. The two most populous counties in Region C, Dallas and Tarrant, have 65 percent of the region's population. Collin, Denton, Ellis, Grayson, Kaufman, and Parker Counties also have year 2008 populations exceeding 100,000 people. Table 1.2 lists the 45 cities in Region C with a year 2006 population of more than 20,000 [5]. These cities include 82 percent of the year 2006 population of the region.

## *1.1 Economic Activity in Region C*

Region C includes most of the Dallas and Fort Worth-Arlington metropolitan statistical areas (MSAs). The largest employment sector in the Dallas MSA is the service industry, followed by trade, manufacturing, and government. The Fort Worth-Arlington MSA's largest employment sectors are service, trade, and manufacturing. The Dallas and Fort Worth-Arlington MSAs experienced strong economic growth in the 1990s [3].

Table 1.3 lists year 2006 payrolls for Region C by county and economic sector [6]. Payroll and employment in Region C are concentrated in the central urban counties of Dallas and Tarrant, which have 80 percent of the region's total payroll and 77.4 percent of the employment. (Economic activity is more concentrated than population because many workers commute from outlying counties to work in Dallas and Tarrant Counties.)

**Table 1.1**
**Historical Population for Region C Counties**

| County | Historical Population [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2008 |
| Collin | 46,180 | 47,190 | 41,692 | 41,247 | 66,920 | 144,490 | 264,036 | 491,774 | 760,013 |
| Cooke | 24,136 | 24,909 | 22,146 | 22,560 | 23,471 | 27,656 | 30,777 | 36,363 | 39,993 |
| Dallas | 325,691 | 398,564 | 614,799 | 951,527 | 1,327,321 | 1,556,549 | 1,852,810 | 2,218,774 | 2,387,963 |
| Denton | 32,822 | 33,658 | 41,365 | 47,432 | 75,633 | 143,126 | 273,525 | 432,976 | 637,358 |
| Ellis | 53,936 | 47,733 | 45,645 | 43,395 | 46,638 | 59,743 | 85,167 | 111,360 | 147,543 |
| Fannin | 41,163 | 41,064 | 31,253 | 23,880 | 22,705 | 24,285 | 24,804 | 31,242 | 34,350 |
| Freestone | 22,589 | 21,138 | 15,696 | 12,525 | 11,116 | 14,830 | 15,818 | 17,867 | 19,759 |
| Grayson | 65,843 | 69,499 | 70,467 | 73,043 | 83,225 | 89,796 | 95,021 | 110,595 | 118,754 |
| Henderson [b] | 21,959 | 22,848 | 16,807 | 15,642 | 19,003 | 30,591 | 41,309 | 51,984 | 56,015 |
| Jack | 9,046 | 10,206 | 7,755 | 7,418 | 6,711 | 7,408 | 6,981 | 8,763 | 8,821 |
| Kaufman | 40,905 | 38,308 | 31,170 | 29,931 | 32,392 | 39,015 | 52,220 | 71,313 | 100,248 |
| Navarro | 60,507 | 51,308 | 39,916 | 34,423 | 31,150 | 35,323 | 39,926 | 45,124 | 49,261 |
| Parker | 18,759 | 20,482 | 24,528 | 22,880 | 33,888 | 44,609 | 64,785 | 88,495 | 111,610 |
| Rockwall | 7,658 | 7,051 | 6,156 | 5,878 | 7,046 | 14,528 | 25,604 | 43,080 | 76,126 |
| Tarrant | 197,553 | 225,521 | 361,253 | 538,495 | 716,317 | 860,880 | 1,170,103 | 1,446,219 | 1,740,964 |
| Wise | 19,178 | 19,074 | 16,141 | 17,021 | 19,687 | 26,575 | 34,679 | 48,793 | 58,548 |
| **Region C Total** | **987,925** | **1,078,553** | **1,386,789** | **1,887,297** | **2,523,223** | **3,119,404** | **4,077,565** | **5,254,722** | **6,347,326** |
| % Increase | | 9.20% | 28.60% | 36.10% | 33.70% | 23.60% | 30.70% | 28.90% | 20.80% |

Notes: a. Population data through 1990 are from *The Texas Almanac*[3]. Data for year 2000 are from the U.S. Census [4]. Data for the year 2008 are from The Texas State Demographer July 1 estimates[5].
b. This population is for the Region C portion of Henderson County only. The Region C population for Henderson County is approximately 70% of the total population.

**Figure 1.1**
**Historical Population for Region C**

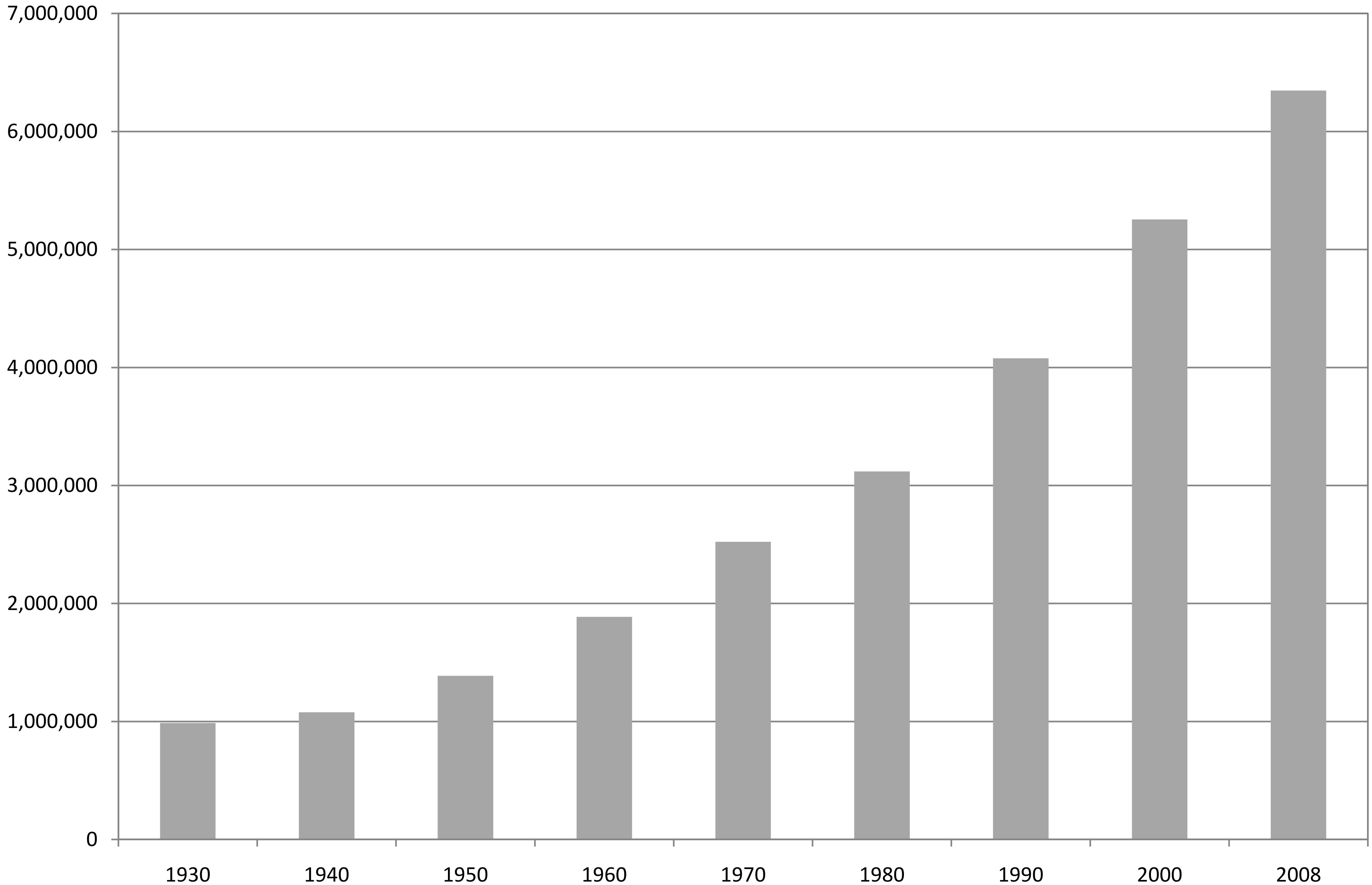


**Table 1.2**
**Cities in Region C with Year 2006 Population Greater than 20,000**

| City | Year 2006 Population | County(ies) | City | Year 2006 Population | County(ies) |
|---|---|---|---|---|---|
| Dallas | 1,233,970 | Dallas, Collin, Denton, Kaufman, Rockwall | Haltom City | 41,832 | Tarrant |
| Fort Worth | 650,344 | Tarrant, Denton, Parker, Wise | Mansfield | 40,819 | Tarrant, Johnson, Ellis |
| Arlington | 372,566 | Tarrant | Coppell | 39,221 | Dallas |
| Plano | 262,722 | Collin, Denton | Sherman | 38,837 | Grayson |
| Garland | 219,141 | Dallas, Collin | Hurst | 37,988 | Tarrant |
| Irving | 195,872 | Dallas | The Colony | 35,849 | Denton |
| Grand Prairie | 152,904 | Dallas, Tarrant, Ellis | Duncanville | 35,173 | Dallas |
| Mesquite | 130,078 | Dallas | Keller | 34,740 | Tarrant |
| Carrollton | 123,995 | Dallas, Denton | Lancaster | 33,364 | Dallas |
| McKinney | 107,930 | Collin | Burleson | 31,887 | Tarrant |
| Denton | 106,294 | Denton | Rockwall | 30,748 | Rockwall |
| Richardson | 98,010 | Dallas, Collin | Farmers Branch | 28,035 | Dallas |
| Lewisville | 97,771 | Denton, Dallas | Corsicana | 26,519 | Navarro |
| Frisco | 76,168 | Collin, Denton | Waxahachie | 26,150 | Ellis |
| Allen | 68,001 | Collin | Southlake | 25,328 | Tarrant, Denton |
| Flower Mound | 65,170 | Denton | Denison | 24,364 | Grayson |
| North Richland Hills | 61,784 | Tarrant | Watauga | 23,205 | Tarrant |
| Rowlett | 55,289 | Dallas, Rockwall | Weatherford | 23,118 | Parker |
| Euless | 52,016 | Tarrant | University Park | 22,811 | Dallas |
| Bedford | 48,883 | Tarrant | Colleyville | 22,368 | Tarrant |
| Grapevine | 47,978 | Tarrant | Benbrook | 21,281 | Tarrant |
| Desoto | 43,004 | Dallas | Little Elm | 20,194 | Denton |
| Cedar Hill | 42,105 | Dallas, Ellis | | | |

Note: Data are from Texas State Data Center [5]

**Table 1.3**
**Year 2006 County Payroll by Category ($1,000)**

| Category | Collin | Cooke | Dallas | Denton | Ellis | Fannin | Freestone | Grayson |
|---|---|---|---|---|---|---|---|---|
| Forestry, Fishing, Hunting and Agriculture Support | $1,077 | $251 | $11,831 | $2,704 | $87 | (a) | $0 | (a) |
| Mining | $132,618 | $21,709 | $637,361 | $17,850 | $4,178 | (a) | $15,584 | $3,791 |
| Utilities | $25,971 | $3,376 | $368,762 | $24,147 | $12,873 | $4,387 | (a) | $11,647 |
| Construction | $645,038 | $31,501 | $3,430,503 | $443,793 | $78,223 | $8,231 | 8357 | $80,117 |
| Manufacturing | $1,127,597 | $93,717 | $6,898,900 | $449,774 | $396,639 | $16,748 | $3,536 | $315,421 |
| Wholesale Trade | $878,672 | $11,877 | $5,175,615 | $547,629 | $30,971 | $4,718 | $3,362 | $43,049 |
| Retail Trade | $994,854 | $42,349 | $3,213,779 | $588,894 | $107,353 | $23,398 | $14,096 | $138,469 |
| Transportation & Warehousing | $85,022 | $29,860 | $2,710,461 | $219,109 | $89,486 | $2,956 | $5,543 | $28,383 |
| Information | $2,065,411 | $6,464 | $3,977,266 | $150,053 | $9,352 | $1,839 | (a) | $18,652 |
| Finance & Insurance | $1,678,906 | $12,396 | $7,140,711 | $464,196 | $25,347 | $3,790 | $4,702 | $78,720 |
| Real Estate & Rental & Leasing | $180,494 | $2,307 | $2,058,449 | $83,691 | $8,848 | $2,638 | $2,274 | $11,330 |
| Professional, Scientific & Technical Services | $1,276,387 | $6,979 | $8,726,832 | $309,972 | $27,133 | $3,581 | $3,827 | $34,245 |
| Management of Companies & Enterprises | $1,138,283 | (a) | $6,483,610 | $298,346 | $15,004 | (a) | (a) | (a) |
| Admin, Support, Waste Mgt, Remediation Services | $465,207 | $11,643 | $4,552,043 | $395,152 | $58,796 | $1,224 | (a) | $37,603 |
| Education Services | $51,860 | (a) | $827,592 | $42,992 | $7,379 | (a) | (a) | $16,464 |
| Health Care & Social Assistance | $1,016,468 | $31,874 | $5,885,572 | $584,299 | $84,999 | $50,071 | $11,497 | $274,850 |
| Arts, Entertainment & Recreation | $64,976 | (a) | $544,638 | $48,163 | $3,144 | $708 | (a) | $6,135 |
| Accommodation & Food Services | $395,700 | $13,004 | $1,744,446 | $205,221 | $34,837 | $4,815 | 5370 | $46,452 |
| Other Services (except public admin) | $277,989 | $10,744 | $1,470,308 | $163,202 | $31,668 | $3,845 | $3,135 | $25,144 |
| Unclassified Establishments | $1,016,468 | $31,874 | $5,885,572 | $584,299 | $84,999 | $50,071 | $11,497 | $274,850 |
| **Total Payroll** | **$12,503,912** | **$337,613** | **$65,865,237** | **$5,039,972** | **$1,026,423** | **$133,823** | **$120,506** | **$1,174,125** |
| **Total Employees** | **258,669** | **11,095** | **1,323,716** | **141,779** | **31,955** | **4,985** | **3,708** | **38,061** |

**Table 1.3, Continued**

| Category | Henderson [b] | Jack | Kaufman | Navarro | Parker | Rockwall | Tarrant | Wise | Total |
|---|---|---|---|---|---|---|---|---|---|
| Forestry, Fishing, Hunting and Agriculture Support | (a) | (a) | (a) | (a) | $727 | $0 | $6,112 | (a) | $22,789 |
| Mining | $5,227 | $78,914 | $2,984 | $4,704 | $11,600 | $523 | $228,949 | $124,339 | $1,290,331 |
| Utilities | $8,700 | (a) | $10,204 | $6,210 | $4,844 | $1,597 | $113,699 | $10,783 | $607,200 |
| Construction | $23,848 | $2,883 | $60,753 | $18,418 | $63,808 | $45,695 | $1,684,474 | $24,049 | $6,649,691 |
| Manufacturing | $42,773 | (a) | $168,202 | $103,932 | $75,143 | $42,938 | $4,654,629 | $66,309 | $14,456,258 |
| Wholesale Trade | $6,212 | $3,541 | $33,885 | $12,438 | $18,464 | $18,758 | $2,320,868 | $22,343 | $9,132,402 |
| Retail Trade | $54,633 | $3,021 | $83,713 | $40,489 | $109,579 | $72,832 | $2,116,845 | $50,714 | $7,655,018 |
| Transportation & Warehousing | $10,682 | (a) | $28,083 | $19,374 | $16,881 | $21,668 | $1,423,548 | $36,472 | $4,727,528 |
| Information | $11,059 | (a) | $20,514 | $2,864 | $9,675 | $6,658 | $1,017,546 | $5,378 | $7,302,731 |
| Finance & Insurance | $15,214 | $2,308 | $24,046 | $11,570 | $27,069 | $27,464 | $2,060,658 | $12,547 | $11,589,644 |
| Real Estate & Rental & Leasing | $4,273 | $269 | $4,102 | $17,528 | $6,794 | $4,857 | $405,376 | $15,033 | $2,808,263 |
| Professional, Scientific & Technical Services | $13,054 | $1,643 | $15,751 | $8,895 | $25,775 | $43,057 | $1,836,600 | $13,027 | $12,346,758 |
| Management of Companies & Enterprises | (a) | $0 | $1,867 | 4598 | $1,572 | $2,744 | $1,538,478 | (a) | $9,484,502 |
| Admin, Support, Waste Mgt, Remediation Services | $16,045 | $8,133 | $21,782 | $19,314 | $21,895 | 15493 | $2,058,256 | $6,740 | $7,689,326 |
| Education Services | (a) | $0 | $3,382 | (a) | $2,318 | $2,902 | $316,569 | (a) | $1,271,458 |
| Health Care & Social Assistance | $77,584 | $5,338 | $81,877 | $27,399 | $62,808 | $87,003 | $2,916,384 | $51,780 | $11,249,803 |
| Arts, Entertainment & Recreation | $2,235 | (a) | $2,898 | (a) | $4,523 | $4,105 | $352,004 | $696 | $1,034,225 |
| Accommodation & Food Services | $16,388 | $2,236 | $24,286 | $10,955 | $29,731 | $26,610 | $954,956 | $14,559 | $3,529,566 |
| Other Services (except public admin) | $12,648 | $876 | $24,605 | $8,190 | $23,609 | $22,587 | $738,247 | $36,543 | $2,853,340 |
| Unclassified Establishments | $77,584 | $5,338 | $81,877 | $27,399 | $62,808 | $87,003 | $2,916,384 | $51,780 | $11,249,803 |
| **Total Payroll** | **$321,472** | **$113,420** | **$612,983** | **$322,135** | **$517,001** | **$447,574** | **$26,748,895** | **$491,849** | **$115,776,940** |
| **Total Employees** | **13,087** | **2,475** | **20,739** | **13,062** | **18,848** | **15,662** | **685,318** | **14,151** | **2,597,310** |

Notes: a. Amount withheld to avoid disclosing data for individual companies. Data are included in county totals.
b. Data for Henderson County include the entire county.
Source: US Census Bureau Economic Data [6]

## 1.2 Water-Related Physical Features in Region C

Most of Region C is located in the upper portion of the Trinity River Basin, with smaller parts in the Red, Brazos, Sulphur, and Sabine Basins. With the exception of the Red River Basin, the predominant flow of the streams is from northwest to southeast, as is true for most of Texas. The Red River itself flows west to east, forming the north border of Region C, and its major tributaries in Region C flow southwest to northeast. Figure I.1 shows the major streams in Region C, which include the Brazos River, Red River, Trinity River, Clear Fork Trinity River, West Fork Trinity River, Elm Fork Trinity River, East Fork Trinity River, and numerous other tributaries of the Trinity River. According to the Texas Parks and Wildlife Department, there are 324 streams of various sizes in Region C.

Figure 1.2 shows the average annual precipitation for Region C. Average annual precipitation increases west to east from slightly more than 30 inches per year in western Jack County to more than 44 inches per year in the northeast corner of Fannin County [(7)]. Figure 1.3 shows average annual runoff, which follows a similar pattern of increasing from west to east [(8)]. (It is interesting to note that the percentage of rainfall that becomes runoff increases dramatically from west to east across Region C. While the average rainfall is about 1.5 times as great in the east as in the west, the runoff is almost 5 times as great in the east as in the west.) Figure 1.4 shows gross reservoir evaporation in Region C, which is higher to the west [(7)]. (Gross reservoir evaporation indicates the amount lost to evaporation from the surface of a reservoir.) The rate of evaporation from a reservoir surface exceeds rainfall throughout Region C, but the margin is much greater in the western part of the region than in the east. The patterns of rainfall, runoff, and evaporation result in more abundant water supplies in the eastern part of Region C than in the west.

Figure 1.5 shows the variations in annual streamflow for five U.S. Geological Survey (USGS) streamflow gages in Region C [(9)]. The four gages on tributaries have watersheds with limited development and show the natural variation of streamflows in this region. The Trinity River near Rosser gage is on the main stem of the Trinity River downstream from the Dallas-Fort Worth area. At this location, natural flow patterns have been substantially altered by reservoir development and by return flows of treated wastewater.

Figure 1.2
Average Annual Precipitation

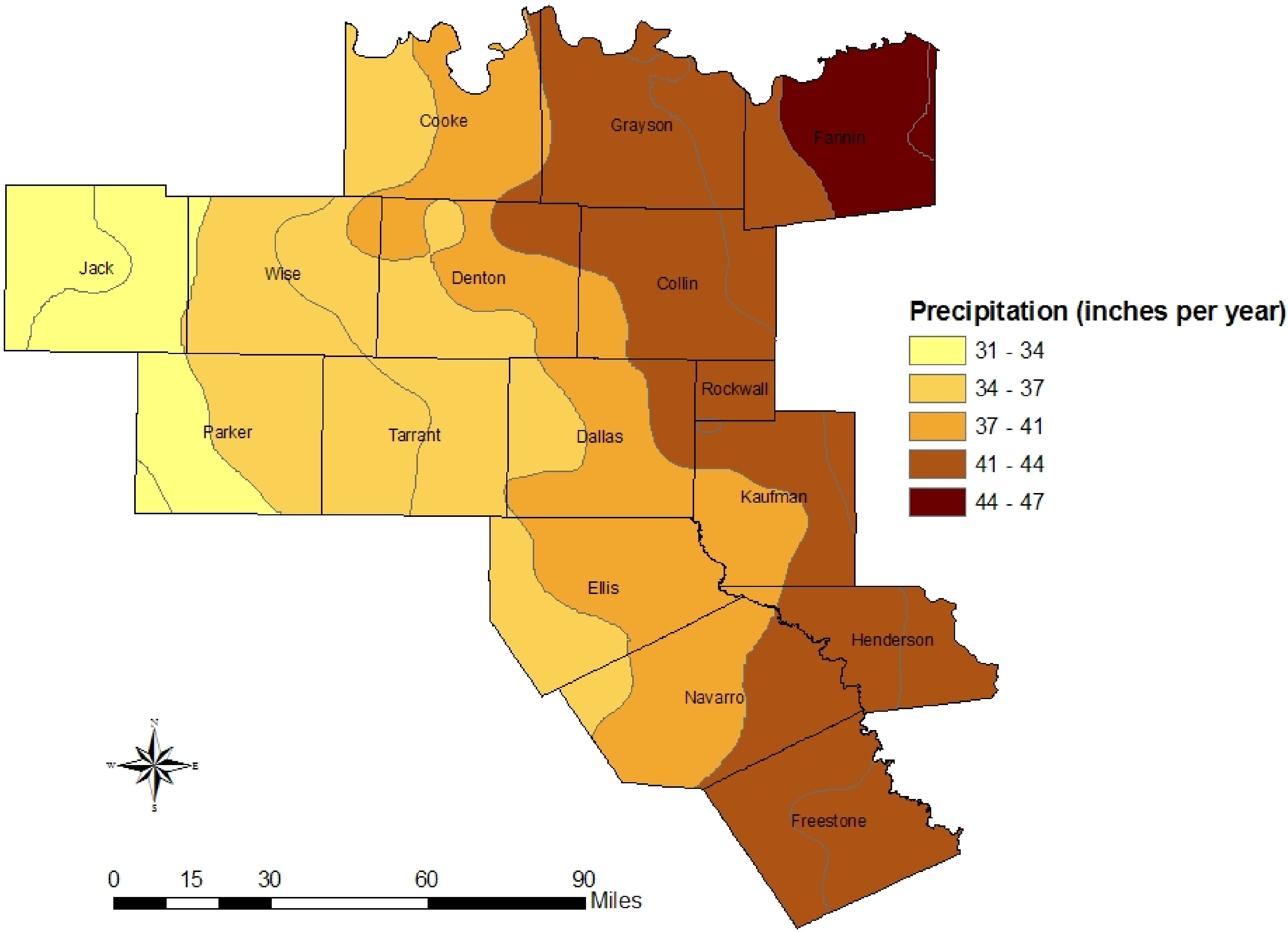


Figure 1.3
Average Annual Runoff

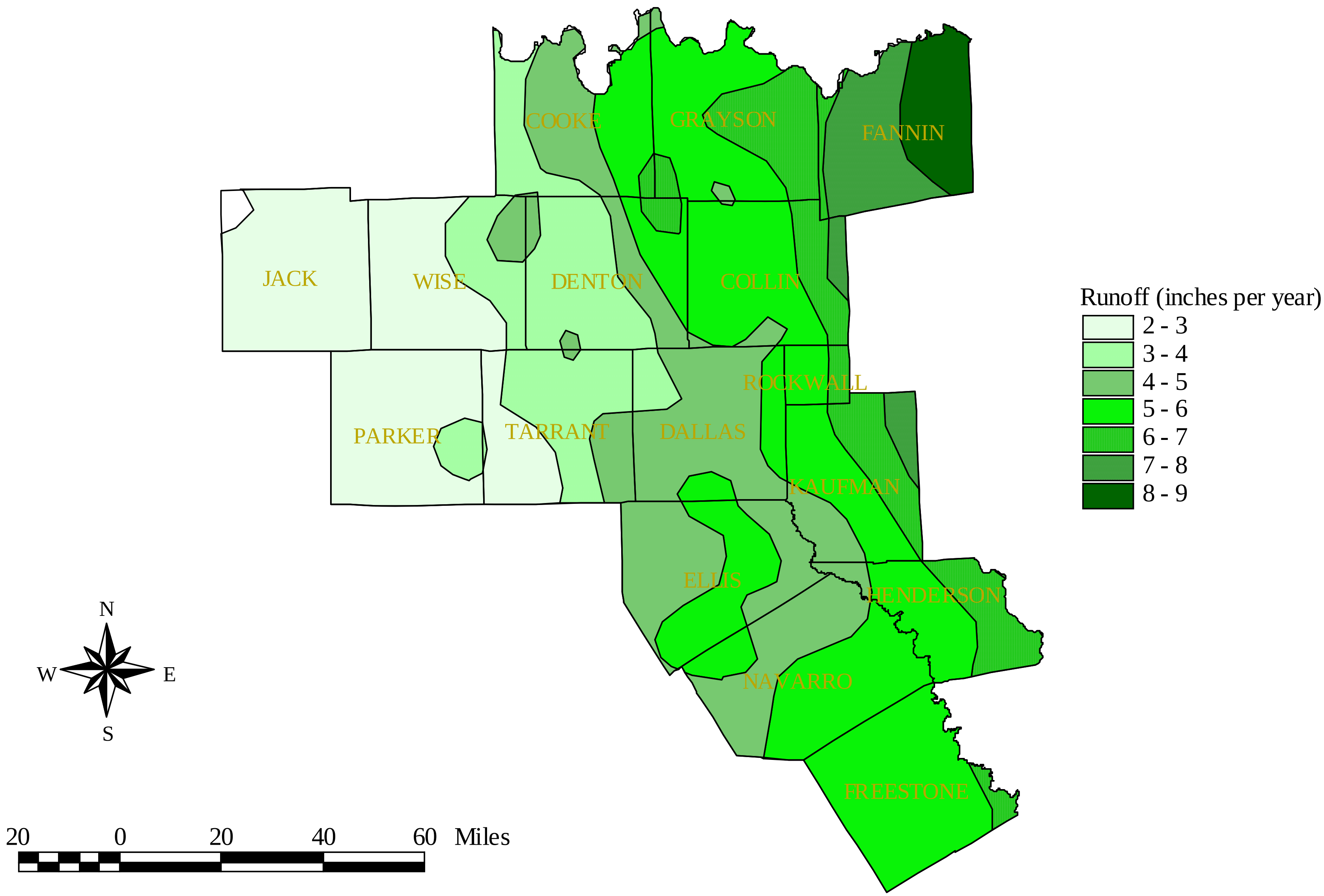


Figure 1.4
Average Annual Gross Evaporation

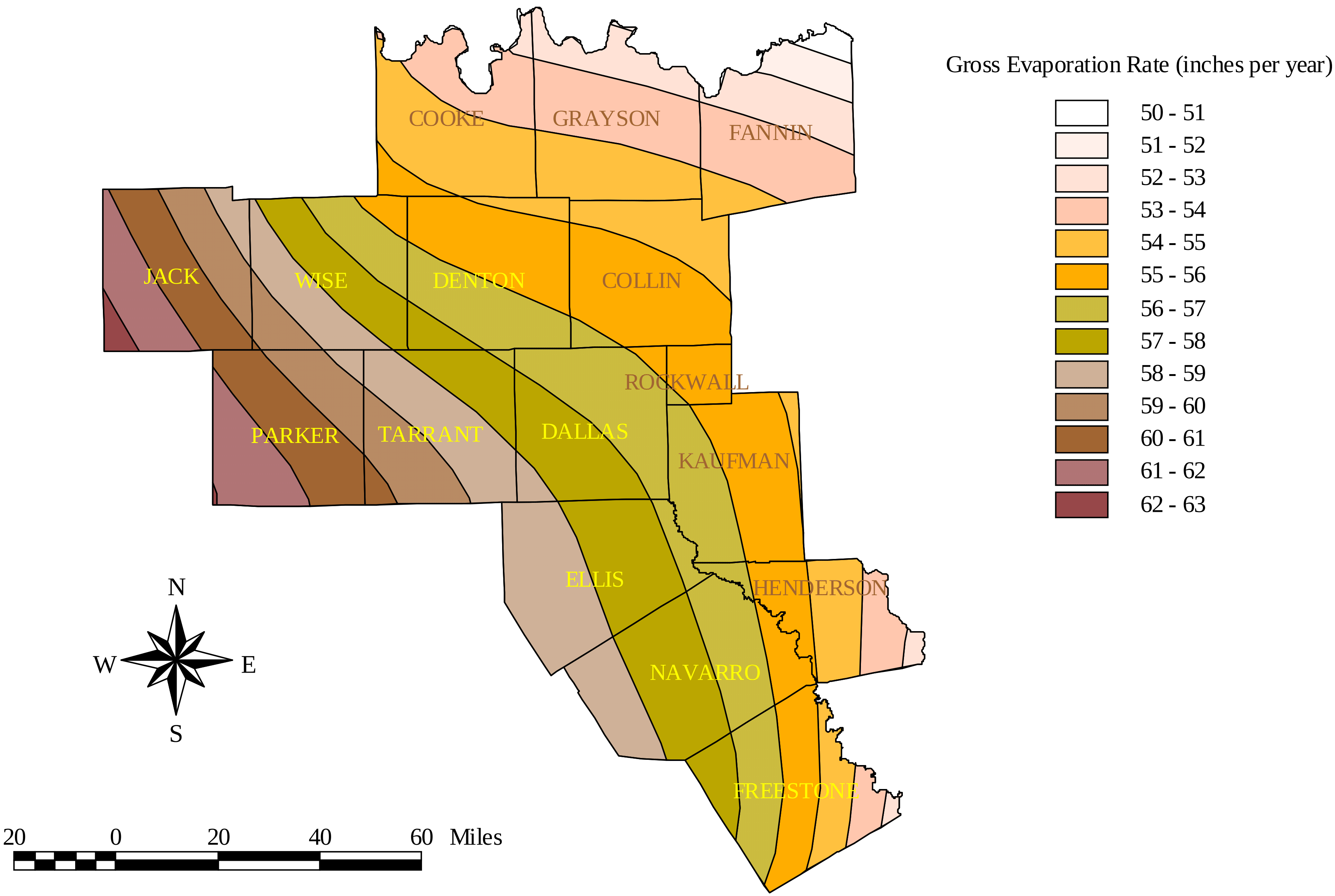
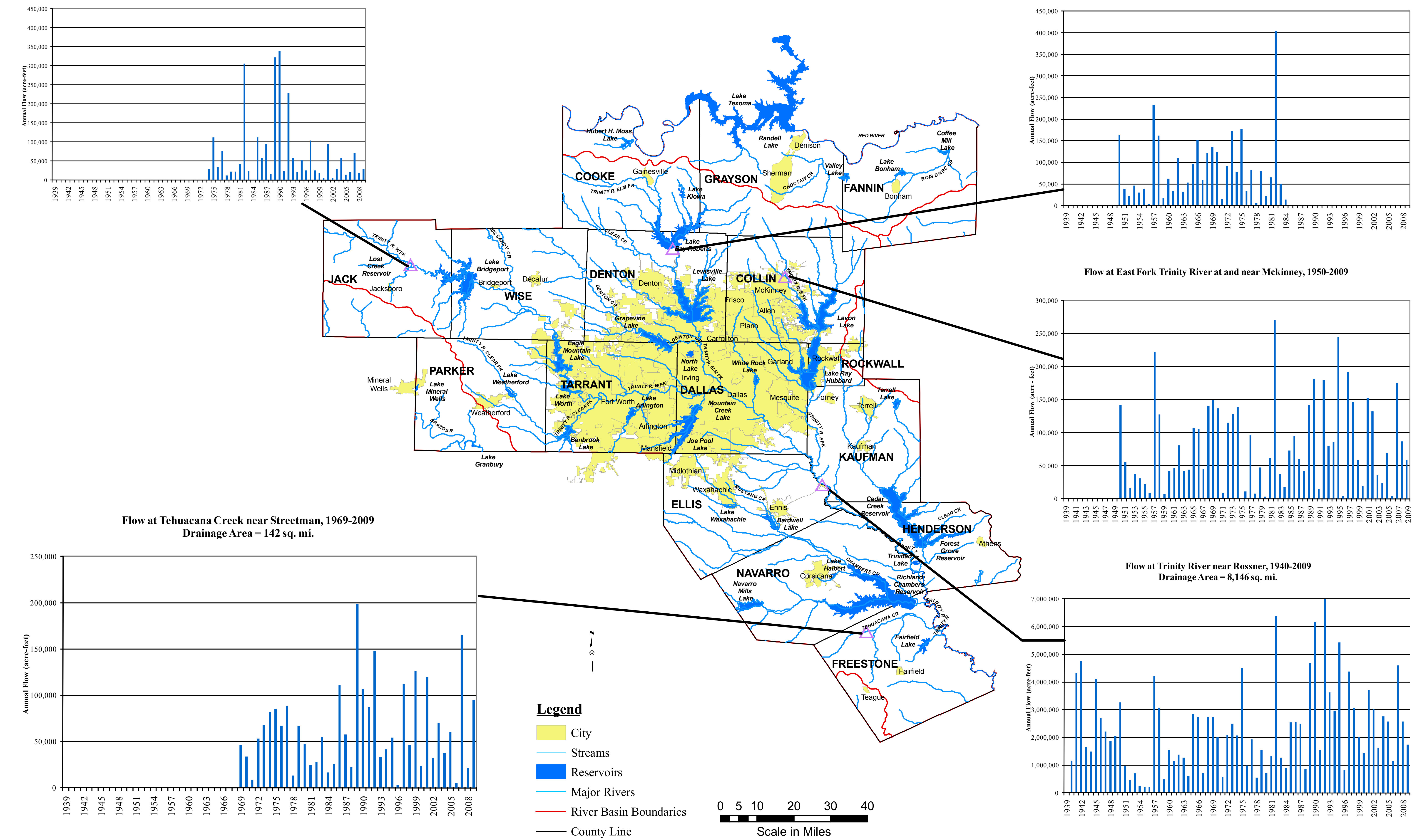


**Figure 1.5**
**Region C Annual Streamflow**



# Figure 1.6
# Region C Median Streamflow

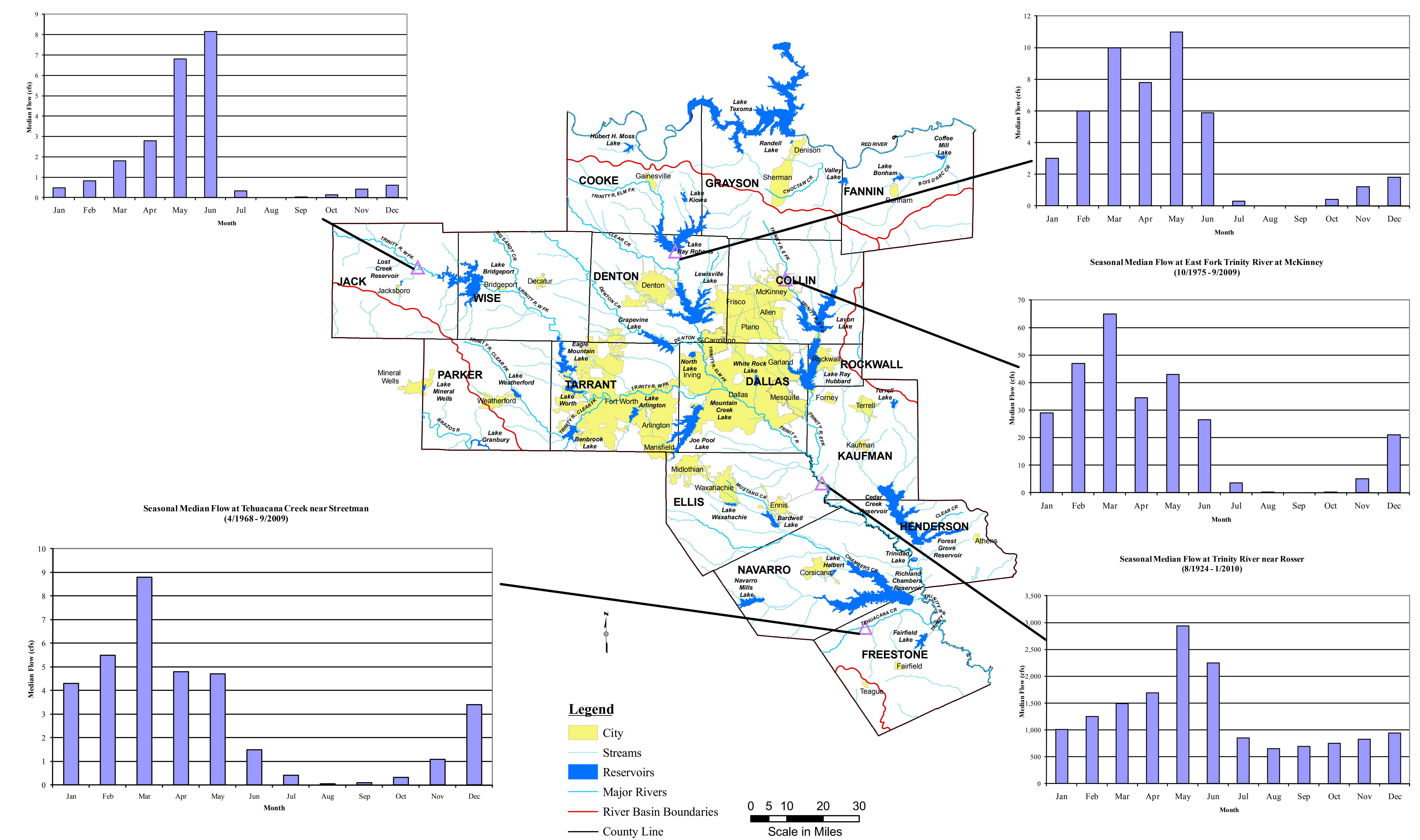


Figure 1.6 shows seasonal patterns of median streamflows for the same five gages [9]. Return flows from the Dallas-Fort Worth area reduce seasonal variations in flow at the Rosser gage by significantly increasing summer flows compared to natural conditions.

Table 1.4 lists the 34 reservoirs in Region C with conservation storage over 5,000 acre-feet, all of which are shown in Figure I.1. These reservoirs and others outside of Region C provide most of the region's water supply. Reservoirs are necessary to provide a reliable surface water supply in this part of the state because of the wide variations in natural streamflow. Reservoir storage serves to capture high flows when they are available and save them for use during times of normal or low flow.

Figure 1.7 shows major aquifers in Region C, and Figure 1.8 shows minor aquifers [10]. The most heavily used aquifer in Region C is the Trinity aquifer, which supplies most of the groundwater used in the region. The Carrizo-Wilcox aquifer also outcrops in Region C in Navarro, Freestone, and Henderson Counties. Minor aquifers in Region C include the Woodbine aquifer, the Nacatoch aquifer, and a small part of the Queen City aquifer.

### *1.3 Current Water Uses and Demand Centers in Region C*

Table 1.5 shows the total water use by county in Region C from 1996 through 2007 [11]. Water use in Region C has increased in recent years, primarily in response to increasing population and municipal use. The historical record shows years of high use, including 1996, 1998, 1999, 2000 and 2006. High use years are associated with dry weather, which causes higher municipal use due to increased outdoor water use (lawn watering). Table 1.6 shows water use since 1980 by Texas Water Development Board use category. Figure 1.9 is a graph of the historical water use for Region C by category. (The Texas Water Development Board categorizes water use as municipal, manufacturing, steam electric power generation, mining, irrigation, and livestock. Municipal use is by far the largest category in Region C, with significant manufacturing as well. There is limited steam electric, mining, irrigation, and livestock use in Region C.) Table 1.6 also shows statewide water use by category for year 2006 and Region C use as a percent of statewide use. It is interesting to note that Region C, with 25.9 percent of Texas' population, had only 8.2 percent of the state's water use in 2006. This is primarily because Region C has very

**Table 1.4**
**Major Reservoirs in Region C (Over 5,000 Acre-Feet of Conservation Storage)**

| Reservoir | Basin | Stream | County(ies) | Permitted Conservation Storage (Acre-Feet) | Owner | Water Right Holder(s) |
|---|---|---|---|---|---|---|
| Moss | Red | Fish Creek | Cooke | 23,210 | Gainesville | Gainesville |
| Texoma | Red | Red River | Grayson, Cooke | 2,722,000 | Corps of Engineers | Red River Authority, Greater Texoma UA, Denison, North Texas MWD, Luminant |
| Randell | Red | Unnamed Trib. Shawnee Creek | Grayson | 5,400 | Denison | Denison |
| Valley | Red | Sand Creek | Fannin, Grayson | 15,000 | Luminant | Luminant |
| Bonham | Red | Timber Creek | Fannin | 13,000 | Bonham MWA | Bonham |
| Coffee Mill | Red | Coffee Mill Creek | Fannin | 8,000 | USDA | U.S. Department of Agriculture |
| Kiowa | Trinity | Indian Creek | Cooke | 7,000 | Lake Kiowa POA Inc. | Lake Kiowa Property Owners Association, Inc. |
| Ray Roberts | Trinity | Elm Fork Trinity River | Denton, Cooke, Grayson | 799,600 | Corps of Engineers | Dallas and Denton |
| Lost Creek | Trinity | Lost Creek | Jack | 11,961 | Jacksboro | Jacksboro |
| Bridgeport | Trinity | West Fork Trinity River | Wise, Jack | 387,000 | TRWD | Tarrant Regional Water District |
| Lewisville | Trinity | Elm Fork Trinity River | Denton | 618,400 | Corps of Engineers | Dallas and Denton |
| Lavon | Trinity | East Fork Trinity River | Collin | 380,000 | Corps of Engineers | North Texas MWD |
| Weatherford | Trinity | Clear Fork Trinity River | Parker | 19,470 | Weatherford | Weatherford |
| Grapevine | Trinity | Denton Creek | Tarrant, Denton | 161,250 | Corps of Engineers | Dallas County Park Cities MUD, Dallas, Grapevine |
| Eagle Mountain | Trinity | West Fork Trinity River | Tarrant, Wise | 210,000 | TRWD | Tarrant Regional Water District |
| Worth | Trinity | West Fork Trinity River | Tarrant | 38,124 | Fort Worth | Fort Worth |
| Benbrook | Trinity | Clear Fork Trinity River | Tarrant | 72,500 | Corps of Engineers | Tarrant Regional Water District, Benbrook WSA |
| Arlington | Trinity | Village Creek | Tarrant | 45,710 | Arlington | Arlington and Luminant |
| Joe Pool | Trinity | Mountain Creek | Dallas, Tarrant | 176,900 | Corps of Engineers | Trinity River Authority |
| Mountain Creek | Trinity | Mountain Creek | Dallas | 22,840 | Luminant | Luminant |
| North | Trinity | South Fork Grapevine Creek | Dallas | 17,100 | Luminant | Luminant |
| White Rock | Trinity | White Rock Creek | Dallas | 21,345 | Dallas | Dallas |

**Table 1.4, Continued**

| Reservoir | Basin | Stream | County(ies) | Permitted Conservation Storage (Acre-Feet) | Owner | Water Right Holder(s) |
|---|---|---|---|---|---|---|
| Ray Hubbard | Trinity | Elm Fork Trinity River | Dallas, Kaufman, Rockwall | 490,000 | Dallas | Dallas |
| Terrell | Trinity | Muddy Cedar Creek | Kaufman | 8,712 | Terrell | Terrell |
| Bardwell | Trinity | Waxahachie Creek | Ellis | 54,900 | Corps of Engineers | Trinity River Authority |
| Waxahachie | Trinity | Waxahachie Creek | Ellis | 13,500 | Ellis Co. WCID#1 | Ellis Co. WCID#1 |
| Cedar Creek | Trinity | Cedar Creek | Henderson, Kaufman | 678,900 | TRWD | Tarrant Regional Water District |
| Forest Grove | Trinity | Caney Creek | Henderson | 20,038 | Luminant | Luminant |
| Trinidad | Trinity | Off-channel | Henderson | 6,200 | Luminant | Luminant |
| Navarro Mills | Trinity | Richland Creek | Navarro | 63,300 | Corps of Engineers | Trinity River Authority |
| Halbert | Trinity | Elm Creek | Navarro | 7,357 | Corsicana | Corsicana |
| Richland-Chambers | Trinity | Richland Creek | Freestone, Navarro | 1,135,000 | TRWD | Tarrant Regional Water District, Corsicana |
| Fairfield | Trinity | Big Brown Creek | Freestone | 50,600 | Luminant | Luminant |
| Mineral Wells | Brazos | Rock Creek | Parker | 7,065 | Mineral Wells | Mineral Wells |

Note: Data are from TCEQ water rights list [12] and other sources.

**Figure 1.7**
**Major Aquifers in Region C Counties**

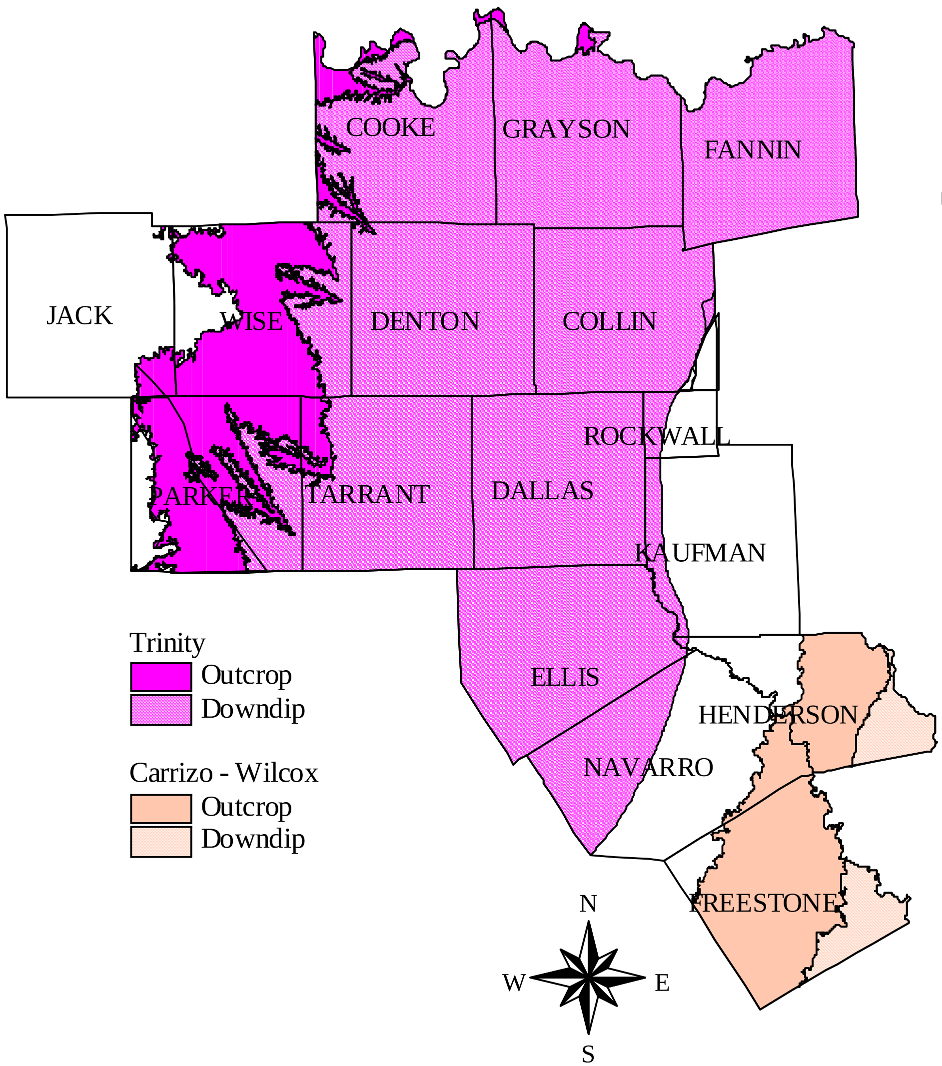
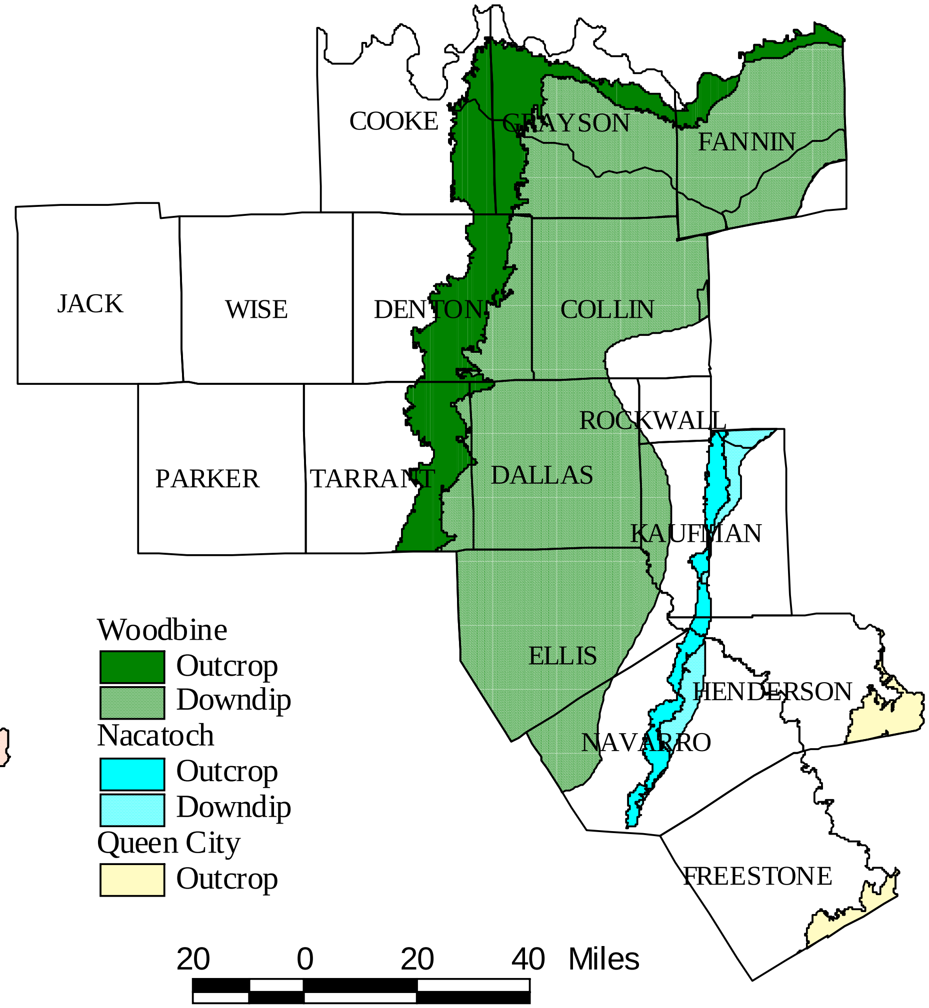



**Figure 1.8**
**Minor Aquifers in Region C Counties**




Note:
Outcrop is the area of the formation at the surface.
Downdip is the area of the formation below the surface.

**Table 1.5**
**Historical Total Water Use by County in Region C**
- Values in Acre-Feet -

| County | Year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| Collin | 89,230 | 94,231 | 116,915 | 133,255 | 136,422 | 147,386 | 146,175 | 135,617 | 135,231 | 150,243 | 160,712 | 146,319 |
| Cooke | 8,429 | 8,534 | 8,608 | 7,966 | 7,559 | 6,707 | 6,343 | 7,144 | 7,720 | 8,161 | 8,324 | 7,241 |
| Dallas | 505,423 | 495,381 | 570,266 | 651,916 | 650,005 | 606,138 | 618,997 | 542,307 | 527,422 | 493,124 | 623,985 | 596,856 |
| Denton | 65,075 | 66,880 | 70,578 | 91,378 | 96,324 | 102,881 | 100,122 | 92,909 | 98,492 | 97,614 | 108,894 | 90,952 |
| Ellis | 19,721 | 20,368 | 25,537 | 23,891 | 26,618 | 39,502 | 28,630 | 27,900 | 22,525 | 33,983 | 32,980 | 27,810 |
| Fannin | 17,515 | 13,760 | 13,533 | 14,061 | 19,018 | 16,049 | 15,933 | 16,040 | 10,689 | 17,333 | 12,191 | 11,012 |
| Freestone | 20,608 | 15,446 | 14,888 | 17,002 | 24,492 | 10,854 | 6,177 | 9,231 | 8,779 | 9,908 | 14,797 | 15,999 |
| Grayson | 29,152 | 27,810 | 37,637 | 35,850 | 33,032 | 36,223 | 35,481 | 34,214 | 30,646 | 29,992 | 30,953 | 21,990 |
| Henderson [b] | 10,653 | 9,791 | 13,181 | 13,367 | 18,648 | 15,189 | 14,610 | 15,115 | 13,889 | 11,033 | 8,343 | 11,002 |
| Jack | 3,337 | 2,399 | 2,597 | 2,647 | 2,601 | 2,609 | 2,526 | 2,855 | 2,743 | 2,907 | 2,892 | 2,549 |
| Kaufman | 10,653 | 10,245 | 11,945 | 11,302 | 15,501 | 15,545 | 14,510 | 13,785 | 14,518 | 15,663 | 21,683 | 15,064 |
| Navarro | 10,558 | 10,540 | 12,414 | 11,669 | 11,391 | 12,133 | 11,417 | 11,799 | 11,707 | 12,703 | 11,184 | 10,008 |
| Parker | 12,372 | 12,600 | 15,407 | 15,638 | 11,606 | 16,583 | 16,611 | 18,290 | 17,755 | 22,035 | 21,527 | 19,373 |
| Rockwall | 6,566 | 6,437 | 7,928 | 8,575 | 10,339 | 10,635 | 4,411 | 10,168 | 10,842 | 13,236 | 11,907 | 9,489 |
| Tarrant | 291,406 | 283,626 | 328,338 | 341,925 | 326,647 | 391,591 | 328,440 | 331,727 | 301,574 | 428,710 | 320,345 | 320,861 |
| Wise | 25,688 | 30,608 | 27,743 | 26,729 | 13,540 | 18,869 | 17,792 | 16,609 | 15,439 | 16,138 | 13,818 | 13,782 |
| **Total** | **1,126,518** | **1,108,656** | **1,277,515** | **1,407,171** | **1,403,743** | **1,448,894** | **1,368,175** | **1,285,710** | **1,229,971** | **1,362,783** | **1,404,535** | **1,320,307** |

Notes: a. Data are from Texas Water Development Board. Data for years 1998 to 2000 have been updated by TWDB since the 2006 Region C Water Plan. The data in this table is updated to match TWDB data as of October 2009 and December 2009.[11]

b. Data for Henderson County include only the part of the county in Region C for 1996 through 1997. Data for Henderson County include the entire county from 1998 through 2007, with year 2005 and 2006 being estimates.

**Table 1.6**
**Historical Water Use by Category in Region C**
- Values in Acre-Feet -

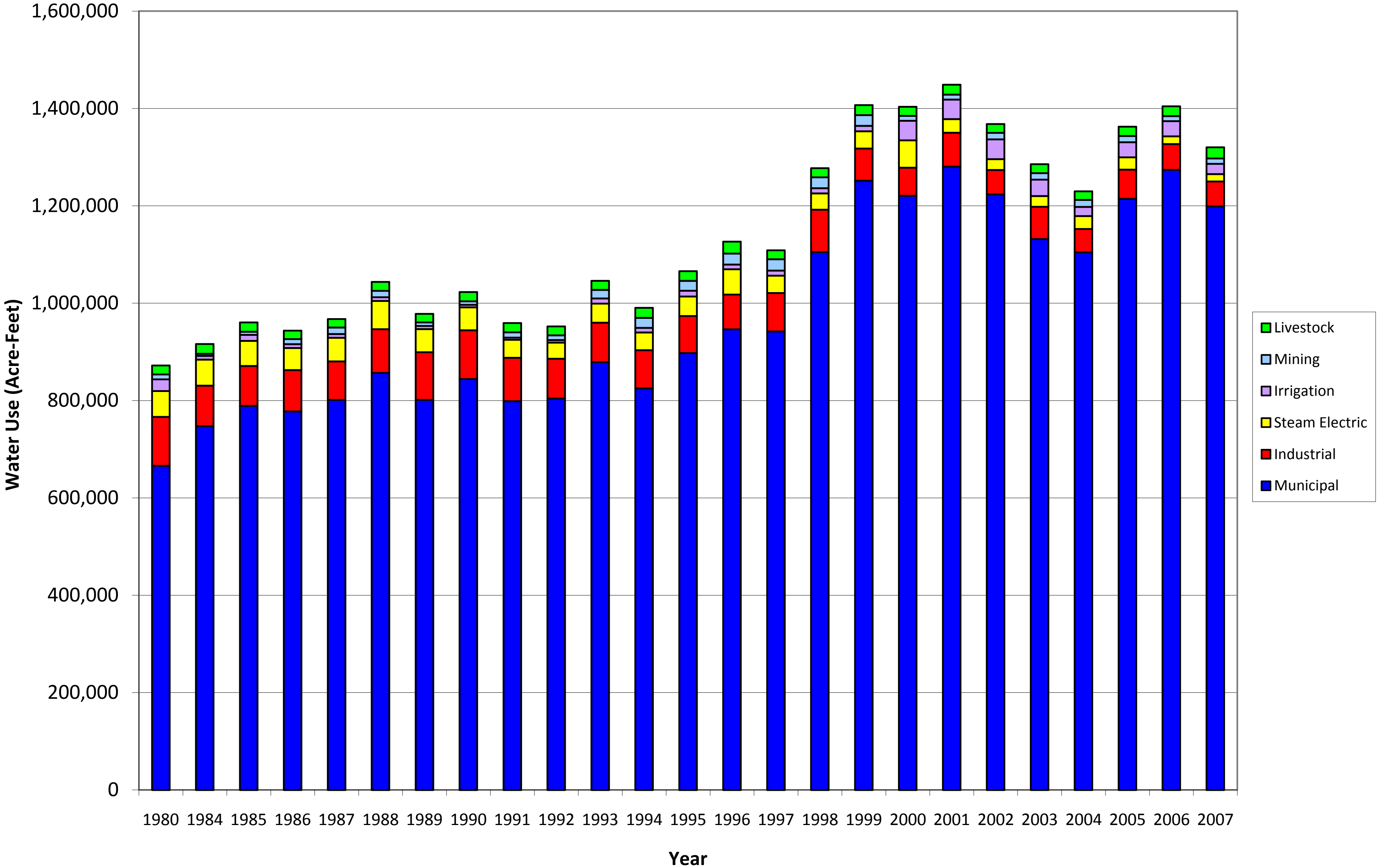
| Year | Municipal | Manu-facturing | Steam Electric | Irrigation | Mining | Livestock | Total |
|---|---|---|---|---|---|---|---|
| 1980 | 666,010 | 100,657 | 53,009 | 23,993 | 10,114 | 18,381 | 872,164 |
| 1984 | 747,532 | 83,337 | 53,403 | 7,716 | 4,149 | 20,004 | 916,141 |
| 1985 | 789,077 | 81,998 | 51,661 | 12,404 | 6,386 | 19,159 | 960,685 |
| 1986 | 777,798 | 84,946 | 45,210 | 7,918 | 10,508 | 17,354 | 943,734 |
| 1987 | 801,530 | 79,017 | 48,503 | 7,817 | 13,437 | 17,224 | 967,528 |
| 1988 | 856,896 | 89,916 | 57,809 | 7,841 | 13,107 | 18,248 | 1,043,817 |
| 1989 | 801,595 | 97,859 | 47,433 | 6,640 | 7,153 | 17,464 | 978,144 |
| 1990 | 844,430 | 100,062 | 46,959 | 5,434 | 7,153 | 18,970 | 1,023,008 |
| 1991 | 798,811 | 89,141 | 36,951 | 4,441 | 10,948 | 19,141 | 959,433 |
| 1992 | 804,145 | 81,776 | 33,393 | 5,117 | 9,522 | 18,475 | 952,428 |
| 1993 | 879,038 | 81,043 | 39,175 | 10,749 | 17,478 | 18,595 | 1,046,078 |
| 1994 | 825,076 | 78,619 | 36,252 | 9,514 | 20,449 | 20,776 | 990,686 |
| 1995 | 897,591 | 76,036 | 40,321 | 11,693 | 20,324 | 19,845 | 1,065,810 |
| 1996 | 946,454 | 71,366 | 52,103 | 9,689 | 22,576 | 24,330 | 1,126,518 |
| 1997 | 942,004 | 79,048 | 35,673 | 10,451 | 23,283 | 18,197 | 1,108,656 |
| 1998 | 1,104,966 | 87,372 | 33,256 | 10,835 | 22,172 | 18,914 | 1,277,515 |
| 1999 | 1,251,807 | 65,993 | 35,492 | 11,125 | 22,172 | 20,582 | 1,407,171 |
| 2000 | 1,220,710 | 57,784 | 56,236 | 40,153 | 10,064 | 18,796 | 1,403,743 |
| 2001 | 1,280,785 | 69,557 | 28,057 | 40,214 | 9,930 | 20,351 | 1,448,894 |
| 2002 | 1,223,661 | 50,197 | 22,136 | 40,763 | 13,243 | 18,175 | 1,368,175 |
| 2003 | 1,132,154 | 65,946 | 22,108 | 33,741 | 13,460 | 18,301 | 1,285,710 |
| 2004 | 1,104,463 | 48,163 | 26,615 | 18,724 | 14,257 | 17,749 | 1,229,971 |
| 2005 | 1,214,573 | 59,995 | 25,154 | 31,004 | 12,848 | 19,209 | 1,362,783 |
| 2006 | 1,274,014 | 53,027 | 15,997 | 31,067 | 10,367 | 20,063 | 1,404,535 |
| 2007 | 1,198,873 | 51,350 | 15,160 | 21,122 | 10,952 | 22,850 | 1,320,307 |
| **State Total in 2006** | **4,221,045** | **1,313,914** | **463,248** | **8,019,215** | **79,608** | **353,255** | **14,450,285** |
| **% in Region C** | **30.2%** | **4.0%** | **3.5%** | **0.4%** | **13%** | **5.7%** | **9.7%** |

Note: a. Data are from the Texas Water Development Board [11]

b. Data for years 1998 to 2000 have been updated by TWDB since the *2006 Region C Water Plan*. The 1998 to 2000 data in this table are updated to match TWDB data as of October 2009.

c. Data for Henderson County includes only the portion of the county within Region C from 1980 to 1997 and for 2005 through 2007 (with years 2005 and 2006 being estimates). Data for Henderson County includes entire county from 1998 to 2004.

**Figure 1.9**
**Historical Water Use by Category in Region C**



limited water use for irrigation, while irrigation use is more than 60 percent of the total use for the state as a whole.

Table 1.7 shows the water use in Region C by category by county in 2006, the base year for this round of regional water planning. About 90 percent of the current water use in Region C is for municipal supply, with manufacturing use as the second largest category. Mining use was unusually high in 2006 due to the increased natural gas drilling activity in the Barnett Shale. The irrigation water use in Region C is somewhat misleading in that this number primarily represents golf course irrigation, as opposed to crop irrigation. The year 2006 water use in Tarrant and Dallas Counties was 67.2 percent of the total Region C use, and these two counties had 66 percent of the region's population in 2006.

**Table 1.7**
**Year 2006 Water Use by Category by County**
- Values in Acre-Feet -

| County | Municipal | Manu-facturing | Steam Electric | Irrigation | Mining | Livestock | Total |
|---|---|---|---|---|---|---|---|
| Collin | 156,918 | 1,423 | 525 | 938 | 0 | 908 | 160,712 |
| Cooke | 6,265 | 121 | 4 | 300 | 268 | 1,366 | 8,324 |
| Dallas | 584,495 | 25,899 | 1,444 | 11,225 | 95 | 827 | 623,985 |
| Denton | 101,879 | 447 | 639 | 2,750 | 2,019 | 1,160 | 108,894 |
| Ellis | 25,601 | 5,931 | 0 | 312 | 21 | 1,115 | 32,980 |
| Fannin | 4,591 | 5 | 361 | 5,567 | 6 | 1,661 | 12,191 |
| Freestone | 2,526 | 0 | 9,936 | 98 | 79 | 2,158 | 14,797 |
| Grayson | 26,000 | 2,222 | 0 | 1,271 | 20 | 1,440 | 30,953 |
| Henderson [b] | 6,633 | 479 | 25 | 0 | 463 | 743 | 8,343 |
| Jack | 1,247 | 0 | 0 | 188 | 402 | 1,055 | 2,892 |
| Kaufman | 18,743 | 678 | 0 | 179 | 0 | 2,083 | 21,683 |
| Navarro | 8,632 | 978 | 0 | 100 | 0 | 1,474 | 11,184 |
| Parker | 16,026 | 571 | 9 | 490 | 2,652 | 1,779 | 21,527 |
| Rockwall | 11,732 | 33 | 0 | 0 | 0 | 142 | 11,907 |
| Tarrant | 294,427 | 13,297 | 3,054 | 6,359 | 2,494 | 714 | 320,345 |
| Wise | 8,299 | 943 | 0 | 1,290 | 1,848 | 1,438 | 13,818 |
| **Total** | **1,274,014** | **53,027** | **15,997** | **31,067** | **10,367** | **20,063** | **1,404,535** |

Notes: a. Data are from the Texas Water Development Board [11].
b. Data for Henderson County include only the portion of county in Region C.

Figure 1.10 is a comparison of year 2006 per capita municipal water use for the sixteen Senate Bill 1 planning regions. (Per capita water use, usually expressed as gallons per capita per day, or gpcd, is an estimate of the water use per person.) Region C had the second highest per capita municipal water use in the year 2006, about 17 percent higher than the statewide average. It should be noted that these municipal per capita use figures include not only residential use, but also commercial use, of which there is a significant amount in Region C. Figure 1.11 shows a comparison of year 2006 per capita non-agricultural water use by region. This includes municipal, manufacturing, steam electric power generation, and mining use. Region C had the 5$^{th}$ lowest per capita non-agricultural water use, about 14 percent below the statewide average. Figure 1.12 shows the year 2006 total per capita water use by region. Region C had by far the lowest total per capita total water use of any of the planning regions in the year 2006.

In addition to the consumptive water uses discussed above, water is used for recreation and other purposes in Region C. Reservoirs for which records of visitors are maintained (primarily Corps of Engineers lakes with recreational facilities) draw millions of visitors each year in Region C. In addition, smaller lakes and streams in the region draw many visitors for fishing, boating, swimming, and other water-related recreational activities. Water in streams and lakes is also important to fish and wildlife in the region.

## 1.4 Current Sources of Water Supply

Table 1.8 summarizes the total surface water and groundwater use in Region C from 1980 through 2007 [11], and Figure 1.13 shows the division of total water use between surface water and groundwater. Total water use has increased significantly since 1980. Since 1990, over 90 percent of the water use in Region C has been supplied by surface water. Table 1.9 shows the groundwater and surface water use by county and category for year 2006 [11]. Table 1.9 demonstrates some interesting points about water use in Region C in the year 2006:

- Although groundwater provided only 7.5 percent of the overall water use in Region C, it provided 13 percent of the irrigation use, 23 percent of the livestock use, and 93 percent of the mining use.
- Groundwater provided the majority of the total water use in Cooke and Parker Counties and over 25 percent in Ellis, Fannin, Grayson, Henderson, Jack and Wise Counties.

**Figure 1.10**
**Comparison of Year 2006 Municipal Per Capita Water Use by Region**

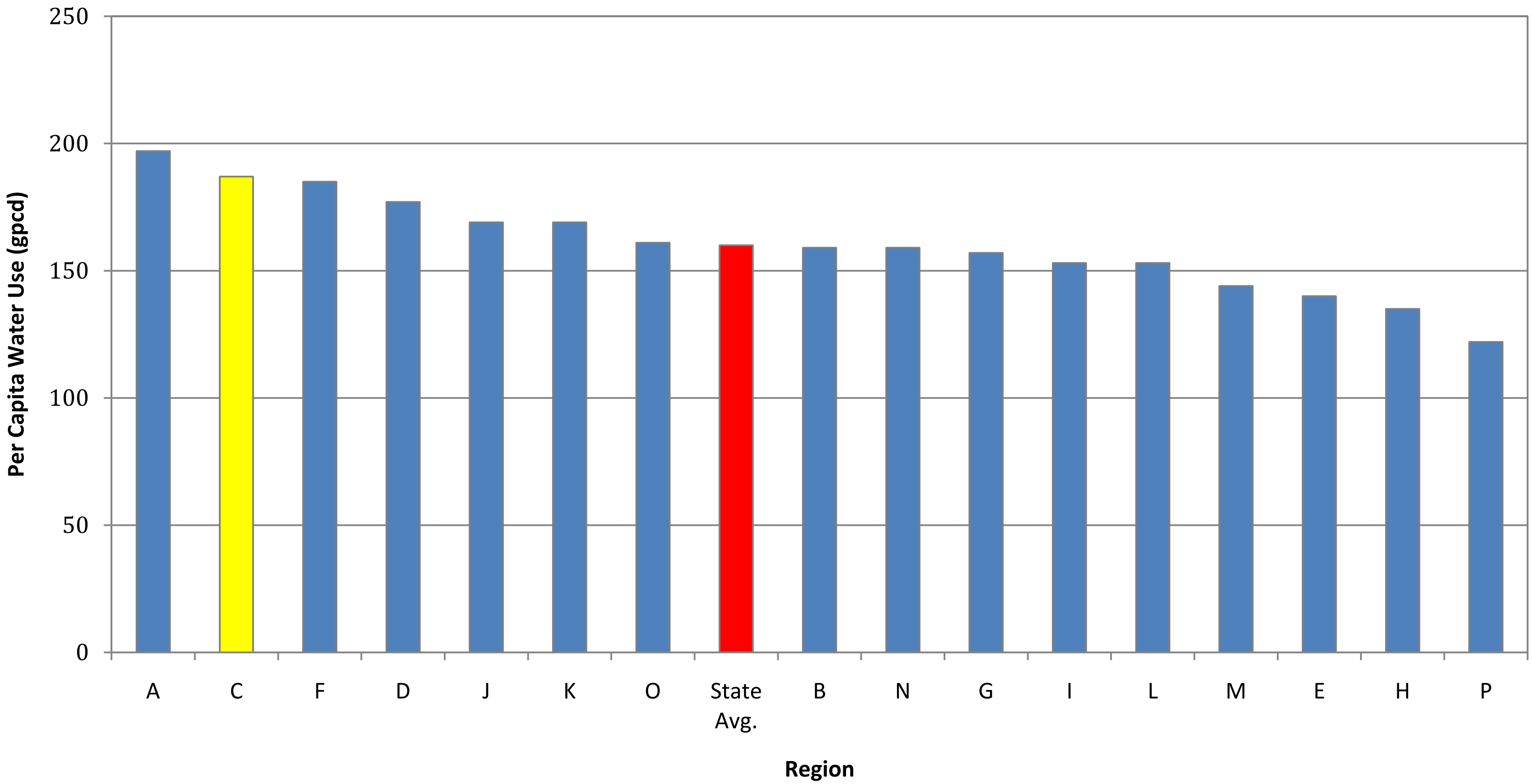


**Figure 1.11**
**Comparison of Year 2006 Non-Agricultural Per Capita Water Use by Region**

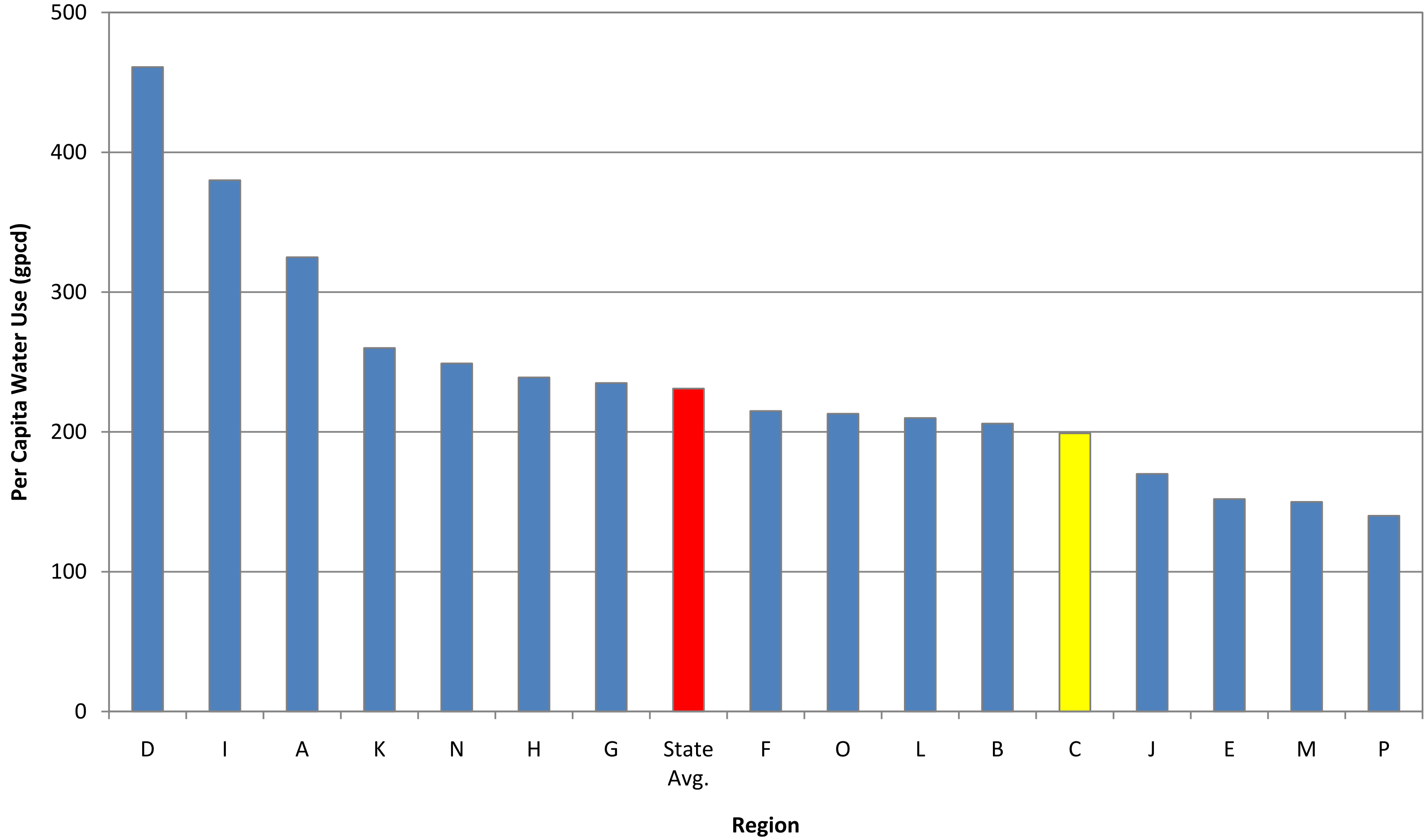


**Figure 1.12**
**Comparison of Year 2006 Total Capita Water Use by Region**

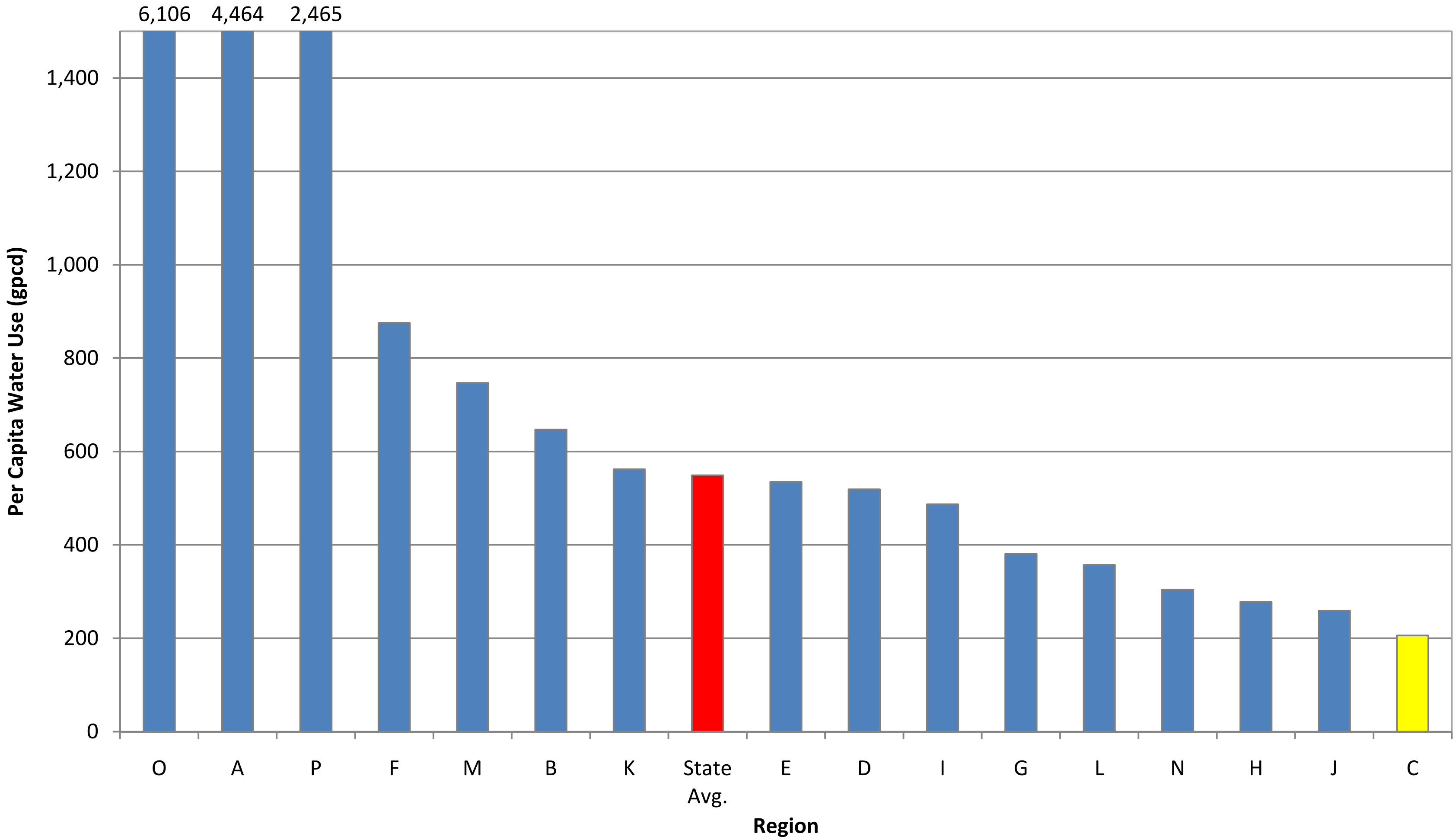
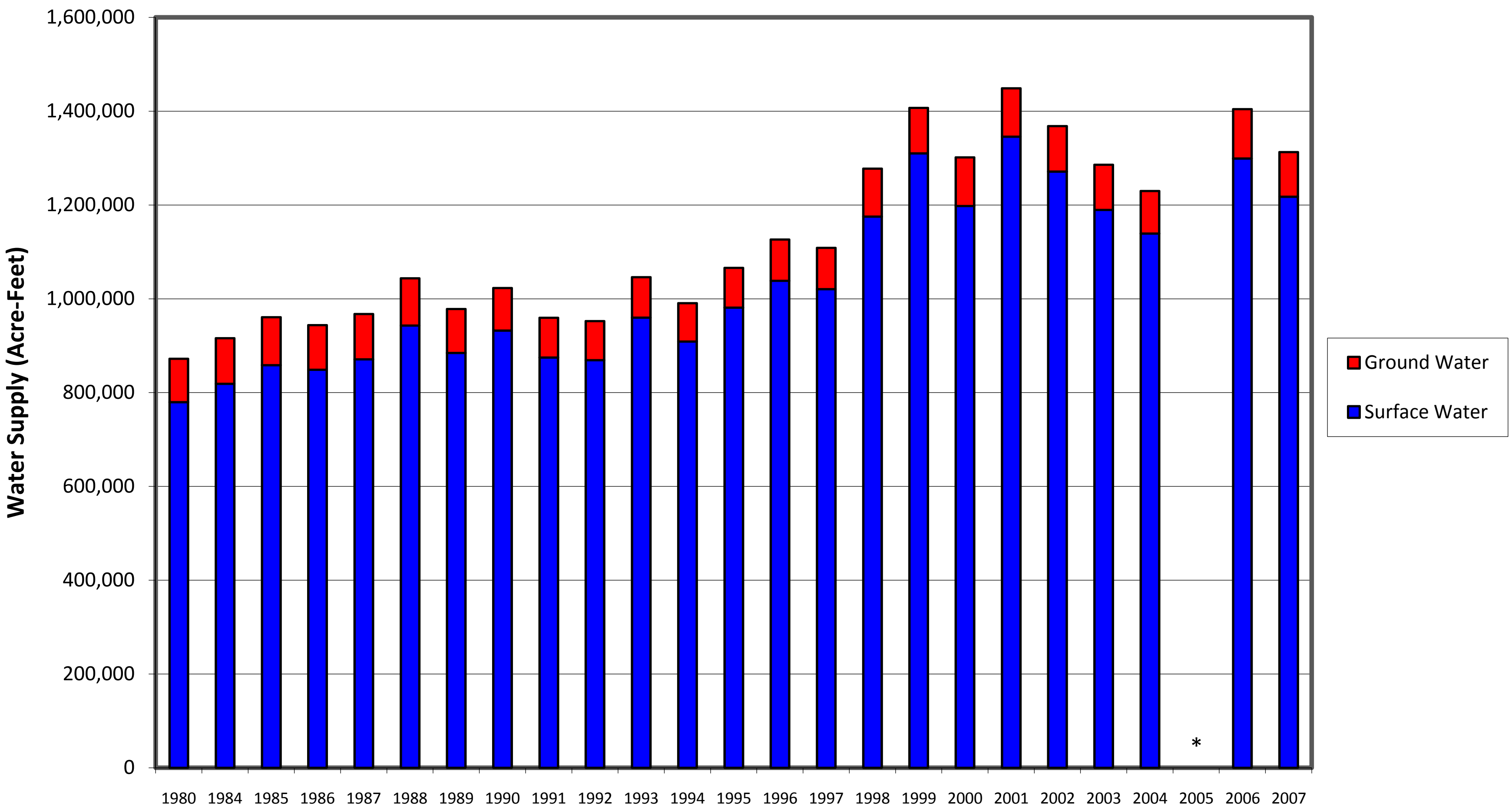


**Table 1.8**
**Historical Sources of Water Supply in Region C**

| Year | Supply in Acre-Feet | | |
|---|---|---|---|
| | Surface Water | Ground-water | Total |
| 1980 | 779,799 | 92,365 | 872,164 |
| 1984 | 818,762 | 97,379 | 916,141 |
| 1985 | 858,607 | 102,078 | 960,685 |
| 1986 | 848,838 | 94,896 | 943,734 |
| 1987 | 871,038 | 96,490 | 967,528 |
| 1988 | 942,863 | 100,954 | 1,043,817 |
| 1989 | 884,663 | 93,481 | 978,144 |
| 1990 | 932,298 | 90,710 | 1,023,008 |
| 1991 | 874,846 | 84,587 | 959,433 |
| 1992 | 869,064 | 83,364 | 952,428 |
| 1993 | 959,840 | 86,238 | 1,046,078 |
| 1994 | 908,770 | 81,916 | 990,686 |
| 1995 | 981,168 | 84,642 | 1,065,810 |
| 1996 | 1,038,508 | 88,010 | 1,126,518 |
| 1997 | 1,020,639 | 88,017 | 1,108,656 |
| 1998 | 1,175,226 | 102,289 | 1,277,515 |
| 1999 | 1,310,178 | 96,993 | 1,407,171 |
| 2000 | 1,197,702 | 103,993 | 1,301,695 |
| 2001 | 1,345,681 | 103,213 | 1,448,894 |
| 2002 | 1,271,475 | 96,700 | 1,368,175 |
| 2003 | 1,189,466 | 96,244 | 1,285,710 |
| 2004 | 1,139,257 | 90,714 | 1,229,971 |
| 2005 | Not Available | | 1,362,783 |
| 2006 | 1,299,320 | 105,215 | 1,404,535 |
| 2007 | 1,217,729 | 94,970 | 1,312,699 |

Notes: a. Data are from Texas Water Development Board [11].
b. Data for years 1998 to 2000 have been updated by TWDB since the *2006 Region C Water Plan.* The 1998 to 2000 data in this table are updated to match TWDB data as of October 2009.
c. Data for Henderson County includes entire county from 1998 to 2004.
d. 2005 - 2007 data includes only the portion of Henderson County within Region C.
e. The Surface water/ground water split for 2005 is not available from TWDB as of October 2009.

**Figure 1.13**
**Historical Source of Supply in Region C**




* The Surface water/ground water split for 2005 is not available from TWDB as of October 2009.

**Table 1.9**
**Sources of Water Supply by County by Category in 2006 for Region C**
- Values in Acre-Feet -

| County | Water Type | Munic-ipal | Manu-facturing | Steam Electic | Irriga-tion | Mining | Live-stock | Total |
|---|---|---|---|---|---|---|---|---|
| Collin | Ground | 5,485 | 327 | 0 | 938 | 0 | 45 | 6,795 |
| | Surface | 151,433 | 1,096 | 525 | 0 | 0 | 863 | 153,917 |
| | Total | 156,918 | 1,423 | 525 | 938 | 0 | 908 | 160,712 |
| Cooke | Ground | 5,840 | 121 | 4 | 82 | 268 | 205 | 6,520 |
| | Surface | 425 | 0 | 0 | 218 | 0 | 1,161 | 1,804 |
| | Total | 6,265 | 121 | 4 | 300 | 268 | 1,366 | 8,324 |
| Dallas | Ground | 2,488 | 1,853 | 0 | 0 | 15 | 703 | 5,059 |
| | Surface | 582,007 | 24,046 | 1,444 | 11,225 | 80 | 124 | 618,926 |
| | Total | 584,495 | 25,899 | 1,444 | 11,225 | 95 | 827 | 623,985 |
| Denton | Ground | 12,541 | 30 | 0 | 1,337 | 2,019 | 348 | 16,275 |
| | Surface | 89,338 | 417 | 639 | 1,413 | 0 | 812 | 92,619 |
| | Total | 101,879 | 447 | 639 | 2,750 | 2,019 | 1,160 | 108,894 |
| | | | | | | | | |
| Ellis | Ground | 6,707 | 2,325 | 0 | 261 | 21 | 22 | 9,336 |
| | Surface | 18,894 | 3,606 | 0 | 51 | 0 | 1,093 | 23,644 |
| | Total | 25,601 | 5,931 | 0 | 312 | 21 | 1,115 | 32,980 |
| Fannin | Ground | 2,998 | 0 | 80 | 0 | 6 | 1,495 | 4,579 |
| | Surface | 1,593 | 5 | 281 | 5,567 | 0 | 166 | 7,612 |
| | Total | 4,591 | 5 | 361 | 5,567 | 6 | 1,661 | 12,191 |
| Freestone | Ground | 2,249 | 0 | 745 | 38 | 79 | 216 | 3,327 |
| | Surface | 277 | 0 | 9,191 | 60 | 0 | 1,942 | 11,470 |
| | Total | 2,526 | 0 | 9,936 | 98 | 79 | 2,158 | 14,797 |
| Grayson | Ground | 10,704 | 1,215 | 0 | 334 | 20 | 360 | 12,633 |
| | Surface | 15,296 | 1,007 | 0 | 937 | 0 | 1,080 | 18,320 |
| | Total | 26,000 | 2,222 | 0 | 1,271 | 20 | 1,440 | 30,953 |
| Henderson [b] | Ground | 2,765 | 408 | 0 | 0 | 315 | 298 | 3,786 |
| | Surface | 3,868 | 71 | 25 | 0 | 148 | 446 | 4,558 |
| | Total | 6,633 | 479 | 25 | 0 | 463 | 744 | 8,344 |
| Jack | Ground | 483 | 0 | 0 | 127 | 402 | 158 | 1,170 |
| | Surface | 764 | 0 | 0 | 61 | 0 | 897 | 1,722 |
| | Total | 1,247 | 0 | 0 | 188 | 402 | 1,055 | 2,892 |
| Kaufman | Ground | 0 | 430 | 0 | 170 | 0 | 104 | 704 |
| | Surface | 18,743 | 248 | 0 | 9 | 0 | 1,979 | 20,979 |
| | Total | 18,743 | 678 | 0 | 179 | 0 | 2,083 | 21,683 |
| Navarro | Ground | 187 | 1 | 0 | 98 | 0 | 74 | 360 |
| | Surface | 8,445 | 977 | 0 | 2 | 0 | 1,400 | 10,824 |
| | Total | 8,632 | 978 | 0 | 100 | 0 | 1,474 | 11,184 |

**Table 1.9, Continued**

| County | Water Type | Municipal | Manu-facturing | Steam Electic | Irriga-tion | Mining | Live-stock | Total |
|---|---|---|---|---|---|---|---|---|
| Parker | Ground | 8,341 | 13 | 0 | 474 | 2,225 | 178 | 11,231 |
| | Surface | 7,685 | 558 | 9 | 16 | 427 | 1,601 | 10,296 |
| | Total | 16,026 | 571 | 9 | 490 | 2,652 | 1,779 | 21,527 |
| Rockwall | Ground | 119 | 0 | 0 | 0 | 0 | 1 | 120 |
| | Surface | 11,613 | 33 | 0 | 0 | 0 | 141 | 11,787 |
| | Total | 11,732 | 33 | 0 | 0 | 0 | 142 | 11,907 |
| Tarrant | Ground | 13,293 | 1,019 | 0 | 0 | 2,494 | 107 | 16,913 |
| | Surface | 281,134 | 12,278 | 3,054 | 6,359 | 0 | 606 | 303,431 |
| | Total | 294,427 | 13,297 | 3,054 | 6,359 | 2,494 | 713 | 320,344 |
| Wise | Ground | 4,138 | 6 | 0 | 290 | 1,736 | 288 | 6,458 |
| | Surface | 4,161 | 937 | 0 | 1,000 | 112 | 1,150 | 7,360 |
| | Total | 8,299 | 943 | 0 | 1,290 | 1,848 | 1,438 | 13,818 |
| Region C | Ground | 78,338 | 7,748 | 829 | 4,149 | 9,600 | 4,602 | 105,266 |
| | Surface | 1,195,676 | 45,279 | 15,168 | 26,918 | 767 | 15,461 | 1,299,269 |
| | Total | 1,274,014 | 53,027 | 15,997 | 31,067 | 10,367 | 20,063 | 1,404,535 |

Notes: a. Data are from the Texas Water Development Board (11).
b. Data for Henderson County include only the portion of Henderson County within Region C.

- Groundwater provided the majority of the municipal use in Cooke, Fannin, Freestone, and Parker Counties.
- Dallas and Tarrant Counties had 69 percent of the municipal water use in the region.
- Dallas and Tarrant Counties had 74 percent of the manufacturing water use in the region.
- Freestone and Tarrant Counties had 81 percent of the steam electric power water use in the region.
- Dallas and Tarrant Counties had 57 percent of the irrigation use in the region.
- Denton, Parker, Tarrant, and Wise Counties had 87 percent of the mining use in the region.
- Livestock use is widely spread throughout the region.

### Surface Water Sources

Most of the surface water supply in Region C comes from major reservoirs. Table 1.10 lists the permitted conservation storage, permitted diversion, year 2010 yield and the 2006 diversion for major reservoirs (over 5,000 acre-feet of conservation storage) in the region.

Another major source of supply in Region C is surface water imported from other regions. Table 1.11 lists currently permitted imports of water to Region C from other regions. (No special permit is required if importation from another region does not involve interbasin transfers, but all significant imports to Region C, except TRA's upstream sale from Lake Livingston, currently involve interbasin transfers and thus require interbasin transfer permits.) Figure I.1 shows the surface water reservoirs that provide these imports. There is also small-scale importation of treated water in parts of the region, where suppliers purchase water that originates in other regions.

**Table 1.10**
**Water Rights, Storage, Diversion, and Yield for Major Reservoirs in Region C**

| Reservoir | County(ies) | Water Right Number(s) [a] | Permitted Conservation Storage [b] (Acre-Feet) | Permitted Diversion [b] (Acre-Feet/Year) | 2006 Diversion [c] (Acre-Feet) | Year 2010 Yield [k] (Acre-Feet/Year) |
|---|---|---|---|---|---|---|
| Moss | Cooke | 4881 | 23,210 | 7,740 | 444 | 7,410 |
| Texoma | Grayson, Cooke | 4898, 2006, 4899, 4901, 4900, 5003 | 2,913,850 | 264,800 | 58,200 | 258,350 |
| Randell | Grayson | 4901 | 5,400 | 5,280 | 5,429 | 1,400 |
| Valley | Fannin, Grayson | 4900 | 15,000 | 16,400 | 281 | 0 |
| Bonham | Fannin | 4925 | 13,000 | 5,340 | No Data | 5,340 |
| Coffee Mill | Fannin | 4915 | 8,000 | 0 | 0 | 0 (Recreation) |
| Kiowa | Cooke | 2334B | 7,000 | 203 | 0 | 0 (Recreation) |
| Ray Roberts | Denton, Cooke, Grayson | 2335A, 2455A | 799,600 | 799,600 | 77,356 | System |
| Lewisville | Denton | 2348,2456 | 618,400 | 598,900 | 83,370 | System |
| Elm Fork/ Lewisville/Ray Roberts System | See individual reservoirs for this information | | | | | 238,597 |
| Lost Creek | Jack | 3313A | 11,961 | 1,440 | 635 | 1,597 |
| Bridgeport | Wise, Jack | 3808A | 387,000 | 15,000[d] | 11,786 | System |
| Eagle Mountain | Tarrant, Wise | 3809 | 210,000 | 159,600[g] | 67,946 | System |
| Bridgeport/Eagle Mountain/Worth System | See individual reservoirs for this information | | | | | 109,833 |
| Lavon | Collin | 2410G | 443,800 | 118,670[e] | 186,613 | 112,033 |

**Table 1.10, Continued**

| Reservoir | County(ies) | Water Right Number(s) [a] | Permitted Conservation Storage [b] (Acre-Feet) | Permitted Diversion [b] (Acre-Feet/Year) | 2006 Diversion [c] (Acre-Feet) | Year 2010 Yield [k] (Acre-Feet/Year) |
|---|---|---|---|---|---|---|
| Weatherford | Parker | 3356 | 19,470 | 5,220[f] | 2,565 | 2,967 |
| Grapevine | Tarrant, Denton | 2362A, 2363A, 2458C | 161,250 | 161,250 | 51,051 | 26,650 |
| Benbrook[j] | Tarrant | 5157A | 72,500 | 6,833 | 42,590 | 6,833 |
| Arlington | Tarrant | 3391 | 45,710 | 23,120 | 25,473 | 9,850 |
| Joe Pool | Dallas, Tarrant | 3404D | 176,900 | 17,000 | 6,080 | 15,192 |
| Mountain Creek | Dallas | 3408 | 22,840 | 6,400 | 696 | 6,400 |
| North | Dallas | 2365 | 17,100 | 1,000[h] | 247 | 0 |
| White Rock | Dallas | 2461B | 21,345 | 8,703 | 2761 | 3,500 |
| Ray Hubbard | Dallas, Kaufman, Rockwall | 2462H | 490,000 | 89,700 | 87,339 | 57,427 |
| Terrell | Kaufman | 4972 | 8,712 | 6,000 | 4,793 | 2,283 |
| Bardwell | Ellis | 5021D | 54,900 | 9,600[e] | 13,916 | 9,600 |
| Waxahachie | Ellis | 5018 | 13,500 | 3,570 | 1,066 | 2,905 |
| Cedar Creek | Henderson, Kaufman | 4976C | 678,900 | 175,000[e] | 96,632 | 175,000 |
| Teague City Lake | Freestone | 5291 | 1,160 | 605 | 0 | 189 |
| Clark | Ellis | 5019 | 1,549 | 450 | 155 | 210 |
| Forest Grove | Henderson | 4983 | 20,038 | 9,500[i] | 0 | 8,767 |
| Trinidad | Henderson | 4970 | 6,200 | 4,000 | 57 | 3,050 |
| Navarro Mills | Navarro | 4992 | 63,300 | 19,400 | 7,798 | 19,342 |
| Richland-Chambers | Freestone, Navarro | 5030, 5035C | 1,135,000 | 223,650[e] | 109,344 | 223,872 |
| Fairfield | Freestone | 5040 | 50,600 | 14,150 | 9,936 | 870 |
| Mineral Wells | Parker | 4039 | 7,065 | 2,520 | 54 | 2,508 |
| Muenster | Cooke | 2323 | 4,700 | 500 | 0 | 300 |

Notes: a. Water rights numbers are Certificate of Adjudication numbers. For permits issued since adjudication, they are application numbers.
b. Permitted conservation storage and permitted diversion are from TCEQ permits [(13)].
c. Year 2006 diversion amount is from TCEQ water use records [(14)].
d. Release of 78,000 acre-feet per year for diversion and use from Eagle Mountain Lake is also authorized.
e. Permitted diversion does not include reuse.
f. Diversion does not include 59,400 acre-feet per year of non-consumptive industrial use.
g. Permitted diversion includes water releases from Lake Bridgeport.
h. Additional use (beyond the water right) is based on purchased water.
i. Permitted diversion does not include non-consumptive use.
j. Year 2006 use includes water originally diverted from Cedar Creek and Richland-Chambers Reservoir and stored in Benbrook Lake.
k. Year 2010 yield is from the Water Availability Models.

**Table 1.11**
**Permitted Importation of Surface Water to Region C**

| Destination | Source | Source Region | Source Basin | Destination Basin | Permitted Amount (Acre-Feet/Year) | Raw or Treated | Status |
|---|---|---|---|---|---|---|---|
| North Texas MWD | Chapman Lake [a] | D | Sulphur | Trinity | 57,214 | Raw | Operating |
| Irving | Chapman Lake [a] | D | Sulphur | Trinity | 54,000 | Raw | Operating |
| Upper Trinity RWD | Chapman Lake [a] | D | Sulphur | Trinity | 16,106 | Raw | Operating |
| Dallas | Lake Tawakoni | D | Sabine | Trinity | 184,600 | Raw | Operating |
| Dallas | Lake Fork Reservoir | D | Sabine | Trinity | 120,000 | Raw | Operating |
| Dallas | Lake Palestine | I | Neches | Trinity | 114,337 | Raw | Not Yet Developed |
| Athens [b] | Lake Athens | I | Neches | Trinity | 5,477 | Treated | Operating |
| North Texas MWD | Lake Tawakoni | D | Sabine | Trinity | 10,090 | Raw | Operating |
| North Texas MWD | Lake Tawakoni and Lake Fork | D | Sabine | Trinity | 40,000[d] | Raw | Operating |
| TXU Big Brown Plant | Lake Livingston [c] | H | Trinity | Trinity | 20,000 | Raw | Operating |

Notes:
a. Chapman Lake was formerly Cooper Lake.
b. Most of Athens is in the Trinity Basin.
c. Use is an upstream diversion based on Lake Livingston water right. Contract allows 20,000 acre per year, with a maximum of 48,000 acre-feet over 3 years.
d. This is an interim supply.

## Groundwater Sources

Table 1.12 lists historical groundwater pumping by aquifer for Region C [(11)]. Table 1.13 shows the historical pumping by county and aquifer through 2006 [(11)]. (Note that the pumping totals do not match use totals given in Tables 1.8 and 1.9. The Texas Water Development Board supplied both sets of data. The discrepancy may be due to water that is pumped in one county and used in another.) The Trinity aquifer is by far the largest source of groundwater in Region C, providing 71.4 percent of the total groundwater pumped in 2006. (The Trinity aquifer is sometimes called the Trinity Sands and includes the Antlers, Twin Mountain, Glen Rose, and Paluxy formations [(15)].) The Woodbine and Carrizo-Wilcox aquifers provided 17.3 and 9.2 percent of the year 2006 totals, respectively.

The remaining 2.0 percent came from the Nacatoch, Queen City, and undifferentiated aquifers. Groundwater pumping is highest in Denton, Grayson, Parker, and Tarrant Counties. These four counties had 52 percent of the region's total groundwater pumping in 2006.

**Table 1.12**
**Year 2006 Groundwater Pumping by County and Aquifer in Region C (acre-feet)**

| County | Trinity | Wood-bine | Carrizo-Wilcox | Nacatoch | Queen City | Undiffer-entiated/ Other | Subtotal From TWDB Pumping Data and Estimates [a] | Use Not Accounted for by Pumping Data [b] | Total |
|---|---|---|---|---|---|---|---|---|---|
| Collin | 2,792 | 3,671 | | | | 163 | 6,626 | 169 | 6,795 |
| Cooke | 6,223 | | | | | 18 | 6,241 | 0 | 6,241 |
| Dallas | 2,592 | 1,230 | | | | 565 | 4,387 | 915 | 5,302 |
| Denton | 12,059 | 2,123 | | | | 50 | 14,232 | 0 | 14,232 |
| Ellis | 7,186 | 2,129 | | | | | 9,315 | 0 | 9,315 |
| Fannin | 663 | 3,910 | | | | 6 | 4,579 | 0 | 4,579 |
| Freestone | | | 2,963 | | 12 | 14 | 2,989 | 608 | 3,597 |
| Grayson | 7,582 | 5,027 | | | | 20 | 12,629 | 0 | 12,629 |
| Henderson [c] | | | 3,428 | | 394 | 290 | 4,111 | 0 | 4,111 |
| Jack | 407 | | | | | 763 | 1,170 | 0 | 1,170 |
| Kaufman | | 174 | | 100 | | | 274 | 430 | 704 |
| Navarro | | 71 | 13 | 122 | | 153 | 359 | 1 | 360 |
| Parker | 10,788 | | | | | 430 | 11,218 | 13 | 11,231 |
| Rockwall | | | | | | 120 | 120 | 0 | 120 |
| Tarrant | 16,744 | | | | | | 16,744 | 169 | 16,913 |
| Wise | 6,445 | | | | | 13 | 6,458 | 0 | 6,458 |
| **Total** | **73,481** | **18,335** | **6,404** | **223** | **405** | **2,604** | **101,452** | **2,305** | **103,757** |

Notes:

a. Estimates are based on TWDB survey data plus TWDB estimates for irrigation use, livestock use, and non-system municipal groundwater use. TWDB survey data is raw data without adjustments, and the estimates by TWDB for livestock, irrigation, and non-system municipal use are estimates of the groundwater pumping that is not reported on surveys returned to the TWDB.
b. Use not accounted for by pumping data is the gap between pumping data provided by TWDB and estimated groundwater use totals provided by TWDB.

c. Data for Henderson County include all of Henderson County.

Table 1.14 compares the managed available groundwater supplies for the Trinity and Woodbine aquifers in Region C to 2006 use. The "managed available groundwater" represents the amount of groundwater that can be pumped while maintaining stated "desired future conditions" in an aquifer. For Region C, the desired future conditions for the Trinity and Woodbine aquifer were set by Groundwater Management Area 8, a consortium of groundwater districts in North-Central and North Texas, covering most Region C and most of the area overlying the Northern Trinity and Woodbine aquifers. Once the desired future conditions were established, the Texas Water Development Board determined the managed available water that could be pumped while meeting those conditions. For planning purposes, the managed available groundwater represents the reliable long-term supply from an aquifer.

Table 1.14 shows that current groundwater use (as of 2006) exceeds the managed available groundwater in certain Region C counties and aquifers. In particular, pumping from the Trinity aquifer in Ellis County in 2006 was almost twice the managed available groundwater. Pumping from the Trinity and Woodbine aquifers in Collin County, the Woodbine aquifer in Fannin County, and the Trinity aquifer in Jack County exceeded the managed available groundwater by a smaller margin. Pumping from the Trinity aquifer in Cooke, Fannin and Tarrant Counties in 2006 was very near the managed available groundwater.

In Texas, groundwater conservation districts (GCD) manage groundwater conservation, preservation, protection, recharging, and waste prevention within their borders. Typical GCD responsibilities include: permitting wells, developing management plans, and adopting rules to implement management plans. Four GCDs exist within the Region C boundaries:

- Mid-East Texas GCD, which includes Freestone County,
- Neches and Trinity Valley GCD, which includes Henderson County,
- Northern Trinity GCD, which comprises of only Tarrant County, and
- Upper Trinity GCD, which includes Parker and Wise Counties, as well as Montague County in Region B and Hood County in Region G

These Districts are shown on Figure 1.14. The Northern and Upper Trinity GCDs were both established in 2007 and are expected to publish management plans in 2010. In the

2009 session of the Texas Legislature, three additional GCDs in Region C were created, but these districts have not yet begun operation. They include:

- Prairielands GCD, which includes Ellis County
- North Texas GCD, which is comprised of Collin, Cooke, and Denton Counties, and
- Red River GCD, which is comprised of Grayson and Fannin Counties.

**Table 1.13**
**Historical Groundwater Pumping by Aquifer in Region C**

| Year | Pumping by Aquifer (Acre-Feet) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Trinity | Woodbine | Carrizo-Wilcox | Nacatoch | Queen City | Other | Total |
| 1980 | 65,200 | 12,898 | 5,813 | 424 | 563 | 1,734 | 86,632 |
| 1984 | 74,768 | 13,210 | 8,440 | 283 | 563 | 1,725 | 98,989 |
| 1985 | 77,760 | 16,324 | 7,828 | 325 | 509 | 1,501 | 104,247 |
| 1986 | 73,464 | 13,654 | 7,595 | 269 | 616 | 1,485 | 97,083 |
| 1987 | 74,728 | 14,861 | 7,000 | 253 | 439 | 1,444 | 98,725 |
| 1988 | 78,344 | 13,979 | 7,853 | 277 | 588 | 1,434 | 102,475 |
| 1989 | 71,443 | 14,332 | 6,837 | 278 | 619 | 1,211 | 94,720 |
| 1990 | 69,295 | 13,486 | 6,486 | 256 | 910 | 1,212 | 91,645 |
| 1991 | 63,484 | 13,256 | 6,172 | 311 | 964 | 1,447 | 85,634 |
| 1992 | 61,322 | 14,009 | 6,475 | 238 | 896 | 1,391 | 84,331 |
| 1993 | 61,089 | 16,330 | 6,829 | 241 | 973 | 1,881 | 87,343 |
| 1994 | 57,110 | 13,408 | 7,165 | 244 | 888 | 4,134 | 82,949 |
| 1995 | 57,241 | 15,349 | 7,518 | 285 | 800 | 4,677 | 85,870 |
| 1996 | 60,589 | 14,849 | 7,922 | 316 | 902 | 4,452 | 89,030 |
| 1997 | 60,032 | 15,423 | 7,334 | 285 | 940 | 3,938 | 87,952 |
| 1998 | 69,018 | 15,800 | 7,842 | 303 | 1,046 | 3,984 | 97,993 |
| 1999 | 65,959 | 16,513 | 7,977 | 296 | 1,041 | 4,098 | 95,884 |
| 2000 | 69,837 | 18,470 | 7,844 | 329 | 1,055 | 3,001 | 100,536 |
| 2001 | 61,389 | 18,149 | 7,639 | 332 | 1,103 | 3,760 | 92,372 |
| 2002 | 60,503 | 16,959 | 8,008 | 330 | 1,065 | 3,755 | 90,620 |
| 2003 | 58,799 | 17,428 | 7,469 | 311 | 1,128 | 2,965 | 88,100 |
| 2004 | 43,297 | 10,575 | 6,366 | 0 | 196 | 1,529 | 61,962 |
| 2005 | 48,171 | 11,941 | 6,744 | 0 | 80 | 1,982 | 68,918 |
| 2006 | 73,481 | 18,335 | 6,404 | 223 | 405 | 2,604 | 101,452 |

Note: Data are from the Texas Water Development Board. Henderson County data includes the portion in Region I.

**Table 1.14**
**Comparison of Year 2006 Estimated Groundwater Pumping to Managed Available Groundwater by Aquifer (Acre-Feet)**

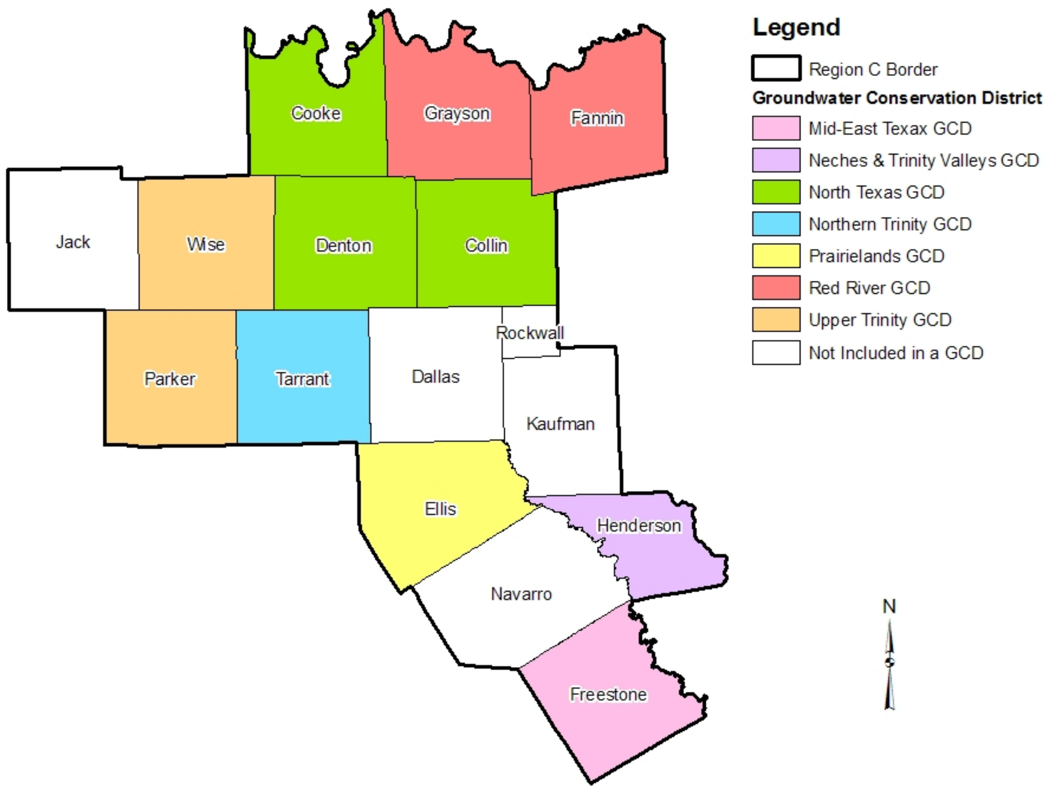
| County | Trinity 2006 Pumping | Trinity Managed Available Groundwater(46) | Trinity Over-Pumping | Woodbine 2006 Pumping | Woodbine Managed Available Groundwater(47) | Woodbine Over-Pumping |
|---|---|---|---|---|---|---|
| Collin | 2,792 | 2,104 | 688 | 3,671 | 2,509 | 1,162 |
| Cooke | 6,223 | 6,850 | | | 154 | |
| Dallas | 2,592 | 5,458 | | 1,230 | 2,313 | |
| Denton | 12,059 | 19,333 | | 2,123 | 4,126 | |
| Ellis | 7,186 | 3,959 | 3,227 | 2,129 | 5,441 | |
| Fannin | 663 | 700 | | 3,910 | 3,297 | 613 |
| Freestone | | | | | | |
| Grayson | 7,582 | 9,400 | | 5,027 | 12,087 | |
| Henderson | | | | | | |
| Jack | 407 | 0 | 407 | | | |
| Kaufman | | 1,181 | | 174 | 200 | |
| Navarro | | 1,873 | | 71 | 300 | |
| Parker | 10,788 | 15,248 | | | | |
| Rockwall | | 958 | | | 144 | |
| Tarrant | 16,744 | 18,747 | | | 632 | |
| Wise | 6,445 | 9,282 | | | | |
| **Total** | **73,481** | **95,093** | **4,323** | **18,335** | **31,203** | **1,775** |

Notes:
a. Pumping data and estimates are from Texas Water Development Board. (11)

## Water Reclamation

Over half of the water used for municipal supply in Region C is discharged as treated effluent from wastewater treatment plants after use, making wastewater reclamation and reuse a potentially significant source of additional water supply. At present, only a fraction of the region's treated wastewater is reclaimed and reused in the region. There are currently a number of water reclamation projects in Region C that reuse highly treated wastewater for non-potable uses such as the irrigation of golf courses. Table 1.15 and Figure 1.15 show the entities in Region C that held TCEQ Chapter 210 reclaimed water authorizations as of July 2009 (16). The Chapter 210 authorizations give these entities permission to implement direct non-potable reuse projects. Many of these entities have projects already in operation, but several have not yet begun implementation of their reuse projects.

**Figure 1.14**
**Groundwater Conservation Districts in Region C**




In addition to direct reuse projects, there are sizable return flows of treated wastewater upstream from many Region C reservoirs. If a reservoir's water rights exceed its firm yield without return flows, as is the case for many Region C reservoirs, return flows will increase the reliable supply from the reservoir. If the reservoir's water rights do not exceed its firm yield, a water right must be obtained to allow indirect reuse of return flows. Many entities have been issued water rights for indirect reuse of return flows since publication of the 2006 Region C plan. Current indirect reuse projects in Region C are shown on Figure 1.16.

In addition, the Trinity River Authority has obtained a water right allowing the impoundment and diversion of return flows originating from TRA Central, Red Oak Creek, and Ten Mile Creek WWTPs at Lake Livingston, which is located in Region H.

**Table 1.15**
**Current Chapter 210 Authorizations in Region C**

| County | Permittee | Other Sponsoring Entities | Permit Number | Current Usage Category |
|---|---|---|---|---|
| Collin | City of Frisco | NTMWD | R10172-003 | Golf Course Irrigation |
| | North Texas Municipal Water District | City of Frisco | R10363-001/ R14245-001 | Golf Course Irrigation |
| Cooke | City of Gainesville | - | R10726-001 | General Irrigation |
| Dallas | City of Dallas | - | R10060-001/ R10060-006 | Golf Course Irrigation |
| | Trinity River Authority | DCURD | R10303-001 | Golf Course Irrigation, General Irrigation, Lake Level Maintenance |
| | Trinity River Authority | - | R10984-001 | General Irrigation |
| Denton | City of Denton | - | R10027-003/ R10027-004 | Golf Course Irrigation, Steam Electric Power, General Irrigation |
| | City of Lewisville | UTRWD | R10662-001 | Golf Course Irrigation |
| | City of Sanger | - | R10271-001 | not currently active |
| | City of the Colony | - | R11570-001 | Golf Course Irrigation |
| | North Texas Municipal Water District | - | R14008-001 | Golf Course Irrigation |
| | Town of Flower Mound | - | R11321-001 | not currently active |
| Ellis | City of Ennis | - | R10443-002 | Steam Electric Power |
| Grayson | City of Denison | - | R10079-005 | not currently active |
| | Munson Point LTD | - | R14487-001 | not currently active |
| Kaufman | City of Crandall | - | R10834-001 | Golf Course Irrigation |
| | City of Garland | City of Forney | R10090-001 | Steam Electric Power |
| Parker | City of Weatherford | - | R10380-002/ R14198-001 | not currently active |
| | Deer Creek Waterworks/ City of Willow Park | - | R13759-001/ R13834-001 | Golf Course Irrigation |
| | Millsap ISD | - | R13357-001 | General Irrigation |

**Table 1.15, Continued**

| County | Permittee | Other Sponsoring Entities | Permit Number | Current Usage Category |
|---|---|---|---|---|
| Rockwall | City of Royse City | NTMWD | R10366-001 | Golf Course Irrigation |
| | North Texas Municipal Water District | Royse City | R11894-001/ R12047-001/ R14469-001 | Golf Course Irrigation |
| Tarrant | City of Fort Worth | - | R10494-013 | Golf Course Irrigation, Cooling Tower Makeup, General Irrigation |
| | City of Grapevine | - | R10486-002 | not currently active |
| Tarrant/Parker | City of Azle | - | Pending | Golf Course Irrigation |
| Wise | City of Runaway Bay | - | R10862-001 | not currently active |

### Springs in Region C

There are no springs in Region C that are currently used as a significant source of water supply. Springs are further discussed in Section 1.7 of this report (Agricultural and Natural Resources in Region C).

## *1.5 Water Providers in Region C*

Water providers in Region C include regional wholesale water providers such as river authorities, larger water districts, and cities with large wholesale customer bases; local wholesale water providers such as smaller water districts and some cities, and retail suppliers (cities and towns, water supply corporations, special utility districts, and private water companies). Cities and towns provide most of the retail water service in Region C, with significant contributions from water districts and water supply corporations. Table 1.16 lists water providers that supplied more than 5,000 acre-feet of water in Region C in the year 2006. The list includes 47 entities - 39 cities, 6 water districts, and 2 river authorities.

**Figure 1.15**
**Current Chapter 210 Authorizations in Region C**

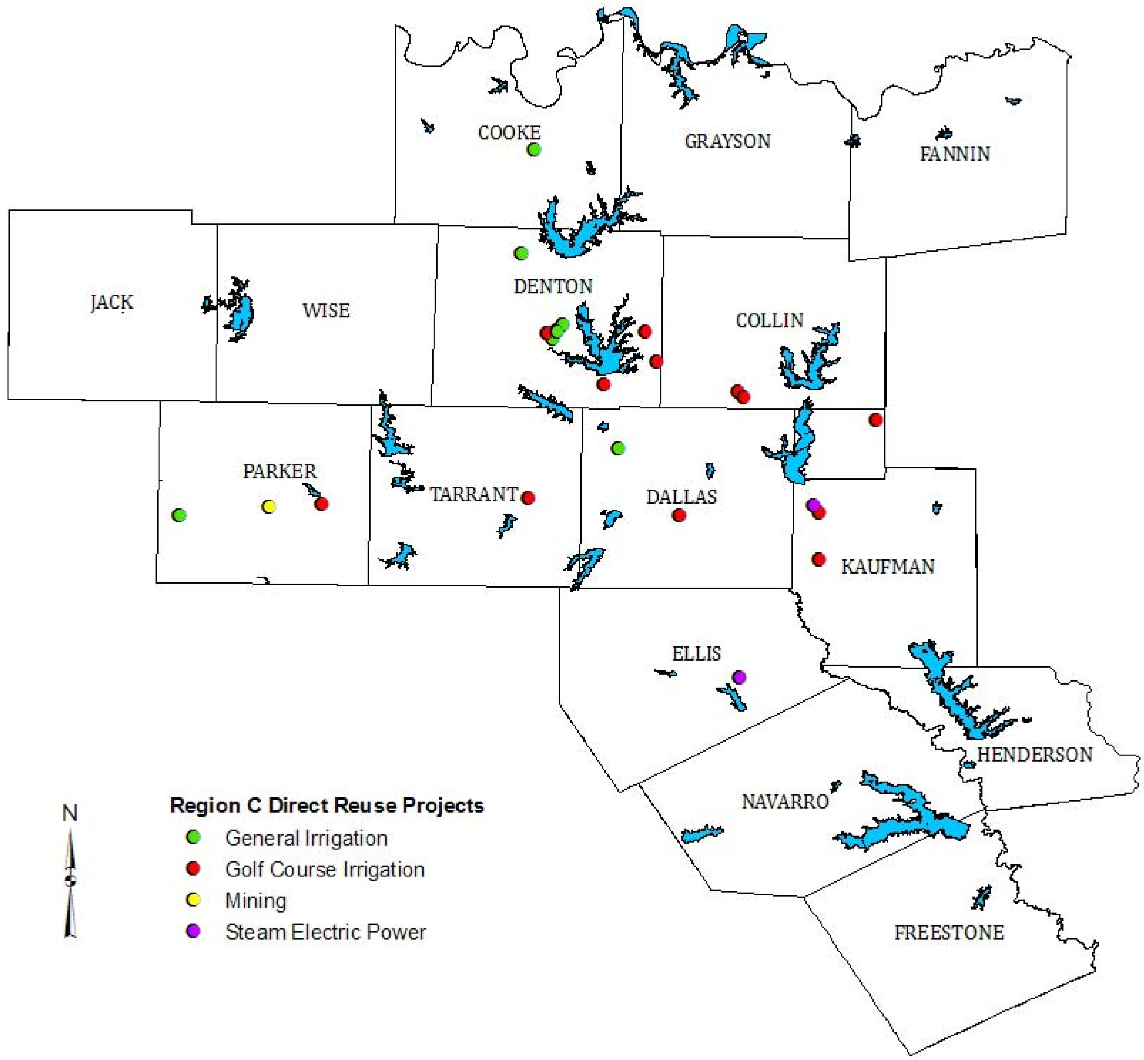
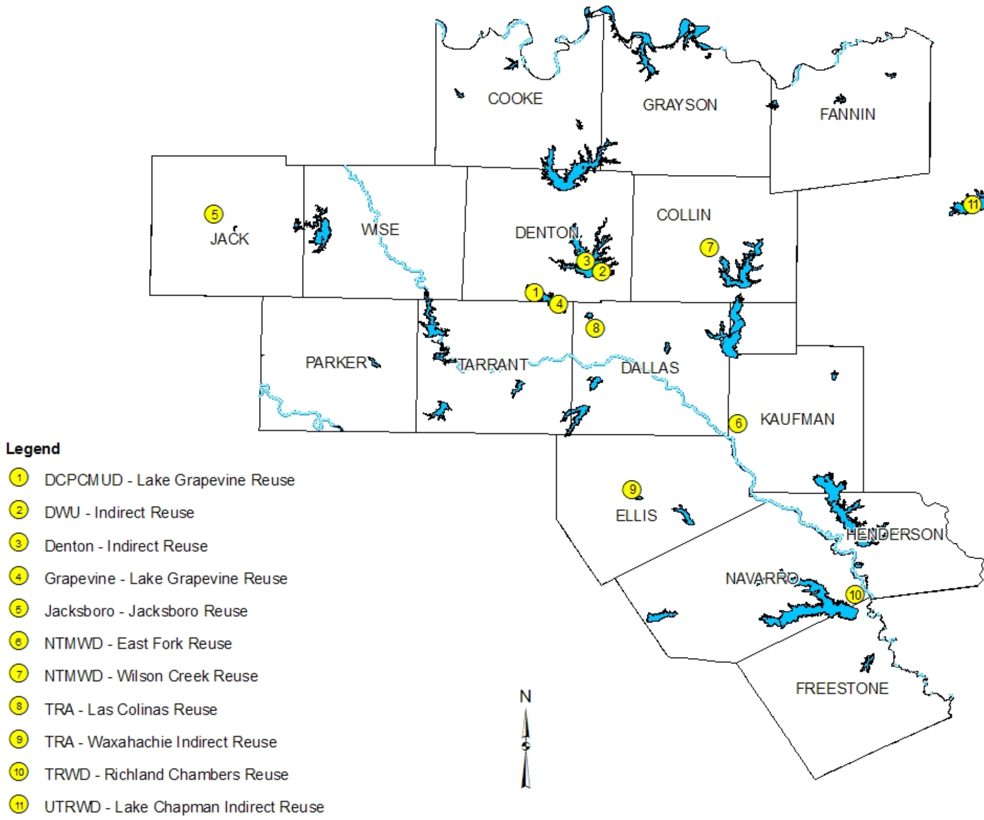


**Figure 1.16**
**Current Indirect Reuse Projects in Region C**




## Wholesale Water Providers (WWPs)

In the first round of Senate Bill One planning, the regulations required additional data development for "major providers of water for municipal and manufacturing purposes." For the second round of Senate Bill One planning, the Texas Water Development Board (TWDB) has replaced the term "major water providers" with the term "wholesale water providers". There are no implications of designation as a "wholesale water provider" except for the additional data required by TWDB. The wholesale water provider data is a different way of grouping water supply information.

The Texas Water Development Board defined the term wholesale water provider (WWP) as follows: "[A WWP is] any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acre-feet of water wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan. The Planning Groups shall [also] include as wholesale water providers other persons and entities that enter or that the Planning Group expects to enter contracts to sell more than 1,000 acre-feet of water wholesale during the period covered by the plan."

Table 1.17 lists the 41 entities in Region C that qualify as wholesale water providers (20 cities, 2 river authorities, and 19 water districts). Twelve of the wholesale water providers provide a large amount of wholesale supplies to several customers and are discussed below as regional wholesale water providers. The remaining 29 have fewer customers and are discussed as local wholesale water providers. Customers included in the counts of Table 1.17 are direct (first line) wholesale municipal customers that are defined as WUGs for the purposes of regional planning.

### Regional Wholesale Water Providers

There are twelve wholesale water providers in Region C that serve a large number of customers and/or provide large wholesale supplies and are called regional wholesale water providers: the City of Dallas (Dallas Water Utilities), Tarrant Regional Water District, North Texas Municipal Water District, the City of Fort Worth, Sabine River Authority, Trinity River Authority, Upper Neches River Municipal Water Authority, Upper Trinity Regional Water District, Sulphur River Water District, Dallas County Park Cities Municipal Utility District, Greater Texoma Utility Authority, and the City of Corsicana.

*City of Dallas (Dallas Water Utilities, or DWU)*. Table 1.18 lists the year 2006 wholesale water sales by Dallas Water Utilities, which totaled 222,618 acre-feet. (As shown in Table 1.16, Dallas Water Utilities also provided retail supplies of 284,244 acre-feet in the year 2006.) Dallas Water Utilities currently obtains its water supplies from Lake Ray Hubbard, Lake Tawakoni, Grapevine Lake, the Lake Ray Roberts/Lewisville/Elm Fork system, and Lake Fork. Dallas Water Utilities has contracted with the Upper Neches River Municipal Water Authority to secure water from Lake Palestine. However, Lake Palestine

**Table 1.16**
**Entities Supplying more than 5,000 Acre-Feet in Region C in the Year 2006**

| Supplier | Year 2006 Region C Supplies (Acre-Feet) [a] | | | | | Comments |
|---|---|---|---|---|---|---|
| | Wholesale Sales [d] | Manufac-turing | Municipal Retail | Other | Total | |
| Dallas Water Utilities [b] | 216,856 | 3,076 [b] | 284,244 | 2,686 | 506,862 | Manufacturing shown is only wholesale manufacturing. |
| Tarrant Regional Water District [c] | 385,069 | 1,864 | 0 | 7,411 | 394,344 | Other includes Steam Electric and Irrigation |
| North Texas Municipal Water District [c] | 286,879 | 0 | 6 | 0 | 286,885 | |
| Fort Worth | 70,065 | 16,221 | 137,774 | 7,689 | 231,749 | Other is reuse |
| Sabine River Authority [c] | 185,893 | 0 | 0 | 0 | 185,893 | Includes sales to Dallas, Terrell, Cash WSC, MacBee WSC, and Ables Springs WSC |
| Trinity River Authority [c] | 69,193 | 0 | 0 | 17,759 | 86,952 | Other includes Steam Electric Power |
| Plano | 243 | 627 | 71,322 | 0 | 72,192 | |
| Arlington | 5 | 2,201 | 57,782 | 0 | 59,988 | |
| Garland | 8 | 2,325 | 38,187 | 8,015 | 48,535 | Other is reuse for steam electric power |
| Irving | 0 | 2,074 | 46,411 | 0 | 48,485 | |
| Denton | 9,058 | 1,025 | 20,833 | 725 | 31,641 | Other is reuse for steam electric power and irrigation |
| Richardson | 0 | 1,095 | 28,808 | 0 | 29,903 | |
| Grand Prairie | 16 | 1,118 | 28,728 | 0 | 29,862 | |
| Carrollton | 0 | 1,755 | 26,779 | 0 | 28,534 | |
| Frisco | 975 | 995 | 24,438 | 0 | 26,408 | |

**Table 1.16, Continued**

| Supplier | Year 2006 Region C Supplies (Acre-Feet) [a] | | | | | Comments |
|---|---|---|---|---|---|---|
| | Wholesale Sales | Manufac-turing | Municipal Retail | Other | Total | |
| Upper Trinity Regional Water District [c] | 24,690 | 0 | 0 | 0 | 24,690 | |
| Greater Texoma Utility Authority | 21,906 | 0 | 0 | 0 | 21,906 | Sales to Sherman and NTMWD |
| Mesquite | 0 | 878 | 19,571 | | 20,449 | |
| Lewisville | 223 | 56 | 17,787 | 0 | 18,066 | |
| Flower Mound | 534 | 0 | 16,443 | 0 | 16,977 | |
| Grapevine | 0 | 9 | 16,810 | 0 | 16,819 | |
| McKinney | 1,285 | 582 | 14,072 | 0 | 15,939 | |
| Allen | 0 | 63 | 15,478 | 0 | 15,541 | |
| North Richland Hills | 3,240 | 11 | 8,886 | 0 | 12,137 | |
| Mansfield | 528 | 245 | 11,349 | 0 | 12,122 | |
| Dallas County Park Cities MUD | 11,503 | 0 | 0 | 4,734 | 16,237 | Sales to Highland Park and University Park; Other is reuse |
| Coppell | 0 | 0 | 11,306 | 0 | 11,306 | |
| Denison | 730 | 436 | 10,052 | 0 | 11,218 | |
| Waxahachie | 1,934 | 957 | 7,922 | 0 | 10,813 | |
| Farmers Branch | 105 | 1,260 | 9,241 | 0 | 10,606 | |
| Bedford | 0 | 0 | 10,506 | 0 | 10,506 | |
| Euless | 0 | 2 | 9,878 | 0 | 9,880 | |
| Sherman | 375 | 1,749 | 7,649 | 0 | 9,773 | |
| Corsicana | 3,679 | 502 | 5,567 | 0 | 9,748 | |
| Rockwall | 3,327 | 27 | 6,028 | 0 | 9,382 | |

**Table 1.16, Continued**

| Supplier | Year 2006 Region C Supplies (Acre-Feet) [a] | | | | | Comments |
|---|---|---|---|---|---|---|
| | Wholesale Sales | Manufac-turing | Municipal Retail | Other | Total | |
| DeSoto | 0 | 36 | 9,173 | 0 | 9,209 | |
| Keller | 0 | 30 | 8,830 | 0 | 8,860 | |
| Rowlett | 0 | 10 | 8,618 | 0 | 8,628 | |
| Hurst | 0 | 12 | 7,568 | 0 | 7,580 | |
| University Park | 0 | 0 | 7,376 | 0 | 7,376 | |
| Southlake | 2,420 | 1 | 4,709 | 0 | 7,130 | |
| Athens MWA | 2,454 | 0 | 0 | 3,942 | 6,396 | Other is fish hatchery sales |
| Duncanville | 0 | 5 | 6,267 | 0 | 6,272 | |
| Addison | 108 | 11 | 6,025 | 0 | 6,144 | |
| Midlothian | 2,367 | 391 | 2,880 | 0 | 5,638 | |
| Haltom City | 0 | 541 | 4,876 | 0 | 5,417 | |
| Benbrook | 0 | 0 | 5,134 | 0 | 5,134 | |
| The Colony | 0 | 10 | 5,119 | 0 | 5,129 | |

Notes: a. Information based on TWDB data in the WUGSUMM file (11), unless specific sales data were provided by the entity.

b. Wholesale sales provided by Dallas Water Utilities. Manufacturing shown is only wholesale manufacturing.

c. Data based on information provided by the Wholesale Water Provider.

d. Wholesale sales are sales to cities and other water suppliers, some of which may ultimately go to manufacturing or other use.

**Table 1.17**
**Wholesale Water Providers in Region C**

| Wholesale Water Provider | Year 2006 Wholesale Sales [b] (Acre-Feet) | Year 2006 Total Sales (Acre-Feet) | Number of Wholesale Customers | |
|---|---|---|---|---|
| | | | Current | Additional Future |
| Argyle WSC | 0 [a] | 1,401 | 1 | 0 |
| Arlington | 5 | 59,988 | 1 | 3 |
| Athens Municipal Water Auth. | 2,454 | 6,396 | 3 | 0 |
| Bartonville WSC | 0 [a] | 1,572 | 3 | 0 |
| Bolivar WSC | 0 [a] | 1,074 | 2 | 0 |
| Corsicana | 3,679 | 9,748 | 14 | 1 |
| Dallas (Dallas Water Utilities) | 219,932 | 506,862 | 24 | 2 |
| Dallas County Park Cities MUD | 11,503 | 16,237 | 2 | 0 |
| Dallas County WCID #6 | 2,488 | 2,488 | 1 | 0 |
| Denton | 9,058 | 31,641 | 4 | 0 |
| East Cedar Creek FWSD | 208 | 1,408 | 3 | 0 |
| Ennis | 375 | 3,847 | 5 | 0 |
| Forney | 1,334 | 4,267 | 5 | 0 |
| Fort Worth | 70,065 | 231,749 | 29 | 4 |
| Gainesville | 40 | 3,022 | 1 | 7 |
| Garland | 8 | 48,535 | 4 | 0 |
| Grand Prairie | 16 | 29,862 | 2 | 1 |
| Greater Texoma Utility Authority | 21,906 | 21,906 | 7 | 13 |
| Lake Cities MUA | 1,946 | 1,950 | 3 | 0 |
| Mansfield | 528 | 12,122 | 3 | 1 |
| Midlothian | 2,367 | 5,638 | 6 | 1 |
| Mustang SUD | 103 | 1,392 | 3 | 0 |
| North Richland Hills | 3,240 | 12,137 | 2 | 0 |
| North Texas Municipal Water District | 286,879 | 286,885 | 43 | 11 |
| Princeton | 539 | 1,119 | 1 | 0 |
| Rockett SUD | 196 | 4,063 | 4 | 2 |
| Rockwall | 3,327 | 9,382 | 6 | 0 |
| Sabine River Authority | 185,893 | 185,893 | 5 [d] | 0 |
| Seagoville | 349 | 1,455 | 1 | 0 |
| Sherman | 2,124 | 9,774 | 3 | 1 |
| Sulphur River Water District (all in Region D) [c] | 60,572 | 60,572 | 3 | 0 |
| Tarrant Regional Water District | 385,069 | 394,344 | 27 | 6 |
| Terrell | 1,050 | 3,626 | 5 | 0 |
| Trinity River Authority | 69,163 | 86,952 | 13 | 2 |
| Upper Neches River Municipal Water Authority (all in Region I) | 13,799 | 13,799 | 6 | 1 |

**Table 1.17, Continued**

| Wholesale Water Provider | Year 2006 Wholesale Sales [b] (Acre-Feet) | Year 2006 Total Sales (Acre-Feet) | Number of Wholesale Customers | |
|---|---|---|---|---|
| | | | Current | Additional Future |
| Upper Trinity Regional Water District | 24,690 | 24,690 | 16 | 4 |
| Walnut Creek SUD | 338 | 2,168 | 6 | 2 |
| Waxahachie | 1,934 | 10,813 | 4 | 3 |
| Weatherford | 122 | 4,900 | 3 | 3 |
| West Cedar Creek MUD | 0 [a] | 1,299 | 2 | 0 |
| Wise County WSD | 1,668 [e] | 1,668 | 2 | 0 |

Notes: a. These suppliers have retail customers in other user groups. The sales to these retail customers do not show up as wholesale sales. For the purposes of regional water planning, the other WUGs are counted as wholesale customers.
b. Includes reuse sales
c. Includes UTRWD, NTMWD, and City of Sulphur Springs 2006 diversions. UTRWD diversions in 2006 were 7,613 ac-ft. In a typical year UTRWD diverts around 13,000 ac-ft.
d. Only includes Region C customers
e. Wise County Manufacturing Wholesale data not available.

is not currently connected to DWU's system. Currently, DWU has the capacity to treat up to 900 million gallons of water per day (mgd) with another 100 mgd of treatment capacity under construction. DWU supplies treated and raw water to wholesale customers in Dallas, Collin, Denton, Ellis, and Kaufman Counties.

*Tarrant Regional Water District (TRWD).* Table 1.19 is a list of year 2006 sales by the Tarrant Regional Water District, which totaled 394,344 acre-feet. TRWD supplies raw water to customers in Tarrant County, eight other counties in Region C, and Johnson County in the Brazos G Region. TRWD owns and operates Lake Bridgeport, Eagle Mountain Lake, Cedar Creek Reservoir, and Richland-Chambers Reservoir. The district's water supply system also includes Lake Arlington (owned by Arlington), Lake Worth (owned by Fort Worth), and Benbrook Lake (owned by the Corps of Engineers, with TRWD holding water rights), a major reuse project, and a substantial water transmission system. In addition to the customers shown in Table 1.19, the district has commitments to supply water through the Trinity River Authority to users in Ellis County.

**Table 1.18**
**Year 2006 Wholesale Sales by Dallas Water Utilities**

| Customer | 2006 Treated Water Sales (Acre-Feet) | 2006 Raw Water Sales (Acre-Feet) | 2006 Total Sales (Acre-Feet) |
|---|---|---|---|
| Addison | 6,632 | | 6,632 |
| Carrollton | 27,568 | | 27,568 |
| Cedar Hill | 9,934 | | 9,934 |
| Cockrell Hill | 460 | | 460 |
| DCWCID #6 | 2,507 | | 2,507 |
| D/FW Airport | 3,076 | | 3,076 |
| DeSoto | 9,743 | | 9,743 |
| Duncanville | 6,154 | | 6,154 |
| Farmers Branch | 10,575 | | 10,575 |
| Flower Mound | 8,814 | | 8,814 |
| Glenn Heights | 1,772 | | 1,772 |
| Grand Prairie | 25,715 | | 25,715 |
| Hutchins | 1,016 | | 1,016 |
| Irving (from Dallas' water supplies) | 13,429 | 416 | 13,845 |
| Lancaster | 5,373 | | 5,373 |
| Lewisville | 9,599 | 8,594 | 18,193 |
| Seagoville | 2,046 | | 2,046 |
| The Colony | 4,743 | | 4,743 |
| TRA (COPPELL) | 11,305 | | 11,305 |
| Irving (Irving's water supply treated by Dallas on behalf of Irving) | 42,094 | | 42,094 |
| Allen | | 189 | 189 |
| Grapevine | | 964 | 964 |
| UTRWD | | 7,214 | 7,214 |
| US Army Corps of Engineers | | 9 | 9 |
| Carrollton Indian Creek Golf Course | | 312 | 312 |
| Garland Firewheel Golf Course | | 1,428 | 1,428 |
| Carrollton/Farmers Branch ISD | | 1 | 1 |
| EDS | | 936 | 936 |
| **TOTAL** | **202,555** | **20,063** | **222,618** |

Note: Data provided by Dallas Water Utilities

**Table 1.19**
**Year 2006 Sales by Tarrant Regional Water District**

| Customer | 2006 Raw Water Sales (Acre-Feet) |
|---|---|
| Fort Worth | 231,516 |
| Arlington | 73,976 |
| Trinity River Authority (Tarrant Co.) | 44,164 |
| Mansfield | 12,889 |
| Weatherford | 4,071 |
| Benbrook Water & Sewer Authority | 3,945 |
| Freestone/Calpine | 2,847 |
| Suez Power/Wise County Power | 2,100 |
| Walnut Creek SUD | 2,022 |
| Azle | 1,938 |
| Wise County WSD | 1,668 |
| Bridgeport | 1,447 |
| West Cedar Creek MUD | 1,439 |
| East Cedar Creek FWSD | 1,396 |
| Mabank | 1,183 |
| TXI | 958 |
| River Oaks | 746 |
| Monarch Utilities/Southwest Water Services - Tecon | 547 |
| Springtown | 508 |
| Trinity Materials | 484 |
| Ridglea County Club | 478 |
| West Wise SUD | 456 |
| Hanson Aggregates | 422 |
| The Resort Golf Club (Eagle Mountain) | 377 |
| Hawks Creek Golf Club | 367 |
| Mira Vista County Club | 346 |
| Runaway Bay | 331 |
| Community WSC | 319 |
| Kemp | 288 |
| Whitestone Golf | 217 |
| Shady Oaks Country Club | 147 |
| Cedar Creek Country Club | 129 |
| Runaway Bay Golf Club | 111 |
| Star Harbor | 109 |
| Texstar/Enbridge/Regency Gas Services | 96 |
| Pinnacle Club | 86 |
| Fort Worth Country Day School | 73 |
| Winkler Water Supply | 59 |

**Table 1.19, Continued**

| Customer | 2006 Raw Water Sales (Acre-Feet) |
|---|---|
| Malakoff | 52 |
| Long Cove | 30 |
| Shady Oaks Golf/Bill Sisul | 5 |
| TXU Electric | 2 |
| **TOTAL** | 394,344 |

Note: Data were provided by the Tarrant Regional Water District.

*North Texas Municipal Water District (NTMWD).* Table 1.20 is a list of year 2006 sales by the North Texas Municipal Water District, which totaled 286,885 acre-feet. NTMWD supplies treated water to customers in suburban communities north and east of Dallas. The district obtains raw water from water rights in Lake Lavon, Lake Texoma, and Chapman Lake, all of which are owned and operated by the Corps of Engineers. NTMWD also has a permit to reuse treated wastewater effluent from its Wilson Creek Wastewater Treatment Plant and diversions from its East Fork Water Supply Project. This supply is blended with other freshwater supplies in Lake Lavon. In addition to providing treated water, the NTMWD also owns and/or operates a number of wastewater treatment plants in Region C.

*City of Fort Worth*. Table 1.21 lists wholesale water sales by the City of Fort Worth for fiscal year 2006, which totaled 70,065 acre-feet. (As shown in Table 1.16, Fort Worth also had 161,684 acre-feet of retail sales in 2006.) The City of Fort Worth purchases all of its water from Tarrant Regional Water District and has water treatment plants with combined current capacity to treat 370 million gallons of water per day. The City of Fort Worth sells wholesale treated water to other water suppliers, mostly located in Tarrant County.

*Sabine River Authority (SRA)*. The Sabine River Authority is primarily located in Region D (the North East Texas Region) and Region I (the East Texas Region). However, SRA has contracts to supply water to several entities in Region C, the largest contracts being with Dallas Water Utilities. SRA has water supplies in Lake Fork Reservoir, Lake Tawakoni, Toledo Bend Reservoir, and the Sabine River Basin canal system. Table 1.22 shows the 2006 raw water sales by SRA to its Region C customers, which totaled 185,893 acre-feet.

**Table 1.20**
**Year 2006 Sales by North Texas Municipal Water District**

| Customer | Total 2006 Treated Water Sales (Acre-Feet) |
|---|---|
| Plano | 72,195 |
| Garland | 40,523 |
| Richardson | 29,915 |
| McKinney | 24,932 |
| Frisco | 23,660 |
| Mesquite | 20,310 |
| Allen | 15,541 |
| Rockwall | 9,275 |
| Rowlett | 8,710 |
| Wylie | 5,013 |
| Forney | 4,259 |
| Little Elm | 3,737 |
| Murphy | 3,590 |
| Sachse | 3,335 |
| Fairview | 2,030 |
| Sunnyvale | 1,550 |
| Royse City | 1,361 |
| Parker | 1,300 |
| Lucas | 1,290 |
| Princeton | 1,219 |
| Kaufman Four One | 1,202 |
| Kaufman | 1,175 |
| East Fork SUD | 943 |
| Fate | 943 |
| Cash WSC | 899 |
| Forney Lake WSC | 853 |
| Caddo Basin SUD | 845 |
| North Collin WSC | 833 |
| Farmersville | 807 |
| Prosper | 639 |
| Lavon WSC | 582 |
| Wylie Northeast WSC | 580 |
| Mt Zion WSC | 453 |
| Melissa | 424 |
| Milligan WSC | 416 |
| Gastonia-Scurry WSC | 324 |
| Seis Lagos MUD | 256 |

**Table 1.20, Continued**

| Customer | Total 2006 Treated Water Sales (Acre-Feet) |
|---|---|
| Nevada WSC | 244 |
| Copeville WSC | 221 |
| College Mound WSC | 203 |
| Josephine | 159 |
| Rose Hill WSC | 125 |
| Terrell | 8 |
| Individual Meters | 6 |
| **TOTAL** | **286,885** |

Notes: a. Data were provided by the NTMWD.
b. All sales are from the NTMWD system, which draws water from Lake Lavon, Lake Texoma, and Chapman Lake.

*Trinity River Authority (TRA).* The Trinity River Authority serves as a regional wholesale water supplier through a number of projects in Region C:

- TRA holds water rights in Joe Pool Lake, Navarro Mills Lake, and Bardwell Lake, all owned and operated by the Corps of Engineers. TRA sells raw water from these lakes for use in Region C. (TRA has contracts to sell Joe Pool Lake water to Midlothian, Duncanville, Cedar Hill, and Grand Prairie. TRA sells water from Navarro Mills Lake to the City of Corsicana and from Bardwell Lake to Ennis and Waxahachie.)
- TRA sells raw water to Luminant for use in the Big Brown Steam Electric Station on Lake Fairfield. This water is diverted from the Trinity River under water rights held by TRA in Lake Livingston downstream, in Region H.

**Table 1.21**
**Year 2006 Wholesale Sales by the City of Fort Worth**

| Customer | 2006 Treated Water Sales (Acre-Feet) |
|---|---|
| Southlake | 13,334 |
| North Richland Hills | 8,432 |
| Keller | 8,135 |
| Hurst | 6,908 |
| Haltom City | 5,992 |
| Burleson | 4,875 |
| Saginaw | 3,244 |
| Bethesda Water Supply | 2,642 |
| Grand Prairie | 1,950 |
| Trophy Club MUD #1 | 1,827 |

**Table 1.21, Continued**

| Customer | 2006 Treated Water Sales (Acre-Feet) |
|---|---|
| Crowley | 1,477 |
| Forest Hill | 1,423 |
| D/FW Airport | 1,387 |
| Roanoke | 1,381 |
| White Settlement | 1,209 |
| Westlake | 1,110 |
| Lake Worth | 929 |
| Westover Hills | 912 |
| Richland Hills | 869 |
| Dalworthington Gardens | 577 |
| Haslet | 521 |
| Edgecliff Village | 467 |
| Westworth Village | 239 |
| Northlake | 170 |
| Everman | 51 |
| River Oaks | 4 |
| Benbrook | <1 |
| Sansom Park | <1 |
| TRA (Mosier Valley) | <1 |
| **TOTAL** | **70,065** |

Note: Data are from City of Fort Worth

- TRA has a regional treated water system in northeast Tarrant County, which treats raw water delivered by the Tarrant Regional Water District system through Lake Arlington and sells treated water to cities.
- TRA has a commitment to sell raw water provided by the Tarrant Regional Water District to water suppliers in Ellis County in the future and is now selling water to some Ellis County entities.

Table 1.23 lists the 2006 sales by Trinity River Authority in Region C, which totaled 41,540 acre-feet of treated water from the Tarrant County Water Supply System and 45,412 acre-feet of raw water. In addition to its raw and treated water sales, TRA operates a number of regional wastewater treatment projects in Region C.

*Upper Neches River Municipal Water Authority (UNRMWA).* The Upper Neches River Municipal Water Authority is located in Region I (the East Texas Region), where it owns and operates Lake Palestine. UNRMWA has contracted to supply up to 114,937 acre-feet per year to Dallas Water Utilities in Region C, and the facilities to connect the supplies have not yet been constructed.

*Upper Trinity Regional Water District (UTRWD)*. Table 1.24 lists the year 2006 water sales by the Upper Trinity Regional Water District, which totaled 24,690 acre-feet. UTRWD operates a regional water supply system in Denton County, which is a rapidly growing area. The UTRWD currently has a peak water treatment capacity of 90 million gallons per day.

UTRWD has a contract with the City of Commerce to divert up to 16,106 acre-feet per year of raw water from Chapman Lake in the Sulphur River Basin. UTRWD cooperates with the City of Irving to bring that water to Lewisville Lake. UTRWD also has contracts to buy raw water from Dallas and Denton and has an indirect reuse permit. In addition to its water supply activities, UTRWD provides regional wastewater treatment services in Denton County.

*Sulphur River Water District (SRWD).* The Sulphur River Water District is located in Region D (the North East Texas Region) and has water rights in Chapman Lake on the South Fork of the Sulphur River. The SRWD sells raw water to the Upper Trinity Regional Water District in Region C.

**Table 1.22**
**Year 2006 Sales by the Sabine River Authority**
**to Region C Customers**

| Customer | 2006 Raw Water Sales (Acre-Feet) |
|---|---:|
| Dallas Water Utilities | 177,750 |
| Terrell | 5,809 |
| Cash WSC [a] | 1,447 |
| MacBee WSC [a] | 623 |
| Ables Springs WSC [a] | 264 |
| **TOTAL** | **185,893** |

Notes: Data are from the Sabine River Authority.
a. Cash WSC, MacBee WSC, and Ables Springs WSC are located in both Regions C and D. Data listed are for all water sold, not just the portion used in Region C.

**Table 1.23**
**Year 2006 Sales by Trinity River Authority**

| Customer | 2006 Water Sales (Acre-Feet) | | | Source |
|---|---|---|---|---|
| | Treated | Raw | Total | |
| Bedford | 8,733 | | 8,733 | Tarrant County System (TRWD) |
| Colleyville | 9,564 | | 9,564 | Tarrant County System (TRWD) |
| Euless | 8,784 | | 8,784 | Tarrant County System (TRWD) |
| Grapevine | 8,001 | | 8,001 | Tarrant County System (TRWD) |
| North Richland Hills | 6,458 | | 6,458 | Tarrant County System (TRWD) |
| Midlothian | | 5,797 | 5,797 | Joe Pool |
| Ellis County WCID | | 8,317 | 8,317 | Bardwell |
| Ennis | | 4,095 | 4,095 | Bardwell |
| Ennis | | 1,363 | 1,363 | Richland Chambers/Cedar Creek |
| Calpine | | 2,846 | 2,846 | Richland Chambers |
| Luminant | | 14,913 | 14,913 | Livingston (Trinity River) |
| Grand Prairie | | 283 | 283 | Joe Pool |
| Corsicana | | 7,798 | 7,798 | Navarro Mills |
| **TOTAL** | **41,540** | **45,412** | **86,952** | |

Notes: a. Data are from the Trinity River Authority.
b. Water use is highly variable depending on annual rainfall.

*Dallas County Park Cities Municipal Utility District (PCMUD).* The Dallas County Park Cities Municipal Utility District has a water right to divert 50,000 acre-feet per year from Grapevine Lake, but its share of the firm yield from the lake is considerably less than the water right. According to TCEQ use records, the PCMUD diverted 16,237 acre-feet, of which 4,734 was reuse, from Grapevine Lake in the year 2006 [11]. The district operates its own water treatment plant and provides treated water to Highland Park and University Park. The district also sells raw water to the City of Grapevine. This raw water originates from the City of Grapevine's wastewater treatment plant discharges to into Lake Grapevine.

**Table 1.24**
**Year 2006 Sales by the Upper Trinity Regional Water District**

| Customer | 2006 Treated Water Sales (Acre-Feet) |
|---|---|
| Flower Mound | 8,025 |
| Corinth | 3,892 |
| Highland Village | 2,659 |
| Lake Cities MUA | 1,647 |
| Denton County FWSD #1A | 1,636 |
| Denton County FWSD #7 | 1,351 |
| Bartonville WSC | 1,132 |
| Mustang SUD | 870 |
| Argyle WSC | 701 |
| Denton County FWSD #9 [a] | 662 |
| Denton County FWSD #10 [a] | 489 |
| Celina | 483 |
| Justin | 370 |
| Denton County FWSD #8A [a] | 261 |
| Denton County FWSD #11A [a] | 230 |
| Sanger [b] | 167 |
| Krum [b] | 79 |
| Lincoln Park | 34 |
| Aubrey | 2 |
| **TOTAL** | **24,690** |

Notes: Data are from Upper Trinity Regional Water District.
a) Denotes a customer, rather than a member entity
b) Treated water provided from the City of Denton in 2006

*Greater Texoma Utility Authority (GTUA).* The Greater Texoma Utility Authority has water rights for 25,000 acre-feet per year from Lake Texoma and sells raw water to Sherman, which operates a desalination and treatment plant. GTUA also sells raw water to the North Texas Municipal Water District. In 2006, the GTUA diverted 21,906 acre-feet of raw water from Lake Texoma [11]. The authority also operates wastewater treatment plants for several communities in the Red River Basin.

*City of Corsicana*. Table 1.25 lists the year 2006 wholesale water sales by the City of Corsicana, which totaled 3,679 acre-feet. (As shown in Table 1.16, Corsicana also supplied 6,069 acre-feet of retail water in 2006.) The City of Corsicana supplies treated surface water to a significant portion of Navarro County. Corsicana has water rights in Lake Halbert and Richland-Chambers Reservoir and has a contract to purchase water from

**Table 1.25**
**Year 2006 Sales by the City of Corsicana**

| Customer | 2006 Treated Water Sales (Acre-Feet) |
|---|---|
| Rice WSC | 740 |
| Chatfield WSC | 409 |
| Post Oak | 364 |
| M.E.N. WSC | 356 |
| Navarro Mills WSC | 304 |
| Corbet WSC | 289 |
| B & B | 268 |
| City of Kerens | 187 |
| City of Blooming Grove | 146 |
| City of Dawson | 137 |
| Angus WSC | 105 |
| Northtown Acres | 75 |
| Emhouse Water Corp. | 75 |
| City of Frost | 59 |
| Community/Retreat | 55 |
| City of Richland | 38 |
| Community/Purdon | 37 |
| North Petty's Chapel | 15 |
| Northcrest/Wilson Rd | 9 |
| Community/Beaton Lake | 8 |
| Lakeside Water | 3 |
| **TOTAL** | **3,679** |

Navarro Mills Lake from the Trinity River Authority. Corsicana currently uses water from Lake Halbert and Navarro Mills Lake. The City is currently constructing infrastructure to divert water from the Richland-Chambers Reservoir. Corsicana has the capacity to treat up to 3 million gallons per day at their Lake Halbert water treatment plant and up to 17 million gallons per day at their Navarro Mills treatment plant.

### Local Wholesale Water Providers

Twenty nine other entities qualify as local wholesale water providers in Region C. These entities provide or are expected to provide over 1,000 acre-feet of wholesale water per year. These entities have been noted as "local" because they supply only a few customers in their immediate area. Table 1.26 lists the local wholesale water providers and their customers.

### Retail Water Suppliers

Cities, towns, water supply corporations, and special utility districts provide most of the retail water service in Region C. The Texas Water Development Board developed the term "water user group" (WUG) to identify entities that regional water planning groups must include in their plans. The TWDB definition for a water user group states that a WUG is defined as one of the following:

- Cities and towns with a population of 500 or more
- Non-city utilities providing more than 280 acre-feet per year of water for municipal use
- Collective reporting units (CRUs) consisting of grouped utilities having a common association
- County-Wide WUGs:
  - Rural/unincorporated areas of municipal water use (referred to as County-Other)
  - Manufacturing
  - Steam electric power generation
  - Mining
  - Irrigation
  - Livestock.

Table 1.27 shows the number of WUGs for each county in Region C.

**Table 1.26**
**Local Wholesale Water Providers and Associated Customers**

| Name of Local Wholesale Water Provider | 2006 Wholesale Sales [a] (Acre-Feet) | Current and Expected Customers of Local Wholesale Water Provider |
|---|---|---|
| City of Arlington | 5 | Grand Prairie |
| | | Bethesda WSC |
| | | Pantego |
| | | Tarrant County Manufacturing |
| City of Denton | 9,058 | Denton County Steam Electric |
| | | Denton County Manufacturing |
| | | Denton County Irrigation |
| | | Upper Trinity Regional Water District |
| City of Ennis | 375 | Community Water Co. |
| | | Rice WSC |
| | | Ellis County Manufacturing |
| | | Ellis County Other |
| | | Ellis County Steam Electric |
| City of Forney | 1,334 | High Point WSC |
| | | Talty WSC |
| | | Kaufman County Other |
| | | Kaufman County Manufacturing |
| | | Kaufman County Steam Electric (reuse) |
| City of Gainesville | 40 | Cooke County Irrigation |
| | | Cooke County Manufacturing |
| | | Cooke County Other |
| | | Woodbine WSC |
| | | Valley View |
| | | Lindsay |
| | | Kiowa Homeowners WSC |
| | | Bolivar WSC |
| City of Garland | 8,023 | Collin County Steam Electric |
| | | Dallas County Steam Electric |
| | | Dallas County Manufacturing |
| | | Forney for Kaufman County Steam Electric (reuse) |
| City of Grand Prairie | 1,134 | Johnson County SUD |
| | | Dallas County Manufacturing |
| | | Dallas County Irrigation |

**Table 1.26, Continued**

| Name of Local Wholesale Water Provider | 2006 Wholesale Sales [a] (Acre-Feet) | Current and Expected Customers of Local Wholesale Water Provider |
|---|---|---|
| City of Mansfield | 528 | Grand Prairie |
| | | Johnson County SUD |
| | | Tarrant County Manufacturing |
| | | Alvarado |
| City of Midlothian | 2,367 | Rockett SUD |
| | | Ellis County Steam Electric |
| | | Ellis County Manufacturing |
| | | Grand Prairie |
| | | Mountain Peak WSC |
| | | Venus |
| | | Alvarado |
| City of North Richland Hills | 3,240 | Tarrant County Manufacturing |
| | | Watauga |
| City of Princeton | 539 | Culleoka WSC |
| City of Rockwall | 3,327 | Mt. Zion WSC |
| | | McLendon-Chisolm |
| | | Blackland WSC |
| | | RCH WSC |
| | | Rockwall County Other |
| | | Rockwall County Manufacturing |
| City of Seagoville | 349 | Combine WSC |
| City of Sherman | 2,124 | Marilee SUD |
| | | Dorchester |
| | | Pinkhill WSC |
| | | Grayson County Manufacturing |
| City of Terrell | 1,050 | College Mound WSC |
| | | High Point WSC |
| | | Kaufman County Manufacturing |
| | | Kaufman County Other |
| | | Hunt County Other |

**Table 1.26, Continued**

| Name of Local Wholesale Water Provider | 2006 Wholesale Sales [a] (Acre-Feet) | Current and Expected Customers of Local Wholesale Water Provider |
|---|---|---|
| City of Waxahachie | 1,934 | Ellis County Other |
| | | Ellis County Manufacturing |
| | | Files Valley WSC |
| | | Buena Vista-Bethel SUD |
| | | Italy |
| | | Maypearl |
| | | Rockett SUD |
| City of Weatherford | 122 | Parker County Other |
| | | Parker County Manufacturing |
| | | Annetta |
| | | Annetta South |
| | | Hudson Oaks |
| | | Willow Park |
| Argyle WSC | 0[b] | Argyle |
| Athens MWA | 6,396 | TPWD Fish Hatchery |
| | | City of Athens |
| | | Local lake irrigation |
| Bartonville WSC | 0 [b] | Bartonville |
| | | Copper Canyon |
| | | Double Oak |
| Bolivar WSC | 0[b] | Sanger |
| | | Valley View |
| Dallas County WCID #6 | 2,488 | Balch Springs |
| East Cedar Creek FWSD | 208 | Henderson County Manufacturing |
| | | Henderson County Steam Electric |
| | | Gun Barrel City |
| Lake Cities Municipal Utility Authority | 1,950 | Lake Dallas |
| | | Hickory Creek |
| | | Shady Shores |
| Mustang SUD | 103 | Cross Roads |
| | | Oak Point |
| | | Krugerville |

**Table 1.26, Continued**

| Name of Local Wholesale Water Provider | 2006 Wholesale Sales [a] (Acre-Feet) | Current and Expected Customers of Local Wholesale Water Provider |
|---|---|---|
| Rockett SUD | 196 | Pecan Hill |
| | | Red Oak |
| | | Ferris |
| | | Palmer |
| | | Ellis County Other |
| | | Sardis-Lone Elm WSC |
| Walnut Creek SUD | 338 | Boyd |
| | | Rhome |
| | | West Wise SUD |
| | | Reno |
| | | New Fairview |
| | | Newark |
| | | Paradise |
| | | Sanctuary |
| West Cedar Creek MUD | 0[b] | Seven Points |
| | | Tool |
| Wise County Water Supply District | 1,668[c] | Decatur |
| | | Wise County Manufacturing |

Note: Data are from the Texas Water Development Board [11].

a. Some of these WWPs provide retail (rather than wholesale) sales to their customer WUGs.
b. These suppliers have retail customers in other user groups. The sales to these retail customers do not show up as wholesale sales. For the purpose of regional water planning, the other WUGs are counted as wholesale customers. Refer to Table 1.16 for retail sales.
c. Wise County Manufacturing wholesale data not available.

**Table 1.27**
**Region C Number of Water User Groups by County and Category**

| County | Cities | Utilities | County-Other | Non- Municipal | Total |
|---|---|---|---|---|---|
| Collin | 27 | 10 | 1 | 5 | 43 |
| Cooke | 4 | 4 | 1 | 5 | 14 |
| Dallas | 30 | 5 | 1 | 5 | 41 |
| Denton | 37 | 5 | 1 | 5 | 48 |
| Ellis | 17 | 9 | 1 | 5 | 32 |
| Fannin | 8 | 3 | 1 | 5 | 17 |
| Freestone | 3 | 2 | 1 | 5 | 11 |
| Grayson | 13 | 6 | 1 | 5 | 25 |
| Henderson | 10 | 4 | 1 | 5 | 20 |
| Jack | 2 | 0 | 1 | 5 | 8 |
| Kaufman | 15 | 7 | 1 | 5 | 28 |
| Navarro | 6 | 6 | 1 | 5 | 18 |
| Parker | 13 | 1 | 1 | 5 | 20 |
| Rockwall | 8 | 8 | 1 | 5 | 22 |
| Tarrant | 36 | 3 | 1 | 5 | 45 |
| Wise | 12 | 4 | 1 | 5 | 22 |
| **TOTAL** | **207** | **54** | **16** | **80** | **357** |

Note that the columns do not sum to the total because some WUGs are located in more than one county.

## *1.6 Pre-Existing Plans for Water Supply Development*

### Previous Water Supply Planning in Region C

Appendix B is a list of water-related plans and reports for Region C. The region has a long history of successful local water supply planning and development. Significant plans for developing additional water supplies in Region C in the near future include the following:

- Dallas Water Utilities plans to connect its currently unused supplies in Lake Palestine to its system by participating with Tarrant Regional Water District in the Integrated Pipeline Project and increase its transmission capacity for supplies from Lake Fork Reservoir.
- Tarrant Regional Water District plans to expand the facilities that divert return flows of treated wastewater from the Trinity River into Cedar Creek and Richland-Chambers Reservoirs. TRWD also plans to complete the Integrated Pipeline Project in cooperation with Dallas Water Utilities to deliver additional water from East Texas.

- North Texas Municipal Water District plans to construct the Lower Bois d'Arc Creek Reservoir.
- Several Region C water suppliers have received permits to reuse return flows of treated wastewater in Region C and are developing projects to use those supplies.
- The Upper Trinity Regional Water District has applied for a water right permit for the proposed Lake Ralph Hall on the North Sulphur River in Fannin County.
- Region C water suppliers are considering the development of water supplies in the Sulphur Basin to the east. Alternatives include the George Parkhouse Reservoirs (North and South), Marvin Nichols Reservoir, and Marvin Nichols Reservoir (South).
- Region C water suppliers are exploring obtaining water from existing sources in Oklahoma and from Toledo Bend Reservoir in East Texas.
- Other Region C suppliers are planning and developing smaller water supply projects to meet local needs.

As discussed in Section 1.4, there has been increasing reuse of treated wastewater in Region C in recent years. There are several permits for significant indirect reuse projects in the region. In addition to these permitted indirect reuse projects, many of the reservoirs in Region C make indirect reuse of treated wastewater return flows in their watersheds, which increase reservoir yields. Direct reuse, often for irrigation of golf courses, is also increasing in the region. It is clear that reuse of treated wastewater will remain a significant part of future water planning for Region C.

### Recommendations in the *2006 Region C Water Plan* and the *2007 State Water Plan*

The most significant recommendations for Region C in the *2006 Region C Water Plan* (1) and the 2007 State Water Plan (17) are summarized below. (A more detailed discussion of the recommendations is available in the original documents.)

A large part of the water supplied in Region C is provided by five major water providers: Dallas Water Utilities, Tarrant Regional Water District, North Texas Municipal Water District, Fort Worth, and the Trinity River Authority. In the *2006 Region C Water Plan* and the 2007 State Water Plan, these five entities are expected to provide the majority of the water supply for Region C through 2060. Recommended water management strategies to meet the needs of these major water providers include the following:

- **Marvin Nichols I Reservoir**
  - Located in the Sulphur River Basin in the North East Texas Region (Region D)

- Yield of 495,300 acre-feet per year for Region C
  - 280,000 acre-feet per year to Tarrant Regional Water District
  - 174,840 acre-feet per year to North Texas Municipal Water District
  - 35,000 acre-feet per year to Upper Trinity Regional Water District

- **Dallas Water Utilities**
  - Conservation
  - Continue to use return flows above its lakes
  - Connect Lake Palestine to its system
  - Develop supplies from Lake Wright Patman
  - Develop Fastrill Reservoir
  - Expand water treatment capacity
  - Expand existing connection to Lake Fork Reservoir
  - Develop direct and indirect reuse projects
  - Develop additional water treatment capacity as needed
  - Other alternatives for Dallas Water Utilities include additional reuse and development of yield from return flows in the watersheds of water supply reservoirs.
- **Tarrant Regional Water District**
  - Conservation
  - Develop additional capacity in the pipeline from Richland-Chambers Reservoir to Tarrant County (done)
  - Develop the Eagle Mountain Connection to allow water to be transferred among the parts of the water supply system (done)
  - Develop the proposed reuse project to pump water from the Trinity River into Cedar Creek Reservoir and Richland-Chambers Reservoir to supplement yields (Phase I complete)
  - Develop a water supply from existing water sources in Oklahoma
  - Develop a third pipeline from Cedar Creek Reservoir and Richland-Chambers Reservoir to Tarrant County
  - Participate in the Marvin Nichols Reservoir project
  - Other alternatives for Tarrant Regional Water District include the development of Lake Tehuacana and obtaining water from Lake Texoma.
- **North Texas Municipal Water District**
  - Conservation

- Develop additional water supplies in Lake Lavon from reuse (done)
- Develop the East Fork reuse project (done)
- Develop additional water supplies from Lake Texoma (permitted)
- Develop a water supply from existing water sources in Oklahoma and Toledo Bend Reservoir in Texas
- Develop Lower Bois d'Arc Creek Reservoir on Bois d'Arc Creek in Fannin Co.
- Participate in the Marvin Nichols Reservoir project
- Develop additional water treatment capacity and treated water transmission system improvements as needed
- Other alternatives for North Texas Municipal Water District include obtaining a substantial additional supply from Lake Texoma (done) and extending the existing Lake Texoma pipeline to minimize channel losses.

- **City of Fort Worth**
  - Conservation
  - Continue to obtain raw water from Tarrant Regional Water District
  - Develop direct reuse projects
  - Renew contracts with its existing customers as they expire
  - Develop additional water treatment capacity as needed
- **Trinity River Authority**
  - Conservation
  - Continue to obtain raw water from Tarrant Regional Water District for its Tarrant County water supply project
  - Expand Tarrant County Water Supply Project facilities as needed
  - Obtain raw water from Tarrant Regional Water District and implement the Ellis County water supply project (underway)
  - Develop reuse projects:
    - Additional golf course and landscape irrigation in the Las Colinas area
    - Golf course and landscape irrigation in Denton and Tarrant Counties
    - Steam electric power supply in Dallas and Ellis Counties
    - Reuse for municipal supply through Joe Pool Lake and Grapevine Lake

In addition to the strategies recommended for the five major water providers above, the Region C plan included strategies for individual water user groups. Major types of strategies included the following:

- Development of new regional surface water supply systems in Cooke, Ellis, Fannin, Grayson, and Parker Counties to supplement local groundwater supplies
- Continued development and expansion of existing regional water supply systems
- Connection of water user groups to larger regional systems
- Construction of additional water treatment capacity as needed
- Temporary overdrafting of groundwater where needed
- Development of reuse projects to meet growing steam electric and other demands

The estimated capital costs for all recommended water management strategies in the *2006 Region C Water Plan* total $14 billion in 2002 dollars.

### Conservation Planning in Region C

Significant new information regarding water conservation in Region C has been developed since completion of the 2001 and 2006 Region C Water Plans. Sources of new information include individual water conservation plans, the Water Conservation Advisory Council, conservation implementation by Region C entities, and the 2009 *Region C Conservation and Reuse Study* [18]. Below is a summary of this information. A more detailed discussion of this is presented in Chapter 6 of this report.

*Water Conservation Plans.* The TCEQ requires water conservation plans for all municipal, industrial, and mining water users with surface water rights of 1,000 acre-feet per year or more, all irrigation water users with surface water rights of 10,000 acre-feet per year or more, and all retail public utilities with 3,300 connections or more. The retail public utility requirement is an additional reporting requirement since the *2006 Region C Water Plan*. Water conservation plans are also required for all water users applying for a state water right and may also be required for entities seeking state funding for water supply projects. Primarily as a result of these requirements, many entities in Region C and around the state have developed conservation and drought contingency plans. These plans have significantly improved the awareness of water conservation in Region C. Beginning May 1, 2009, these plans are to be updated and resubmitted to TCEQ every five years.

Information has been collected from the various water conservation plans of Region C entities and used to help determine future savings from water conservation. A detailed discussion of this is presented in Chapter 6 of this report.

*Water Conservation Advisory Council.* The 80th Regular Session of the Texas Legislature (2007), via the passage of Senate Bill 3 and House Bill 4, directed the TWDB to appoint members to the newly created Water Conservation Advisory Council. The Water Conservation Advisory Council replaced the Water Conservation Implementation Task Force, which was created in 2003 and abolished on January 1, 2005.

In 2004, the Task Force published the *Water Conservation Best Management Practices Guide* (19), published the *Report to the 79th Legislature* (20), and made a number of recommendations regarding water conservation and regional water planning. These recommendations include the following:

- The Best Management Practices (BMPs) should be voluntary and state policies should recognize the fundamental decision-making primacy and prerogative of planning groups, municipalities, industrial and agricultural water users, and water providers.
- Municipal water user groups that are developing water conservation plans should consider a target that implements a minimum one percent per year reduction in total per capita water use, based on a rolling five-year average, until the total per capita water use is 140 gallons per capita per day (gpcd) or less. [Note that the Task Force also recommended that water supplied by indirect reuse should not be included when computing per capita use.]
- The TWDB should work with manufacturers of water-using equipment, water utilities, water users, and others to reduce overall statewide indoor water use to 50 gpcd through education, research, and funding programs.
- Municipal water user groups with projected water needs should first meet or reduce the need using advanced water conservation strategies (beyond implementation of state plumbing fixture requirements and adoption and implementation of water conservation education programs).

In December 2008, the Advisory Council published a *Report on Progress of Water Conservation in Texas* (21). The report included a number of recommendations regarding water conservation and regional water planning. These recommendations include the following:

- Develop methodology, metrics, and standards for water conservation implementation measurement and reporting.
- Develop specific guidelines for how gallons per capita per day should be determined and how it should be applied to population-dependent water use only.
- Develop reporting guidelines for improved data collection.
- Expand data collection efforts to include all water providers and water use categories.

- Develop a pilot project for water use data reporting.
- Develop a pilot project for determining population figures appropriate for certain water use metrics.
- Provide the Council with the necessary resources to sufficiently develop and implement tools to monitor implementation of water conservation strategies recommended in the regional water plans.
- Expand public awareness of water conservation statewide and coordinate campaigns at the state, regional, and local levels.
- Establish a statewide water conservation recognition program.
- Collaborate with national efforts to develop a clearinghouse of resources, tools, and best management practices.
- Direct the TWDB to develop a certification process for conservation training programs and provide preference for technical and financial assistance to these certified programs.

*Conservation Implementation by Region C Entities.* In addition to the water conservation plans discussed above, Region C entities have implemented water conservation strategies since completion of the *2006 Region C Water Plan* (2).

In particular, Dallas Water Utilities, North Texas Municipal Water District, and Tarrant Regional Water District have implemented large scale conservation programs. More detail on these programs is presented in Chapter 6 of this report.

The 2009 *Region C Conservation and Reuse Study* (18) was funded by the TWDB and was performed as in interim study for the Region C Water Planning Group. This report presented results from an extensive survey of water supplies and water user groups in Region C regarding implementation of conservation practices and plans for future implementation. Section 6.4 of this report summarizes the findings of that study.

Finally, as mentioned in previous sections, several Region C entities have continued to develop and implement direct and indirect reuse projects.

### Preliminary Assessment of Current Preparations for Drought in Region C

The recent dry summers in 1996, 1998, 1999, 2000, and 2006 placed considerable stress on water suppliers throughout Texas, including Region C. The larger systems in Region C did not have a shortage of supply, but several had problems with delivery of raw water to points of need and with treated water distribution. Many Region C water suppliers have already made or are currently making improvements to increase delivery of raw and treated water under drought conditions. Some smaller suppliers in Region C faced a shortage of supplies in the recent droughts. Most of those entities have moved to address this problem by connecting to a larger supplier or by developing additional supplies on their own.

Most of the water conservation plans developed in response to TCEQ and TWDB requirements include a drought contingency plan. In addition to its regional planning provisions, Senate Bill One included a requirement that all public water suppliers and irrigation districts develop and implement a drought contingency plan.

### Other Water-Related Programs

In addition to the Senate Bill One regional planning efforts, there are a number of other significant water-related programs that will affect water supply efforts in Region C. Perhaps the most important are Texas Commission on Environmental Quality water rights permitting, the Clean Rivers Program, the Clean Water Act, and the Safe Drinking Water Act.

*Texas Commission on Environmental Quality (TCEQ) Water Rights Permitting.* Surface water in Texas is a public resource, and the TCEQ is empowered to grant water rights that allow beneficial use of that resource. The development of any new surface water supply requires a water right permit. In recent years, TCEQ has increased its scrutiny of the environmental impacts of water supply projects, and permitting has become more difficult and complex. Among its many other provisions, Senate Bill One set out formal criteria for the permitting of interbasin transfers for water supply. Since many of the major sources of supply that have been considered for Region C involve interbasin transfers, these criteria will be important in Region C planning.

*Clean Rivers Program.* The Clean Rivers Program is a Texas program overseen by TCEQ and funded by fees assessed on water use and wastewater discharge permit holders. The program is designed to provide information on water quality issues and to develop plans to resolve water quality problems. The Clean Rivers Program is carried out by local entities. In Region C, the program is carried out by river authorities: the Trinity River Authority in the Trinity Basin, the Red River Authority in the Red Basin, the Brazos River Authority in the Brazos Basin, the Sulphur River Basin Authority in the Sulphur Basin, and the Sabine River Authority in the Sabine Basin.

*Clean Water Act.* The Clean Water Act is a federal law designed to protect water quality. The parts of the act which have the greatest impact on water supplies are the National Pollutant Discharge Elimination System (NPDES) permitting process, which covers wastewater treatment plant and storm water discharges, and the Section 404 permitting program for the discharge of dredged and fill material into the waters of the United States, which affects construction for development of water resources. In Texas, the state has recently taken over the NPDES permitting system, renaming it the Texas PDES (TPDES). The TPDES Program sets the discharge requirements for wastewater treatment plants and for storm water discharges associated with construction and industrial activities. The Section 404 permit program is handled by the U.S. Army Corps of Engineers. Section 404 permitting is a required step in the development of a new reservoir and is also required for pipelines, pump stations, and other facilities constructed in or through waters of the United States.

*Safe Drinking Water Act (SDWA).* The Safe Drinking Water Act is a federal program that regulates drinking water supplies. In recent years, new requirements introduced under the SDWA have required significant changes to water treatment. On-going SDWA initiatives will continue to impact water treatment requirements. Some of the initiatives that may have significant impacts in Region C are the reduction in allowable levels of trihalomethanes in treated water, the requirement for reduction of total organic carbon levels in raw water, and the reduction of the allowable level of arsenic in drinking water.

*SDWA New Groundwater Rules*. The EPA has recently developed new groundwater monitoring regulations as part of the SWDA. TCEQ is the agency responsible for implementing these rules in Texas and has developed a source sampling compliance program for groundwater systems which took effect on December 1, 2009. Requirements of this rule are meant to ensure that 1) groundwater systems conduct source water monitoring, 2) address significant deficiencies, 3) address source water fecal contamination, and 4) implement corrective actions. The New Groundwater Rule has the potential to encourage entities on groundwater to consider alternative sources. Systems that utilize groundwater as a supplemental supply may find that the additional regulatory monitoring and reporting are more trouble than the supplemental supply is worth..

## *1.7 Agricultural and Natural Resources in Region C*

### Springs in Region C

No springs in Region C are currently used as a significant source of water supply. Springs were important sources of water supply to Native Americans and in the initial settlement of the area and had great influence on the initial patterns of settlement. Groundwater development and the resulting water level declines have caused many springs to disappear and greatly diminished the flow from those that remain [22].

The TPWD has identified a number of small to medium-sized springs in Region C [23]. Table 1.28 shows the distribution and number of these springs as of 1980. Former springs are springs that have run dry due to groundwater pumping, sedimentation caused by surface erosion, or other causes [24].

**Table 1.28**
**Distribution and Estimated Size of Springs and Seeps**

| County | Medium (2.8 – 28 cfs) | Small (0.28 – 2.8 cfs) | Very Small (0.028 – 0.28 cfs) | Seep (Less than 0.028 cfs) | Former |
|---|---|---|---|---|---|
| Collin | 0 | 3 | 10 | 1 | 4 |
| Cooke | 0 | 3 | 9 | 3 | 1 |
| Dallas | 2 | 6 | 2 | 0 | 4 |
| Denton | 0 | 3 | 8 | 1 | 1 |
| Ellis | 0 | 0 | 0 | 0 | 1 |
| Fannin | 0 | 3 | 6 | 3 | 1 |
| Grayson | 0 | 2 | 12 | 1 | 1 |
| Parker | 0 | 8 | 3 | 2 | 6 |
| Rockwall | 0 | 0 | 1 | 0 | 2 |
| Tarrant | 3 | 6 | 1 | 3 | 5 |
| Wise | 0 | 7 | 4 | 3 | 2 |

Note: Data are from Texas Parks and Wildlife Department [23].

### Wetlands

According to the regulatory definition of the U.S. Army Corps of Engineers [25], wetlands are "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Areas classified as wetlands are often dependent on water from streams and reservoirs. Some of the important functions of wetlands include providing food and habitat for fish and wildlife, water quality improvement, flood protection, shoreline erosion control, and groundwater exchange, in addition to opportunities for human recreation, education, and research.

The Natural Resources Conservation Service (NRCS) has mapped and quantified areas of hydric soils for all but five of the counties in Region C. The agency makes these data available through its local county offices and, in some cases, publishes the acreages of soil series in the soil survey report for the county. Hydric soil is defined as "soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation" (26). Thus, the area of hydric soils mapped in a county provides an indication of the potential extent of wetlands in that county. However, as implied in the definition, some areas mapped as hydric soils may not occur as wetlands because the hydrology has been changed to preclude saturation or inundation.

Table 1.29 is a list of acreages of hydric soils for the counties in Region C for which the data are available. The hydric soil areas range from just over one percent of the county area in Collin, Cooke, and Tarrant counties to approximately 24 percent in Henderson County. The acreages of hydric soils listed in Table 1.29 should be considered as an indicator of the relative abundance of wetlands in the counties and not as an absolute quantity. It should also be noted that wetlands are likely to occur in other areas throughout the region as "atypical" or "problem area" wetlands, as defined in the Corps of Engineers' Wetland Delineation Manual (25).

## Endangered or Threatened Species

The Endangered Species Act (ESA) provides for the conservation of endangered or threatened species and their critical habitats. Recovery plans are created for each species

**Table 1.29**
**Hydric Soils Mapped by the Natural Resources Conservation Service for the Counties in Region C**

| County | Total County Acreage (Acres) | Hydric Soil Acreage within County (Acres) | Percent of County (%) |
|---|---|---|---|
| Collin | 565,760 | 8,620 | 1.52 |
| Cooke | 568,320 | 7,100 | 1.25 |
| Dallas | 577,920 | 53,570 | 9.27 |
| Denton | 611,200 | 10,460 | 1.71 |
| Ellis | 608,000 | Not Available | |
| Fannin | 574,080 | Not Available | |
| Freestone | 574,720 | 85,855 | 14.94 |
| Grayson | 627,840 | 29,240 | 4.66 |
| Henderson [a] | 604,800 | 142,540 | 23.57 |
| Jack | 588,800 | Not Available | |
| Kaufman | 517,760 | Not Available | |
| Navarro | 695,680 | 86,100 | 12.38 |
| Parker | 581,760 | 35,350 | 6.08 |
| Rockwall | 94,080 | Not Available | |
| Tarrant | 574,080 | 9,410 | 1.64 |
| Wise | 592,000 | 13,100 | 2.21 |

Note: a. The values for Henderson County include all of Henderson County, not just the Region C portion.

to provide protocols, timelines, and costs for recovering endangered species. Federal agencies are required to ensure that their activities do not jeopardize listed species or their critical habitats. In addition, many federal agencies incorporate conservation of listed species into their existing authorities.

The U.S. Fish and Wildlife Service (USFWS) [(27)] is the authority responsible for the federal listing of endangered and threatened species. The Texas Parks and Wildlife Department (TPWD) maintains a separate listing of species of special concern [(28)] in the Texas Biological and Conservation Data System. Table 1.30 lists federal endangered or threatened species identified by USFWS in Region C counties. Table 1.31 lists species of special concern as identified at the state level and species that have limited range within the state. County designations indicate that a species is either known to occur or existing habitat is suitable to support a species in the particular county.

**Table 1.30**
**Federal Endangered or Threatened Species in Region C [a]**

| Species | Federal Status [b] | County | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Collin | Cooke | Dallas | Denton | Ellis | Fannin | Freestone | Grayson | Henderson | Jack | Kaufman | Navarro | Parker | Rockwall | Tarrant | Wise |
| Bald Eagle | DM | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Louisiana Black Bear | T | | | | | | X | | | | | | | | | | |
| Black Capped Vireo | E | | X | X | | | | | | | X | | | X | | | X |
| Golden Cheeked Warbler | E | | | X | | | | | | | X | | | | | | |
| Least Tern | E | | X | X | X | | X | X | X | | | | | | | X | |
| Large Fruited Sand Verbena | E | | | | | | | X | | | | | | | | | |
| Navasota Ladies Tresses | E | | | | | | | X | | | | | | | | | |
| Piping Plover | E, T | | | X | X | | | | X | | | | | | | | |
| Whooping Crane | E | X | X | X | X | X | | X | X | | X | | X | X | | X | X |

Notes: a. Information obtained from U.S. Fish and Wildlife Service [(27)].
b. DM is a federally delisted taxon, recovered, being monitored first five years; EXPN is federally listed experimental, E is federally listed endangered; T is federally listed threatened.

## Stream Segments with Significant Natural Resources

In Region C, the TPWD has identified river and stream segments classified as having significant natural resources in their report *Ecologically Significant River and Stream Segments of Region C, Regional Water Planning Area* [(29)]. Stream segments have been placed on this list because they have been identified by TPWD as having one or more of the following: biological function, hydrologic function, riparian conservation area, high water quality/aesthetic value, or endangered species/unique communities. Three hundred and twenty-four streams were identified within Region C, and the following ten were chosen for inclusion in the aforementioned report. More information on Unique Stream Segments is presented in Chapter 8.

- Bois d'Arc Creek (from the confluence with the Red River in Fannin County upstream to its headwaters in Eastern Grayson County)
- Brazos River (from a point 330 feet upstream of FM 2580 in Parker County upstream to the Parker/Palo Pinto County line)

**Table 1.31**
**State Species of Special Concern in Region C [a]**

| Species | State Status [a] | Collin [c] | Cooke [c] | Dallas [c] | Denton [c] | Ellis [c] | Fannin [c] | Freestone [d] | Grayson [c] | Henderson [e] | Jack [f] | Kaufman [c] | Navarro [c] | Parker [g] | Rockwall [c] | Tarrant [c] | Wise [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A Crayfish | R | X | | | | | | | | | | | | | | | |
| Alligator Snapping Turtle | T | X | | X | | X | X | X | X | X | | X | X | | X | | |
| American Burying Beetle | R | | | | | | X | | | | | | | | | | |
| American Peregrine Falcon | E | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Arctic Peregrine Falcon | T | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Bachman's Sparrow | T | | | | | | | X | | X | | | | | | | |
| Baird's Sparrow | R | | | | | | | | | | X | | | | | | |
| Bald Eagle | T | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Black Bear | T | | | | | | X | | | X | | | | | | | |
| Black Lordithon Rove Beetle | R | | | X | | | | | | | | | | | | | |
| Black Capped Vireo | E | | | X | | | | | | | X | | | | | | |
| Blackside Darter | T | | | | | | X | | | | | | | | | | |
| Bleached Skimmer | R | | | | | | | | | | X | | | | | | |
| Blue Sucker | T | | | | | | X | | X | | | | | | | | |
| Brazos Water Snake | T | | | | | | | | | | | | | X | | | |
| Cave Myotis Bat | R | | | X | | | | | | | | | | | | | |
| Cerulean Warbler | R | | X | | | | X | | X | | | | | | | | |
| Chapman's Yellow-Eyed Grass | R | | | | | | | X | | X | | | | | | | |
| Comanche Peak Prairie-Clover | R | | | | | | | | | | | | | X | | | X |
| Common Pimpleback | R | | X | | | | X | | X | | | | | | | | |
| Creek Chubsucker | T | | | | | | X | | X | | | | | | | | |
| Creeper (squawfoot) | R | | | | | | | X | | X | | X | X | | | | |
| Eskimo Curlew | E | | X | | | | X | | X | | | | | | | | |
| Fawnsfoot | R | X | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Glen Rose Yucca | R | | | X | X | | | | | | | | | X | | X | |
| Golden-Cheeked Warbler | E | | | X | | X | | | | | | | | X | | | |
| Goldeye | R | | | | | | X | | X | | | | | | | | |
| Gray Wolf | E | | X | | | | | | | | X | | | X | | X | X |
| Hall's Baby Bulrush | R | | | | | | | | | | | | | | | | X |
| Henslow's Sparrow | R | X | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Houston toad | E | | | | | | | X | | | | | | | | | |
| Interior Least Tern | E | X | X | X | | X | X | X | X | X | | X | X | X | | X | X |
| Large-fruited sand-verbena | E | | | | | | | X | | | | | | | | | |
| Little Spectaclecase | R | X | | X | X | X | | X | | X | | X | X | | X | X | X |
| Louisiana Pigtoe | R | X | | X | X | X | | X | | X | | X | X | | X | X | X |

**Table 1.31, Continued**

| Species | State Status [a] | Collin [c] | Cooke [c] | Dallas [c] | Denton [c] | Ellis [c] | Fannin [c] | Freestone [d] | Grayson [c] | Henderson [e] | Jack [f] | Kaufman [c] | Navarro [c] | Parker [g] | Rockwall [c] | Tarrant [c] | Wise [g] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mountain Plover | R | | | | | | | | | | X | | | X | | | X |
| Navasota Ladies Tresses | E | | | | | | | X | | | | | | | | | |
| Northern Scarlet Snake | T | | | | | | | | | X | | | | | | | |
| Orangebelly Darter | R | | | | | | X | | X | | | | | | | | |
| Paddlefish | T | | | | | | X | | X | | | | | | | | |
| Peregrine Falcon | ET | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Piping Plover | T | X | | X | | | X | X | X | X | | X | X | | X | | |
| Pistolgrip | R | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Plain Pocketbook | R | | X | | | | X | | X | | | | | | | | |
| Plains Spotted Skunk | R | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Red Wolf | E | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Rock Pocketbook | R | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Rough Stem Astor | R | | | | | | | X | | X | | | | | | | |
| Sabine Map Turtle | R | | | | | | | | | X | | | | | | | |
| Sandbank Pocketbook | R | X | | X | X | X | | X | | X | | X | X | | X | X | |
| Sharpnose Shiner | R | | | | | | | | | | | | | X | | | |
| Shovelnose Sturgeon | T | | | | | | X | | X | | | | | | | | |
| Smalleye Shiner | R | | | | | | | | | | | | | X | | | |
| Smallheaded Pipewort | R | | | | | | | | | X | | | | | | | |
| Southeastern Myotis Bat | R | | | | | | | X | | X | | | | | | | |
| Southern Hickorynut | R | | | | | | | | | X | | | | | | | |
| Taillight Shiner | R | | | | | | X | | | | | | | | | | |
| Texas Fawnsfoot | R | | | | | | | | | | | | | X | | | |
| Texas Garter Snake | R | X | | X | X | X | | X | | | | X | X | X | X | X | X |
| Texas Heelsplitter | R | X | | X | X | X | | X | | X | X | X | X | | X | X | X |
| Texas Horned Lizard | T | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Texas Kangaroo Rat | T | | | | | | | | | | X | | | | | | |
| Texas Pigtoe | R | | | | | X | | X | | X | | X | X | | | | |
| Timber/Canebrake Rattlesnake | T | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Wabash Pigtoe | R | X | | X | X | X | X | X | X | X | | X | X | | X | | |
| Warnock's Coral-Root | R | | | X | | | | | | | | | | | | | |
| Wartyback | R | | | | | | | | | X | | | | | | | |
| Western Burrowing Owl | RX | X | X | X | X | X | | | X | | X | X | X | X | X | X | X |
| Western Sand Darter | R | | | | | | X | | | | | | | | | | |
| White Heelsplitter | R | | | | | | X | | X | | | | | | | | |
| White Faced Ibis | T | X | | X | X | X | | | | | | X | X | | X | | |
| Whooping Crane | E | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X |
| Wood Stork | T | X | X | X | X | X | X | X | X | X | | X | X | | X | | |

Notes: a. Information is obtained from TPWD [(29)]. b. E is endangered, T is threatened, R is rare. c. Last updated 8/8/2007. d. Last updated 11/17/2008. e. Last updated 12/22/2008. f. Last updated 12/7/2007. g. Last updated 12/12/2008.

- Buffalo/Linn Creek (from the confluence with Alligator Creek upstream to State Route 164 (Buffalo Creek) and from the confluence with Buffalo Creek upstream to County Road 691 (Linn Creek))
- Clear Creek (from the confluence with the Elm Fork of the Trinity River northeast of Denton in Denton County upstream to the Denton/Cooke County line)
- Coffee Mill Creek (from the confluence with Bois d'Arc Creek in Fannin County upstream to its headwaters)
- Elm Fork (from a point 110 yards upstream of U.S. 380 in Denton County upstream to Ray Roberts Dam in Denton County)
- Elm Fork (from the confluence with the West Fork of the Trinity River in Dallas County upstream to California Crossing Road in Dallas County)
- Lost Creek (from the confluence with the West Fork of the Trinity River upstream to its headwaters in Jack County)
- Purtis Creek (from the Henderson County line upstream to its headwaters)
- Trinity River (from Interstate Highway 45 in Dallas County upstream to MacArthur Boulevard in Dallas County)

### Navigation

There is very little navigation in Region C. However, the Corps of Engineers has defined two stretches of river in Region C that qualify as "navigable". In the Red River Basin, the segment of the Red River from Denison Dam forming Lake Texoma upstream to Warrens Bend in Cooke County is defined as navigable. In the Trinity River Basin, the Trinity River has a reach that is considered to be "navigable" from the southeastern border of Freestone County up to Riverside Drive in Fort Worth. While these rivers meet the legal definition of navigable waters, they are not currently used for this purpose.

### Agriculture and Prime Farmland

Table 1.32 gives some basic data on agricultural production in Region C, based on the 2007 Agricultural Census from the U.S. Department of Agriculture (USDA) [30]. Region C includes over 5,800,000 acres in farms and over 1,900,000 acres of cropland. Irrigated

**Table 1.32**
**2007 U.S. Department of Agriculture County Data**

| | Collin | Cooke | Dallas | Denton | Ellis | Fannin | Freestone | Grayson |
|---|---|---|---|---|---|---|---|---|
| Farms | 2,235 | 1,956 | 755 | 2,575 | 2,415 | 2,110 | 1,468 | 2,723 |
| Land in Farms (acres) | 290,831 | 455,393 | 88,010 | 350,274 | 442,656 | 473,853 | 399,584 | 400,414 |
| Crop Land (acres) | 150,210 | 136,571 | 43,547 | 140,933 | 204,578 | 207,535 | 80,055 | 166,541 |
| Harvested Crop Land (acres) | 114,856 | 96,280 | 60,837 | 91,086 | 156,704 | 134,253 | 38,327 | 124,085 |
| Irrigated Crop Land (acres) | 708 | 548 | 902 | 1,323 | 825 | 5,264 | 346 | 3,066 |
| Market Value ($1,000) | | | | | | | | |
| Crops | 34,916 | 11,437 | 31,118 | 18,538 | 33,384 | 23,962 | 3,206 | 29,853 |
| Livestock | 26,248 | 46,857 | 4,056 | 60,699 | 15,998 | 24,758 | 30,719 | 22,986 |
| Total | 61,164 | 58,294 | 35,174 | 79,237 | 49,382 | 48,720 | 33,925 | 52,839 |

| | Henderson[b] | Jack | Kaufman | Navarro | Parker | Rockwall | Tarrant | Wise | Total |
|---|---|---|---|---|---|---|---|---|---|
| Farms | 2,109 | 902 | 2,563 | 2,078 | 3,677 | 347 | 1,248 | 3,164 | 32,325 |
| Land in Farms (acres) | 318,452 | 576,091 | 421,803 | 586,936 | 441,575 | 37,433 | 154,377 | 442,753 | 5,880,435 |
| Crop Land (acres) | 86,495 | 72,042 | 155,113 | 164,245 | 103,759 | 14,475 | 46,134 | 133,972 | 1,906,205 |
| Harvested Crop Land (acres) | 57,128 | 20,188 | 83,210 | 112,695 | 56,173 | 10,963 | 22,019 | 75,739 | 1,224,543 |
| Irrigated Crop Land (acres) | 1,328 | 717 | 1,585 | 1,117 | 1,525 | 72 | 1,388 | 2,461 | 23,175 |
| Market Value ($1,000) | | | | | | | | | |
| Crops | 19,123 | 1,880 | 14,029 | 21,820 | 14,838 | 1,837 | 53,655 | 13,607 | 327,203 |
| Livestock | 25,390 | 16,393 | 29,621 | 30,588 | 45,196 | 2,025 | 7,712 | 27,472 | 416,718 |
| Total | 44,513 | 18,273 | 43,650 | 52,408 | 60,034 | 3,862 | 61,367 | 41,079 | 743,921 |

Notes: a. Data are from the U.S. Department of Agriculture [30].
b. Data for Henderson County are for the entire county.

agriculture does not play a significant role in Region C, with less than 2 percent of the harvested cropland being irrigated. The market value of agricultural products is significant in all Region C counties, with a total value for 2007 of over $743,000,000. (Separate data are not available for the portion of Henderson County in Region C, so the USDA data include the entire county.)

The Natural Resources Conservation Service (NRCS) defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses (31)." As part of the National Resources Inventory, the NRCS has identified prime farmland throughout the country. Figure 1.17 shows the distribution of prime farmland in Region C. Each color in Figure 1.17 represents the percentage of the total acreage that is prime farmland of any kind. (There are four categories of prime farmland in the NRCS STATSGO database for Texas: prime farmland, prime farmland if drained, prime farmland if protected from flooding or not frequently flooded during the growing season, and prime farmland if irrigated.) There are large areas of prime farmland in Cooke, Denton, Collin, Tarrant, Dallas, and Ellis Counties.

There are localized areas of irrigated agriculture in Region C. Table 1.9 shows that 13 percent of the year 2006 water use for irrigation in Region C came from groundwater (compared to only 7 percent of total water use from groundwater.) Texas Water Development Board Report 269 (15) studied groundwater in most of Region C (except for Jack and Henderson Counties and part of Navarro County). Most irrigation wells in the study area were scattered over the outcrop areas of the Trinity and the Woodbine aquifers with only a few areas of concentrated activity. The largest concentration of irrigation wells is located on the Woodbine outcrop in an area bounded by western Grayson County, the eastern edge of Cooke County, and the northeastern corner of Denton County. Approximately 80 irrigation wells operated in this region (as of 1982), and several produced as much as 900 gpm. Several smaller irrigation well developments were located in Parker County and Wise County in the Trinity aquifer. There were also irrigation wells in Fannin County producing from the alluvium along the Red River (15).

## State and Federal Natural Resource Holdings

The TPWD operates several state parks in Region C: Bonham State Park in Fannin County, Cedar Hill State Park in Dallas County, Eisenhower State Park in Grayson County, Fairfield Lake State Park in Freestone County, Lake Lewisville State Park in Denton County, Lake Mineral Wells State Park in Parker County, Lake Ray Roberts State Park in Denton and Cooke Counties, and Purtis Creek State Park partially located in Henderson County. TPWD also operates Caddo Wildlife Management Area in Fannin County, Ray Roberts Wildlife Management Area in Cooke, Denton, and Grayson Counties, Richland Creek Wildlife Management Area in Freestone and Navarro Counties, and Eisenhower State Historic Park in Grayson County.

Federal government natural resource holdings in Region C include the following:

- Parks and other land around all of the Corps of Engineers lakes in the region (Texoma, Ray Roberts, Lewisville, Lavon, Grapevine, Benbrook, Joe Pool, Bardwell, and Navarro Mills)
- Hagerman National Wildlife Refuge on the shore of Lake Texoma in Grayson County
- Caddo National Grasslands in Fannin County
- Lyndon B. Johnson National Grasslands in Wise County.

Area reservoirs provide a variety of recreational benefits, as well as water supply. Table 1.33 lists the reservoirs located in Region C that have national or state lands associated with them and the recreational opportunities available at these sites [32, 33, 34]. Recreational activities typically found at these sites include camping, fishing, boating, hiking, swimming, and picnicking.

## Oil and Gas Resources

Oil and natural gas fields are significant natural resources in portions of Region C. Gas production in the Barnett Shale has rapidly increased in the past decade due in large part to improvements in hydraulic fracture stimulation technologies [35]. This process uses water at high pressure to fracture the shale formation and greatly improves the gas production from a well. This additional use of water in gas production has significantly increased the mining use in Region C.

**Table 1.33**
**Recreational Activities at Region C Reservoirs**

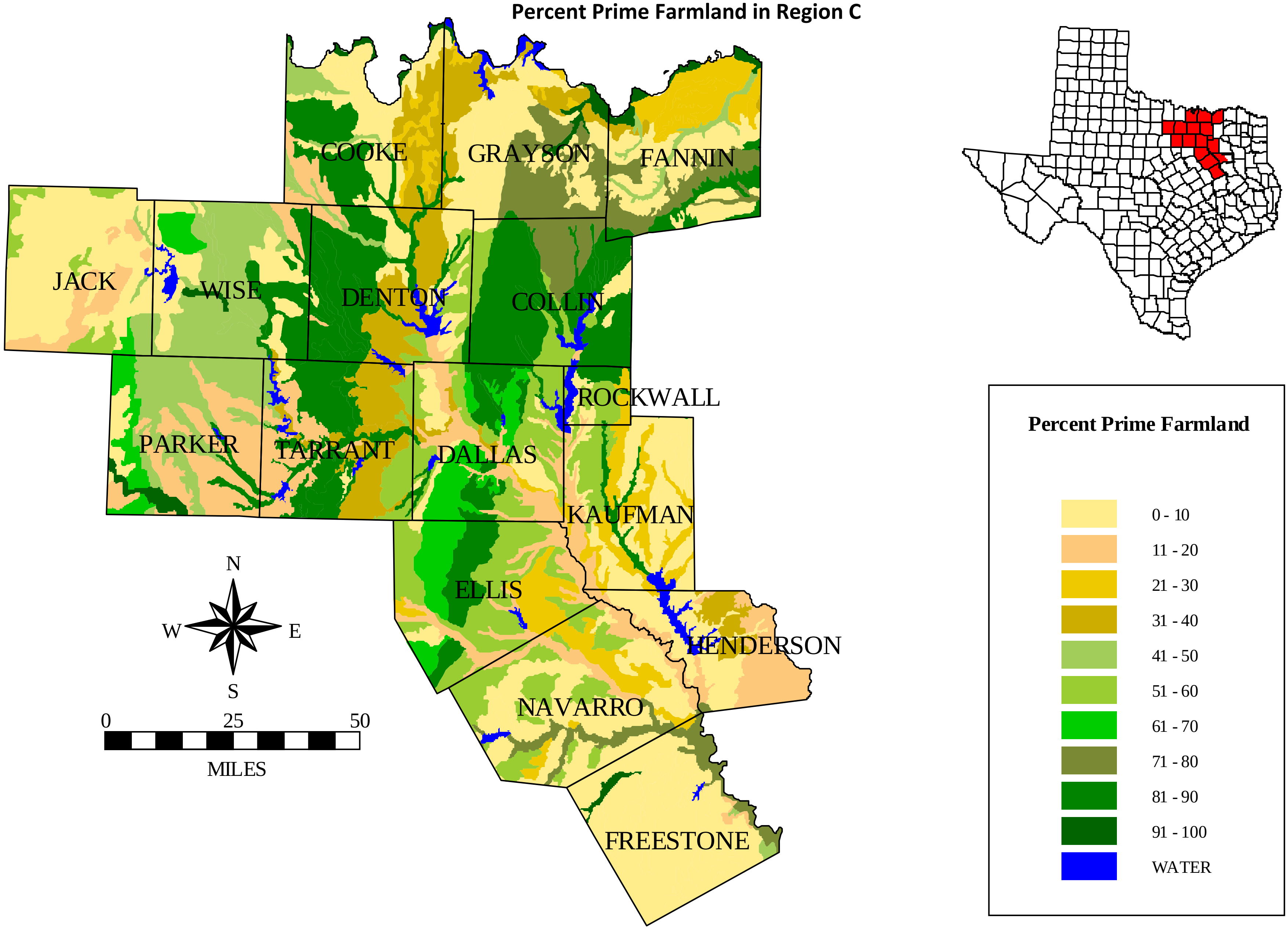
| Reservoir | National Lands | State Lands | Camping | Fishing | Boating | Hiking/Nature Trails | Hunting | Swimming | Picnic Sites | Bicycling Trails | Equestrian Trails | Playgrounds |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lavon | X | | X | X | X | X | X | X | X | X | X | |
| Texoma | X | X | X | X | X | X | X | X | X | X | | X |
| Bonham | | X | X | X | X | X | | X | X | X | | X |
| Ray Roberts | X | X | X | X | X | X | X | X | X | X | X | X |
| Lewisville | X | | X | X | X | X | X | X | X | X | X | |
| Benbrook | X | | X | X | X | X | X | X | X | X | | |
| Grapevine | X | | X | X | X | X | X | X | X | X | X | |
| Joe Pool | X | X | X | X | X | X | | X | X | X | X | X |
| Bardwell | X | | X | X | X | X | X | X | X | X | X | |
| Navarro Mills | X | | X | X | X | X | X | X | X | | | |
| Fairfield | | X | X | X | X | X | | X | X | X | | X |
| Mineral Wells | | X | X | X | X | X | | X | X | X | X | X |

As of September 2009, six counties within Region C had 1,300 or more regular producing gas wells (Denton, Freestone, Jack, Parker, Tarrant and Wise), with Wise County having the most at 3,998 (36). As of September 2009, two counties within Region C had 1,500 or more regular producing oil wells (Cooke and Jack) and three Counties had between 500 and 1,000 regular producing oil wells (Grayson, Navarro, and Wise) (36).

## Lignite Coal Fields

There are some lignite coal resources in Region C (37). Paleozoic rocks with bituminous coal deposits underlie most of Jack County and small portions of Wise and Parker Counties. Near surface (to 200 feet in depth) lignite deposits in the Wilcox Group underlie significant portions of Freestone, Navarro, and Henderson Counties. Deposits of deep basin lignite (200 - 2,000 feet in depth) in rocks of the Wilcox Group underlie a significant portion of Freestone County. The most significant current lignite production in Region C is from the near surface Wilcox Group deposits in Freestone County to supply Luminant's Big Brown Steam Electric Station on Lake Fairfield (38).

**Figure 1.17**
**Percent Prime Farmland in Region C**



## 1.8 Summary of Threats and Constraints to Water Supply in Region C

The most significant potential threats to existing water supplies in Region C are surface water quality concerns, groundwater drawdown, and groundwater quality. Constraints on the development of new supplies include the availability of sites and unappropriated water for new water supply reservoirs and the challenges imposed by environmental concerns and permitting.

### Need to Develop Additional Supplies

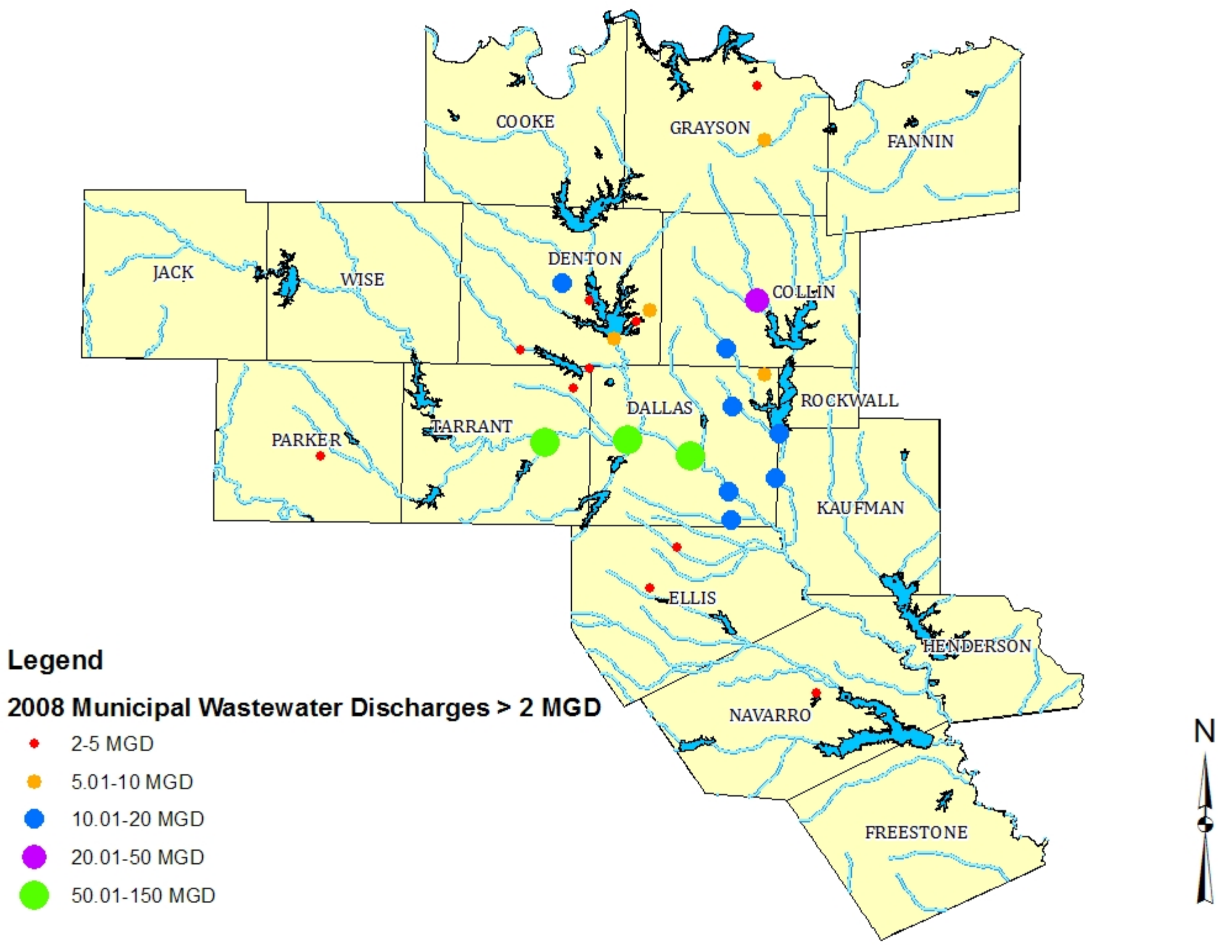
Most of the water suppliers in Region C will have to develop additional supplies before 2060. The major water suppliers have supplies in excess of current needs, but they will require additional supplies to meet projected growth. Some smaller water suppliers face a more urgent need for water. Their needs can be addressed by local water supply projects or by purchasing water from a major water supplier.

### Surface Water Quality Concerns

The Texas Commission on Environmental Quality (TCEQ) publishes *The State of Texas Water Quality Inventory and 303(d) List* every two years in accordance with the schedule mandated under section 303(d) and 305(b) of the Clean Water Act. The latest EPA-approved edition of the Water Quality Inventory was approved by the EPA in July 2008 [39]. The TCEQ has also established a list of stream segments for which it intends to develop total maximum daily load (TMDL) evaluations to address water quality concerns. Table 1.34 lists the stream segments in Region C for which TMDL evaluations are proposed or have been conducted and summarizes the water quality concerns to be addressed. None of the proposed TMDL studies in Region C are due to concerns related to public water supply. Most are due to general use, aquatic life, contact recreation, and fish consumption.

Many of the water supply reservoirs in Region C are experiencing increasing discharges of treated wastewater in their watersheds. To date, this has not presented a problem for public water supplies, but increased amounts of wastewater and greater nutrient loads may lead to concerns about eutrophication in some lakes. Figure 1.18 shows municipal wastewater treatment plants in Region C larger than 2 million gallons per day. Most of the

**Figure 1.18**
**Wastewater Discharge Points in Region C**




largest plants are on the Trinity River in the Dallas-Fort Worth Metroplex and do not discharge into the watershed of any Region C reservoir. However, several projects under development will withdraw water from rivers downstream of municipal wastewater treatment plants, polish the water with wetlands treatment, and convey the water to Region C water supply reservoirs. Additionally, there are significant permitted discharges upstream from many reservoirs in the region, and return flows are tending to increase with time.

In December 1998, the U.S. EPA published the *Stage 1 Disinfectants and Disinfection Byproducts (D/DBP) Rule* [40], which applies to water systems that treat surface water with a chemical disinfectant. This rule sets forth Maximum Contaminant Levels (MCLs) for a number of different contaminants including: total organic carbon, trihalomethane, haloacetic acid, dissolved solids, and arsenic. Under certain circumstances, the rule mandates the use of enhanced coagulation to remove total organic carbon (TOC), an indicator of potential disinfection byproduct formation. Effective January 1, 2004, all community and nontransient, noncommunity systems were required to comply with the MCLs for TTHM (0.080 milligrams per liter, or mg/l) and HAA5 (0.060 mg/l) based on the running annual average for the entire distribution system.

In January 2006, the U.S. EPA published the *Stage 2 Disinfectants and Disinfection Byproducts (D/DBP) Rule*, which requires utilities to evaluate their distribution systems to identify locations with high DBP concentrations. The utilities will then use these locations as sampling sites for DBP compliance monitoring [41]. This rule requires compliance with the MCLs for TTHM and HAA5 at each monitoring location as soon as six years after promulgation.

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) [42] is a companion rule to Stage 2 DBPR. This rule requires additional Cryptosporidium treatment techniques for higher-risk systems as well as provisions to reduce risks from uncovered finished water reservoirs and provisions to ensure that microbial protection is maintained when DBP concentrations are decreased. Utilities will initially conduct source water monitoring to determine their treatment requirements. EPA predicts that the majority of systems will be located in the lowest risk classification, which carries no additional treatment requirements [42]. The effect of this rule on Region C source waters has not been evaluated.

Dissolved solids in the Red River and Lake Texoma along the northern boundary of Region C are generally high in comparison to other current Region C supplies. The use of Lake Texoma water for public supply requires desalination (Sherman, Red River Authority Preston Shores) or blending with higher quality water (North Texas MWD, Denison). This requirement has limited the use of water from the Red River and Lake Texoma for public water supply. The Red River Authority is serving as a local sponsor for the Red River Chloride Control Project, which may serve to improve the quality of Lake Texoma water for public water supply by diverting saline water before it reaches the lake. Before any of the chloride control efforts were initiated, about 3,450 tons per day of chlorides entered the Red River. Although portions of the project have been online since 1987, construction efforts were temporarily placed on hold while a cost-sharing partner for the operation and maintenance responsibilities was identified. The Water Resources Development Act of 2007 reaffirmed that operation and maintenance responsibilities would be federally funded. In 2008, funding for efforts in Texas was used to complete contract plans and specifications and continue environmental monitoring activities.

The Texas Commission on Environmental Quality (TCEQ) has the primary responsibility for enforcing state laws regarding water pollution. Chapter 7 of the Texas Water Code also establishes laws to allow local governments to combat environmental crime, including water pollution. Local enforcement of these laws can supplement the enforcement activities of TCEQ and help protect Texas' water resources.

### Invasive Species

The appearance of several invasive and/or harmful species (including zebra mussels, giant salvinia, and golden algae) poses a potential threat to water supplies throughout the state of Texas. Continued monitoring and management by water suppliers in Region C will be necessary in the coming decades. Invasive species will likely be an ongoing area of interest to Region C, as the appearance of additional invasive species in the future remains a possibility.

Zebra mussel (*Dreissena polymorpha*) is an invasive species that is native to Eurasia and is believed to have first entered the United States in 1988 through the ballast water in ships entering the Great Lakes. Zebra mussels multiply rapidly, can be easily transported on boats, and can clog intakes, pumps, pipes and other water supply infrastructure. Additionally, zebra mussels can impact fish populations, native mussels, and birds.

TPWD has confirmed the existence of zebra mussels in Lake Texoma, a water supply source which is imported into Region C. In addition, a small number of zebra mussels have been found in Sister Grove Creek, a tributary to Lake Lavon which receives imported water from Lake Texoma. To date, there have been no other confirmed sightings of zebra mussels in reservoirs located within the boundaries of Region C. Due to the number of water transfers in Region C and other potential pathways of transferring zebra mussels into a reservoir (boats, birds), reservoirs should continue to be monitored for the appearance of zebra mussels. If zebra mussels do spread into Region C water supply reservoirs, the operation and maintenance cost of control and removal from water supply infrastructure could be significant.

Giant salvinia (*salvinia molesta*) is a floating plant that is native to South America. Colonies of giant salvinia can develop, covering the water surface. Under certain environmental conditions (light, temperature, and available nutrients), oxygen depletion and fish kills can occur. In addition, colonies of giant salvinia can block sunlight penetration to submerged plants. Lower water levels typically experienced during the summer months, help prevent the spread of giant salvinia.

Giant salvinia was first discovered in Texas in the Houston area in 1998, and has spread to over a dozen Texas lakes, including Toledo Bend and Sam Rayburn. Due to the number of water transfers in Region C and other potential pathways of transferring, reservoirs should continue to be monitored for the appearance of giant salvinia. If giant salvinia appears in Region C water supply reservoirs, mechanical techniques and herbicide can be applied during the summer months to control the population.

Golden alga (*prymnesium parvum*) is a type of aquatic plant that produces toxins that can be lethal to fish, mussels, clams, and certain amphibians. Under certain environmental conditions, an explosive increase in the algal population can occur, which can result in fish kills. Golden alga typically occurs in waters with a high TDS concentration, and appears to have a competitive advantage over beneficial algae during the winter and spring months. Golden alga blooms have occurred in the Rio Grande, Brazos, Canadian, Colorado, and Red River basins. Golden alga was first identified in Texas in the 1980s; it remains unclear whether the species is native or invasive. Research is ongoing to better understand, detect, and manage golden alga blooms.

### Groundwater Drawdown

Overdevelopment of aquifers and the resulting decline in water levels poses a threat to small water suppliers and to household water use in rural areas. As water levels decline, the cost of pumping water grows and water quality generally suffers. Wells that go dry must be redrilled to reach deeper portions of the aquifer. Water level declines have been reported in localized areas in each of the major and minor aquifers in Region C. In particular, the annual pumpage from the Trinity aquifer in some counties is estimated to be greater than the annual recharge [15]. Concern about groundwater drawdown is likely to prevent any substantial increase in groundwater use in Region C and may require conversion to surface water in some areas.

### Groundwater Quality

Figure 1.7 shows the major aquifers in Region C, the Trinity aquifer and the Carrizo-Wilcox aquifer. Figure 1.8 shows the minor aquifers in Region C, which are the Woodbine aquifer, the Nacatoch aquifer, and the Queen City aquifer. Water quality in the Trinity aquifer is acceptable for most municipal and industrial purposes [15, 43]. However, in some areas, natural concentrations of arsenic, fluoride, nitrate, chloride, iron, manganese, sulfate, and total dissolved solids in excess of either primary or secondary drinking water standards can be found. Water on the outcrop tends to be harder with relatively high iron concentration. Downdip, water tends to be softer, with concentrations of TDS, chlorides, and sulfates higher than on the outcrop. Groundwater contamination from man-made sources is found in localized areas. Texas Water Development Board Report 269 reported contaminated water in wells located between Springtown in Parker County and Decatur in Wise County [15]. The apparent source of the contamination was improperly completed oil and gas wells. Other potential contaminant sources (agricultural practices, abandoned wells, septic systems, etc.) are known to exist on the Trinity outcrop, but existing data are insufficient to quantify their impact on the aquifer [43].

Water from the Carrizo-Wilcox aquifer is fresh to slightly saline. In the outcrop, the water is hard and low in TDS [44]. In the downdip, the water is softer, with a higher temperature and higher TDS concentrations [44]. Hydrogen sulfide and methane may be found in localized areas [44]. In much of the northeastern part of the aquifer, water is excessively corrosive and has high iron content [44]. In this area, the groundwater may also have high concentrations of TDS, sulfate, and chloride. Some of these sites may be mineralized due to waters passing through lignite deposits, especially in the case of high sulfate [44]. Another cause may be the historic practice of storing oil field brines in unlined

## Table 1.34
## Total Maximum Daily Load (TMDL) Studies in Region C, in Region C Water Supplies, and in Potential Region C Water Supplies

| Segment | | | County | Basin | Category[1] | Year Listed | Impairment is for | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Name | Area[2] | | | | | Public Supply | General | Aquatic Life | Contact Recreation | Fish Consumption | |
| 805 | Upper Trinity River | 0805_01 | Dallas, Henderson, & Navarro | Trinity | 5A | 2002 | | | | | X | PCBs in edible tissue |
| | | 0805_02 | | Trinity | 5A | 2002 | | | | | X | PCBs in edible tissue |
| | | 0805_02 | | Trinity | 4B | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_02 | | Trinity | 4B | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_03 | | Trinity | 5A | 1996 | | | | X | | bacteria |
| | | 0805_03 | | Trinity | 5A | 2002 | | | | | X | PCBs in edible tissue |
| | | 0805_03 | | Trinity | 4A | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_03 | | Trinity | 4A | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_04 | | Trinity | 4A | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_04 | | Trinity | 4A | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_04 | | Trinity | 5A | 1996 | | | | X | | bacteria |
| | | 0805_04 | | Trinity | 5A | 2002 | | | | | X | PCBs in edible tissue |
| | | 0805_05 | | Trinity | 5A | 2002 | | | | | X | PCBs in edible tissue |
| | | 0805_06 | | Trinity | 4B | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_06 | | Trinity | 4B | 1998 | | | | | X | chlordane in fish tissue |
| | | 0805_06 | | Trinity | 5A | 2002 | | | | | X | PCBs in edible tissue |
| 820C | Muddy Creek (unclassified) | 0820C_01 | Dallas & Collin | Trinity | 5C | 2002 | | | | X | | bacteria |
| 822 | Elm Fork Trinity River Below Lewisville Lake | 822 | Dallas & Denton | Trinity | 5A | 2006 | | | | X | | bacteria |
| 822A | Cottonwood Branch (unclassified water body) | 0822A | Dallas | Trinity | 5A | 2006 | | | | X | | bacteria |
| 822B | Grapevine Creek (unclassified water body) | 0822B | Dallas & Tarrant | Trinity | 5A | 2006 | | | | X | | bacteria |

**Table 1.34, Continued**

| Segment | | | County | Basin | Category[1] | Year Listed | Impairment is for | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Name | Area[2] | | | | | Public Supply | General | Aquatic Life | Contact Recreation | Fish Consumption | |
| 841 | Lower West Fork Trinity River | 0841_01 | Dallas & Tarrant | Trinity | 5A | 1996 | | | | X | | bacteria |
| | | 0841_01 | | Trinity | 4A | 1996 | | | | | X | chlordane in fish tissue |
| | | 0841_01 | | Trinity | 5A | 1996 | | | | | X | PCBs in edible tissue |
| | | 0841_02 | | Trinity | 4A | 1996 | | | | | X | chlordane in fish tissue |
| | | 0841_02 | | Trinity | 5A | 1996 | | | | | X | PCBs in edible tissue |
| 841A | Mountain Creek Lake | 0841A_01 | Dallas | Trinity | 4A | 2000 | | | | | X | heptachlor epoxide in fish tissue |
| | | 0841A_01 | | Trinity | 4A | 1996 | | | | | X | PCBs in fish tissue |
| | | 0841A_01 | | Trinity | 4A | 2000 | | | | | X | dieldrin in fish tissue |
| | | 0841A_01 | | Trinity | 4A | 2000 | | | | | X | DDE in fish tissue |
| | | 0841A_01 | | Trinity | 4A | 2000 | | | | | X | DDD is fish tissue |
| | | 0841A_01 | | Trinity | 4A | 2000 | | | | | X | chlordane in fish tissue |
| | | 0841A_01 | | Trinity | 4A | 2000 | | | | | X | DDT in fish tissue |
| 841B | Bear Creek (unclassified water body) | 0841B_01 | Dallas | Trinity | 5A | 2006 | | | | X | | bacteria |
| 841C | Arbor Creek (unclassified water body) | 0841C_01 | Dallas | Trinity | 5A | 2006 | | | | X | | bacteria |
| 841E | Copart Branch Mountain Creek (unclassified) | 0841E_01 | Dallas | Trinity | 5C | 2006 | | | | X | | bacteria |
| 841F | Cottonwood Creek (unclassified water body) | 0841F | Dallas & Tarrant | Trinity | 5C | 2006 | | | | X | | bacteria |
| 841G | Dalworth Creek (unclassified water body) | 0841G_01 | Dallas | Trinity | 5A | 2006 | | | | X | | bacteria |
| 841H | Delaware Creek (unclassified water body) | 0841H_01 | Dallas | Trinity | 5A | 2006 | | | | X | | bacteria |
| 841J | Estelle Creek (unclassified water body) | 0841J_01 | Dallas | Trinity | 5A | 2006 | | | | X | | bacteria |
| 841K | Fish Creek (unclassified water body) | 0841K_01 | Dallas & Tarrant | Trinity | 5C | 2006 | | | | X | | bacteria |

**Table 1.34, Continued**

| Segment # | Segment Name | Segment Area[2] | County | Basin | Category[1] | Year Listed | Impairment is for: Public Supply | General | Aquatic Life | Contact Recreation | Fish Consumption | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 841N | Kirby Creek (unclassified water body) | 0841N_01 | Dallas & Tarrant | Trinity | 5C | 2006 | | | | X | | bacteria |
| 841S | Vilbig Lakes (unclassified water body) | 0841S_01 | Dallas | Trinity | 5C | 2006 | | | | X | | bacteria |
| 841U | West Irving Creek (unclassified water body) | 0841U | Dallas | Trinity | 5C | 2006 | | | | X | | bacteria |
| 305 | North Sulphur River | 0305_02 | Fannin & Lamar | Sulphur | 5B | 2006 | | | X | | | impaired fish community |
| | | 0305_02 | | Sulphur | 5B | 2006 | | | X | | | impaired macrobenthic community |
| 306 | Upper South Sulphur River | 306_02 | Fannin, Delta, & Hopkins | Sulphur | 5B | 2008 | | X | | | | pH |
| 804G | Catfish Creek (unclassified water body) | 0804G_01 | Henderson & Anderson | Trinity | 5C | 2006 | | | X | | | depressed dissolved oxygen |
| | | 0804G_01 | | Trinity | 5C | 2006 | | | X | | | impaired macrobenthic community |
| 812 | West Fork Trinity River Above Bridgeport Reservoir | 0812_01 | Jack & Archer | Trinity | 5B | 1998 | | X | | | | chloride |
| | | 0812_01 | | Trinity | 5B | 1998 | | | X | | | depressed dissolved oxygen |
| | | 0812_01 | | Trinity | 5B | 1998 | | X | | | | total dissolved solids |
| | | 0812_02 | | Trinity | 5B | 1998 | | X | | | | total dissolved solids |
| | | 0812_02 | | Trinity | 5B | 1998 | | X | | | | chloride |
| 818 | Cedar Creek Reservoir | 0818_01 | Henderson | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_02 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_03 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_04 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_05 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_06 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_07 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_08 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_09 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_10 | | Trinity | 5C | 2002 | | X | | | | pH |
| | | 0818_11 | | Trinity | 5C | 2002 | | X | | | | pH |

**Table 1.34, Continued**

| Segment | | | County | Basin | Category[1] | Year Listed | Impairment is for | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Name | Area[2] | | | | | Public Supply | General | Aquatic Life | Contact Recreation | Fish Consumption | |
| 818 | Cedar Creek Reservoir | 0818_12 | Henderson | Trinity | 5C | 2002 | | X | | | | pH |
| 819 | East Fork Trinity River | 0819_01 | Kaufman | Trinity | 5B | 2008 | | X | | | | sulfate |
| | | 0819_01 | | | 5B | 2008 | | X | | | | total dissolved solids |
| | | 0819_01 | | | 5B | 2008 | | X | | | | chloride |
| 831 | Clear Fork Trinity River Below Lake Weatherford | 0831_04 | Parker & Tarrant | Trinity | 5B | 1996 | | | X | | | depressed dissolved oxygen |
| | | 0831_05 | | | 5B | 1996 | | | X | | | depressed dissolved oxygen |
| 833 | Clear Fork Trinity River Above Lake Weatherford | 0833_02 | Parker | Trinity | 5B | 1998 | | | X | | | depressed dissolved oxygen |
| | | 0833_03 | | | 5B | 1998 | | | X | | | depressed dissolved oxygen |
| | | 0833_04 | | | 5B | 1998 | | | X | | | depressed dissolved oxygen |
| 1205 | Lake Granbury | 1205_01 | Parker & Hood | Brazos | 5C | 2008 | | X | | | | chloride |
| | | 1205_02 | | | 5C | 2008 | | X | | | | chloride |
| | | 1205_03 | | | 5C | 2008 | | X | | | | chloride |
| | | 1205_04 | | | 5C | 2008 | | X | | | | chloride |
| | | 1205_05 | | | 5C | 2008 | | X | | | | chloride |
| 1206 | Brazos River Below Possum Kingdom Lake | 1206_01 | Parker & Palo Pinto | Brazos | 5B | 2006 | | X | | | | chloride |
| | | 1206_01 | | | 5C | 2008 | | | X | | | impaired macrobenthic community |
| | | 1206_02 | | | 5B | 2006 | | X | | | | chloride |
| | | 1206_02 | | | 5C | 2008 | | | X | | | impaired macrobenthic community |
| | | 1206_03 | | | 5B | 2006 | | X | | | | chloride |
| 806 | West Fork Trinity River Below Lake Worth | 0806_01 | Tarrant | Trinity | 4A | 1998 | | | | | X | chlordane in fish tissue |
| | | 0806_01 | | Trinity | 5A | 1996 | | | | | X | PCBs in edible tissue |
| 806A | Fosdic Lake (unclassified water body) | 0806A_01 | Tarrant | Trinity | 4A | 1998 | | | | | X | PCBs in fish tissue |
| 806B | Echo Lake (unclassified water body) | 0806B_01 | Tarrant | Trinity | 4A | 1998 | | | | | X | PCBs in fish tissue |
| 806D | Marine Creek (unclassified water body) | 0806D_01 | Tarrant | Trinity | 5A | 2006 | | | | X | | bacteria |

**Table 1.34, Continued**

| Segment | | | County | Basin | Category[1] | Year Listed | Impairment is for | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Name | Area[2] | | | | | Public Supply | General | Aquatic Life | Contact Recreation | Fish Consumption | |
| 806E | Sycamore Creek (unclassified water body) | 0806E_01 | Tarrant | Trinity | 5A | 2006 | | | | X | | bacteria |
| 807 | Lake Worth | 0807_01 | Tarrant | Trinity | 4A | 2002 | | | | | X | PCBs in fish tissue |
| 829 | Clear Fork Trinity River Below Benbrook Lake | 0829_01 | Tarrant | Trinity | 5A | 1996 | | | | | X | PCBs in edible tissue |
| 838C | Walnut Creek (unclassified water body) | 0838C_01 | Tarrant | Trinity | 5C | 2006 | | | | X | | bacteria |
| 841D | Big Bear Creek (unclassified water body) | 0841D_01 | Tarrant | Trinity | 5A | 2006 | | | | X | | bacteria |
| 841M | Kee Branch (unclassified water body) | 0841M_01 | Tarrant | Trinity | 5A | 2006 | | | | X | | bacteria |
| 810 | West Fork Trinity River Below Bridgeport Reservoir | 0810_01 | Wise | Trinity | 5A | 1998 | | | | X | | bacteria |
| 810A | Big Sandy Creek (unclassified water body) | 0810A_01 | Wise | Trinity | 5A | 2006 | | | | X | | bacteria |
| 810B | Garrett Creek (unclassified water body) | 0810B_01 | Wise | Trinity | 5A | 2006 | | | | X | | bacteria |
| 810C | Martin Branch (unclassified water body) | 0810C_01 | Wise | Trinity | 5A | 2006 | | | | X | | bacteria |
| 810D | Salt Creek (unclassified water body) | 0810D_01 | Wise | Trinity | 5A | 2006 | | | | X | | bacteria |
| 507 | Lake Tawakoni | 0507_04 | Hunt | Sabine | 5C | 2008 | | X | | | | pH |
| 605 | Lake Palestine | 0605_03 | Anderson, Cherokee, Henderson & Smith | Neches | 5C | 2006 | | X | | | | pH |
| | | 0605_09 | | | 5C | 2006 | | X | | | | pH |
| | | 0605_10 | | | 5C | 2006 | | X | | | | pH |
| 803 | Lake Livingston | 0803_01 | Polk/San Jacinto/Houston/ Leon | Trinity | 5C | 2008 | | X | | | | pH |

**Table 1.34, Continued**

| Segment | | | County | Basin | Category[1] | Year Listed | Impairment is for | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Name | Area[2] | | | | | Public Supply | General | Aquatic Life | Contact Recreation | Fish Consumption | |
| 803 | Lake Livingston | 0803_01 | Polk, San Jacinto, Houston, Leon | Trinity | 5C | 2006 | | X | | | | sulfate |
| | | 0803_02 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_03 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_04 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_05 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_06 | | | 5C | 2008 | | X | | | | pH |
| | | 0803_06 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_07 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_08 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_09 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_10 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_11 | | | 5C | 2006 | | X | | | | sulfate |
| | | 0803_12 | | | 5C | 2006 | | X | | | | sulfate |
| 504 | Toledo Bend Reservoir | 0504_01 | Newton & Panola | Sabine | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_02 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_03 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_04 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_05 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_06 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_06 | | | 5C | 2000 | | | | | | depressed dissolved oxygen |
| | | 0504_07 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_08 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_09 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_10 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_11 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0504_12 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |
| 302 | Wright Patman Lake | 0302_02 | Bowie & Cass | Sulphur | 5A | 1996 | | | X | | | depressed dissolved oxygen |
| | | 0302_02 | | | 5A | 2000 | | X | | | | pH |
| | | 0302_04 | | | 5A | 2000 | | X | | | | pH |
| | | 0302_05 | | | 5A | 2000 | | X | | | | pH |

**Table 1.34, Continued**

| Segment | | | County | Basin | Category[1] | Year Listed | Impairment is for | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Name | Area[2] | | | | | Public Supply | General | Aquatic Life | Contact Recreation | Fish Consumption | |
| 302 | Wright Patman Lake | 0302_06 | Bowie & Cass | Sulphur | 5A | 2000 | | X | | | | pH |
| | | 0302_07 | | | 5A | 2000 | | X | | | | pH |
| | | 0302_08 | | | 5A | 2000 | | X | | | | pH |
| | | 0302_10 | | | 5A | 1996 | | | X | | | depressed dissolved oxygen |
| 610 | Sam Rayburn Reservoir | 0610_01 | Angelina, Nacogdoches, Jasper, & San Augustine | Neches | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_02 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_03 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_04 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_05 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_06 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_07 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_08 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_09 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| | | 0610_10 | | | 5C | 1996 | | | X | | X | mercury in edible tissue |
| 603 | B.A. Steinhagen Lake | 0603_01 | Jasper & Tyler | Neches | 5C | 1998 | | | X | | X | mercury in edible tissue |
| | | 0603_02 | | | 5C | 1998 | | | X | | X | mercury in edible tissue |

[1] Category Description:
4a: All TMDLs have been completed and approved by EPA.
4b: Other control requirements are reasonably expected to result in the attainment of all standards.
4c: Nonattainment of the standard for one or more parameters is shown to be caused by pollution, not by pollutants and that the water quality conditions cannot be changed by the allocation and control of pollutants through the TMDl process.
5a: TMDLs are underway, scheduled, or will be scheduled for one or more parameters.
5b: A review of the standards for one or more parameters will be conducted before TMDLs are scheduled.
5c: Additional data or information will be collected for one or more parameters before TMDLs are scheduled.
[2] The area description is used to denote specific areas in which one or more water quality standards are not met. Full descriptions are given in the 2009 303(d) plan.

surface storage pits [44]. In Freestone County, excessive iron concentration may be a problem; a well completed in recent years by the City of Fairfield contained water with a high iron concentration [45]. Excessive iron concentrations can be removed by treatment.

Water quality in the layers of the Woodbine aquifer used for public water supply is good along the outcrop. Water quality decreases downdip (southeast), with increasing concentrations of sodium, chloride, TDS, and bicarbonate. High sulfate and boron concentrations may be found in Tarrant, Dallas, Ellis, and Navarro Counties. Excessive iron concentrations also occur in parts of the Woodbine formation.

The Nacatoch and Queen City aquifers provide very little water in Region C. Available data indicate that the quality of the Nacatoch in this area is acceptable for most uses. Water quality data on the Queen City aquifer in Region C are very limited.

As stated at the end of Section 1.6, the new SDWA Groundwater Rule will affect water user groups currently on groundwater. This rule has the potential to encourage entities on groundwater to consider alternative sources. Systems that utilize groundwater as a supplemental supply may find that the additional regulatory monitoring and reporting does not warrant the supplemental coverage.

## *1.9 Water-Related Threats to Agricultural and Natural Resources in Region C*

Water-related threats to agricultural and natural resources in Region C include changes to natural flow conditions, water quality concerns, and inundation of land due to reservoir development. In general, there are few significant water-related threats to agricultural resources in Region C due to the limited use of water for agricultural purposes. Water-related threats to natural resources are more significant.

### Changes to Natural Flow Conditions

Reservoir development, groundwater drawdown, and return flows of treated wastewater have greatly altered natural flow patterns in Region C. Spring flows in Region C have diminished, and many springs have dried up because of groundwater development and the resulting drawdown. This has reduced reliable flows for many tributary streams. Reservoir development also changes natural hydrology, diminishing flood flows and capturing low flows. (Some reservoirs provide steady flows in downstream reaches due to releases to empty flood control storage or meet permit requirements.) Downstream from the Dallas-Fort Worth Metroplex, base flows on the Trinity River have been greatly increased due to return flows of treated wastewater. It is unlikely that future changes to flow conditions in Region C will be as dramatic as those that have already occurred. If additional reservoirs are developed, they will likely be required to release some inflow to maintain downstream stream conditions, which was often not required in the past. It is likely that return flows from the Dallas-Fort Worth area will continue to increase, thus increasing flows in the Trinity River. On balance, this will probably enhance habitat in this reach.

### Water Quality Concerns

Table 1.34 lists a number of reaches in which the TCEQ has documented concerns over water quality impacts to aquatic life or fish consumption. In general, these concerns are due to low dissolved oxygen levels or to levels of lead, pesticides, or other pollutants that can harm aquatic life or present a threat to humans eating fish in which these compounds tend to accumulate. Several total maximum daily load (TMDL) studies on areas of concerns have been conducted and others will follow over the next few years. Baseline water quality conditions used to evaluate water management strategies are included in Appendix M.

### Inundation Due to Reservoir Development

At various times, a number of new reservoirs have been considered for development in Region C, including:

- Tehuacana Reservoir on Tehuacana Creek in Freestone County.
- Tennessee Colony Reservoir on the main stem of the Trinity River in Freestone, Navarro, Henderson, and Anderson Counties.
- Roanoke Reservoir on Denton Creek in Denton County.
- Italy Reservoir on Chambers Creek in Ellis and Navarro Counties.
- Emhouse Reservoir at the confluence of Chambers and Waxahachie Creeks in Ellis and Navarro Counties.
- Upper Red Oak Reservoir and Lower Red Oak Reservoir on Red Oak Creek in Ellis County.

- Bear Creek Reservoir on Bear Creek in Ellis County.
- Lower Bois d'Arc Reservoir on Bois d'Arc Creek in Fannin County.
- Ralph Hall Reservoir on North Fork Sulphur River in Fannin County.

At this time, Lower Bois d'Arc Reservoir, Lake Ralph Hall, and Tehuacana Reservoir seem to be the most likely to be developed of these projects. The impacts of a new reservoir on natural resources include the inundation of habitat, often including wetlands and bottomland hardwoods, and changes to downstream flow patterns. Depending on the location, a reservoir may also inundate prime farmland. The impacts of specific projects depend on the location, the mitigation required, and the operation of the projects.

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# 2. Population and Water Demand Projections

## 2.1 Historical Perspective

This section presents the population and water demand projections for Region C as approved by the Texas Water Development Board (TWDB). The section includes a discussion on historical growth trends in Region C, the basis of projections, and the final population and water demand projections for Region C.

The sixteen counties that comprise Region C have been among the fastest growing areas in Texas and the nation since the 1950s. The region's highest population density is centered in and near Dallas and Tarrant Counties. For many years, the population growth in the region was concentrated in the cities of Dallas and Fort Worth. In the 1960s and 1970s, growth spilled over into near suburbs in Dallas and Tarrant Counties. Then in the 1980s and more so in the 1990s and 2000s, the growth spilled into Collin, Denton, Rockwall and Ellis Counties.

According to the U.S. Census Bureau, the year 2000 population of Region C was 5,254,722 [(1)]. The State Demographer estimated that the July 1, 2006 population of Region C was 6,085,221 [(2)]. The total Region C water demand was 1,380,556 acre-feet [(3)] in the year 2000 and was 1,404,535 acre-feet [(4)] in the year 2006. Figure 2.1 shows the historical population for Region C from 1900 to 2000 [(1, 5)] as well as the projected populations presented in Section 2.2 of this report. The historical water use for Region C by type of use in 1980, 1990, 2000 and 2006 is presented in Figure 2.2 [(6)].

## 2.2 Population Projections

Population and water demand projections have been developed for all cities with population over 500 and for any retail water supplier (such as a water supply corporation or a utility district) which provides an annual average of over 0.25 million gallons per day of water supply. This group of entities is collectively referred to as water user groups (WUGs). Any rural population not included in a specific water user group has been included in the "County Other" water user group for each county. Six new water user

**Figure 2.1**
**Historical and Projected Population in Region C**

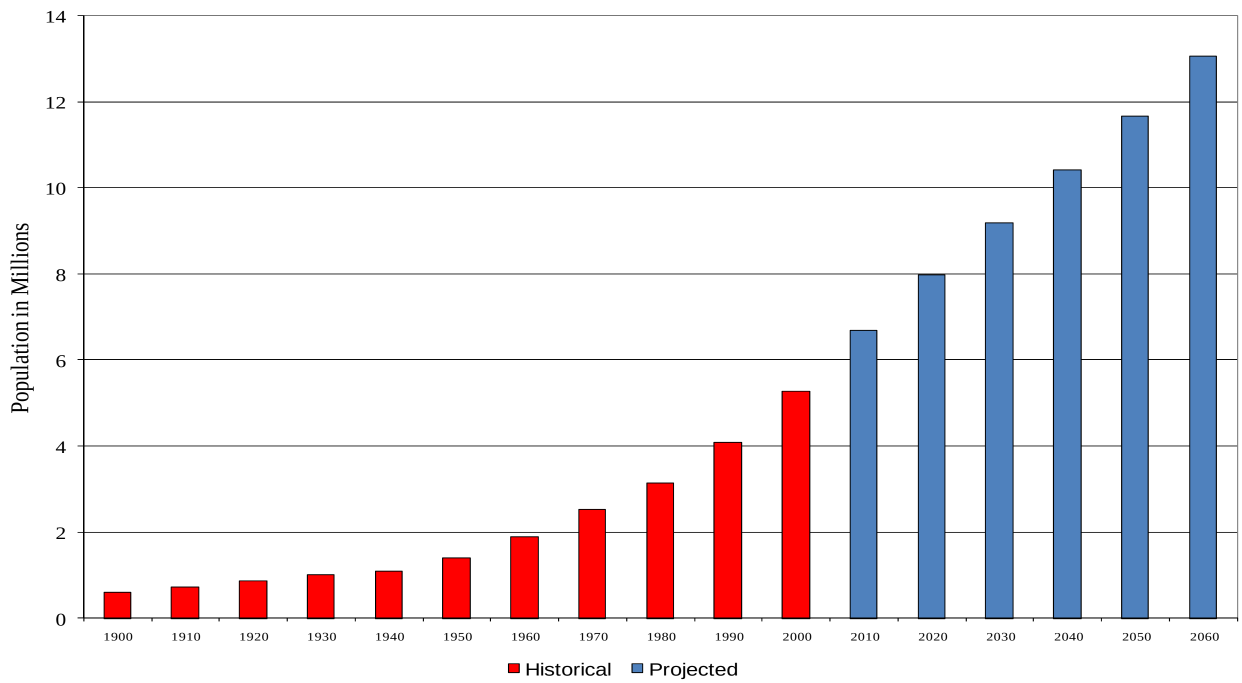
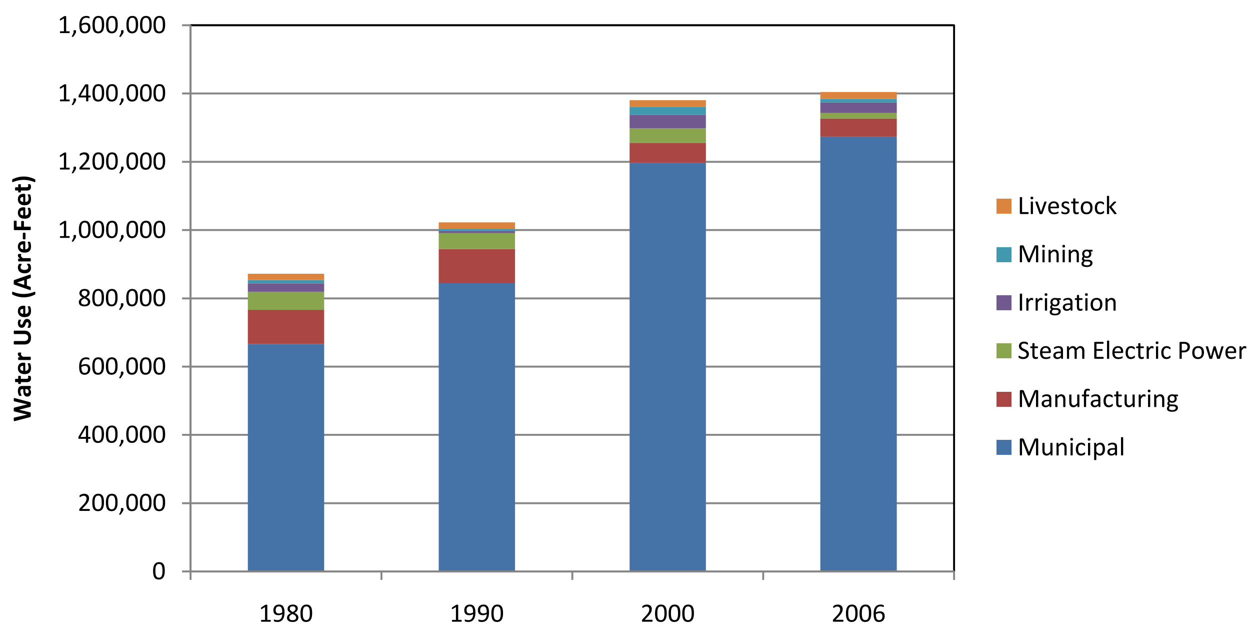



**Figure 2.2**
**Historical Water Use by Category in Region C**



groups have been added for this update of the Region C Plan because their populations have recently reached at least 500. There are over 270 municipal water user groups in Region C.

### Basis for Population Projections

Population projections presented in this section are based on the population projections from the *2006 Region C Water Plan* [3]. Those projections were updated based on suggested changes from the Texas Water Development Board (TWDB) [7], recent population estimates from the State Demographer [8] and the North Central Texas Council of Governments (NCTCOG) [9], input from water user groups, and input from wholesale water providers (WWPs) in Region C. The TWDB provided population projections for the six new water user groups [10].

The TWDB provided suggested revisions to population projections for 54 WUGs. These suggested revisions were based on year 2007 population estimates from the State Demographer. In cases where the year 2007 population estimate for a WUG exceeded the previous 2010 projected population, TWDB recommended that the population projections be increased. Similarly, the 2009 NCTCOG population estimates were used by Region C consultants to make adjustments to the projections. The growth rate from 2008 to 2009 was applied to the 2009 population to estimate a 2010 population. If the calculated 2010 population was significantly different from the 2010 projection, the projections were adjusted accordingly, either up or down.

Revisions to the projections were also made based on input from water user groups and wholesale water providers in Region C. Each WUG and WWP in Region C was surveyed regarding their population projections. (A copy of this survey is included in Appendix D.) In the survey, each WUG was provided a copy of their population projections from the 2006 Region C Water Plan and asked if they were in agreement with the projections. If the WUG was not in agreement with the projections they were asked to provide alternative projections. Many WUGs responded with suggestions for revisions to the population projections. Additionally, interviews were set up with certain WUGs and WWPs to gather more detailed information. Phone and email correspondence was also used to gather additional information. The data obtained from all the surveys, interviews, and correspondence was compiled and used to develop a final set of recommended population projections. Appendix E summarizes the adjustments made to the population projections since the *2006 Region C Water Plan*. Email notification was sent to all WUGs for which revisions were proposed. As required by TWDB regulations, these projections were posted for public review on the Region C website well in advance of the Region C Planning Group meeting at which they were considered for approval.

For Region C as a whole, the population projections recommended by Region C and adopted by the TWDB compare very closely with the projections from the *2006 Region C Water Plan*. The revised total population is slightly higher in years 2000 through 2050 and slightly lower in 2060. In general, the projected population increases in future years have shifted from urban areas to areas further from urban centers.

### Water User Group Projections

The projected 2060 population for Region C is 13,045,592. This compares very closely to the projected 2060 population from the *2006 Region C Water Plan* of 13,087,849. Texas State Data Center population estimates from 2007 reveal that current population growth in Region C is generally equal to the growth that was projected in the *2006 Region C Water Plan*. Table 2.1 and Figure 2.1 present the projected population for the Region C counties, as adopted by TWDB.

Figure 2.3 shows the historical and projected rate of growth for Region C. This figure shows that the population projections for Region C represent a substantial slowing in the historical rate of growth. Figure 2.4 is a map of the year 2000 historical population and the 2060 projected population by county. Figure 2.5 is a map of the projected percent change in population between years 2000 and 2060 by county. Appendix F includes the projected populations for Region C, by water user group and county, as approved by the TWDB. Many of the water user groups have population that is split among multiple counties and regions. For convenience, Appendix F also includes the total projected populations for those water user groups in multiple basins and counties.

**Table 2.1**
**Adopted County Population Projections for Region C**

| County | Historical 1990 | Historical 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|
| Collin | 264,036 | 491,774 | 790,648 | 1,046,601 | 1,265,373 | 1,526,407 | 1,761,082 | 1,938,067 |
| Cooke | 30,777 | 36,363 | 40,674 | 46,141 | 51,749 | 56,973 | 65,099 | 71,328 |
| Dallas | 1,852,810 | 2,218,774 | 2,512,352 | 2,756,079 | 2,950,635 | 3,128,628 | 3,365,780 | 3,695,125 |
| Denton | 273,525 | 432,976 | 674,322 | 889,705 | 1,118,010 | 1,347,185 | 1,573,994 | 1,839,507 |
| Ellis | 85,167 | 111,360 | 169,514 | 233,654 | 293,665 | 351,919 | 411,721 | 471,317 |
| Fannin | 24,804 | 31,242 | 38,129 | 42,648 | 49,775 | 60,659 | 74,490 | 86,970 |
| Freestone | 15,818 | 17,867 | 19,701 | 21,826 | 23,704 | 25,504 | 27,148 | 28,593 |
| Grayson | 95,021 | 110,595 | 126,099 | 152,028 | 179,725 | 203,822 | 227,563 | 253,568 |
| Henderson | 41,309 | 51,984 | 56,254 | 65,009 | 75,232 | 85,112 | 96,835 | 111,026 |
| Jack | 6,981 | 8,763 | 9,567 | 10,275 | 10,915 | 11,415 | 11,915 | 12,415 |
| Kaufman | 52,220 | 71,313 | 103,249 | 162,664 | 208,009 | 254,609 | 297,391 | 349,385 |
| Navarro | 39,926 | 45,124 | 52,752 | 58,919 | 65,331 | 72,374 | 80,168 | 89,638 |
| Parker | 64,785 | 88,495 | 121,653 | 193,559 | 262,053 | 301,760 | 324,546 | 342,887 |
| Rockwall | 25,604 | 43,080 | 89,144 | 141,386 | 171,373 | 199,044 | 215,312 | 232,186 |
| Tarrant | 1,170,103 | 1,446,219 | 1,800,069 | 2,061,887 | 2,337,390 | 2,646,559 | 2,964,622 | 3,353,509 |
| Wise | 34,679 | 48,793 | 66,366 | 89,347 | 108,711 | 127,068 | 148,020 | 170,071 |
| **Region C Total** | **4,077,565** | **5,254,722** | **6,670,493** | **7,971,728** | **9,171,650** | **10,399,038** | **11,645,686** | **13,045,592** |

**Figure 2.3**
**Historical and Projected Population Growth Rates by Decade in Region C**

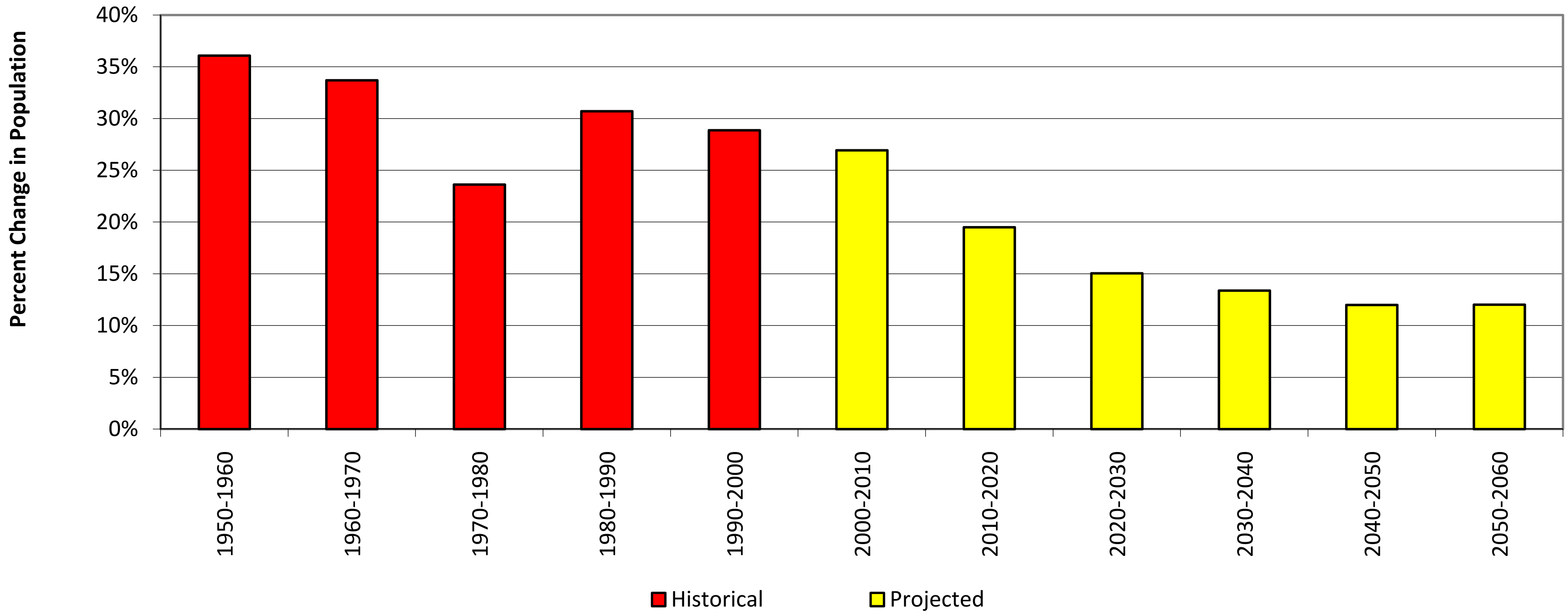
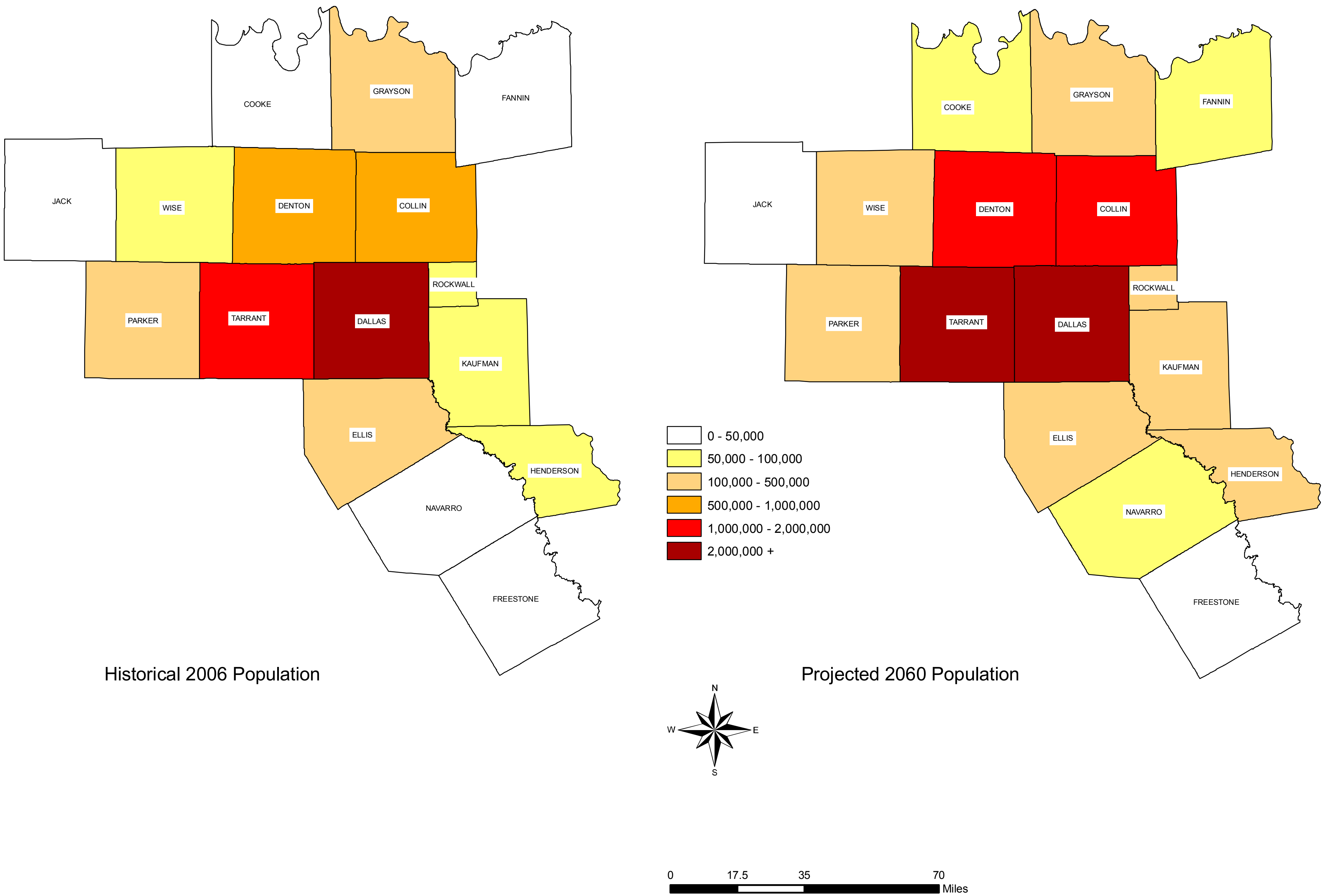
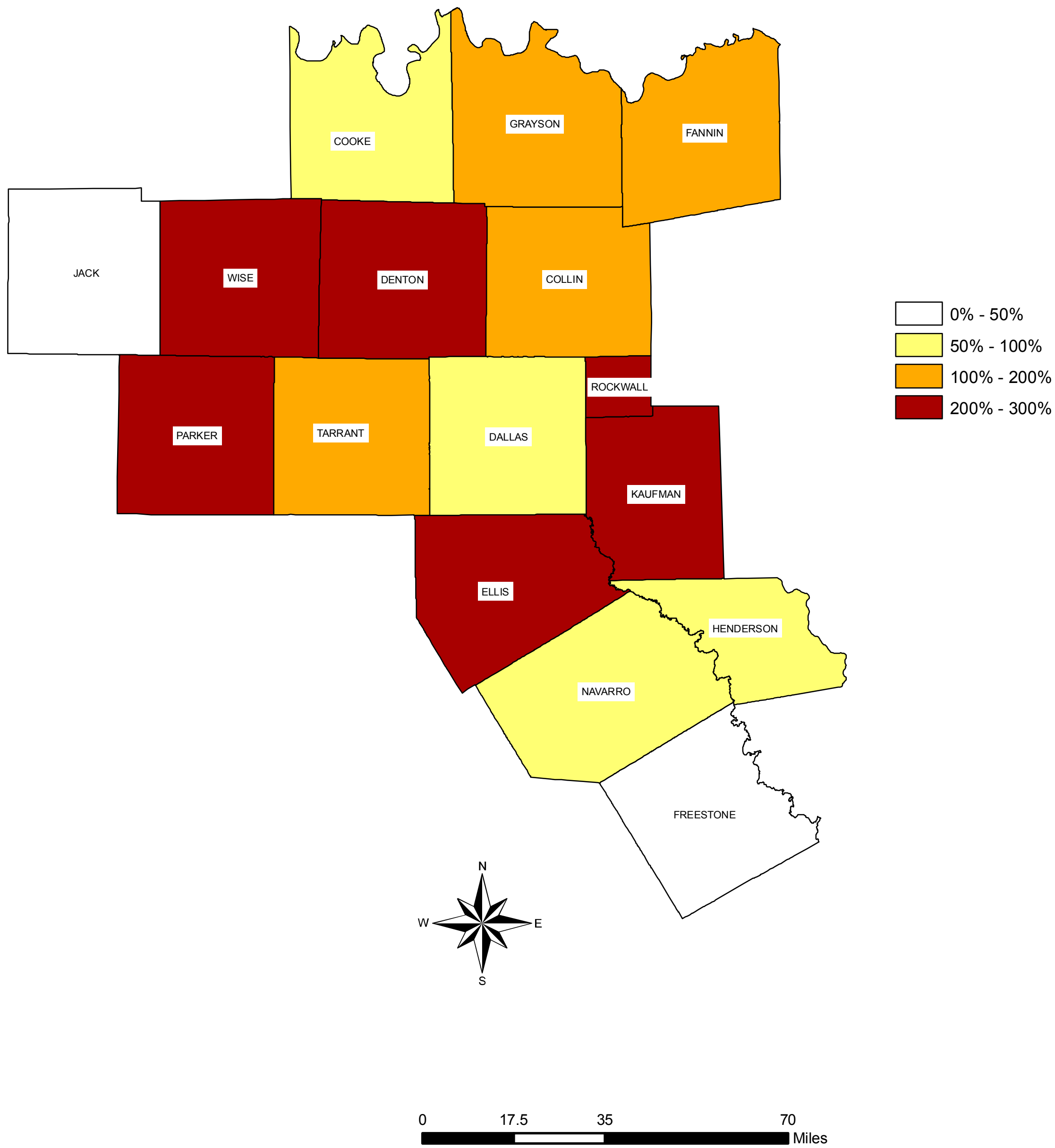


**Figure 2.4**
**Region C Population**



# Figure 2.5
## Projected 2006 - 2060 Population Increase



### *2.3 Water Demand Projections*

#### Basis for Water Demand Projections

The municipal water demand projections presented in this section are based on per capita dry-year water use and the adopted population projections from the previous section. The per capita dry-year water uses are based on the per capita water uses from the *2006 Region C Water Plan*, which include water savings from plumbing code requirements for low-flow fixtures. Adjustments to the per capita water uses from the *2006 Region C Water Plan* were made as necessary based on recent historical per capita information from TWDB and on input from water user groups.

Historical per capita water use for each city was obtained from TWDB for the years 1980 through 2006 [(6)]. (This information was not available for non-city water user groups.) This historical information was compared to the per capita factors used in the *2006 Region C Water Plan*, and revisions were made as necessary. TWDB provided per capita use projections for the six new water user groups [(10)].

In addition, revisions to the demand projections were also made based on input from water user groups and wholesale water providers in Region C. Each WUG and WWP in Region C was surveyed regarding their water use projections. (A copy of this survey is included in Appendix D.) Each WUG was provided a copy of their water use projections from the *2006 Region C Water Plan* and asked if they were in agreement with the projections. If the WUG was not in agreement with the projections they were asked to provide alternative projections. Some WUGs responded with suggestions for revisions to the demand projections. Additionally, interviews were set up with certain WUGs and WWPs to gather more detailed information. Phone and email correspondence was also used to gather additional information. The data obtained from all the surveys, interviews, and correspondence was compiled and used to develop a final set of recommended per capita and demand projections. Appendix E summarizes the adjustments made to the population projections since the *2006 Region C Water Plan*. Email notification was sent to all WUGs for which revisions were proposed. As required by TWDB regulations, these projections were posted for public review on the Region C website well in advance of the Region C Planning Group meeting at which they were considered for approval.

Non-municipal water demand projections include manufacturing, steam-electric-power, irrigation, mining, and livestock, and are reported on a county-wide basis. Projections of the non-municipal water demands were also based on the projections from the *2006 Region C Water Plan*. Projections for manufacturing, irrigation, and livestock did not change from the *2006 Region C Water Plan*. The steam-electric-power demands were revised based on available new information, which included recent power plant development activity, mothballing of existing plants, and the Bureau of Economic Geology report (10) released in 2008. Appendix E contains a technical memorandum detailing the revisions to steam-electric-power demands for Region C. The mining projections were also revised based on changed conditions. The recent exploration of the Barnett Shale has brought about an increase in mining water use in Region C. The mining projections have been revised to reflect this. Appendix E contains a technical memorandum detailing the revisions to mining demands for Region C.

### Water User Group Projections

Table 2.2 presents the historical and projected total water demand for the Region C counties, as adopted by TWDB. The year 2060 projected water demand for Region C is 3,273,461 acre-feet per year. Table 2.3 and Figure 2.6 show the historical and projected water demand for the region by type of use. Additionally, Tables 2.4 through 2.19 show the historical and projected water demand for each Region C County by type of use. Figure 2.7 is a map of the year 2006 historical water usage and the 2060 projected water usage by county. Figure 2.8 is a map of the projected percent change in water demand between years 2006 and 2060 by county. The municipal water demand projections are listed by water user group and by county in Appendix G. Again, for convenience, Appendix G also lists the total projected municipal water demand for those water user groups that are split among multiple basins and counties. The non-municipal water demand projections are also included in Appendix G, both as totals and split by basin.

**Figure 2.6**
**Historical and Adopted Projections for Water Use by Category in Region C**

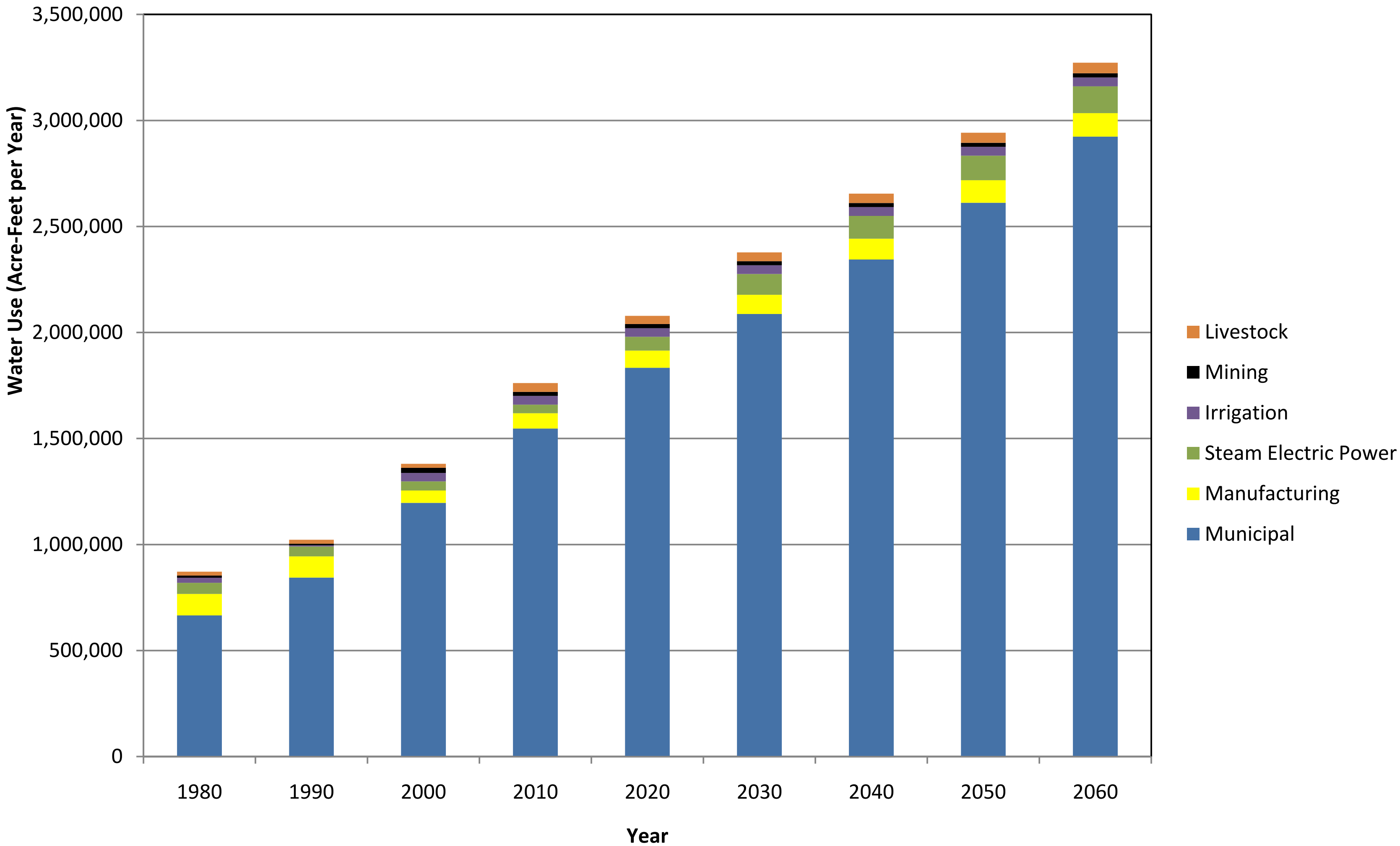


**Table 2.2**
**Adopted County Water Demand Projections for Region C**

| County | Historical Year 2006 Demand (Acre-Feet) | Projected Water Demand (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Collin | 160,712 | 217,512 | 286,372 | 340,681 | 405,122 | 461,762 | 502,770 |
| Cooke | 8,324 | 9,863 | 10,870 | 11,645 | 12,332 | 13,426 | 14,381 |
| Dallas | 623,985 | 691,846 | 750,995 | 800,855 | 842,877 | 902,496 | 991,021 |
| Denton | 108,894 | 153,934 | 201,534 | 255,146 | 302,043 | 348,219 | 400,618 |
| Ellis | 32,980 | 38,067 | 49,730 | 61,287 | 74,192 | 87,403 | 101,095 |
| Fannin | 12,191 | 13,260 | 19,296 | 25,691 | 28,029 | 31,046 | 34,063 |
| Freestone | 14,797 | 16,733 | 23,192 | 25,765 | 29,484 | 33,982 | 39,396 |
| Grayson | 30,953 | 42,798 | 51,677 | 60,588 | 65,415 | 70,485 | 76,742 |
| Henderson | 8,343 | 10,942 | 12,395 | 20,591 | 23,074 | 25,978 | 29,342 |
| Jack | 2,892 | 5,515 | 5,906 | 6,140 | 6,366 | 6,610 | 6,867 |
| Kaufman | 21,683 | 30,609 | 43,906 | 52,411 | 60,848 | 68,246 | 77,308 |
| Navarro | 11,184 | 12,499 | 21,538 | 27,883 | 28,829 | 29,996 | 31,482 |
| Parker | 21,527 | 28,760 | 39,178 | 51,788 | 58,543 | 62,950 | 66,771 |
| Rockwall | 11,907 | 22,267 | 35,482 | 42,571 | 49,278 | 52,975 | 56,463 |
| Tarrant | 320,345 | 423,553 | 476,587 | 537,641 | 604,230 | 674,652 | 763,750 |
| Wise | 13,818 | 43,195 | 50,086 | 57,055 | 64,440 | 72,095 | 80,392 |
| **Region C Total** | **1,404,535** | **1,761,353** | **2,078,744** | **2,377,738** | **2,655,102** | **2,942,321** | **3,272,461** |

**Table 2.3**
**Adopted Water Demand Projections for Region C by Type of Use**

| Use | Historical Year 2006 Demand (Acre-Feet) | Projected Water Demand (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 1,274,014 | 1,546,970 | 1,833,671 | 2,087,597 | 2,344,115 | 2,612,176 | 2,924,157 |
| Manufacturing | 53,027 | 72,026 | 81,273 | 90,010 | 98,486 | 105,808 | 110,597 |
| Steam Electric Power | 15,997 | 40,813 | 64,625 | 98,088 | 107,394 | 116,058 | 126,428 |
| Irrigation | 31,067 | 40,776 | 40,966 | 41,165 | 41,373 | 41,596 | 41,831 |
| Mining | 10,367 | 41,520 | 38,961 | 41,630 | 44,486 | 47,435 | 50,200 |
| Livestock | 20,063 | 19,248 | 19,248 | 19,248 | 19,248 | 19,248 | 19,248 |
| **Region C Total** | **1,404,535** | **1,761,353** | **2,078,744** | **2,377,738** | **2,655,102** | **2,942,321** | **3,272,461** |

**Table 2.4**
**Adopted Water Demand Projections for Collin County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 156,918 | 208,914 | 277,300 | 330,807 | 394,532 | 450,309 | 490,435 |
| Manufacturing | 1,423 | 3,607 | 4,137 | 4,654 | 5,170 | 5,633 | 6,115 |
| Steam-Electric-Power | 525 | 771 | 715 | 1,000 | 1,200 | 1,600 | 2,000 |
| Irrigation | 938 | 2,995 | 2,995 | 2,995 | 2,995 | 2,995 | 2,995 |
| Mining | 0 | 341 | 341 | 341 | 341 | 341 | 341 |
| Livestock | 908 | 884 | 884 | 884 | 884 | 884 | 884 |
| **Total** | **160,712** | **217,512** | **286,372** | **340,681** | **405,122** | **461,762** | **502,770** |

**Table 2.5**
**Adopted Water Demand Projections for Cooke County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 6,265 | 6,887 | 7,738 | 8,547 | 9,198 | 10,260 | 11,177 |
| Manufacturing | 121 | 273 | 306 | 335 | 364 | 389 | 421 |
| Steam-Electric-Power | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Irrigation | 300 | 444 | 444 | 444 | 444 | 444 | 444 |
| Mining | 268 | 361 | 484 | 421 | 428 | 435 | 441 |
| Livestock | 1,366 | 1,898 | 1,898 | 1,898 | 1,898 | 1,898 | 1,898 |
| **Total** | **8,324** | **9,863** | **10,870** | **11,645** | **12,332** | **13,426** | **14,381** |

**Table 2.6**
**Adopted Water Demand Projections for Dallas County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 584,495 | 637,815 | 692,305 | 731,190 | 770,064 | 827,194 | 915,439 |
| Manufacturing | 25,899 | 34,115 | 37,791 | 41,148 | 44,214 | 46,703 | 46,983 |
| Steam-Electric-Power | 1,444 | 3,367 | 4,290 | 11,918 | 12,000 | 12,000 | 12,000 |
| Irrigation | 11,225 | 13,087 | 13,087 | 13,087 | 13,087 | 13,087 | 13,087 |
| Mining | 95 | 2,980 | 3,040 | 3,030 | 3,030 | 3,030 | 3,030 |
| Livestock | 827 | 482 | 482 | 482 | 482 | 482 | 482 |
| **Total** | **623,985** | **691,846** | **750,995** | **800,855** | **842,877** | **902,496** | **991,021** |

**Table 2.7**
**Adopted Water Demand Projections for Denton County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 101,879 | 147,308 | 195,457 | 248,800 | 295,426 | 341,350 | 393,500 |
| Manufacturing | 447 | 1,068 | 1,239 | 1,408 | 1,579 | 1,731 | 1,880 |
| Steam-Electric-Power | 639 | 644 | 744 | 844 | 944 | 1,044 | 1,144 |
| Irrigation | 2,750 | 2,108 | 2,108 | 2,108 | 2,108 | 2,108 | 2,108 |
| Mining | 2,019 | 1,571 | 751 | 751 | 751 | 751 | 751 |
| Livestock | 1,160 | 1,235 | 1,235 | 1,235 | 1,235 | 1,235 | 1,235 |
| **Total** | **108,894** | **153,934** | **201,534** | **255,146** | **302,043** | **348,219** | **400,618** |

**Table 2.8**
**Adopted Water Demand Projections for Ellis County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 25,601 | 31,644 | 43,456 | 54,090 | 64,558 | 75,654 | 87,399 |
| Manufacturing | 5,931 | 3,466 | 3,670 | 3,841 | 3,987 | 4,089 | 3,912 |
| Steam-Electric-Power | 0 | 981 | 698 | 1,450 | 3,741 | 5,754 | 7,878 |
| Irrigation | 312 | 583 | 583 | 583 | 583 | 583 | 583 |
| Mining | 21 | 210 | 140 | 140 | 140 | 140 | 140 |
| Livestock | 1,115 | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 |
| **Total** | **32,980** | **38,067** | **49,730** | **61,287** | **74,192** | **87,403** | **101,095** |

**Table 2.9**
**Adopted Water Demand Projections for Fannin County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 4,591 | 6,036 | 6,961 | 8,237 | 10,131 | 12,608 | 14,967 |
| Manufacturing | 5 | 73 | 82 | 90 | 98 | 105 | 114 |
| Steam-Electric-Power | 361 | 1,261 | 6,363 | 11,474 | 11,910 | 12,443 | 13,092 |
| Irrigation | 5,567 | 4,608 | 4,608 | 4,608 | 4,608 | 4,608 | 4,608 |
| Mining | 6 | 12 | 12 | 12 | 12 | 12 | 12 |
| Livestock | 1,661 | 1,270 | 1,270 | 1,270 | 1,270 | 1,270 | 1,270 |
| **Total** | **12,191** | **13,260** | **19,296** | **25,691** | **28,029** | **31,046** | **34,063** |

**Table 2.10**
**Adopted Water Demand Projections for Freestone County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 2,526 | 2,908 | 3,320 | 3,573 | 3,811 | 4,068 | 4,313 |
| Manufacturing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Steam-Electric-Power | 9,936 | 12,173 | 18,210 | 20,524 | 23,999 | 28,234 | 33,398 |
| Irrigation | 98 | 8 | 8 | 8 | 8 | 8 | 8 |
| Mining | 79 | 116 | 126 | 132 | 138 | 144 | 149 |
| Livestock | 2,158 | 1,528 | 1,528 | 1,528 | 1,528 | 1,528 | 1,528 |
| **Total** | **14,797** | **16,733** | **23,192** | **25,765** | **29,484** | **33,982** | **39,396** |

**Table 2.11**
**Adopted Water Demand Projections for Grayson County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 26,000 | 24,278 | 28,835 | 33,513 | 37,498 | 41,813 | 47,013 |
| Manufacturing | 2,222 | 7,010 | 7,781 | 8,453 | 9,088 | 9,621 | 10,444 |
| Steam-Electric-Power | 0 | 5,600 | 8,963 | 12,326 | 12,326 | 12,326 | 12,326 |
| Irrigation | 1,271 | 3,561 | 3,751 | 3,950 | 4,158 | 4,381 | 4,616 |
| Mining | 20 | 1,052 | 1,050 | 1,049 | 1,048 | 1,047 | 1,046 |
| Livestock | 1,440 | 1,297 | 1,297 | 1,297 | 1,297 | 1,297 | 1,297 |
| **Total** | **30,953** | **42,798** | **51,677** | **60,588** | **65,415** | **70,485** | **76,742** |

**Table 2.12**
**Adopted Water Demand Projections for Henderson County (Region C) by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 6,633 | 9,253 | 10,694 | 12,277 | 13,717 | 15,574 | 17,894 |
| Manufacturing | 479 | 110 | 118 | 133 | 151 | 172 | 195 |
| Steam-Electric-Power | 25 | 460 | 427 | 7,000 | 8,000 | 9,000 | 10,000 |
| Irrigation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mining | 463 | 265 | 302 | 327 | 352 | 378 | 399 |
| Livestock | 743 | 854 | 854 | 854 | 854 | 854 | 854 |
| **Total** | **8,343** | **10,942** | **12,395** | **20,591** | **23,074** | **25,978** | **29,342** |

**Table 2.13**
**Adopted Water Demand Projections for Jack County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 1,247 | 1,333 | 1,396 | 1,440 | 1,466 | 1,510 | 1,567 |
| Manufacturing | 0 | 2 | 2 | 2 | 2 | 2 | 2 |
| Steam-Electric-Power | 0 | 2,162 | 2,500 | 2,700 | 2,900 | 3,100 | 3,300 |
| Irrigation | 188 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mining | 402 | 993 | 983 | 973 | 973 | 973 | 973 |
| Livestock | 1,055 | 1,025 | 1,025 | 1,025 | 1,025 | 1,025 | 1,025 |
| **Total** | **2,892** | **5,515** | **5,906** | **6,140** | **6,366** | **6,610** | **6,867** |

**Table 2.14**
**Adopted Water Demand Projections for Kaufman County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 18,743 | 16,330 | 28,552 | 37,000 | 45,377 | 52,709 | 61,702 |
| Manufacturing | 678 | 760 | 813 | 869 | 928 | 993 | 1,061 |
| Steam-Electric-Power | 0 | 8,979 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Irrigation | 179 | 2,916 | 2,916 | 2,916 | 2,916 | 2,916 | 2,916 |
| Mining | 0 | 79 | 80 | 81 | 82 | 83 | 84 |
| Livestock | 2,083 | 1,545 | 1,545 | 1,545 | 1,545 | 1,545 | 1,545 |
| **Total** | **21,683** | **30,609** | **43,906** | **52,411** | **60,848** | **68,246** | **77,308** |

**Table 2.15**
**Adopted Water Demand Projections for Navarro County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 8,632 | 9,695 | 10,578 | 11,343 | 12,150 | 13,194 | 14,538 |
| Manufacturing | 978 | 1,172 | 1,328 | 1,468 | 1,607 | 1,730 | 1,872 |
| Steam-Electric-Power | 0 | 0 | 8,000 | 13,440 | 13,440 | 13,440 | 13,440 |
| Irrigation | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mining | 0 | 89 | 89 | 89 | 89 | 89 | 89 |
| Livestock | 1,474 | 1,543 | 1,543 | 1,543 | 1,543 | 1,543 | 1,543 |
| **Total** | **11,184** | **12,499** | **21,538** | **27,883** | **28,829** | **29,996** | **31,482** |

**Table 2.16**
**Adopted Water Demand Projections for Parker County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 16,026 | 19,811 | 34,297 | 46,816 | 53,439 | 57,735 | 61,423 |
| Manufacturing | 571 | 779 | 879 | 974 | 1,068 | 1,150 | 1,248 |
| Steam-Electric-Power | 9 | 24 | 22 | 28 | 56 | 75 | 102 |
| Irrigation | 490 | 422 | 422 | 422 | 422 | 422 | 422 |
| Mining | 2,652 | 5,868 | 1,702 | 1,692 | 1,702 | 1,712 | 1,720 |
| Livestock | 1,779 | 1,856 | 1,856 | 1,856 | 1,856 | 1,856 | 1,856 |
| **Total** | **21,527** | **28,760** | **39,178** | **51,788** | **58,543** | **62,950** | **66,771** |

**Table 2.17**
**Adopted Water Demand Projections for Rockwall County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 11,732 | 20,958 | 34,170 | 41,256 | 47,960 | 51,654 | 55,139 |
| Manufacturing | 33 | 20 | 23 | 26 | 29 | 32 | 35 |
| Steam-Electric-Power | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Irrigation | 0 | 1,125 | 1,125 | 1,125 | 1,125 | 1,125 | 1,125 |
| Mining | 0 | 33 | 33 | 33 | 33 | 33 | 33 |
| Livestock | 142 | 131 | 131 | 131 | 131 | 131 | 131 |
| **Total** | **11,907** | **22,267** | **35,482** | **42,571** | **49,278** | **52,975** | **56,463** |

**Table 2.18**
**Adopted Water Demand Projections for Tarrant County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 294,427 | 393,362 | 443,571 | 499,684 | 562,112 | 629,504 | 716,037 |
| Manufacturing | 13,297 | 17,258 | 20,444 | 23,630 | 26,924 | 29,919 | 32,457 |
| Steam-Electric-Power | 3,054 | 2,640 | 2,448 | 4,168 | 5,000 | 5,000 | 5,000 |
| Irrigation | 6,359 | 8,417 | 8,417 | 8,417 | 8,417 | 8,417 | 8,417 |
| Mining | 2,494 | 1,073 | 904 | 939 | 974 | 1,009 | 1,036 |
| Livestock | 714 | 803 | 803 | 803 | 803 | 803 | 803 |
| **Total** | **320,345** | **423,553** | **476,587** | **537,641** | **604,230** | **674,652** | **763,750** |

**Table 2.19**
**Adopted Water Demand Projections for Wise County by Type of Use**

| Type of Use | Historical (Acre-Feet) | Projected (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal | 8,299 | 10,438 | 15,041 | 19,024 | 22,676 | 27,040 | 31,614 |
| Manufacturing | 943 | 2,313 | 2,660 | 2,979 | 3,277 | 3,539 | 3,858 |
| Steam-Electric-Power | 0 | 1,751 | 1,245 | 1,216 | 1,878 | 2,042 | 2,748 |
| Irrigation | 1,290 | 502 | 502 | 502 | 502 | 502 | 502 |
| Mining | 1,848 | 26,477 | 28,924 | 31,620 | 34,393 | 37,258 | 39,956 |
| Livestock | 1,438 | 1,714 | 1,714 | 1,714 | 1,714 | 1,714 | 1,714 |
| **Total** | **13,818** | **43,195** | **50,086** | **57,055** | **64,440** | **72,095** | **80,392** |

**Figure 2.7**
**Region C Water Use**

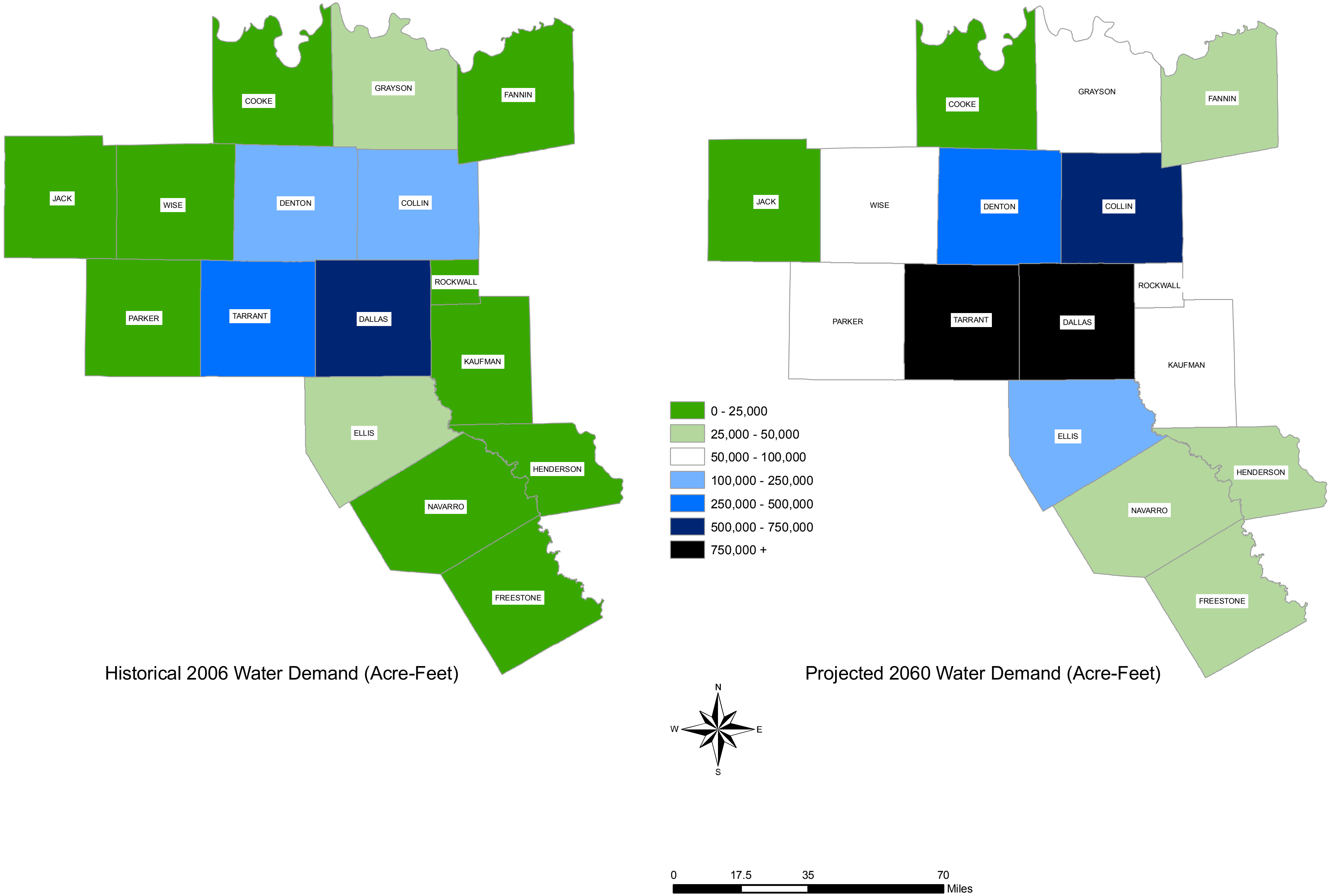
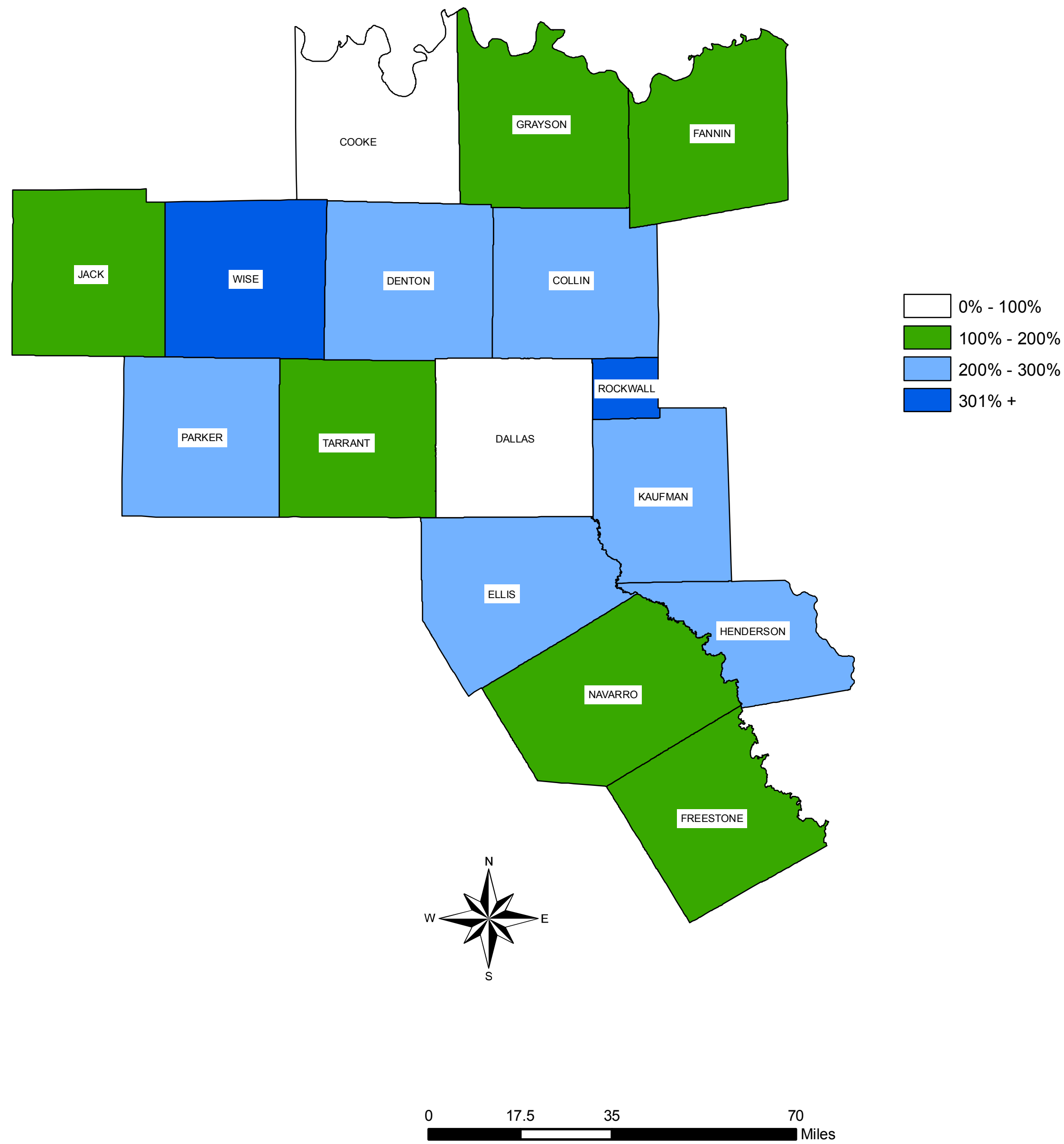


**Figure 2.8**
**Projected 2006 - 2060 Water Use Increase**



## Input for Future Planning

As required by TWDB guidance, the population and water demand projections were established relatively early in the planning process. As the planning effort proceeded, some water user groups and wholesale water providers offered additional input on population and demand projections. Table 2.20 lists the water suppliers that indicated that their population and/or water demand projections should be different from the TWDB approved projections. This input should be considered carefully in the next round of regional water planning. The entities should be contacted and projections should be adjusted where appropriate.

**Table 2.20**
**Region C Entities That Requested Adjustments to Population and/or Demand Projections**

| Entity | Population | | Demand | |
|---|---|---|---|---|
| | Entity Requested Higher Projections | Entity Requested Lower Projections | Entity Requested Higher Projections | Entity Requested Lower Projections |
| Crandall | X | | X | |
| East Cedar Creek Fresh Water Supply District | | X | | X |
| Ector | | X | | X |
| Danville WSC | | X | | X |
| Garland | | | | X |
| Haltom City | | X | | X |
| Lindsay | X | | X | |
| Muenster | | X | | X |
| South Grayson WSC | X | | X | |
| Tioga | | X | | X |
| Tom Bean | | X | | X |
| Trenton | | X | | X |
| Whitesboro | | X | | X |
| **Entities Suggesting they become WUGs:** | | | | |
| Rose Hill SUD | | | | |
| Winkler WSC | | | | |

## Wholesale Water Provider Projections

Table 2.21 shows the projected demand in Region C by Wholesale Water Provider, and Appendix H includes details on Wholesale Water Provider demand projections, including demand split by county and basin.

**Table 2.21**
**Projected Demands Placed on Wholesale Water Providers**

| Wholesale Water Provider | Projected Demand (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| City of Arlington | 80,186 | 94,355 | 99,181 | 103,374 | 103,758 | 104,727 |
| City of Corsicana | 10,865 | 20,384 | 26,693 | 27,604 | 28,750 | 30,212 |
| City of Dallas (Dallas Water Utilities) | 606,630 | 688,693 | 732,512 | 786,911 | 863,119 | 994,168 |
| City of Denton | 26,138 | 36,587 | 47,473 | 60,214 | 73,903 | 100,666 |
| City of Ennis | 5,467 | 6,420 | 7,638 | 9,154 | 11,114 | 13,645 |
| City of Forney | 12,734 | 16,704 | 18,344 | 19,912 | 21,531 | 23,357 |
| City of Fort Worth | 256,732 | 314,875 | 377,372 | 444,688 | 523,473 | 618,676 |
| City of Gainesville | 3,619 | 4,821 | 5,536 | 6,283 | 7,380 | 8,386 |
| City of Garland (Not including Steam Electric Reuse Demand) | 46,392 | 46,257 | 47,730 | 47,881 | 48,233 | 48,658 |
| City of Grand Prairie | 29,434 | 40,292 | 45,452 | 50,277 | 55,351 | 55,351 |
| City of Mansfield | 15,487 | 29,313 | 38,169 | 43,106 | 46,794 | 50,478 |
| City of Midlothian | 7,492 | 19,374 | 21,954 | 24,220 | 26,713 | 29,225 |
| City of North Richland Hills | 16,278 | 17,773 | 18,726 | 19,254 | 19,679 | 20,059 |
| City of Princeton | 2,237 | 4,007 | 5,496 | 8,335 | 12,938 | 18,636 |
| City of Rockwall | 11,553 | 17,900 | 21,901 | 25,466 | 26,132 | 26,134 |
| City of Seagoville | 2,829 | 3,920 | 4,867 | 5,852 | 6,934 | 8,080 |
| City of Sherman | 21,030 | 23,672 | 26,669 | 29,842 | 33,480 | 38,504 |
| City of Terrell | 5,536 | 12,385 | 17,046 | 21,631 | 24,557 | 27,931 |
| City of Waxahachie | 9,110 | 11,681 | 13,851 | 19,365 | 25,648 | 31,320 |
| City of Weatherford | 6,269 | 7,883 | 9,291 | 10,607 | 11,915 | 13,399 |
| Argyle Water Supply Corporation | 2,490 | 4,161 | 5,456 | 5,929 | 6,483 | 7,039 |
| Athens Municipal Water Authority | 5,466 | 5,990 | 6,622 | 7,339 | 8,274 | 9,427 |
| Bartonville Water Supply Corporation | 1,662 | 2,428 | 2,628 | 2,730 | 2,834 | 2,940 |
| Bolivar Water Supply Corporation | 2,038 | 3,274 | 5,763 | 9,796 | 14,200 | 18,197 |
| Dallas County Park Cities MUD | 15,371 | 15,858 | 16,178 | 16,366 | 16,548 | 16,735 |
| Dallas County WCID #6 | 2,621 | 2,730 | 2,805 | 2,852 | 2,934 | 3,028 |
| East Cedar Creek FWSD | 2,402 | 2,843 | 3,319 | 3,625 | 3,991 | 4,409 |
| Greater Texoma Utility Authority | 16,037 | 30,134 | 42,683 | 52,299 | 63,409 | 76,316 |
| Lake Cities MUA | 2,464 | 3,094 | 3,473 | 3,704 | 3,689 | 3,689 |
| Mustang SUD | 2,285 | 4,313 | 5,493 | 7,502 | 9,566 | 11,660 |
| North Texas Municipal Water District | 387,574 | 492,634 | 580,720 | 667,921 | 736,274 | 789,676 |
| Rockett SUD | 6,010 | 9,591 | 11,947 | 13,214 | 13,930 | 14,131 |

Table 2.21, Continued

| Wholesale Water Provider | Projected Demand (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Sabine River Authority [a] | 536,945 | 516,945 | 496,946 | 496,945 | 496,945 | 496,945 |
| Sulphur River Water District [a] | 33,255 | 32,870 | 32,468 | 32,040 | 31,556 | 30,936 |
| Tarrant Regional Water District | 448,806 | 560,680 | 657,866 | 754,210 | 860,389 | 985,584 |
| Trinity River Authority | 107,937 | 135,520 | 154,266 | 166,089 | 182,022 | 201,874 |
| Upper Neches Municipal Water Authority [a] | 210,135 | 210,124 | 210,115 | 210,106 | 210,099 | 210,093 |
| Upper Trinity Regional Water District | 34,902 | 58,104 | 85,674 | 110,308 | 137,411 | 156,545 |
| Walnut Creek SUD | 3,663 | 5,584 | 8,588 | 10,849 | 12,244 | 13,588 |
| West Cedar Creek MUD | 2,317 | 3,278 | 4,089 | 4,838 | 5,800 | 7,013 |
| Wise County WSD | 1,755 | 2,144 | 2,897 | 3,701 | 4,757 | 5,578 |

Note: a. These entities are located mostly in other Regions. Demands listed are contractual obligations as provided by Region D and/or Region I. For Sabine River Authority, demand is for the Upper Basin only and included requests for additional water beyond current contracts.

# CHAPTER 2
# LIST OF REFERENCES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(2) Texas State Data Center and Office of the State Demographer: *Texas Population Estimates Program, 2006-2008,* [ONLINE], Available URL: http://txsdc.utsa.edu/tpepp/txpopest.php, December 2009.

(3) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

(4) Texas Water Development Board: 2006 Texas Water Use Summary Estimates for Region C, Austin, [Online], Available URL: http://www.twdb.state.tx.us/wrpi/wus/2006est/2006wus.htm downloaded September 11, 2009.

(5) Dallas Morning News: *1998-99 Texas Almanac*, Dallas, 1997.

(6) Texas Water Development Board: Historical Water Use Information by City (1980-2006), [Online], Available URL: http://www.twdb.state.tx.us/wushistorical/

(7) Texas Water Development Board: Region C City Revisions (Excel File), Austin, January 2009.

(8) Texas State Data Center and Office of the State Demographer: 2007 Total Population Estimates for Texas Places, [Online], Available URL: http://txsdc.utsa.edu/tpepp/2007_txpopest_place.php

(9) North Central Texas Council of Governments: 2009 Current Population Estimates, Arlington, [Online], Available URL: http://www.nctcog.org/ris/demographics/population/2009PopEstimates.pdf, April 2009.

(10) Texas Water Development Board: Region C New WUGs split population and demands (Excel File), Austin, January 2009.

(11) Bureau of Economic Geology in conjunction with Texas Water Development Board: *Water Demand Projections for Power Generation in Texas*, 2008.

# 3. Analysis of Water Supply Currently Available to Region C

This section gives an overall summary of the water supplies available to Region C. Appendix I includes further details on the development of this information. Under the Texas Water Development Board (TWDB) regional water planning guidelines [1], each region is to identify water supplies currently available to the region by source and user. The supplies available by source are based on the supply available during drought of record conditions. For surface water reservoirs, this is generally the equivalent of firm yield supply or permitted amount (whichever is lower). For run-of-the-river supplies, this is the minimum supply available in a year over the historical record. Available groundwater supplies are defined by county and aquifer. Generally, groundwater supply is the supply available with acceptable long-term impacts to water levels. For some aquifers in Region C, Managed Available Groundwater (MAG) numbers have been developed by the TWDB to define the long-term available groundwater supply. Where applicable, groundwater conservation district rules are also considered.

Currently available water supplies are those water supplies that have been permitted or contracted and that have infrastructure in place to transport and treat the water. Some water supplies that are permitted or contracted for use do not yet have the infrastructure in place. Connecting such supplies is considered a water management strategy for use of this water in the future, and water management strategies are discussed in Section 4 of this report.

## 3.1 *Overall Water Supply Availability*

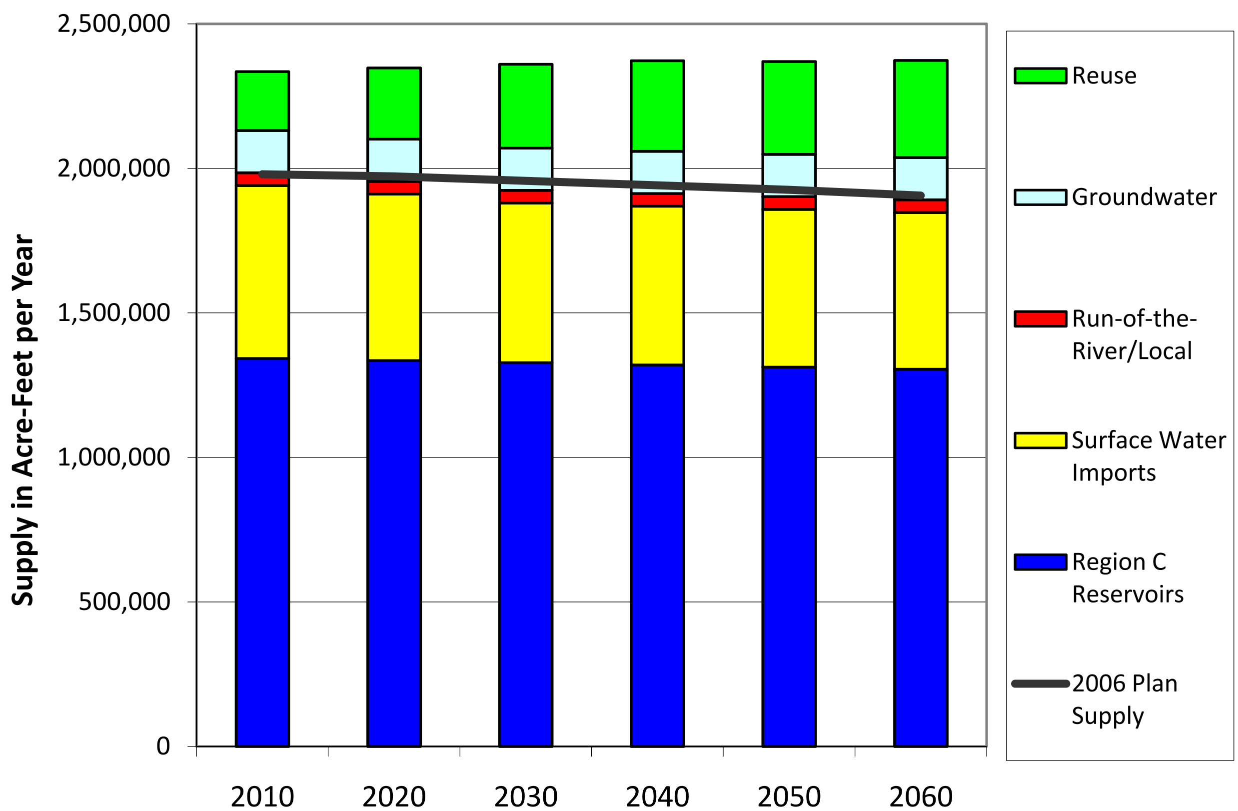
Table 3.1 and Figure 3.1 summarize the overall water supply availability in Region C, including both connected and unconnected water sources. Table 3.1 and Figure 3.1 show that in 2010:

- About 56 percent of the water supply available to Region C is from in-region reservoirs.
- Groundwater is approximately 6 percent of the overall supply available to Region C.
- Local supplies are only 2 percent of the overall supply available to Region C.

**Table 3.1**
**Overall Water Supply Availability in Region C**
- Values in Acre-Feet per Year -

| Summary | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Reservoirs in Region C | 1,342,326 | 1,335,224 | 1,327,817 | 1,320,283 | 1,312,749 | 1,305,213 |
| Local Irrigation | 20,205 | 20,205 | 20,205 | 20,205 | 20,205 | 20,205 |
| Other Local Supply | 23,701 | 23,701 | 23,701 | 23,701 | 23,701 | 23,701 |
| Surface Water Imports | 598,775 | 576,120 | 552,672 | 549,222 | 545,782 | 542,352 |
| Groundwater | 146,152 | 146,152 | 146,152 | 146,152 | 146,152 | 146,152 |
| Reuse | 203,974 | 246,510 | 289,995 | 312,972 | 321,405 | 336,082 |
| **REGION C TOTAL** | **2,335,133** | **2,347,912** | **2,360,542** | **2,374,535** | **2,369,994** | **2,373,705** |

**Figure 3.1**
**Overall Water Supply Availability in Region C**



- Currently authorized reuse is about 9 percent of the overall supply available to Region C. (It is worth noting that the development of reuse strategies has increased the 2060 overall reuse available from 103,000 acre-feet per year in the 2006 Region C Water Plan[2] to 331,000 acre-feet per year in this plan.)
- Importation of water from other regions is approximately 26 percent of the water available to Region C.
- If all of the available supplies could be utilized, Region C would have 2,373,705 acre-feet per year available in 2060. The total water availability is more than in the *2006 Region C Water Plan* [2] primarily due to the following changes:
  - Greater availability from reservoirs in Region C because of increased supplies from some reservoirs (based on changes to the WAMs) and on new water rights obtained since 2006.
  - Higher groundwater availability in the Managed Available Groundwater in the Trinity and Woodbine aquifers [3,4] when compared to previous availability estimates.
  - Greater availability from reuse due to the development of new reuse projects.
- Currently connected and available supplies are less than overall water supplies and are discussed in Section 3.2. The sources of the information in Table 3.1 are discussed in greater detail below.

### Surface Water Availability

**Reservoirs.** In its guidelines for Regional Water Planning [1], the TWDB requires that water availability for reservoirs be based on results of the TCEQ-approved Water Availability Models (WAMs) [5, 6, 7, 8, 9]. In Region C, most of the in-region reservoirs are located in the Trinity River Basin. Region C also uses water supplies originating in the Neches, Red, Sabine, Brazos, and Sulphur River Basins.

The WAM models were developed for the purpose of reviewing and granting new surface water right permits. The assumptions in the WAM models are based on the legal interpretation of water rights, and in some cases do not accurately reflect current operations. For planning purposes, adjustments were made to the WAMs to better reflect current and future surface water conditions in the region. Generally, changes made to the WAM included:

- Assessment of reservoir sedimentation rates and calculation of area-capacity conditions for current (2000) and future (2060) conditions.
- Inclusion of subordination agreements.
- Inclusion of system operations where appropriate.

- Other specific corrections by river basin, as appropriate.

According to the modified WAM results, the total available supply from Region C reservoirs is calculated at 1,342,326 acre-feet per year in 2010 and 1,305,213 acre-feet per year in 2060. The total available supply from imports from reservoirs in other regions is 598,775 acre-feet per year in 2010 and 542,352 acre-feet per year in 2060. Table 3.2 lists the reservoir water supplies available for use in Region C. More detail on the determination of available supplies from reservoirs is included in Appendix I.

**Table 3.2**
**Surface Water Supplies Currently Available to Region C**
- Values in Acre-Feet per Year -

| Reservoir | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Systems in Region C** | | | | | | |
| Lost Creek/Jacksboro System | 1,597 | 1,597 | 1,597 | 1,597 | 1,597 | 1,597 |
| West Fork System (TRWD) | 109,833 | 109,167 | 108,500 | 107,833 | 107,167 | 106,500 |
| Elm Fork/Lewisville/Ray Roberts (Dallas) | 184,801 | 183,733 | 182,665 | 181,597 | 180,529 | 179,459 |
| Grapevine (Dallas) | 7,583 | 7,367 | 7,150 | 6,933 | 6,717 | 6,500 |
| **Subtotal of Systems in Region C** | **303,815** | **301,863** | **299,912** | **297,961** | **296,009** | **294,056** |
| **Reservoirs in Region C** | | | | | | |
| Cedar Creek | 175,000 | 175,000 | 175,000 | 175,000 | 175,000 | 175,000 |
| Richland-Chambers (TRWD) | 210,000 | 210,000 | 210,000 | 210,000 | 210,000 | 210,000 |
| Richland-Chambers (Corsicana) and Lake Halbert | 13,872 | 13,863 | 13,855 | 13,847 | 13,838 | 13,830 |
| Moss | 7,410 | 7,410 | 7,410 | 7,410 | 7,410 | 7,410 |
| Lake Texoma (Texas' Share – NTMWD) | 190,300 | 190,300 | 190,300 | 190,300 | 190,300 | 190,300 |
| Lake Texoma (Texas' Share – GTUA) | 81,500 | 81,500 | 81,500 | 81,500 | 81,500 | 81,500 |
| Lake Texoma (Texas' Share – Denison) | 24,400 | 24,400 | 24,400 | 24,400 | 24,400 | 24,400 |
| Lake Texoma (Texas' Share – TXU) | 16,400 | 16,400 | 16,400 | 16,400 | 16,400 | 16,400 |
| Lake Texoma (Texas' Share – RRA) | 2,250 | 2,250 | 2,250 | 2,250 | 2,250 | 2,250 |
| Randell | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 |
| Valley | 0 | 0 | 0 | 0 | 0 | 0 |
| Bonham | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 |
| Ray Roberts (Denton) | 18,980 | 18,720 | 18,460 | 18,200 | 17,940 | 17,680 |
| Lewisville (Denton) | 7,918 | 7,817 | 7,715 | 7,613 | 7,512 | 7,410 |
| Benbrook | 6,833 | 6,833 | 6,833 | 6,833 | 6,833 | 6,833 |
| Weatherford | 2,967 | 2,923 | 2,880 | 2,837 | 2,793 | 2,750 |
| Grapevine (PCMUD) | 17,050 | 16,900 | 16,750 | 16,600 | 16,450 | 16,300 |
| Grapevine (Grapevine) | 2,017 | 1,983 | 1,950 | 1,917 | 1,883 | 1,850 |
| Arlington | 9,850 | 9,700 | 9,550 | 9,400 | 9,250 | 9,100 |
| Joe Pool | 15,192 | 14,883 | 14,575 | 14,267 | 13,958 | 13,650 |
| Mountain Creek | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |

**Table 3.2, Continued**

| Reservoir | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| North | 0 | 0 | 0 | 0 | 0 | 0 |
| Lake Ray Hubbard (Dallas) | 57,427 | 56,113 | 54,800 | 53,487 | 52,173 | 50,860 |
| White Rock | 3,500 | 3,200 | 2,900 | 2,600 | 2,300 | 2,000 |
| Terrell | 2,283 | 2,267 | 2,250 | 2,233 | 2,217 | 2,200 |
| Clark | 210 | 210 | 210 | 210 | 210 | 210 |
| Bardwell | 9,600 | 9,600 | 9,295 | 8,863 | 8,432 | 8,000 |
| Waxahachie | 2,905 | 2,800 | 2,695 | 2,590 | 2,485 | 2,380 |
| Forest Grove | 8,767 | 8,693 | 8,620 | 8,547 | 8,473 | 8,400 |
| Trinidad City Lake | 450 | 450 | 450 | 450 | 450 | 450 |
| Trinidad | 3,050 | 3,050 | 3,050 | 3,050 | 3,050 | 3,050 |
| Navarro Mills | 19,342 | 18,333 | 17,325 | 16,317 | 15,308 | 14,300 |
| Fairfield | 870 | 870 | 870 | 870 | 870 | 870 |
| Bryson | 0 | 0 | 0 | 0 | 0 | 0 |
| Mineral Wells | 2,508 | 2,495 | 2,483 | 2,470 | 2,458 | 2,445 |
| Teague City Lake | 189 | 189 | 189 | 189 | 189 | 189 |
| Lake Lavon | 112,033 | 110,767 | 109,500 | 108,233 | 106,967 | 105,700 |
| Muenster | 300 | 300 | 300 | 300 | 300 | 300 |
| **Subtotal of Individual Reservoirs in Region C** | **1,038,511** | **1,033,360** | **1,027,905** | **1,022,322** | **1,016,740** | **1,011,157** |
| **Subtotal of Reservoirs in Region C** | **1,342,326** | **1,335,224** | **1,327,817** | **1,320,283** | **1,312,749** | **1,305,213** |
| **Imports** | | | | | | |
| Chapman (NTMWD) | 47,132 | 47,132 | 47,132 | 47,132 | 47,132 | 47,132 |
| Chapman (Irving) | 44,484 | 44,484 | 44,484 | 44,484 | 44,484 | 44,484 |
| Chapman (UTRWD) | 13,268 | 13,268 | 13,268 | 13,268 | 13,268 | 13,268 |
| Tawakoni (Dallas) | 183,619 | 182,251 | 180,882 | 179,515 | 178,146 | 176,777 |
| Fork (Dallas) | 120,000 | 119,943 | 119,095 | 118,248 | 117,400 | 116,551 |
| Upper Sabine Basin (NTMWD) | 49,718 | 29,646 | 9,573 | 9,501 | 9,428 | 9,356 |
| Palestine (Dallas) | 112,881 | 111,776 | 110,670 | 109,563 | 108,455 | 107,347 |
| Lake Livingston (TXU) | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Lake Aquilla | 264 | 276 | 285 | 295 | 309 | 329 |
| Lake Athens (Athens MWA) | 3,908 | 3,856 | 3,804 | 3,751 | 3,699 | 3,647 |
| Lake Granbury | 231 | 231 | 231 | 231 | 231 | 231 |
| Vulcan Materials (from BRA-Possum Kingdom) | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Parker County (from Lake Palo Pinto) | 1,270 | 1,257 | 1,248 | 1,234 | 1,230 | 1,230 |
| **Subtotal of Imports** | **598,775** | **576,120** | **552,672** | **549,222** | **545,782** | **542,352** |
| **TOTAL** | **1,941,101** | **1,911,344** | **1,880,489** | **1,869,505** | **1,858,531** | **1,847,565** |

**Table 3.3**
**Run-of-the-River and Other Local Water Supplies**

| County | Run-of-the-River Supply (Acre-Feet per Year) | | | | Other Local Supply (Acre-Feet per Year) | |
|---|---|---|---|---|---|---|
| | Irrigation | Manufacturing | Mining | Municipal | Livestock | Mining |
| Collin | 408 | 0 | 0 | 0 | 1,002 | 195 |
| Cooke | 23 | 0 | 0 | 0 | 1,187 | 237 |
| Dallas | 791 | 368 | 0 | 0 | 712 | 1,525 |
| Denton | 0 | 0 | 0 | 0 | 935 | 103 |
| Ellis | 3 | 0 | 0 | 0 | 1,688 | 0 |
| Fannin | 14,758 | 0 | 72 | 69 | 1,583 | 0 |
| Freestone | 87 | 0 | 0 | 41 | 1,043 | 120 |
| Grayson | 2,394 | 30 | 0 | 0 | 1,683 | 0 |
| Henderson | 415 | 0 | 0 | 0 | 341 | 0 |
| Jack | 110 | 0 | 0 | 0 | 1,665 | 370 |
| Kaufman | 64 | 0 | 0 | 0 | 1,622 | 86 |
| Navarro | 226 | 0 | 0 | 252 | 1,603 | 0 |
| Parker | 239 | 0 | 0 | 33 | 1,922 | 20 |
| Rockwall | 0 | 0 | 0 | 0 | 168 | 33 |
| Tarrant | 549 | 959 | 0 | 0 | 442 | 342 |
| Wise | 139 | 0 | 133 | 0 | 1,117 | 0 |
| **TOTAL** | **20,205** | **1,357** | **205** | **395** | **18,713** | **3,031** |

**Local Irrigation Supply.** The local irrigation surface water supply is based on existing run-of-the-river water rights for irrigation not associated with major reservoirs. The total irrigation local supply in Region C is estimated at 20,205 acre-feet per year throughout the planning period. More detail on the determination of available supplies for run-of-the-river supply is shown in Table 3.3 and in Appendix I.

**Other Local Supplies.** Other local supplies include run-of-the-river supplies associated with water rights and used for municipal, manufacturing, mining, and power generation. It also includes local surface water supplies used for mining and livestock. For livestock and mining supplies that are not associated with water rights (such as stock ponds and privately-owned water for mining), supplies are assumed to be the same as was reported in the *2006 Region C Water Plan* [2]. The total other local supply available in Region C is 23,701 acre-feet per year. More detail on the determination of available other local supplies is included in Table 3.3 and Appendix I.

**Reuse.** The reuse supply considered as available to the region is from existing projects based on current permits, authorizations, and facilities. Categories of reuse include (1) currently permitted and operating indirect reuse projects, in which water is reused after being returned to the stream; (2) existing reuse projects for industrial purposes (including recycled water for mining use); and (3) authorized direct reuse projects for which facilities are already developed. The specific reuse projects included are discussed in Appendix I.

Indirect reuse project sponsors in Region C include the North Texas Municipal Water District (NTMWD), Trinity River Authority (TRA), Tarrant Regional Water District (TRWD), and the Upper Trinity Regional Water District (UTRWD). In addition, there are a number of existing direct reuse projects for landscape irrigation, golf course irrigation, cooling water, park irrigation, and natural gas industry use in Region C. Many of these projects were included in the *2006 Region C Water Plan* [2]. Significant new reuse projects since the last plan include:

- The expansion of the City of Fort Worth's Village Creek Reclaimed Water Delivery System to serve the Cities of Arlington and Euless, Dallas-Fort Worth International Airport, and other potential retail customers within the City of Fort Worth is currently under construction and is anticipated to be online by the end of 2010.
- The TRWD Richland-Chambers Reservoir reuse project began operation in 2009 and diverts return flows into off-channel, wetland impoundments for water quality treatment purposes before delivery into the Richland-Chambers Reservoir for storage and diversion.
- The NTMWD is now authorized to divert up to an additional 35,941 acre-feet per year (for a total of 71,882 acre-feet per year) of return flows from the District's Wilson Creek Wastewater Treatment Plant in Lake Lavon.
- The NTMWD East Fork Raw Water Supply Project began operation in 2009 and can currently convey nearly 48,000 acre-feet per year of return flows to Lake Lavon for subsequent reuse. The NTMWD East Fork Raw Water Supply Project diverts return flows from the East Fork of the Trinity River to a constructed wetland for polishing treatment and ultimately returns this water to Lake Lavon. The water right for the project authorizes diversions up to 157,393 acre-feet per year, as return flows increase and become available.
- Dallas Water Utilities and NTMWD have entered into an agreement which would allow NTMWD to exchange return flows from its WWTPs discharging into Lake Ray Hubbard for Dallas return flows discharged to the main stem of the Trinity River. Under this agreement, Dallas will obtain the right to divert the NTMWD return flows from Lake Ray Hubbard and will pump an equal amount of flow from the main stem of the Trinity River to the NTMWD East Fork Water Supply Project wetland for use by NTMWD. In

addition, once water rights for Elm Fork return flows (from NTMWD WWTPs discharging to Lake Lewisville) have been secured by NTMWD, NTMWD will support Dallas efforts to secure bed and banks transport, storage and diversion rights for the Elm Fork return flows. In exchange, Dallas will pump a quantity equal to NTMWD's discharge of its future Elm Fork return flows to the East Fork Water Supply Project wetland for use by NTMWD.

It is anticipated that reuse will increase significantly in Region C over the next 50 years, but proposed and potential direct reuse projects are not included as currently available supplies. There are a number of reuse projects being considered as potentially feasible management strategies as part of this planning process. Recommended water management strategies for reuse are discussed in Chapter 4 of this report.

Table 3.4 summarizes the currently available reuse supplies by county in Region C. The total available supply from reuse in Region C by 2010 is 203,974 acre-feet per year, increasing to 336,082 acre-feet per year in 2060.

## Groundwater Availability

Groundwater supplies in Region C are obtained from two major aquifers (Carrizo-Wilcox and Trinity), three minor aquifers (Woodbine, Nacatoch, and Queen City), and locally undifferentiated formations, referred to as "other aquifer".

The TWDB guidelines [1] state that Managed Available Groundwater (MAG) estimates provided by the TWDB are to be used to determine available groundwater supplies unless the MAG estimates are not available. MAG estimates are developed by the TWDB using Desired Future Conditions (DFCs) submitted by Groundwater Management Areas (GMAs). The TWDB created sixteen GMAs in Texas. GMA 8 covers all of Region C except for Jack County, Henderson County, and a small portion of Navarro County.

**Table 3.4**
**Currently Permitted and Available Reuse Supplies by County**
- Values in Acre-Feet per Year -

| County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Collin | 52,227 | 63,168 | 74,109 | 74,109 | 74,109 | 74,109 |
| Cooke | 9 | 9 | 9 | 9 | 9 | 9 |
| Dallas | 8,831 | 8,831 | 8,831 | 8,831 | 8,831 | 8,831 |
| Denton | 41,207 | 61,480 | 75,725 | 85,135 | 94,842 | 110,584 |
| Ellis | 5,798 | 5,929 | 5,929 | 5,929 | 5,929 | 5,929 |
| Fannin | 0 | 0 | 0 | 0 | 0 | 0 |
| Freestone | 0 | 0 | 0 | 0 | 0 | 0 |
| Grayson | 0 | 0 | 0 | 0 | 0 | 0 |
| Henderson | 2,904 | 32 | 32 | 32 | 32 | 32 |
| Jack | 412 | 412 | 411 | 411 | 410 | 410 |
| Kaufman | 61,345 | 76,885 | 96,839 | 111,737 | 111,737 | 111,737 |
| Navarro | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Parker | 13 | 13 | 13 | 13 | 13 | 13 |
| Rockwall | 784 | 784 | 784 | 784 | 784 | 784 |
| Tarrant | 4,514 | 4,893 | 5,161 | 5,339 | 5,473 | 5,583 |
| Wise | 15,930 | 14,074 | 12,152 | 10,643 | 9,236 | 8,061 |
| **TOTAL** | **203,974** | **246,510** | **289,995** | **312,972** | **321,405** | **336,082** |

The GMAs are responsible for developing DFCs for aquifers within their respective areas. The TWDB quantifies MAG estimates based on the DFCs provided by the GMAs. For the 2011 regional water plans, the planning groups were required to use MAG estimates available as of January 1, 2009 as the basis for existing groundwater supplies [(1)]. MAG estimates were available for the Woodbine aquifer prior to the January 1st deadline. MAG estimates were available for the Trinity aquifer in March of 2009. Both the Woodbine and Trinity MAGs were used to calculate the available supplies in Region C. MAGs for the remaining aquifers were not available in time for inclusion in Region C's planning for this round of planning.

Pursuant to Texas Water Code (35.019), county commissioners courts located within Priority Groundwater Management Areas (PMGAs) have the ability to promulgate requirements regarding water availability in their county. Region C is aware of no such requirements made by any county commissioners courts within the Northern Trinity and Woodbine Aquifers PMGA, which is the only PMGA in Region C.

**Carrizo-Wilcox Aquifer.** Supplies from the Carrizo-Wilcox aquifer are available in Freestone, Henderson, and Navarro counties in Region C. The available supply from the Carrizo-Wilcox aquifer is assumed to be the same as that shown in the *2006 Region C Water Plan* (2).

For the *2006 Region C Water Plan* (2) update, Region C requested that the TWDB run both the Northern Carrizo-Wilcox and Central Carrizo-Wilcox Groundwater Availability Models (GAMs) (10), and the two models resulted in significantly different water availabilities. After discussing the results with the groundwater conservation districts in the region, Region C assumed that the currently available groundwater supply from the Carrizo-Wilcox aquifer was equivalent to twice the current use from the aquifer in Freestone, Henderson, and Navarro counties. Table 3.5 shows the resulting groundwater availability by county to Region C from the Carrizo-Wilcox aquifer. As with reservoirs, this number represents the amount of water available from the aquifer, without considering limitations imposed by or current availability due to the capacity of wells and other facilities. The amount of groundwater currently available in Region C is discussed in Section 3.2.

**Trinity and Woodbine Aquifers.** The Woodbine aquifer overlies the Trinity aquifer. The Woodbine aquifer is in Collin, Dallas, Denton, Ellis, Fannin, Grayson, Kaufman, Navarro, and Parker counties in Region C. The Trinity aquifer is in Collin, Cooke, Dallas, Denton, Ellis, Fannin, Grayson, Jack, Navarro, Parker, Tarrant, and Wise counties in Region C. Most of the pumping from the Trinity aquifer in Region C is from three layers: Paluxy, Hensel, and Hosston. MAG estimates provided by the TWDB were used to determine groundwater availability from the Trinity and Woodbine aquifers. These availability numbers are shown in Table 3.5.

**Groundwater Conservation Districts.** There are currently seven Groundwater Conservation Districts (GCDs) that include one or more Region C counties:

- Upper Trinity GCD (Wise and Parker Counties)
- Northern Trinity GCD (Tarrant County)
- Neches and Trinity Valleys GCD (includes Henderson County)

**Table 3.5**
**Groundwater Supplies in Region C**
- Values in Acre-Feet per Year -

| Aquifer | County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Carrizo-Wilcox | Freestone | 6,653 | 6,653 | 6,653 | 6,653 | 6,653 | 6,653 |
| Carrizo-Wilcox | Henderson | 5,370 | 5,370 | 5,370 | 5,370 | 5,370 | 5,370 |
| Carrizo-Wilcox | Navarro | 180 | 180 | 180 | 180 | 180 | 180 |
| **Carrizo-Wilcox Subtotal** | | **12,203** | **12,203** | **12,203** | **12,203** | **12,203** | **12,203** |
| | | | | | | | |
| Trinity | Collin | 2,100 | 2,100 | 2,100 | 2,100 | 2,100 | 2,100 |
| Trinity | Cooke | 6,850 | 6,850 | 6,850 | 6,850 | 6,850 | 6,850 |
| Trinity | Dallas | 5,458 | 5,458 | 5,458 | 5,458 | 5,458 | 5,458 |
| Trinity | Denton | 19,333 | 19,333 | 19,333 | 19,333 | 19,333 | 19,333 |
| Trinity | Ellis | 3,959 | 3,959 | 3,959 | 3,959 | 3,959 | 3,959 |
| Trinity | Fannin | 700 | 700 | 700 | 700 | 700 | 700 |
| Trinity | Grayson | 9,400 | 9,400 | 9,400 | 9,400 | 9,400 | 9,400 |
| Trinity | Jack | 100 | 100 | 100 | 100 | 100 | 100 |
| Trinity | Kaufman | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 |
| Trinity | Navarro | 1,873 | 1,873 | 1,873 | 1,873 | 1,873 | 1,873 |
| Trinity | Parker | 15,248 | 15,248 | 15,248 | 15,248 | 15,248 | 15,248 |
| Trinity | Rockwall | 958 | 958 | 958 | 958 | 958 | 958 |
| Trinity | Tarrant | 18,747 | 18,747 | 18,747 | 18,747 | 18,747 | 18,747 |
| Trinity | Wise | 9,282 | 9,282 | 9,282 | 9,282 | 9,282 | 9,282 |
| **Trinity Subtotal** | | **95,189** | **95,189** | **95,189** | **95,189** | **95,189** | **95,189** |
| | | | | | | | |
| Woodbine | Collin | 2,509 | 2,509 | 2,509 | 2,509 | 2,509 | 2,509 |
| Woodbine | Cooke | 154 | 154 | 154 | 154 | 154 | 154 |
| Woodbine | Dallas | 2,313 | 2,313 | 2,313 | 2,313 | 2,313 | 2,313 |
| Woodbine | Denton | 4,126 | 4,126 | 4,126 | 4,126 | 4,126 | 4,126 |
| Woodbine | Ellis | 5,441 | 5,441 | 5,441 | 5,441 | 5,441 | 5,441 |
| Woodbine | Fannin | 3,297 | 3,297 | 3,297 | 3,297 | 3,297 | 3,297 |
| Woodbine | Grayson | 12,087 | 12,087 | 12,087 | 12,087 | 12,087 | 12,087 |
| Woodbine | Kaufman | 200 | 200 | 200 | 200 | 200 | 200 |
| Woodbine | Navarro | 300 | 300 | 300 | 300 | 300 | 300 |
| Woodbine | Parker | 0 | 0 | 0 | 0 | 0 | 0 |
| Woodbine | Rockwall | 144 | 144 | 144 | 144 | 144 | 144 |
| Woodbine | Tarrant | 632 | 632 | 632 | 632 | 632 | 632 |
| **Woodbine Subtotal** | | **31,203** | **31,203** | **31,203** | **31,203** | **31,203** | **31,203** |

**Table 3.5, Continued**

| Aquifer | County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Nacatoch | Henderson, Kaufman, Navarro, & Rockwall | 558 | 558 | 558 | 558 | 558 | 558 |
| Queen City | Freestone & Henderson | 873 | 873 | 873 | 873 | 873 | 873 |
| Other | All | 6,126 | 6,126 | 6,126 | 6,126 | 6,126 | 6,126 |
| **Minor Aquifers Subtotal** | | **7,557** | **7,557** | **7,557** | **7,557** | **7,557** | **7,557** |
| **TOTAL** | | **146,152** | **146,152** | **146,152** | **146,152** | **146,152** | **146,152** |

- Mid-East Texas GCD (includes Freestone County)
- Prairielands GCD (includes Ellis County)
- North Texas GCD (Collin, Cooke, and Denton Counties)
- Red River GCD (Grayson and Fannin Counties).

**Summary.** In Region C, MAG estimates for the Trinity and Woodbine aquifers were available for this cycle of regional water planning. For the Carrizo-Wilcox, Nacatoch, Queen City, and other aquifers, MAG estimates were not available, and groundwater supplies were assumed to be the same as was shown in the *2006 Region C Water Plan* (2). The total available supply from groundwater in Region C is 146,152 acre-feet per year throughout the planning period. More detail on the determination of available supplies from groundwater is included in Appendix I.

### 3.2 Currently Available Water Supplies

Table 3.6 and Figure 3.2 show the currently available water supplies in Region C by different source types. Table 3.7 shows the currently available supplies to water user groups by county. Currently available supplies are supplies that can be used with currently existing water rights, contracts, and facilities. They are less than the overall supplies available to the region because the facilities needed to use some supplies have not yet been developed. (Common constraints limiting currently available supplies include the availability and capacity of transmission systems, treatment plants, and wells.) The comparison of overall water supply availability and currently available water supplies for Region C shows the following:

- The total currently available supply in Region C for 2060 is 1,793,842 acre-feet per year, of which 1,779,896 acre-feet per year is available to users in Region C (a portion is used to supply customers in adjacent regions). This is 579,863 acre-feet per year less than the overall supply. The difference is due primarily to transmission and treatment plant capacity limitations. This includes 196,881 acre-feet per year of unconnected supplies for Dallas Water Utilities (Lake Fork Reservoir and Lake Palestine). It is worth noting that the currently available supply presented in this plan is significantly greater than what was in the 2006 Region C Plan, demonstrating on-going development by Region C suppliers.
- The currently available supplies from in-region reservoirs, local sources, groundwater and current reuse are nearly fully allocated by 2060. Some of the differences can be attributed to sources that are not currently used for water supply (White Rock Lake, Lake Mineral Wells and Forest Grove Reservoir).
- Groundwater supplies, which represent only 6 percent of the total available supply to the region, are nearly 86 percent utilized by current water users. The total amount of groundwater supply that is available for future development is around 20,000 acre-feet per year.
- Permitted surface water imports to Region C are shown to be more than 540,000 acre-feet per year in 2060 in Table 3.1. Approximately 16% of these supplies are not currently connected to water supply systems. The connection of these supplies will be considered as water management strategies in Section 4.

**Table 3.6**
**Currently Available Water Supplies to Water Users by Source Type**
- Values in Acre-Feet per Year -

| Category | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Reservoirs in Region C | 979,818 | 944,723 | 926,839 | 918,583 | 913,667 | 898,085 |
| Local Irrigation | 19,455 | 19,455 | 19,455 | 19,455 | 19,455 | 19,455 |
| Other Local Supply | 22,862 | 22,814 | 22,846 | 22,884 | 22,931 | 22,989 |
| Surface Water Imports | 456,275 | 425,638 | 402,919 | 399,203 | 396,946 | 390,064 |
| Groundwater | 127,167 | 127,167 | 127,167 | 127,167 | 127,167 | 127,167 |
| Reuse | 203,974 | 246,510 | 289,995 | 312,972 | 321,405 | 336,082 |
| **REGION C TOTAL** | **1,809,551** | **1,786,307** | **1,789,221** | **1,800,264** | **1,801,571** | **1,793,842** |

**Figure 3.2**
**Currently Available Supplies to Region C Water Users**

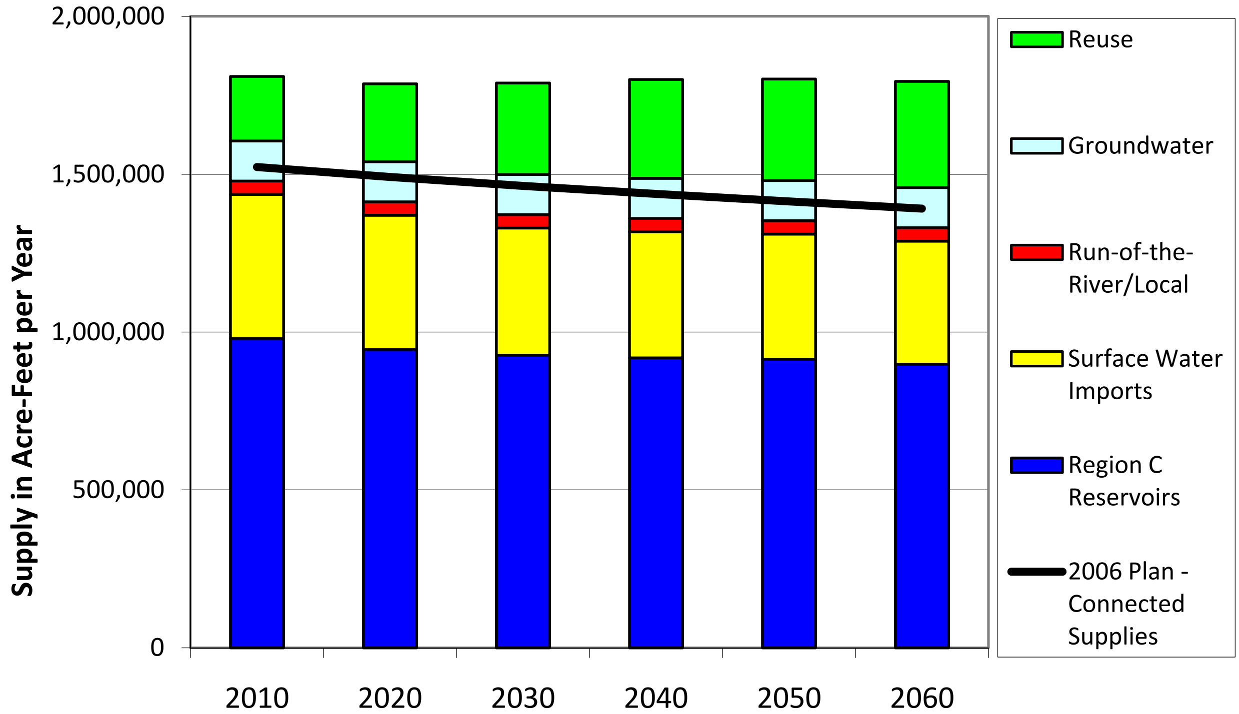



**Table 3.7**
**Currently Available Supplies by County**
- Values in Acre-Feet per Year -

| County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Collin | 218,495 | 232,143 | 237,213 | 247,134 | 248,114 | 244,488 |
| Cooke | 9,960 | 9,808 | 9,726 | 9,689 | 9,616 | 9,580 |
| Dallas | 663,340 | 590,907 | 576,467 | 568,087 | 564,482 | 557,655 |
| Denton | 161,271 | 157,547 | 173,000 | 184,534 | 193,216 | 197,705 |
| Ellis | 39,346 | 42,177 | 47,403 | 51,536 | 53,370 | 53,512 |
| Fannin | 42,279 | 42,134 | 42,410 | 42,994 | 43,524 | 43,482 |
| Freestone | 34,466 | 34,511 | 33,802 | 32,958 | 32,275 | 31,660 |
| Grayson | 46,883 | 46,182 | 46,186 | 45,922 | 45,767 | 45,803 |
| Henderson | 20,209 | 14,728 | 14,808 | 14,771 | 14,829 | 14,895 |
| Jack | 6,801 | 7,137 | 7,333 | 7,531 | 7,729 | 7,929 |
| Kaufman | 31,216 | 36,519 | 38,912 | 41,107 | 42,038 | 43,991 |
| Navarro | 13,150 | 14,123 | 14,202 | 14,597 | 15,070 | 15,622 |
| Parker | 31,567 | 43,302 | 47,461 | 47,544 | 47,041 | 46,031 |
| Rockwall | 22,235 | 29,206 | 30,518 | 31,866 | 31,060 | 30,808 |
| Tarrant | 413,906 | 428,973 | 413,111 | 405,083 | 399,809 | 398,030 |
| Wise | 44,620 | 45,268 | 42,958 | 41,561 | 40,041 | 38,705 |
| **Subtotal** | **1,799,744** | **1,774,665** | **1,775,510** | **1,786,914** | **1,787,981** | **1,779,896** |
| Other Regions | 9,807 | 11,642 | 13,711 | 13,350 | 13,590 | 13,946 |
| **TOTAL** | **1,809,551** | **1,786,307** | **1,789,221** | **1,800,264** | **1,801,571** | **1,793,842** |

### 3.3 Water Availability by Wholesale Water Provider (WWP)

As part of the Senate Bill One planning process, the Texas Water Development Board requires development of water availability for each designated wholesale water provider. A wholesale water provider is defined as "any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acre-feet of water wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan." (1) The planning groups are also required to designate any person or entity expected to contract to sell at least 1,000 acre-feet per year of wholesale water during the planning period as a WWP. There are 41 entities in Region C that qualify as wholesale water providers (20 cities, 2 river authorities, and 19 water districts). Twelve of the wholesale water providers provide a large amount of wholesale water supplies to a number of customers and are discussed below as regional wholesale water providers. The remaining 29 supply less water to fewer customers and are discussed as local wholesale water providers. The 12 regional wholesale water providers are:

- Dallas Water Utilities
- Tarrant Regional Water District
- North Texas Municipal Water District
- City of Fort Worth
- Trinity River Authority
- Upper Trinity Regional Water District
- Greater Texoma Utility Authority
- Dallas County Park Cities Municipal Utility District
- City of Corsicana
- Sabine River Authority
- Sulphur River Water District
- Upper Neches River Municipal Water Authority

The 29 local wholesale water providers include:

- Argyle Water Supply Corporation
- City of Arlington
- Athens Municipal Water Authority

- Bartonville Water Supply Corporation
- Bolivar Water Supply Corporation
- Dallas County WCID #6
- City of Denton
- East Cedar Creek Freshwater Supply District
- City of Ennis
- City of Forney
- City of Gainesville
- City of Garland
- City of Grand Prairie
- Lake Cities Municipal Utility Authority
- City of Mansfield
- City of Midlothian
- Mustang Special Utility District
- City of North Richland Hills
- City of Princeton
- Rockett Special Utility District
- City of Rockwall
- City of Seagoville
- City of Sherman
- City of Terrell
- Walnut Creek Special Utility District
- City of Waxahachie
- City of Weatherford
- West Cedar Creek Municipal Utility District
- Wise County Water Supply District

## 3.4 Water Supplies Currently Available to Regional Wholesale Water Providers

Table 3.8 gives a summary of the supplies currently available to regional wholesale water providers serving Region C. As discussed in Section 3.2, currently available supplies are limited by existing physical facilities.

**Table 3.8**
**Currently Available Supplies to Regional Wholesale Water Providers in Region C**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Dallas Water Utilities | Lake Ray Roberts/Lake Lewisville System | 184,801 | 183,733 | 182,665 | 181,597 | 180,529 | 179,459 |
| | Lake Grapevine | 7,583 | 7,367 | 7,150 | 6,933 | 6,717 | 6,500 |
| | Lake Ray Hubbard | 57,427 | 56,113 | 54,800 | 53,487 | 52,173 | 50,860 |
| | Lake Ray Hubbard Temporary | 49,800 | 0 | 0 | 0 | 0 | 0 |
| | Lake Tawakoni | 183,619 | 182,251 | 180,882 | 179,515 | 178,146 | 176,777 |
| | Lake Fork | 40,581 | 41,949 | 43,318 | 44,685 | 46,054 | 47,423 |
| | Direct Reuse (Cedar Crest GC) | 561 | 561 | 561 | 561 | 561 | 561 |
| | Indirect Reuse | 29,961 | 42,046 | 53,147 | 60,646 | 69,861 | 85,000 |
| | White Rock Lake (Irrigation Only) | 3,500 | 3,200 | 2,900 | 2,600 | 2,300 | 2,000 |
| | **DWU Total** | **557,833** | **517,220** | **525,423** | **530,024** | **536,341** | **548,580** |
| Tarrant Regional Water District | West Fork System | 109,833 | 109,167 | 108,500 | 107,833 | 107,167 | 106,500 |
| | Lake Benbrook | 6,833 | 6,833 | 6,833 | 6,833 | 6,833 | 6,833 |
| | Cedar Creek Lake | 175,000 | 175,000 | 175,000 | 175,000 | 175,000 | 175,000 |
| | Richland-Chambers Res. | 210,000 | 210,000 | 210,000 | 210,000 | 210,000 | 210,000 |
| | Richland-Chambers Reuse | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| | **TRWD Total** | **511,666** | **511,000** | **510,333** | **509,666** | **509,000** | **508,333** |
| North Texas Municipal Water District | Lake Lavon | 112,033 | 110,767 | 109,500 | 108,233 | 106,967 | 105,700 |
| | Lake Texoma | 77,300 | 77,300 | 77,300 | 77,300 | 77,300 | 77,300 |
| | Lake Chapman | 47,132 | 47,132 | 47,132 | 47,132 | 47,132 | 47,132 |
| | Wilson Creek Reuse | 50,000 | 60,941 | 71,882 | 71,882 | 71,882 | 71,882 |
| | Lake Bonham | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 |
| | East Fork Reuse | 51,790 | 67,148 | 87,102 | 102,000 | 102,000 | 102,000 |
| | Interim GTUA | 15,500 | 0 | 0 | 0 | 0 | 0 |
| | Upper Sabine Basin | 49,718 | 29,646 | 9,573 | 9,501 | 9,428 | 9,356 |
| | Direct Reuse | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 |
| | **NTMWD Total** | **411,508** | **400,969** | **410,524** | **424,083** | **422,744** | **421,405** |

**Table 3.8, Continued**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| City of Fort Worth | TRWD Supplies | 247,979 | 277,748 | 277,748 | 277,748 | 277,748 | 277,748 |
| | Direct Reuse | 897 | 897 | 897 | 897 | 897 | 897 |
| | **Fort Worth Total** | **248,876** | **278,645** | **278,645** | **278,645** | **278,645** | **278,645** |
| Trinity River Authority | Joe Pool Lake (Midlothian) | 5,954 | 7,104 | 6,951 | 6,798 | 6,644 | 6,491 |
| | Joe Pool Lake (Grand Prairie) | 300 | 300 | 300 | 300 | 300 | 300 |
| | Navarro Mills Lake | 19,342 | 18,333 | 17,325 | 16,317 | 15,308 | 14,300 |
| | Bardwell Lake | 9,600 | 9,600 | 9,295 | 8,863 | 8,432 | 8,000 |
| | Lake Livingston (Region C) | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| | Reuse (Region C) | 13,248 | 13,379 | 13,379 | 13,379 | 13,379 | 13,379 |
| | **Subtotal** | **68,444** | **68,716** | **67,250** | **65,657** | **64,063** | **62,470** |
| | TRWD | 56,456 | 72,279 | 70,266 | 68,519 | 66,192 | 63,352 |
| | **TRA Total in Region C** | **124,900** | **140,995** | **137,516** | **134,176** | **130,255** | **125,822** |
| Upper Trinity Regional Water District | Lake Chapman | 13,268 | 13,268 | 13,268 | 13,268 | 13,268 | 13,268 |
| | DWU Contract | 8,290 | 36,549 | 42,664 | 41,267 | 39,087 | 35,226 |
| | Denton | 4,069 | 0 | 0 | 0 | 0 | 0 |
| | Chapman Reuse | 6,634 | 6,634 | 6,634 | 6,634 | 6,634 | 6,634 |
| | Direct Reuse | 897 | 897 | 897 | 897 | 897 | 897 |
| | **UTRWD Total** | **33,158** | **57,348** | **63,463** | **62,066** | **59,886** | **56,025** |
| Greater Texoma Utility Authority | Lake Texoma Raw Water | 81,500 | 81,500 | 81,500 | 81,500 | 81,500 | 81,500 |
| | Delivery Limited by WTP Capacity | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| | Usable Lk Texoma Raw Water | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 |
| | Dennison (for Pottsboro) | 560 | 560 | 560 | 560 | 560 | 560 |
| | NTMWD (Collin-Grayson MA) | 1,928 | 5,400 | 5,400 | 5,400 | 5,400 | 5,400 |
| | **GTUA Total** | **16,088** | **19,560** | **19,560** | **19,560** | **19,560** | **19,560** |

**Table 3.8, Continued**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Dallas County Park Cities MUD | Lake Grapevine | 17,050 | 16,900 | 16,750 | 16,600 | 16,450 | 16,300 |
| | Grapevine Reuse | 3,317 | 3,696 | 3,964 | 4,142 | 4,276 | 4,386 |
| | **DCPCMUD Total** | **20,367** | **20,596** | **20,714** | **20,742** | **20,726** | **20,686** |
| City of Corsicana | Navarro Mills Lake (from TRA) | 11,210 | 11,210 | 11,210 | 11,210 | 11,210 | 11,210 |
| | Richland Chambers/Halbert | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 |
| | **Total (Limited by WTP Capacity)** | **13,452** | **13,452** | **13,452** | **13,452** | **13,452** | **13,452** |
| Sabine River Authority | Lake Tawakoni (Dallas) | 183,619 | 182,251 | 180,882 | 179,515 | 178,146 | 176,777 |
| | Lake Tawakoni (NTMWD) | 9,718 | 9,646 | 9,573 | 9,501 | 9,428 | 9,356 |
| | Lake Tawakoni (Others) | 36,469 | 36,197 | 35,925 | 35,651 | 35,379 | 35,107 |
| | Lake Fork (Dallas) - Trinity Basin | 120,000 | 119,943 | 119,095 | 118,248 | 117,400 | 116,551 |
| | Lake Fork (Dallas) - Sabine Basin | 791 | 0 | 0 | 0 | 0 | 0 |
| | Lake Fork (Others) | 52,244 | 51,877 | 51,510 | 51,142 | 50,775 | 50,409 |
| | **Subtotal Upper Basin** | **402,842** | **399,913** | **396,985** | **394,057** | **391,128** | **388,200** |
| | Toledo Bend Lake | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 |
| | Sabine Run-of-River | 147,100 | 147,100 | 147,100 | 147,100 | 147,100 | 147,100 |
| | **SRA Total** | **1,299,942** | **1,297,013** | **1,294,085** | **1,291,157** | **1,288,228** | **1,285,300** |

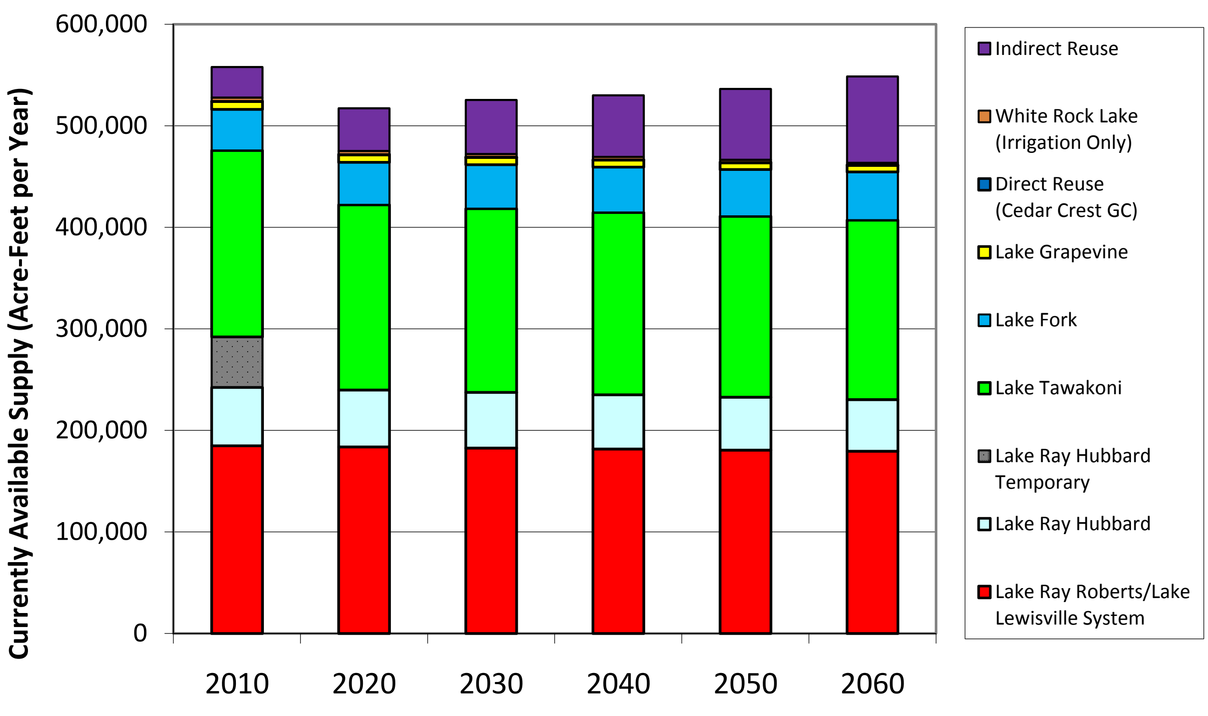
**Table 3.8, Continued**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Sulphur River Water District | Lake Chapman (UTRWD) | 13,268 | 13,268 | 13,268 | 13,268 | 13,268 | 13,268 |
| | Lake Chapman (NTMWD through Cooper) | 883 | 883 | 883 | 883 | 883 | 883 |
| | Lake Chapman (Other) | 14,933 | 14,933 | 14,933 | 14,933 | 14,933 | 14,933 |
| | **SRWD Total** | **29,084** | **29,084** | **29,084** | **29,084** | **29,084** | **29,084** |
| | **SRWD to Region C** | **14,151** | **14,151** | **14,151** | **14,151** | **14,151** | **14,151** |
| Upper Neches River Municipal Water Authority | Lake Palestine (Dallas) | 112,881 | 111,776 | 110,670 | 109,563 | 108,455 | 107,347 |
| | Lake Palestine (Other Committed) | 94,577 | 93,641 | 92,705 | 91,770 | 90,837 | 89,903 |
| | Lake Palestine (Uncommitted) | 0 | 0 | 0 | 0 | 0 | 0 |
| | **UNRMWA Total** | **207,458** | **205,417** | **203,375** | **201,333** | **199,292** | **197,250** |

## Dallas Water Utilities

Figure 3.3 shows the currently available supply for Dallas Water Utilities (DWU). DWU's currently available supply sources include Lake Ray Hubbard, Lake Tawakoni (in Region D), the Ray Roberts/Lewisville Lake/Elm Fork System, Dallas' share of Grapevine Lake, White Rock Lake (irrigation only), direct reuse, indirect reuse of specified return flows above its lakes, and a portion of DWU's share of the Lake Fork supply (in Region D). The first phase of DWU's connection to Lake Fork (a pipeline from Lake Fork to Tawakoni) was completed since the last round of planning. The next phase of the connection (a 144" pipeline to replace the existing 84" and 72" pipelines from Tawakoni to Dallas) is scheduled to be completed in the next five years. The first phase allows DWU to utilize approximately 30% of their Lake Fork supply. Lake Palestine (in Region I) is a significant supply source for DWU that is not currently connected to DWU's system. The estimated reliable supply for DWU from currently available sources (which excludes 70% of Lake Fork Reservoir and all of Lake Palestine, since they are not connected) is 557,833 acre-feet per year as of the year 2010 and 548,580 acre-feet per year in 2060.

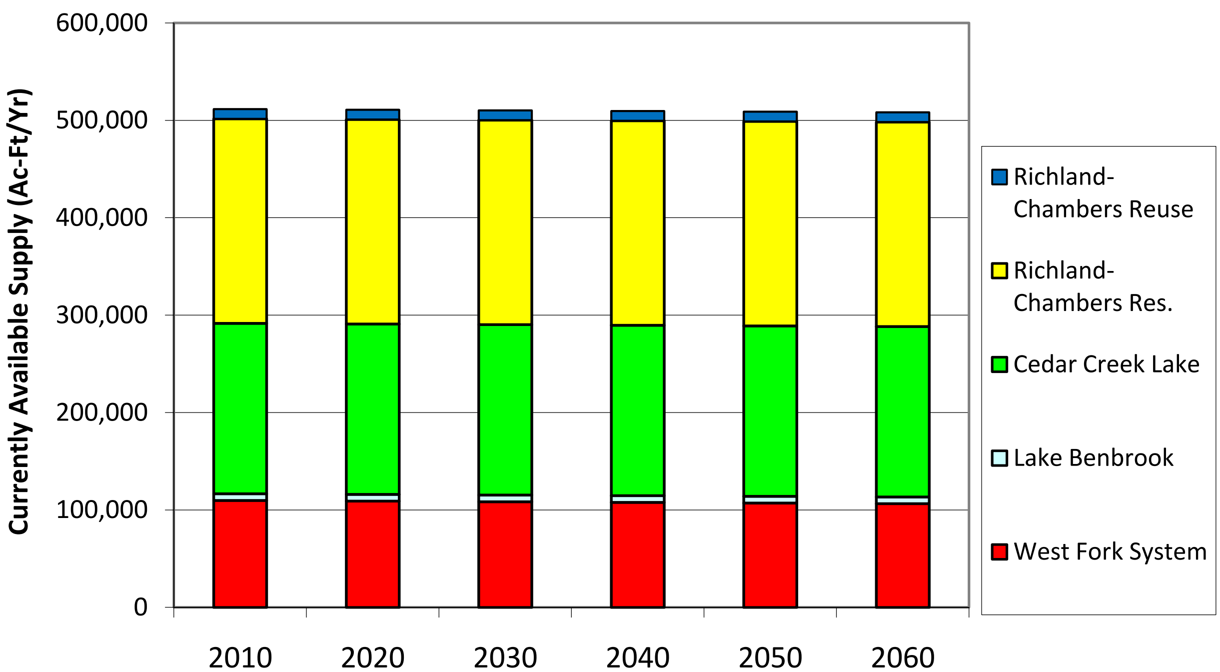
**Figure 3.3**
**Currently Available Water Supplies for Dallas Water Utilities**



## Tarrant Regional Water District

Figure 3.4 shows the currently available water supply for Tarrant Regional Water District (TRWD). TRWD's water supply system includes Cedar Creek Reservoir, Richland-Chambers Reservoir, Richland-Chambers reuse supply, Benbrook Lake, Lake Bridgeport, Eagle Mountain Lake and Lake Worth (owned by Fort Worth). Lakes Bridgeport, Eagle Mountain, and Worth are operated as the West Fork system. The currently available water supply as of 2060 is 508,333 acre-feet per year on a firm yield basis. The Richland-Chambers Reservoir reuse project is an existing water supply source that was a water management strategy for TRWD in the *2006 Region C Water Plan* (2). This project adds 10,000 acre-feet per year of currently available supply to the TRWD system. The water is used for municipal, mining, industrial, and agricultural purposes. Further development of the Richland-Chambers Reservoir reuse project is a water management strategy for TRWD and is discussed in Chapter 4. TRWD also has a water right allowing it to divert return flows from the Trinity River into Cedar Creek Reservoir. This project is a water management strategy for TRWD and is discussed in more detail in Chapter 4.

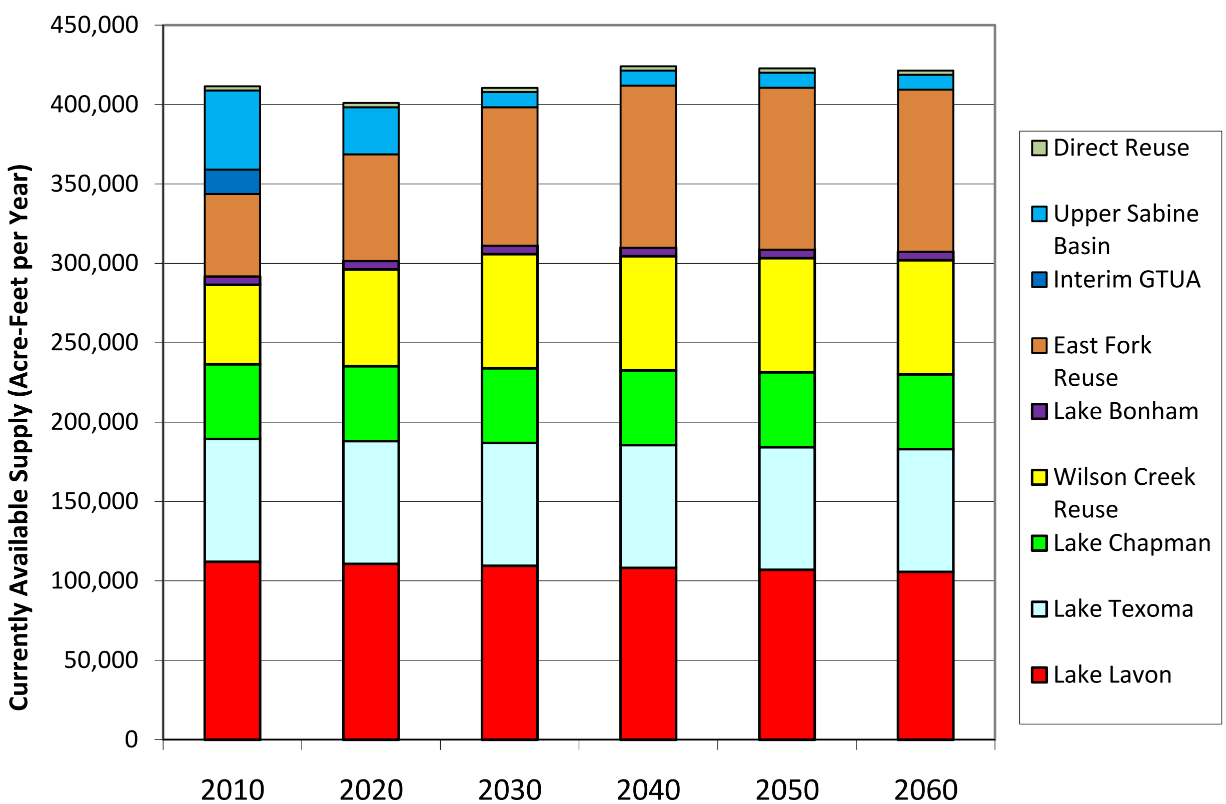
**Figure 3.4**
**Currently Available Water Supplies for the Tarrant Regional Water District**



## North Texas Municipal Water District

Figure 3.5 shows the currently available water supply for the North Texas Municipal Water District (NTMWD). NTMWD's sources of supply include Lake Lavon, Lake Texoma, Chapman Lake (in Region D), direct reuse from several NTMWD wastewater treatment plants, return flows into the Lake Lavon watershed, Bonham Lake, return flows from the East Fork Raw Water Supply Project, raw water from the Upper Sabine Basin, and an interim raw water supply from GTUA. The East Fork Raw Water Supply Project, Upper Sabine Basin supply, interim GTUA supply, additional yield from Lake Lavon, and additional Wilson Creek Wastewater Treatment Plant reuse were all water management strategies for NTMWD in the *2006 Region C Water Plan* [(2)].

**Figure 3.5**
**Currently Available Water Supplies for the North Texas Municipal Water District**




## City of Fort Worth

Fort Worth obtains raw water from the Tarrant Regional Water District and sells treated water to wholesale and retail customers. The City currently provides reuse water for golf course irrigation and is expanding its system to provide reuse water to the City of Arlington, City of Euless, Dallas-Fort Worth International Airport, and additional retail customers within the Fort Worth city limits. As shown in Table 3.8, Fort Worth's currently available supply is between 248,876 acre-feet per year and 278,645 acre-feet per year throughout the planning period.

### Trinity River Authority

The Trinity River Authority (TRA) has water rights in Joe Pool Lake, Navarro Mills Lake, and Bardwell Lake in Region C. TRA also imports water from Lake Livingston in Region H (by an upstream diversion from the Trinity River) and has permits and authorization for three reuse projects, two of which are in operation. TRA purchases water from the Tarrant Regional Water District for its Tarrant County water supply project and has plans to purchase water from TRWD for use in Ellis County. Based on the WAM and reuse permit amounts, TRA's independent supply in Region C from current sources is projected to be 62,470 acre-feet as of 2060. This is in addition to the water it purchases from the Tarrant Regional Water District. The TRA has also received several recent water right amendments that will allow the diversion of up to 251,328 acre-feet per year of return flows for beneficial use.

### Upper Trinity Regional Water District

As shown in Table 3.8, the Upper Trinity Regional Water District (UTRWD) has water supply available from Chapman Lake (in Region D, purchased from the Sulphur River Water District), Dallas Water Utilities, City of Denton, and reuse projects. UTRWD provides treated water to customers in Denton County and surrounding counties. UTRWD has recently received a water right amendment which allows the District to divert from Lake Lewisville up to 9,664 acre-feet per year of return flows, originating from UTRWD's Lake Chapman water, for municipal and industrial purposes.

### Greater Texoma Utility Authority

The Greater Texoma Utility Authority (GTUA) has water rights for 81,500 acre-feet per year from Lake Texoma and sells raw water to Sherman, which operates a desalination and treatment plant. Additional information regarding the Sherman Desalination Facility is provided in Appendix I. The yield of Lake Texoma is sufficient to provide 81,500 acre-feet per year through the year 2060. Congress allocated 50,000 acre-feet of storage in Lake Texoma from hydropower to municipal use for the GTUA. In early 2010, GTUA received a water right for this additional 50,000 acre-feet of storage and an additional 56,500 acre-feet per year of supply. This additional 56,500 acre-feet per year is combined with GTUA's previous right of 25,000 acre-feet per year for a total of 81,500 acre-feet per year.

### Dallas County Park Cities MUD

Dallas Cities Park Cities Municipal Utility District (PCMUD) holds water rights in Grapevine Lake and supplies treated water to Highland Park and University Park in Dallas County. PCMUD also has a contract with the City of Grapevine allowing Grapevine to reuse return flows discharged to Grapevine Lake from Grapevine's Peach Street WWTP.

### City of Corsicana

The City of Corsicana purchases water from Navarro Mills Lake from the Trinity River Authority. The firm yield of the lake ranges from 19,342 acre-feet per year in 2010 to14,300 acre-feet per year in 2060. The currently available supply for the City of Corsicana is limited by the capacity of its Navarro Mills water treatment plant to 11,210 acre-feet per year. Corsicana also has water rights in Lake Halbert and Richland-Chambers Reservoir, which was recently connected to the City's system. With the connection to Richland-Chambers Reservoir, the combined firm yield from Corsicana's share of Richland-Chambers Reservoir and from Lake Halbert is 13,830 acre-feet per year as of 2060. The currently available supply to Corsicana from Richland-Chambers Reservoir and Lake Halbert is 2,242 acre-feet per year because it is limited by the water treatment plant capacity at Lake Halbert.

### Sabine River Authority

As shown in Table 3.8, the Sabine River Authority (SRA) has water supplies available from Lake Tawakoni and Lake Fork Reservoir in Region D and from Toledo Bend Reservoir and a run-of-the-river water right in Region I. SRA supplies water to Region C from Lake

Tawakoni and Lake Fork Reservoir through sales to Dallas Water Utilities and North Texas Municipal Water District. SRA also supplies water to other water suppliers in the Upper Sabine Basin, mostly located in Region D (but with some service in Region C). SRA's supplies from Lake Tawakoni and Lake Fork Reservoir are fully committed, but SRA has significant uncommitted supplies in Toledo Bend Reservoir.

#### Sulphur River Water District

The Sulphur River Water District (SRWD) holds water rights in Chapman Lake in Region C. SRWD supplies Chapman Lake raw water to UTRWD in Region C and suppliers in Region D.

#### Upper Neches River Municipal Water Authority

The Upper Neches River Municipal Water Authority (UNRMWA) holds water rights in Lake Palestine in Region I and has a contract to provide water to Dallas Water Utilities in Region C. UNRMWA also provides water from Lake Palestine to suppliers in Region I. DWU has not yet developed the facilities to deliver Lake Palestine water to DWU and plans to connect this supply in the future.

### *3.5 Current Water Supplies Available to Local Wholesale Water Providers*

The supplies currently available to local wholesale water providers are summarized in Table 3.9. Many of the local wholesale water providers purchase their water from the regional suppliers and sell that water to their customers. Entities buying and selling water in this manner include:

- Argyle Water Supply Corporation purchases some of their supply from Upper Trinity Regional Water District.
- Bartonville Water Supply Corporation purchases some of their supply from Upper Trinity Regional Water District.
- City of Denton plans to purchase some of their supply from Dallas Water Utilities.
- City of Ennis purchases water from the Trinity River Authority (Bardwell Lake) and the Tarrant Regional Water District through the Trinity River Authority.
- City of Forney purchases water from North Texas Municipal Water District and purchases reuse water from Garland for Steam Electric Power.

- City of Garland purchase water from North Texas Municipal Water District and sells reuse water to Forney for Steam Electric Power.
- City of Mansfield purchases water from the Tarrant Regional Water District.
- City of McKinney purchases water from North Texas Municipal Water District.
- City of Midlothian purchases water from Trinity River Authority (Joe Pool Lake, with plans for Tarrant Regional Water District supplies through the Trinity River Authority as well).
- City of North Richland Hills purchases water from Tarrant Regional Water District through Fort Worth and Trinity River Authority.
- City of Rockwall purchases the water from North Texas Municipal Water District.
- City of Seagoville purchases water from Dallas Water Utilities.
- City of Sherman purchases water from Greater Texoma Utility Authority.
- City of Terrell purchases water from North Texas Municipal Water District.
- City of Waxahachie purchases some of its water from the Trinity River Authority (Bardwell Lake) and the Tarrant Regional Water District through the Trinity River Authority.
- City of Weatherford purchases some of its water from Tarrant Regional Water District.
- East Cedar Creek Freshwater Supply District purchases water from Tarrant Regional Water District (Cedar Creek Reservoir).
- Lake Cities Municipal Utility Authority purchases water from Upper Trinity Regional Water District.
- Mustang Special Utility District purchases water from Upper Trinity Regional Water District.
- Rockett Special Utility District purchases water from Midlothian, Waxahachie, and the Tarrant Regional Water District through the Trinity River Authority.
- Walnut Creek Special Utility District purchases water from Tarrant Regional Water District.
- West Cedar Creek Municipal Utility District purchases water from Tarrant Regional Water District.
- Wise County Water Supply District purchases water from Tarrant Regional Water District.

The remaining local wholesale water providers supply water to their customers from their own water supplies.

### *3.6 Water Availability by Water User Group (WUG)*

As part of the regional water planning process, the TWDB requires development of information on currently available water supplies for each water user group (WUG) by river basin and county. (Water user groups are cities with populations greater than 500, water suppliers who serve an average of at least 0.25 million gallons per day (mgd) annually, "county-other" municipal uses, and countywide manufacturing, irrigation, mining, livestock, and steam electric uses.) The availability figures by water user group are limited by contracts and existing physical facilities, including transmission facilities, groundwater wells, and water treatment. The supplies available to each WUG are shown in Appendix J.

As the information on currently available water supply for WUGs was developed, several important points became apparent:

- Most water user groups in Region C will need additional water supplies over the next 50 years to meet growing demands.
- Current groundwater use in a few areas exceeds the long-term reliable supply.
- There are some significant water supplies that can be made available by the development of additional water transmission facilities. Examples include full development of Dallas Water Utilities' share of Lake Fork Reservoir in the Sabine Basin and Lake Palestine in the Neches Basin.

### *3.7 Summary of Current Water Supply in Region C*

1. Region C water suppliers are currently using most of the reliable supply available from in-region reservoirs. The current use from some in-region reservoirs exceeds the reliable supplies that would be available in an extended drought. (In all cases where this is being done, the water suppliers have developed or are developing access to other supplies.)
2. The projected overall water supply available to Region C in 2060 from current sources is 2,373,705 acre-feet per year. (This figure does not consider supply limitations due to the capacities of current raw water transmission facilities and wells.) The sources of supply for Region C in 2060 include:
    - 11,305,213 acre-feet per year (55%) from in-region reservoirs
    - 146,152 acre-feet per year (6%) from groundwater
    - 43,906 acre-feet per year (2%) from local supplies
    - 336,082 acre-feet per year (14%) from reuse
    - 542,352 acre-feet per year (23%) from imports from other regions

3. The supply currently available to Region C from existing sources in 2060 (1.79 million acre-feet per year) is significantly less than the projected 2060 water use, which is over 3.27million acre-feet per year.
4. Considering supply limitations due to the capacities of current raw water transmission facilities and wells, the currently available supply for Region C water users in 2060 is 1,779,896 acre- feet per year, with 13,946 acre-feet per year for water users in other regions. The total available supply is 1,793,842 acre-feet per year, which is 579,863 acre-feet per year less than the overall supply from existing sources. Most water user groups will have to make improvements to their facilities to provide for projected needs.
5. The currently available supply for 2060 presented in this plan (1,793,842 acre-feet per year) is significantly greater than what was in the 2006 Region C Plan (1,391,001 acre-feet per year), demonstrating on-going development by Region C suppliers.
6. Several major water suppliers will require additional raw water transmission facilities to make full use of their existing sources.
7. Current groundwater use in a few areas in Region C exceeds the projected long-term water supply availability. Supplies from other sources will be needed in these areas so that groundwater use can be reduced to sustainable levels.
8. Some sources of supply will probably not be utilized fully during the period covered by this plan, but these will generally be the smaller local supplies.
9. The two operating desalination facilities in Region C are capable of treating 8,550 acre-feet per year of brackish water within Region C. The City of Sherman facility treats water from Lake Texoma, and the City of Bardwell facility treats local groundwater. Additional information regarding desalination in Region C is provided in Appendix I.

**Table 3.9**
**Currently Available Supplies to Local Wholesale Water Providers in Region C**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Argyle WSC | Groundwater | 667 | 667 | 667 | 667 | 667 | 667 |
| | UTRWD | 1,775 | 1,251 | 1,179 | 1,017 | 911 | 882 |
| | **Total** | **2,442** | **1,918** | **1,846** | **1,684** | **1,578** | **1,549** |
| Arlington | Lake Arlington (TRWD) | 9,850 | 9,700 | 9,550 | 9,400 | 9,250 | 9,100 |
| | TRWD | 68,006 | 77,114 | 69,406 | 62,992 | 55,473 | 48,949 |
| | **Total (limited by WTP capacity)** | **77,856** | **86,814** | **78,956** | **72,392** | **64,723** | **58,049** |
| Athens Municipal Water Authority | Lake Athens (firm yield) | 6,064 | 5,983 | 5,903 | 5,822 | 5,741 | 5,660 |
| | Lake Athens (operational yield) | 2,900 | 2,900 | 2,900 | 2,900 | 2,900 | 2,900 |
| | Reuse for Fish Hatchery | 2,872 | 0 | 0 | 0 | 0 | 0 |
| | **Total (limited by operation)** | **5,772** | **2,900** | **2,900** | **2,900** | **2,900** | **2,900** |
| Bartonville WSC | UTRWD | 1,170 | 708 | 540 | 447 | 381 | 355 |
| | Trinity Aquifer | 449 | 449 | 449 | 449 | 449 | 449 |
| | **Total** | **1,619** | **1,157** | **989** | **896** | **830** | **804** |
| Bolivar WSC | UTRWD | 773 | 720 | 1,120 | 1,660 | 2,023 | 2,327 |
| | Trinity Aquifer | 1,548 | 1,548 | 1,548 | 1,548 | 1,548 | 1,548 |
| | **Total** | **2,321** | **2,268** | **2,668** | **3,208** | **3,571** | **3,875** |
| Dallas County WCID #6 | **Total (from DWU)** | **2,516** | **2,156** | **2,112** | **2,014** | **1,909** | **1,731** |
| Denton | Lake Lewisville | 7,918 | 7,817 | 7,715 | 7,613 | 7,512 | 7,410 |
| | Lake Ray Roberts | 18,980 | 18,720 | 18,460 | 18,200 | 17,940 | 17,680 |
| | Indirect Reuse | 1,682 | 8,861 | 11,557 | 12,907 | 12,726 | 12,545 |
| | DWU | 0 | 0 | 5,310 | 12,883 | 20,694 | 33,332 |
| | **Subtotal (limited by WTP capacity)** | **28,580** | **31,949** | **31,949** | **31,949** | **31,949** | **31,949** |
| | Reuse (Steam Electric Power and Irrigation) | 1,233 | 2,242 | 2,690 | 3,251 | 3,924 | 4,708 |
| | **Total** | **29,813** | **34,191** | **34,639** | **35,200** | **35,873** | **36,657** |
| East Cedar Creek FWSD | **TRWD (limited by contract)** | **2,330** | **2,608** | **2,587** | **2,446** | **2,358** | **2,271** |

**Table 3.9, Continued**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Ennis | Bardwell Lake (TRA) | 4,712 | 4,484 | 4,257 | 4,030 | 4,802 | 3,575 |
| | TRA (TRWD Sources) | 0 | 1,042 | 2,012 | 2,692 | 2,358 | 2,871 |
| | Direct Reuse | 800 | 800 | 800 | 800 | 800 | 800 |
| | **Total** | **5,512** | **6,326** | **7,069** | **7,522** | **6,960** | **7,246** |
| Forney | NTMWD | 3,717 | 6,367 | 6,692 | 7,007 | 7,265 | 7,729 |
| | Reuse from Garland (Steam Electric only) | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 |
| | **Total** | **12,696** | **15,346** | **15,671** | **15,986** | **16,244** | **16,708** |
| Gainesville | Trinity Aquifer | 2,360 | 2,360 | 2,360 | 2,360 | 2,360 | 2,360 |
| | Moss Lake (limited by WTP) | 1,120 | 1,120 | 1,120 | 1,120 | 1,120 | 1,120 |
| | Direct Reuse | 9 | 9 | 9 | 9 | 9 | 9 |
| | **Total** | **3,489** | **3,489** | **3,489** | **3,489** | **3,489** | **3,489** |
| Garland | NTMWD (Treated and raw water) | 45,634 | 37,649 | 33,741 | 30,411 | 27,702 | 25,973 |
| | Reuse sold to Forney (Steam Electric only) | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 |
| | **Total** | **54,613** | **46,628** | **42,720** | **39,390** | **36,681** | **34,952** |
| Grand Prairie | Groundwater | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 |
| | Joe Pool Raw Water | 300 | 300 | 300 | 300 | 300 | 300 |
| | Fort Worth (TRWD) | 1,065 | 1,028 | 874 | 756 | 662 | 577 |
| | DWU | 21,897 | 12,147 | 15,303 | 17,615 | 19,404 | 17,062 |
| | **Total** | **27,462** | **17,676** | **20,677** | **22,871** | **24,566** | **22,139** |
| Lake Cities MUA | UTRWD | 2,099 | 995 | 775 | 651 | 525 | 465 |
| | Trinity Aquifer | 150 | 150 | 150 | 150 | 150 | 150 |
| | Woodbine Aquifer | 324 | 324 | 324 | 324 | 324 | 324 |
| | **Total** | **2,573** | **1,469** | **1,249** | **1,125** | **999** | **939** |
| Mansfield | **TRWD (limited by WTP)** | **14,965** | **16,815** | **16,815** | **16,815** | **16,815** | **16,815** |
| Midlothian | Joe Pool Lake | 5,954 | 5,833 | 5,712 | 5,591 | 5,470 | 5,349 |
| | Joe Pool Lake from Grand Prairie | 1,304 | 1,272 | 1,239 | 1,207 | 1,174 | 1,141 |
| | **Total** | **7,258** | **7,104** | **6,951** | **6,798** | **6,644** | **6,490** |

**Table 3.9, Continued**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Mustang SUD | Trinity Aquifer | 1,162 | 1,162 | 1,162 | 1,162 | 1,162 | 1,162 |
| | UTRWD Sources | 1,096 | 1,128 | 1,080 | 1,239 | 1,325 | 1,457 |
| | **Total** | **2,258** | **2,290** | **2,242** | **2,401** | **2,487** | **2,619** |
| North Richland Hills | TRWD (through Ft Worth & TRA) | 15,906 | 16,092 | 14,416 | 12,832 | 11,487 | 10,212 |
| | Trinity Aquifer | 233 | 233 | 233 | 233 | 233 | 233 |
| | **Total** | **16,139** | **16,325** | **14,649** | **13,065** | **11,720** | **10,445** |
| Princeton | **NTMWD** | **2,207** | **3,261** | **3,885** | **5,294** | **7,431** | **9,948** |
| Rockett SUD | Midlothian | 1,926 | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 |
| | Waxahachie | 0 | 0 | 0 | 0 | 0 | 0 |
| | TRA (TRWD Sources) | 4,356 | 7,256 | 8,003 | 7,779 | 7,235 | 6,413 |
| | TRA/TRWD (limited by WTP) | 4,356 | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 |
| | **Total** | **6,282** | **7,842** | **7,842** | **7,842** | **7,842** | **7,842** |
| Rockwall | **NTMWD** | **11,444** | **14,568** | **15,481** | **16,174** | **15,009** | **13,950** |
| Seagoville | **DWU** | **2,601** | **2,944** | **3,491** | **3,941** | **4,308** | **4,414** |
| Sherman | Trinity Aquifer | 4,083 | 4,083 | 4,083 | 4,083 | 4,083 | 4,083 |
| | Woodbine Aquifer | 3,463 | 3,463 | 3,463 | 3,463 | 3,463 | 3,463 |
| | GTUA | 13,600 | 13,600 | 13,600 | 13,600 | 13,600 | 13,600 |
| | **Total** | **21,146** | **21,146** | **21,146** | **21,146** | **21,146** | **21,146** |
| Terrell | **North Texas Municipal Water District** | **5,490** | **10,081** | **12,050** | **13,739** | **14,103** | **14,910** |
| Walnut Creek SUD | TRWD | 3,575 | 5,124 | 6,694 | 7,320 | 7,233 | 6,999 |
| | **Total (limited by WTP capacity)** | **3,575** | **4,204** | **4,204** | **4,204** | **4,204** | **4,204** |

**Table 3.9, Continued**

| Provider | Source | Water Supply Currently Available (Acre-Feet per Year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Waxahachie | Lake Waxahachie | 2,905 | 2,800 | 2,695 | 2,590 | 2,485 | 2,380 |
| | TRA (Bardwell) | 4,320 | 4,320 | 4,183 | 3,988 | 3,794 | 3,600 |
| | Rockett SUD (for retail connections) | 613 | 613 | 613 | 613 | 613 | 613 |
| | Reuse | 4,998 | 5,129 | 5,129 | 5,129 | 5,129 | 5,129 |
| | TRA (TRWD Sources for Sokol WTP) | 2,325 | 2,440 | 3,765 | 6,978 | 9,822 | 11,487 |
| | Sokol WTP (limited by capacity) | 2,325 | 2,440 | 3,765 | 5,605 | 5,605 | 5,605 |
| | **Total (limited by WTP capacity)** | **11,346** | **11,461** | **12,786** | **14,626** | **14,626** | **14,626** |
| Weatherford | Lake Weatherford | 2,967 | 2,923 | 2,880 | 2,837 | 2,793 | 2,750 |
| | Benbrook Lake (TRWD) | 3,076 | 4,550 | 4,998 | 5,243 | 5,389 | 5,486 |
| | **Total (limited by WTP capacity)** | **6,043** | **7,473** | **7,840** | **7,840** | **7,840** | **7,840** |
| West Cedar Creek SUD | **TRWD (limited by contract)** | **1,714** | **1,714** | **1,714** | **1,714** | **1,714** | **1,714** |
| Wise Co. WSD | TRWD | 1,730 | 1,966 | 2,258 | 2,496 | 2,810 | 2,873 |
| | **Total (limited by WTP capacity)** | **1,730** | **1,754** | **1,754** | **1,754** | **1,754** | **1,754** |

## CHAPTER 3
## LIST OF REFERENCES


(1) Texas Water Development Board, *Exhibit C General Guidelines for Regional Water Plan Development (2007-2011)*, Austin, [Online] Available URL: http://www.twdb.state.tx.us/wrpi/rwp/docu.htm, September 8, 2008.

(2) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

(3) Texas Water Development Board: "GAM Run 08-84mag," Managed available groundwater estimates for the Trinity Aquifer in Groundwater Management Area 8, Austin, March 2009.

(4) Texas Water Development Board: "GAM Run 08-14mag," Managed available groundwater estimates for the Woodbine Aquifer in Groundwater Management Area 8, Austin, December 2008.

(5) Espey Consultants, Inc., Brown and Root, Inc., Freese and Nichols, Inc., GSG Inc., Crespo Consulting Services, Inc.: *Final Water Availability Models for the Trinity, Trinity-San Jacinto, and Neches-Trinity Basins,* prepared for the Texas Natural Resource Conservation Commission, Austin, March 2002.

(6) Brown and Root Services, Freese and Nichols, Inc., Espey-Padden, and Crespo Consultants: *Final Report Water Availability Modeling for the Neches River Basin,* prepared for the Texas Natural Resource Conservation Commission, Houston, January 2000.

(7) Espey Consulting, Inc., PBS&J, Halff Associates, Inc., Crespo Consulting Services, Inc., and CivilTech Engineering, Inc.: *Water Availability Models for the Red and Canadian River Basins,* prepared for the Texas Natural Resource Conservation Commission, Austin, March 2002.

(8) Brown and Root Services, R.J. Brandes Company, and Crespo Consultants: *Final Report Water Availability Modeling for the Sabine River Basin,* prepared for the Texas Natural Resource Conservation Commission, Houston, December 2001.

(9) R.J. Brandes Company: *Final Report Water Availability Modeling for the Sulphur River Basin,* prepared for the Texas Natural Resource Conservation Commission, Austin, June 1999.

(10) Intera and Parsons, *Final Report Groundwater Availability Model for the Northern Carrizo-Wilcox Aquifer,* prepared for the Texas Water Development Board, Austin, January 31, 2003.

# 4. Identification, Evaluation, and Selection of Water Management Strategies

This chapter of the report covers the heart of the *2011 Region C Water Plan* - the identification, evaluation, and selection of water management strategies. Since the required content of Chapter 4 covers a great deal of material, we have divided the chapter into sections as follows:

4A – Comparison of Current Water Supply and Projected Demand

4B – Water Conservation and Reuse

4C – Methodology for Evaluation and Selection of Water Management Strategies

4D – Evaluation of Major Water Management Strategies

4E – Recommended Water Management Strategies for Wholesale Water Providers

4F – Recommended Water Management Strategies for Water User Groups by County

4G – TWDB Required Tables

4H – Summary of Special Studies

# 4A. Comparison of Current Water Supply and Projected Demand

Texas Water Development Board (TWDB) guidelines require that reserves and needs for additional water supply be determined for each water user group in the region based on the comparison of current water supply and projected demand. The specific surpluses and needs shown should be treated with caution because their development requires certain assumptions:

- TWDB guidelines require that the comparison be based on currently connected supplies, without considering future connection of already developed supplies [1].
- The division of existing supplies among users can be made in many ways. For example, the amount of groundwater available in a county on a sustainable basis was divided among users based on historical use and on well capacities. The actual future groundwater use may differ from these assumptions.

The resulting comparison shows the reserves and needs that will exist in Region C <u>if no steps are taken to connect existing water supplies or develop to additional water supplies</u>. This comparison is specifically required by Texas Water Development Board planning guidelines [1]. Development of infrastructure to make existing supplies available to users and development of new supplies are treated as water management strategies, and they will be discussed in Sections 4C, 4D, 4E, and 4F.

In the remainder of this section, projected water demands are compared to currently available water supplies, and projected water shortages and reserves are identified for Region C as a whole (Section 4A.1), for wholesale water providers (Section 4A.2), and for water user groups (Section 4A.3). Finally, the projected shortages are summarized (Section 4A.4), and the socio-economic impacts of not meeting the projected shortages are discussed (Section 4A.5).

## *4A.1 Regional Comparison of Supply and Demand*

Table 4A.1 and Figure 4A.1 summarize the comparison of total currently connected water supply and total projected water demand in Region C, considering all water user groups. If only water user groups with projected shortages (and not reserves) are considered, there is a need for approximately 77,671 acre-feet per year of additional supply by 2010, growing to a need for 1.55 million acre-feet per year of additional supply by 2060,

**Table 4A.1**
**Comparison of Connected Supply with Projected Demand by Decade in Region C**
-Values in Acre-Feet per Year-

| Item | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Connected Supply in Region C | 1,799,744 | 1,774,665 | 1,775,510 | 1,786,914 | 1,787,981 | 1,779,896 |
| Projected Demand | 1,761,353 | 2,078,744 | 2,377,738 | 2,655,102 | 2,942,321 | 3,272,461 |
| Total Regional Reserve or (Need) | 38,391 | (304,079) | (602,228) | (868,188) | (1,154,340) | (1,492,565) |
| Regional Reserve or (Need) Considering Only Water User Groups With Needs | (77,671) | (390,942) | (672,469) | (931,670) | (1,212,980) | (1,549,377) |
| Counties with Needs | 3 | 11 | 13 | 13 | 14 | 14 |
| User Groups with Needs | 205 | 292 | 308 | 314 | 317 | 319 |

**Figure 4A.1**
**Comparison of Connected Supply with Projected Demand by Decade for Region C**

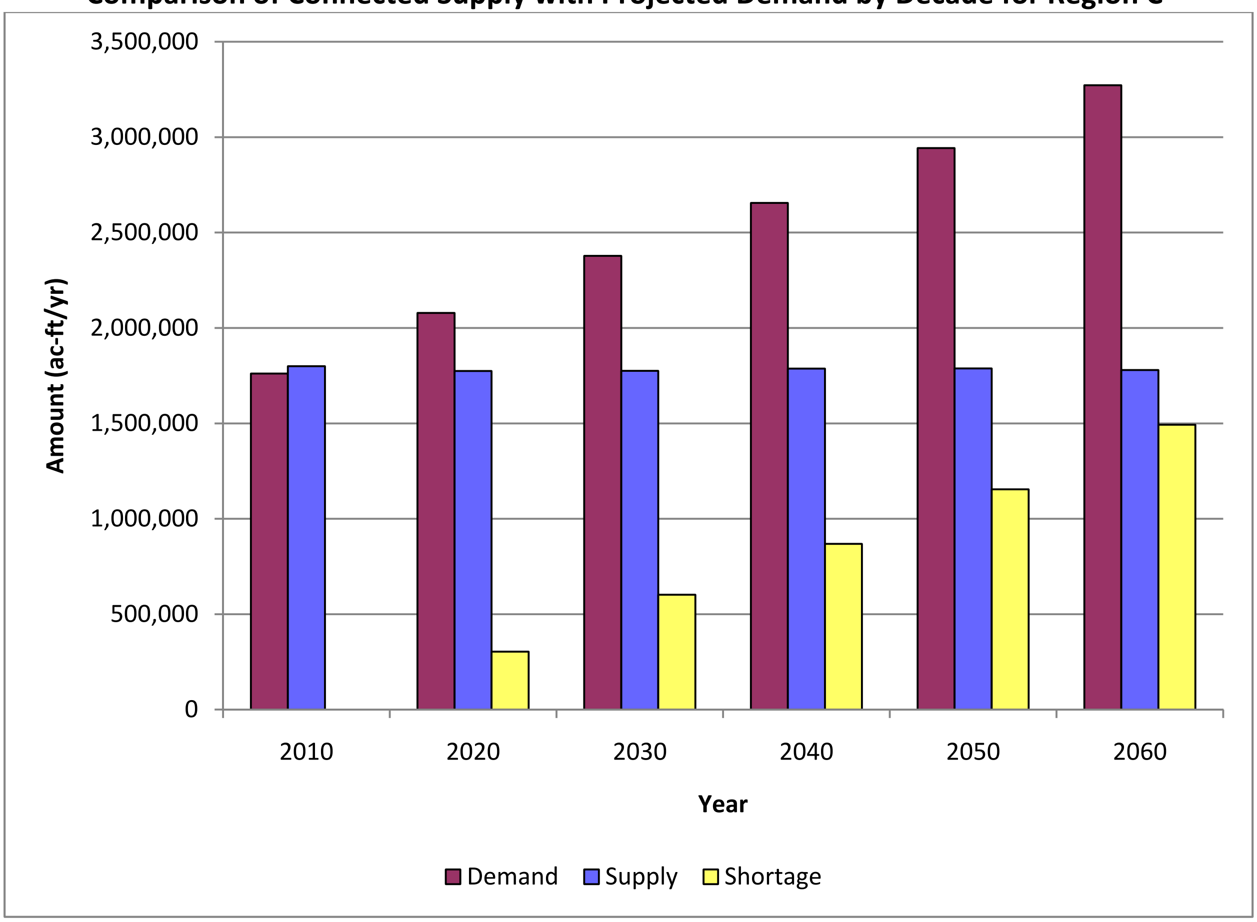
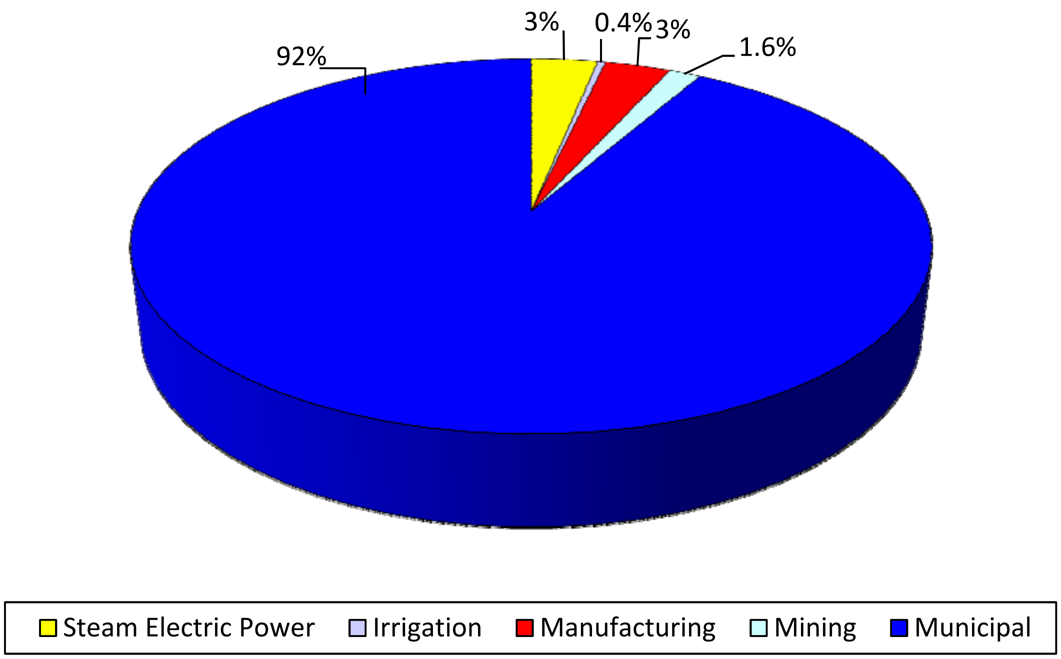


**Figure 4A.2**
**Projected Shortage by Use Type for Region C in 2060**




based on currently connected supplies. Figure 4A.2 shows the projected distribution of shortages. Ninety-two percent of the projected shortage in 2060 is for municipal users. It should be noted that most of the "shortages" shown for 2010 are fully met with expected conservation savings which is treated as a water management strategy rather than a currently available supply.

Table 4A.2 shows the comparison of supply and demands by county. In 2010, Dallas, Rockwall, and Tarrant Counties (3 out of 16 in the region) show a net need for more water. By 2060, only Fannin and Jack Counties show a net surplus. Most of the surplus in Fannin County is attributed to surplus supply for irrigation from run-of-the-river water rights in the Red River Basin. There are seven water user groups with projected 2060 shortages in Fannin County, totaling over 8,000 acre-feet per year. On a regional basis, 319 out of 357 water users in Region C are predicted to have a need for additional water by 2060. In general, the largest water needs are in Collin, Dallas, Denton and Tarrant Counties, with lesser but significant needs in other counties.

The comparison of supply and demand in Table 4A.1 and Figure 4A.1 focuses on currently connected supplies. Region C also has a significant amount of unconnected supplies that could be made available to the region. An unconnected water supply is an existing and permitted supply that is not currently available due to infrastructure limitations. Table 4A.3 and Figure 4A.3 show the comparison of total supply with demand for Region C, including connected and unconnected supply. By 2030, the projected demand for Region C exceeds total connected and unconnected supply.

**Table 4A.2**
**Reserve or (Need) by County for Region C**
-Values in Acre-Feet per Year-

| County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Collin | 983 | (54,228) | (103,468) | (157,988) | (213,648) | (258,282) |
| Cooke | 97 | (1,062) | (1,919) | (2,643) | (3,810) | (4,801) |
| Dallas | (28,507) | (160,086) | (224,387) | (274,788) | (338,013) | (427,978) |
| Denton | 7,337 | (43,987) | (82,146) | (117,509) | (155,003) | (208,300) |
| Ellis | 1,279 | (7,553) | (13,884) | (22,656) | (34,033) | (47,583) |
| Fannin | 29,019 | 22,837 | 16,719 | 14,965 | 12,478 | 9,419 |
| Freestone | 17,733 | 11,319 | 8,037 | 3,474 | (1,707) | (7,736) |
| Grayson | 4,085 | (5,495) | (14,402) | (19,493) | (24,718) | (30,939) |
| Henderson | 9,267 | 2,333 | (5,783) | (8,303) | (11,149) | (14,447) |
| Jack | 1,286 | 1,231 | 1,193 | 1,165 | 1,119 | 1,062 |
| Kaufman | 607 | (7,387) | (13,499) | (19,741) | (26,208) | (33,317) |
| Navarro | 651 | (7,415) | (13,681) | (14,232) | (14,926) | (15,860) |
| Parker | 2,807 | 4,124 | (4,327) | (10,999) | (15,909) | (20,740) |
| Rockwall | (32) | (6,276) | (12,053) | (17,412) | (21,915) | (25,655) |
| Tarrant | (9,647) | (47,614) | (124,530) | (199,147) | (274,843) | (365,720) |
| Wise | 1,425 | (4,818) | (14,097) | (22,879) | (32,054) | (41,687) |
| **Total** | **38,391** | **(304,079)** | **(602,228)** | **(868,188)** | **(1,154,340)** | **(1,492,565)** |

**Table 4A.3**
**Comparison of Total Connected and Unconnected Supply with Region C Demand**
- Values in Acre-Feet per Year -

| Item | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Total Connected and Unconnected Supply | 2,335,133 | 2,347,912 | 2,360,542 | 2,374,535 | 2,369,994 | 2,373,705 |
| Demand | 1,761,353 | 2,078,744 | 2,377,738 | 2,655,102 | 2,942,321 | 3,272,461 |
| Reserve/(Need) | 573,780 | 269,168 | (17,196) | (280,567) | (572,327) | (898,756) |

### 4A.2 Comparison of Connected Supply and Projected Demand by Wholesale Water Provider

Under the planning rules, a wholesale water provider (WWP) is defined as an entity that sold or had contracts to sell more than 1,000 acre-feet of water on a wholesale basis in recent years or that is projected to sell more than 1,000 acre-feet per year on a wholesale basis during the planning period [1]. The Region C Water Planning Group has designated 41 wholesale water providers for Region C. Table 4A.4 summarizes the comparison of supply and demand and shows the reserves or needs for additional supply for each wholesale water provider. As a group, the wholesale water providers are projected to have a need for additional supply in each decade of the planning period. Steps to meet these projected needs will be discussed in Section 4E.

Two wholesale water providers do not have a projected shortage in Region C within the planning period: Dallas County Park Cities Municipal Utility District and Sulphur River Water District. Five wholesale water providers (Dallas Water Utilities, Tarrant Regional Water District, North Texas Municipal Water District, Trinity River Authority and Upper Trinity Regional Water District) provide water to meet approximately 90 percent of the total demand in Region C.

### 4A.3 Comparison of Connected Supply and Projected Demand by Water User Group

Projected supplies, demands, reserves, and shortages are summarized for each water user group in Appendix C. As shown on Table 4A.1, there are 319 water user groups with projected water shortages by 2060. These shortages range from 62 acre-feet per year for the City of Palmer to nearly 252,017 acre-feet per year for the City of Dallas.

Sections 4C through 4F of this report discusses the selection of water management strategies to address the requirements for additional supply. Many water user groups in Region C are served by wholesale water providers, and the needs of these water user groups will be addressed by obtaining additional supplies from the wholesale water providers. Other water user groups will require the development of individual water management strategies to address their needs.

**Figure 4A.3**
**Comparison of Connected and Unconnected Supply and Demand for Region C**

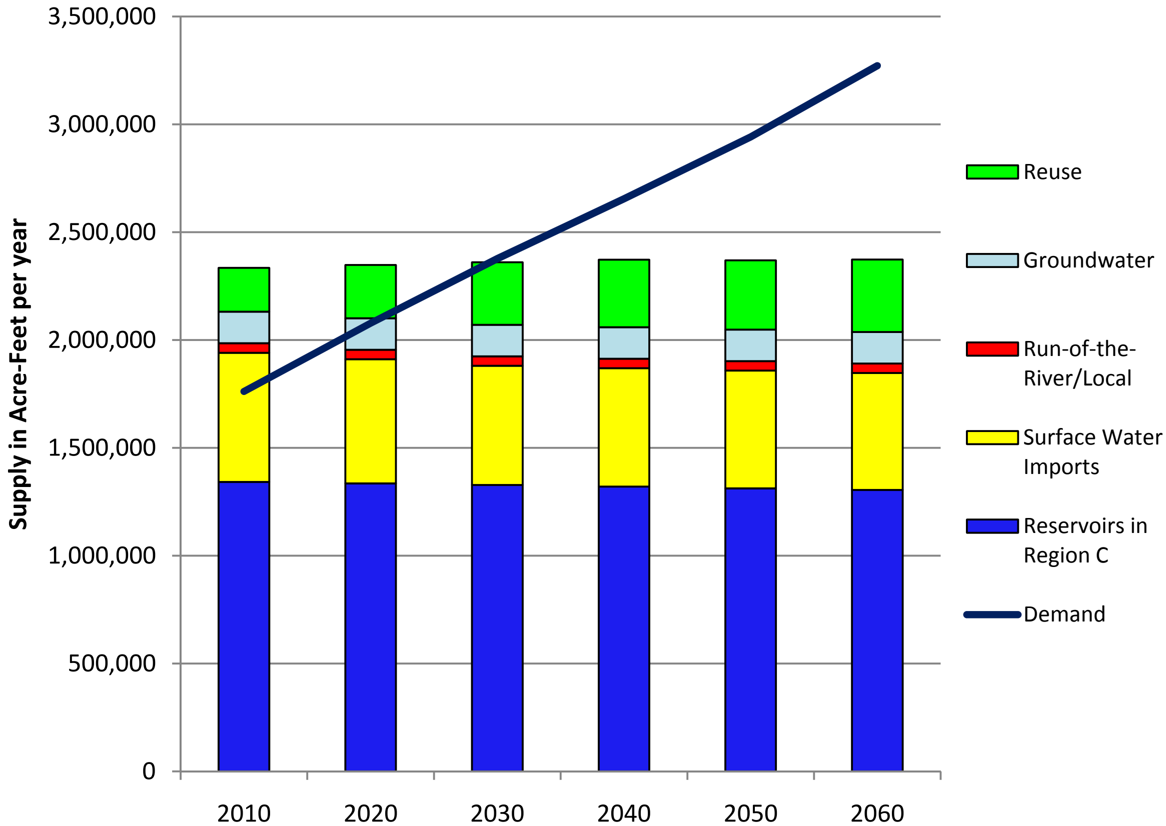



**Table 4A.4**
**Reserve or (Need) by Wholesale Water Provider Using Only Connected Supplies**
- Values in Acre-Feet per Year -

| Wholesale Water Provider | Projected Needs for Current and Future Customers | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Dallas Water Utilities | (48,797) | (171,460) | (207,076) | (257,089) | (326,980) | (445,790) |
| Tarrant Regional Water District | 0 | (49,680) | (147,533) | (244,544) | (351,389) | (477,251) |
| North Texas Municipal Water District | 0 | (91,679) | (170,209) | (243,628) | (313,320) | (368,061) |
| City of Fort Worth | (7,856) | (36,230) | (98,727) | (166,043) | (244,828) | (340,031) |
| Trinity River Authority | 0 | 0 | (16,750) | (31,912) | (51,767) | (76,052) |
| Upper Trinity Regional Water District | (1,744) | (756) | (22,211) | (48,242) | (77,525) | (100,520) |
| Greater Texoma Utility Authority | 0 | (10,574) | (23,123) | (32,739) | (43,849) | (56,756) |
| Dallas County Park Cities Municipal Utility District | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 4A.4, Continued**

| Wholesale Water Provider | Projected Needs for Current and Future Customers | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| City of Corsicana | 0 | (6,932) | (13,241) | (14,152) | (15,298) | (16,760) |
| Sabine River Authority | (94,103) | (97,032) | (99,960) | (102,888) | (105,817) | (108,745) |
| Sulphur River Water District | 0 | 0 | 0 | 0 | 0 | 0 |
| Upper Neches River Municipal Water Authority | (2,677) | (4,708) | (6,740) | (8,773) | (10,808) | (12,843) |
| Argyle Water Supply Corporation | 0 | (2,069) | (3,436) | (4,070) | (4,731) | (5,316) |
| City of Arlington | (2,330) | (7,541) | (20,225) | (30,982) | (39,035) | (46,678) |
| Athens Municipal Water Authority | 0 | (3,090) | (3,722) | (4,439) | (5,374) | (6,527) |
| Bartonville Water Supply Corporation | (43) | (1,271) | (1,639) | (1,834) | (2,004) | (2,136) |
| Bolivar Water Supply Corporation | 0 | (1,006) | (3,095) | (6,588) | (10,629) | (14,321) |
| Dallas County WCID #6 | (211) | (680) | (793) | (932) | (1,111) | (1,374) |
| City of Denton | 0 | (2,396) | (12,834) | (25,014) | (38,030) | (64,009) |
| East Cedar Creek Freshwater Supply District | (72) | (235) | (732) | (1,179) | (1,633) | (2,138) |
| City of Ennis | 0 | (93) | (569) | (1,632) | (4,154) | (6,399) |
| City of Forney | (38) | (1,358) | (2,673) | (3,926) | (5,287) | (6,649) |
| City of Gainesville | (130) | (1,332) | (2,047) | (2,794) | (3,891) | (4,897) |
| City of Garland | (758) | (8,608) | (13,989) | (17,470) | (20,531) | (22,685) |
| City of Grand Prairie | (1,972) | (22,616) | (24,775) | (27,405) | (30,785) | (33,211) |
| Lake Cities Municipal Utility Authority | 0 | (1,625) | (2,224) | (2,579) | (2,690) | (2,750) |
| City of Mansfield | (531) | (12,498) | (21,354) | (26,291) | (29,979) | (33,663) |
| City of Midlothian | (234) | (12,270) | (15,003) | (17,422) | (20,069) | (22,735) |
| Mustang Special Utility District | (27) | (2,023) | (3,251) | (5,101) | (7,079) | (9,041) |
| City of North Richland Hills | (139) | (1,448) | (4,073) | (6,186) | (7,957) | (9,612) |
| City of Princeton | (30) | (746) | (1,611) | (3,041) | (5,507) | (8,688) |
| Rockett Special Utility District | 0 | (1,749) | (4,105) | (5,372) | (6,088) | (6,289) |
| City of Rockwall | (109) | (3,332) | (6,420) | (9,292) | (11,123) | (12,184) |
| City of Seagoville | (228) | (976) | (1,376) | (1,911) | (2,626) | (3,666) |
| City of Sherman | 0 | (2,526) | (5,523) | (8,696) | (12,334) | (17,358) |
| City of Terrell | (46) | (2,304) | (4,996) | (7,892) | (10,454) | (13,021) |
| Walnut Creek Special Utility District | (88) | (1,380) | (4,384) | (6,645) | (8,040) | (9,384) |
| City of Waxahachie | 0 | (220) | (1,065) | (4,739) | (11,022) | (16,694) |
| City of Weatherford | (226) | (410) | (1,451) | (2,767) | (4,075) | (5,559) |
| West Cedar Creek Municipal Utility District | (603) | (1,564) | (2,375) | (3,124) | (4,086) | (5,299) |
| Wise County Water Supply District | (25) | (390) | (1,143) | (1,947) | (3,003) | (3,824) |

### 4A.4 Summary of Projected Water Shortages

- If no new supplies are developed, the total of projected shortages in Region C is 77,671 acre-feet per year by 2010, growing to 1,549,377 acre-feet per year by 2060.
- Many of the shortages in 2010 are fully addressed by water conservation measures.
- There are substantial unconnected supplies in Region C that could be made available by completing water transmission facilities.
- The number of Region C counties with net needs for more water changes from 3 out of 16 counties in 2010 to 14 out of 16 counties in 2060.
- There are 357 individual water user groups in Region C. Of these, 205 water user groups are projected to need more supply in 2010, growing to 319 water user groups by 2060.
- Many Region C water suppliers depend on the region's wholesale water providers for all or part of their supplies. All but two of the wholesale water providers will need to develop additional supplies by 2060.

### 4A.5 Socio-Economic Impacts of Not Meeting Projected Shortages

If no additional water supplies are developed, Region C will face substantial shortages in water supply over the next 50 years. The Texas Water Development Board (TWDB) provides technical assistance to regional water planning groups in the development of specific information on the socio-economic impacts of failing to meet projected water needs. This information is presented in Appendix N. A summary of the TWDB's socio-economic report (2) is presented in this section.

The TWDB analysis of socio-economic impacts is based on information on potential shortages in Region C provided to the TWDB by Region C. Table 4A.5 and Figures 4A.4 and 4A.5 summarize the TWDB's analysis of the impacts of a severe drought occurring in a single year at each decadal period in Region C. It was assumed that all of the projected shortage was attributed to drought. Under these assumptions, the TWDB's findings can be summarized as follows:

- With the projected shortages, the region's projected 2060 population would be reduced by approximately 2 percent.
- Without any additional supplies, the projected water needs would reduce the region's projected 2060 employment by nearly 547,000 jobs.

- Without any additional supplies, the projected water needs would reduce the region's projected annual income and taxes in 2060 by over $64 billion.
- The monetary value of domestic water shortages in 2060 is $11.7 billion.
- The lost water utility revenues (municipal sector only) in 2060 are $3.5 billion.

The projected impact on population and jobs over the planning period is shown on Figure 4A.4. The impacts to income and local and state taxes are shown on Figure 4A.5.

It is important to note that this socio-economic impact analysis only considers a severe drought occurring in a single year. A drought several years long would have an even greater impact on the region.

**Table 4A.5**
**Socio-Economic Impacts in Region C of Not Meeting Projected Demands**

| Year | Income ($ Millions) | State and Local Taxes ($ Millions) | Jobs Lost | Population Losses |
|---|---|---|---|---|
| 2010 | $2,682.23 | $129.50 | 23,808 | 12,490 |
| 2020 | $6,668.39 | $340.74 | 52,165 | 28,278 |
| 2030 | $15,687.26 | $847.87 | 131,257 | 73,478 |
| 2040 | $24,553.45 | $1,287.96 | 206,836 | 111,021 |
| 2050 | $33,440.87 | $1,671.87 | 270,935 | 148,215 |
| 2060 | $61,457.79 | $3,059.54 | 546,676 | 244,179 |

**Figure 4A.4**
**Socio-Economic Impacts of Not Meeting Projected Demands**

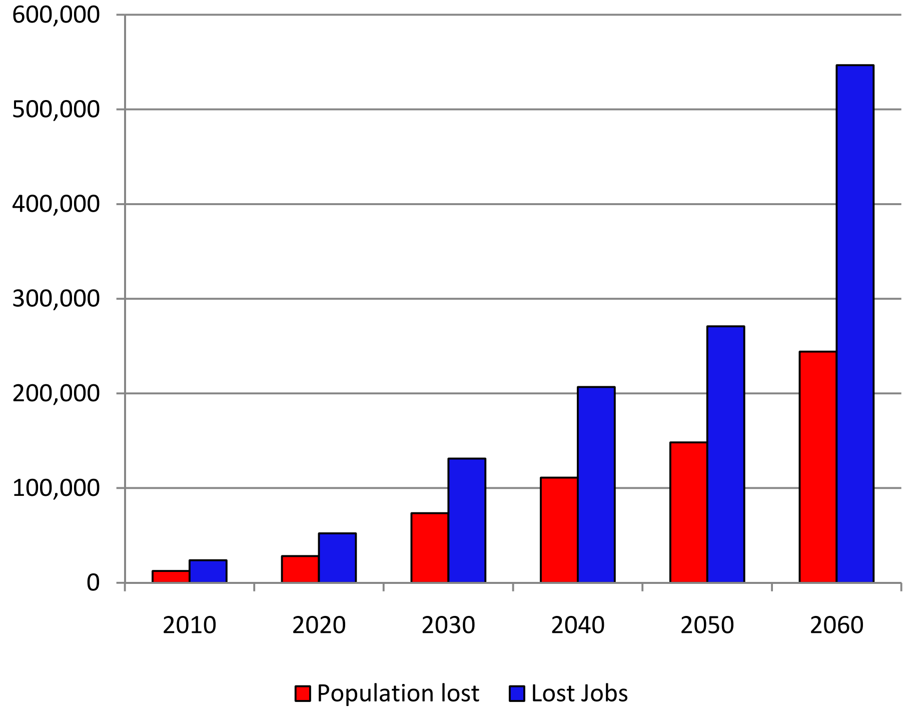
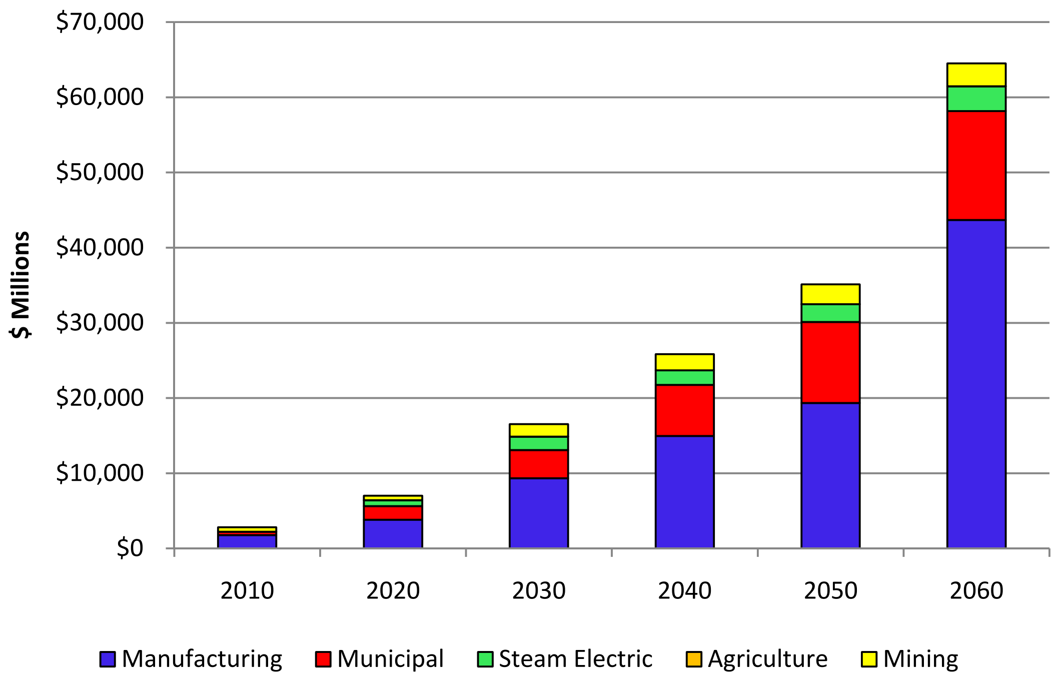



**Figure 4A.5**
**Projected Loss of Income and Taxes with Not Meeting Projected Demands**



**SECTION 4A**
**LIST OF REFERENCES**


(1) Texas Water Development Board, *Exhibit C General Guidelines for Regional Water Plan Development (2007-2011)*, Austin, [Online] Available URL: http://www.twdb.state.tx.us/wrpi/rwp/docu.htm, September 8, 2008.

(2) Texas Water Development Board, *Economic Impacts of Projected Water Shortages for the Region C Regional Water Planning Area,* Austin, July 2010 (Revised 1 September, 2010).

# 4B. Water Conservation and Reuse

During development of this plan, the Region C Water Planning Group placed strong emphasis on water conservation and reuse as a means of meeting projected water needs. This section provides overviews of water conservation (Section 4B.1), reuse (Section 4B.2), drought management measures (Section 4B.3), and a summary of recommended water conservation and reuse strategies for Region C (Section 4B.4). Chapter 6 includes more detailed discussions of Region C water conservation (including reuse) and drought management strategies and recommendations. Appendix K includes an estimation of savings and costs for water conservation strategies.

## *4B.1 Water Conservation*

The Texas Water Code §11.002(8) (1) defines *conservation* as "the development of water resources; and those practices, techniques, and technologies that will reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses." By this definition, it is clear that reuse of treated wastewater effluent is a water conservation measure.

Although water conservation measures and drought or emergency water management measures both save water, water conservation measures are fundamentally different from drought or emergency management measures. *Drought/emergency management measures* are temporary measures that are implemented when certain criteria are met and are terminated when these criteria are no longer met, while water conservation measures are designed to provide permanent or long-term water savings.

Currently implemented water conservation strategies and water conservation assumptions implicit in the water demand projections (Chapter 2) are discussed below.

### Currently Implemented Water Conservation Strategies in Region C

To provide a basis for assessment of potentially feasible water conservation strategies in Region C, it is necessary to identify currently implemented water conservation strategies in the region. To accomplish this, the Region C Water Planning Group surveyed water suppliers, conducted telephone interviews with selected water suppliers, and obtained data from other sources including water conservation and drought contingency plans from water suppliers, TWDB historical use records, the TCEQ water rights data base and historical wastewater return flows, and by surveying reuse providers. Survey responses were received from 25 WWPs and 96 WUGs. Along with the returned surveys, many WWPs and WUGs included their current Water Conservation and Drought Contingency Plans. Information in these plans was used to supplement the survey responses. From among the 121 entities that returned completed surveys, 24 were selected to provide more comprehensive cost and public education information related to the implementation of the water conservation BMPs. This information was obtained through telephone interviews. Historical water use data was also collected from the TWDB for some entities. Water rights information and wastewater return flow information was obtained from the TCEQ. A full discussion of the findings of these studies is contained in Chapter 6. Appendix L provides model conservation plans.

Table 4B.1 shows the percentage of water retailers that have implemented certain water conservation strategies.

Significant efforts have been made by water providers and water users to conserve water in Region C. Regional coordination is one tool that has been utilized by wholesale water providers in the region. The North Texas Municipal Water District, Dallas Water Utilities and Tarrant Regional Water District jointly sponsor the North Texas Regional Water Conservation Symposium, now in its third year. Outdoor water conservation practices, such as time of day watering restrictions, have become part of local ordinances in Fort Worth, Dallas, and most of the larger cities in the area. Cities and water utilities have begun allocating conservation staff and budgeting dollars as part of their full time water management strategies. These individual conservation efforts are part of the ongoing Region C effort to promote conservation as a permanent, valuable water management strategy.

## Table 4B.1(2)

## Water Conservation Response Data from Water Retailers

| | Basic Package | | | | | | | Expanded Package | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low flow plumbing fixture rules | Public and school education | Water use reduction due to Increasing water prices | Water system audit, leak detection and repair, and pressure control | New efficient residential clothes washer standards | Water conservation pricing structure | Water waste prohibition | Coin-operated clothes washer rebate | Residential customer water audit | ICI water audit, water waste reduction, and site-specific conservation program | Reuse of treated wastewater effluent |
| **BMP Implementation** | | | | | | | | | | | |
| **Implemented** | | 49% | 62% | 58% | | 46% | 29% | 0% | 13% | 4% | 10% |
| **Target Res.** [(a)] | | 78% | 84% | 68% | | 71% | 73% | 0% | 47% | 0% | 18% |
| **Target Ind.** [(b)] | | 13% | 43% | 34% | | 37% | 52% | 0% | 0% | 40% | 27% |
| **Target Comm.** [(c)] | | 29% | 61% | 48% | | 49% | 64% | 0% | 0% | 40% | 45% |
| **Target Inst.** [(d)] | | 31% | 48% | 38% | | 43% | 61% | 0% | 0% | 60% | 27% |
| **Level of BMP Effectiveness** | | | | | | | | | | | |
| **Very Effective** | 20% | 9% | 25% | 31% | 10% | 33% | 27% | 0% | 20% | 0% | 45% |
| **Somewhat Effective** | 61% | 64% | 45% | 46% | 60% | 25% | 45% | 0% | 60% | 20% | 36% |
| **Not Effective** | 2% | 9% | 13% | 3% | 20% | 10% | 9% | 0% | 7% | 0% | 0% |
| **No Response** | 16% | 18% | 16% | 20% | 10% | 31% | 18% | 0% | 13% | 80% | 18% |
| **Plans to Maintain BMP** | | | | | | | | | | | |
| **Yes** | | 87% | 86% | 80% | | 71% | 94% | 0% | 67% | 80% | 73% |
| **No** | | 2% | 0% | 0% | | 0% | 0% | 0% | 0% | 0% | 0% |
| **No Response** | | 11% | 14% | 20% | | 29% | 6% | 0% | 33% | 20% | 27% |
| **Would Consider Implementing BMP** | | | | | | | | | | | |
| **Yes** | | 28% | 30% | 30% | | 33% | 18% | 17% | 23% | 25% | 20% |
| **No** | | 11% | 9% | 9% | | 7% | 15% | 23% | 15% | 14% | 20% |
| **No Response** | | 61% | 60% | 62% | | 61% | 67% | 60% | 62% | 61% | 60% |
| **Public Reaction** | | | | | | | | | | | |
| **Favorable** | 7% | 53% | 7% | 28% | 0% | 14% | 33% | 0% | 47% | 20% | 55% |
| **Unfavorable** | 2% | 0% | 28% | 0% | 0% | 18% | 15% | 0% | 0% | 0% | 0% |
| **No Reaction** | 36% | 13% | 19% | 23% | 50% | 16% | 6% | 0% | 0% | 0% | 0% |
| **No Response** | 52% | 33% | 43% | 48% | 50% | 49% | 39% | 0% | 53% | 80% | 45% |

(a) Respondents indicated that BMP was targeted to residential customers
(b) Respondents indicated that BMP was targeted to industrial customers
(c) Respondents indicated that BMP was targeted to commercial customers
(d) Respondents indicated that BMP was targeted to institutional customers

## Information Developed Since the *2006 Region C Water Plan*

The 80th Regular Session of the Texas Legislature (2007), via the passage of Senate Bill 3 and House Bill 4, directed the TWDB to appoint members to the newly created Water Conservation Advisory Council. The Water Conservation Advisory Council replaced the Water Conservation Implementation Task Force, which was created in 2003 and abolished on January 1, 2005. Duties of the Council include: monitoring trends in water conservation implementation and new technologies for possible inclusion as best management practices; monitoring the effectiveness of the statewide water conservation public awareness program; developing and implementing a state water management resource library; developing and implementing a public recognition program for water conservation; monitoring the implementation of water conservation strategies by water users included in regional water plans; monitoring target and goal guidelines for water conservation to be considered by the TWDB and TCEQ; and conducting a study to evaluate the desirability of requiring the TWDB to designate entities and programs that provide assistance to retail public utilities in developing water conservation plans as certified water conservation training facilities and to give preference to certified water conservation training facilities in making loans or grants for water conservation training and education activities.

In December 2008, the Advisory Council published *A Report on Progress of Water Conservation in Texas* [(3)]. The report included a number of recommendations regarding water conservation and regional water planning. These recommendations include the following:

- Develop methodology, metrics, and standards for water conservation implementation measurement and reporting.
- Develop specific guidelines for how gallons per capita per day should be determined and how it should be applied to population-dependent water use only.
- Develop reporting guidelines for improved data collection.
- Expand data collection efforts to include all water providers and water use categories.
- Develop a pilot project for water use data reporting.
- Develop a pilot project for determining population figures appropriate for certain water use metrics.

- Provide the Council with the necessary resources to sufficiently develop and implement tools to monitor implementation of water conservation strategies recommended in the regional water plans.
- Expand public awareness of water conservation statewide and coordinate campaigns at the state, regional, and local levels.
- Establish a statewide water conservation recognition program.
- Collaborate with national efforts to develop a clearinghouse of resources, tools, and best management practices.
- Direct the TWDB to develop a certification process for conservation training programs and provide preference for technical and financial assistance to these certified programs.

### New Regional Planning Requirements

The TWDB has revised its planning guidelines since the last round of regional water planning. Based on updated legislation, TWDB now requires that:

- Retail public utilities with populations greater than 20,000 implement a landscape irrigation permitting, inspection and enforcement program under HB 1656
- Retail public utilities with more than 3,300 connections submit a water conservation plan under Texas Water Code §13.146
- The TWDB review each water conservation plan and annual report to determine compliance with minimum requirements and submission deadlines under Texas Water Code §16.402

In addition, new legislation (House Bill 2667) enacted in 2009 will require toilets purchased after January 1, 2014 to have a maximum flush volume of 1.28 gallons per flush. This will supplant the existing 1.6 gallons per flush maximum rate defined in the Water Saving Performance Standards for Plumbing Act (Chapter 372 of Texas Health and Safety Code, effective January 1992) and should be used as appropriate to estimate water savings. Further discussion of this Bill and estimated savings are included in Section 6.4.

## *4B.2 Reuse*

Reuse is becoming an increasingly important source of water in Region C and across Texas. There are a number of water reuse projects in operation in Region C, and many others are currently in the planning and permitting process.

Direct reuse and indirect reuse have significantly different permitting requirements and potential applications. Direct reuse occurs when reclaimed water is delivered from a wastewater treatment plant to a water user, with no intervening discharge to waters of the state. Direct reuse requires a notification to the Texas Commission on Environmental Quality (TCEQ), which is routinely accepted so long as requirements to protect public health are met. Direct reuse is most commonly used to supply water for landscape irrigation (especially golf courses) and industrial uses (especially cooling for steam electric power plants).

In 2008, the TCEQ adopted rule language (§30 TAC Chapter 321) that applies specifically to permitted wastewater treatment facility owners who plan to produce reclaimed water at a site other than an existing permitted domestic wastewater treatment facility. The new rule, which streamlines the permitting of offsite reclaimed water production facilities that do not discharge to waters of the state, could potentially reduce costs associated with the transportation of raw wastewater to an existing facility and from the existing facility to reclaimed water users.

Indirect reuse occurs when reclaimed water is discharged to a stream or reservoir and is diverted downstream or out of the reservoir for reuse. The discharged water mixes with ambient water in the stream or reservoir as it travels to the point of diversion. Many of the water supplies within Region C have historically included return flows from treated wastewater as well as natural runoff. These return flows provide a supplement to supply that can be used as long as the return flows continue. An entity can ensure the ability to use its return flows through a water right permit from the TCEQ. A wastewater discharge permit from the TCEQ may also be required if the discharge location were to be changed as part of the reuse project.

Potential applications for water reuse in Region C include:

- Landscape irrigation (parks, school grounds, freeway medians, golf courses, cemeteries, residential)
- Agricultural irrigation (crops, commercial nurseries)
- Industrial and power generation reuse (cooling, boiler feed, process water, heavy construction, mining)

- Recreational/environmental uses (lakes and ponds, wetlands, stream flow augmentation)
- Supplementing potable water supplies.

There are a number of benefits associated with water reuse as a water management strategy, including:

- Water reuse represents an effective water conservation measure.
- Water reuse provides a reliable source that remains available in a drought.
- Water reuse quantities increase as population increases.
- Water demands that can be met by reuse are often near reuse sources.
- Water reuse is a viable way to defer and avoid construction of new surface water impoundments.

Reuse has been a source of water supply in Region C for a number of years. In 2010, Region C is expected to have nearly 204,000 acre-feet per year of wastewater return flows available for use as water supplies. Under current permits and infrastructure, this supply is expected to increase to nearly 336,000 acre-feet per year by 2060. There are also several reuse projects that have been permitted, but do not have infrastructure in place. Significant new reuse projects since the last plan include:

- The expansion of the City of Fort Worth's Village Creek Reclaimed Water Delivery System to serve the Cities of Arlington and Euless, Dallas-Fort Worth International Airport, and other potential retail customers within the City of Fort Worth is currently under construction and is anticipated to be online by the end of 2010.
- The TRWD Richland-Chambers Reservoir reuse project began operation in 2009 and diverts return flows into off-channel, wetland impoundments for water quality treatment purposes before delivery into the Richland-Chambers Reservoir for storage and diversion.
- The NTMWD is now authorized to divert up to an additional 35,941 acre-feet per year (for a total of 71,882 acre-feet per year) of return flows from the District's Wilson Creek Wastewater Treatment Plant in Lake Lavon.
- The NTMWD East Fork Raw Water Supply Project began operation in 2009 and can currently convey nearly 48,000 acre-feet per year of return flows to Lake Lavon for subsequent reuse. The NTMWD East Fork Raw Water Supply Project diverts return flows from the East Fork of the Trinity River to a constructed wetland for polishing treatment and ultimately returns this water to Lake Lavon. The water right for the project authorizes diversions up to 157,393 acre-feet per year, as return flows increase and become available.

- Dallas Water Utilities and NTMWD have entered into an agreement which would allow NTMWD to exchange return flows from its WWTPs discharging into Lake Ray Hubbard for Dallas return flows discharged to the main stem of the Trinity River. Under this agreement, Dallas will obtain the right to divert the NTMWD return flows from Lake Ray Hubbard and will pump an equal amount of flow from the main stem of the Trinity River to the NTMWD East Fork Water Supply Project wetland for use by NTMWD. In addition, once water rights for Elm Fork return flows (from NTMWD WWTPs discharging to Lake Lewisville) have been secured by NTMWD, NTMWD will support Dallas efforts to secure bed and banks transport, storage and diversion rights for the Elm Fork return flows. In exchange, Dallas will pump a quantity equal to NTMWD's discharge of its future Elm Fork return flows to the East Fork Water Supply Project wetland for use by NTMWD.

A number of other reuse projects have already been defined, and planning is in the early stages. These will be considered as potentially feasible strategies. A list of the current reuse projects in Region C is shown on Table 6.3 in Section 6 and discussed in detail in Appendix I.

In general, reuse strategies will require the use of multiple barriers (such as advanced wastewater treatment, blending, residence time, and/or advanced water treatment) to mitigate potential negative impacts to the environment, agricultural resources, and other resources. Sources of wastewater effluent needed for new reuse projects are generally limited to owners and operators of large wastewater treatment plants. These include the Trinity River Authority, which operates several wastewater treatment plants in the region, North Texas Municipal Water District, the cities of Fort Worth and Dallas, and several smaller cities.

The potential for additional reuse projects in Region C is dependent upon the amount of wastewater generated and the ability of the user to use treated effluent. Approximately 93 percent of the 1.76 million acre-feet of water expected to be used in the Trinity River Basin in Region C in 2010 is attributed to municipal and manufacturing use. Municipal and manufacturing use in Region C is expected to increase to 3.2 million acre-feet per year by 2060. Of the total amount of water projected for use in Region C, a considerable amount is expected to be returned to the Trinity River Basin through return flows.

Return flow is the term used to describe water that has been beneficially used and then is discharged to a receiving stream or reservoir. Existing streams and reservoirs have historically relied on these return flows for water supplies and instream uses. Recommending reuse projects that have a significant impact to the historical return flows can have an impact to the health of the river system. Discussions with the regional and local water providers identified several potential reuse projects that could be used to help meet the projected shortages in Region C. A list of the recommended reuse projects in Region C is shown in Table 4B.2.

The Region C plan proposes to reuse an additional 257,000 acre-feet of return flows in 2020 through both direct and indirect reuse projects, with most of this additional reuse occurring in the Trinity River Basin. By 2060, the proposed reuse in the region is expected to reach more than 300,000 acre-feet per year. The total 2060 reuse from proposed and existing projects will be nearly 636,000 acre-feet per year.

### *4B.3 Drought Management Measures*

The Region C Water Planning Group decided not to recommend drought management measures as a water management strategy to provide additional supplies for Region C. The consensus of the planning group is that:

- Drought management and emergency response planning are intended to preserve water resources for the most essential uses when water supplies are threatened by an unexpected condition such as a multi-year drought, an unexpected increase in demands, or a water supply system component failure.
- Drought contingency and emergency response measures provide protection in the event of water supply shortages, but they are not a reliable source of additional supplies to meet growing demands. They provide a backup plan in case a supplier experiences a drought worse than the drought of record or if a water management strategy is incomplete when it is needed.

### *4B.4 Summary of Water Conservation and Reuse Recommendations*

Despite the efforts that have been made by water providers and water users, the survey results indicate that there is more work to be done to fully implement the proposed water conservation strategies. Cities and utilities in Region C have made significant strides in the implementation of water conservation efforts in Region C. It is important that suppliers in the region build on this momentum with continued conservation efforts, and this plan suggests areas of emphasis for that effort.

**Table 4B.2**
**Recommended Reuse Projects in Region C***
- Values in Acre-Feet per Year –

| Provider | Project Name | Type | County [a] | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|
| Athens | Athens Fish Hatchery | direct | Henderson | 0 | 2,872 | 2,872 | 2,872 | 2,872 | 2,872 |
| Cooke County | Direct Reuse | direct | Cooke | 0 | 70 | 70 | 70 | 70 | 70 |
| Cooke County Mining | Mining Reuse | direct | Cooke | 0 | 99 | 67 | 71 | 74 | 77 |
| DWU | Direct Reuse | direct | Dallas | 0 | 20,458 | 20,458 | 20,458 | 20,458 | 20,458 |
| DWU/NTMWD | NTWMD WWTP Discharges to the Lake Ray Hubbard Watershed | indirect | Dallas/Kaufman/ Collin/Rockwall | 0 | 31,612 | 35,872 | 39,459 | 40,244 | 41,029 |
| Ennis | Indirect Reuse | indirect | Ellis | 0 | 0 | 0 | 333 | 2,521 | 3,696 |
| Fort Worth | Village Creek Direct Reuse | direct | Tarrant | 1,552 | 3,469 | 3,526 | 3,526 | 3,526 | 3,526 |
| Fort Worth/TRA | Alliance Corridor Direct Reuse | direct | Tarrant | 0 | 1,120 | 4,694 | 4,694 | 4,694 | 4,694 |
| Fort Worth | Fort Worth Future Direct Reuse | direct | Tarrant | 0 | 0 | 3,460 | 7,979 | 7,979 | 7,979 |
| Frisco | Collin/Denton County Direct Reuse | direct | Collin/Denton | 0 | 2,240 | 3,360 | 5,650 | 5,650 | 5,650 |
| Jacksboro | Indirect Reuse (Jack County mining) | indirect | Jack | 385 | 385 | 385 | 385 | 385 | 385 |
| Irving/TRA | Irving Direct Reuse | direct | Dallas | 0 | 6,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| NTMWD | Additional Supplies from Dallas for East Fork | indirect | Dallas/Kaufman/ Collin/Rockwall | 0 | 34,900 | 15,100 | 0 | 0 | 0 |
| Tarrant County SEP | Tarrant County SEP | direct | Tarrant | 0 | 0 | 1,528 | 2,360 | 2,360 | 2,360 |
| TRA | Tarrant County Indirect Reuse | indirect | Tarrant | 0 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 |
| TRA | Dallas County Direct Reuse | direct | Dallas | 0 | 0 | 6,760 | 6,760 | 6,760 | 6,760 |
| TRA | Joe Pool Lake Indirect Reuse (New WWTP) | indirect | Dallas | 0 | 4,368 | 4,368 | 4,368 | 4,368 | 4,368 |
| TRA | Ellis County Direct Reuse | direct | Ellis | 0 | 0 | 0 | 0 | 0 | 2,200 |

* NOTE: Lists recommended reuse strategies for Region C and does not include existing reuse projects.
(a) County reflects location of reuse project.

**Table 4B.2* (continued)**

| Provider | Project Name | Type | County [a] | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|
| TRA | Freestone County Direct Reuse | direct | Freestone | 0 | 0 | 0 | 0 | 6,760 | 6,760 |
| TRA | Kaufman County Direct Reuse | direct | Kaufman | 0 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| TRA | Las Colinas Direct Reuse | direct | Dallas | 0 | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 |
| TRA | Tarrant and Denton Counties Direct Reuse | direct | Tarrant/ Denton | 0 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 |
| TRWD | Trinity River Indirect Reuse - Richland Chambers | indirect | Navarro | 0 | 53,000 | 53,000 | 53,000 | 53,000 | 53,000 |
| TRWD | Trinity River Indirect Reuse - Cedar Creek | indirect | Henderson /Kaufman | 0 | 52,500 | 52,500 | 52,500 | 52,500 | 52,500 |
| UTRWD | Indirect Reuse of Lake Ralph Hall Water | indirect | Fannin | 0 | 6,810 | 13,620 | 20,430 | 20,430 | 20,430 |
| UTRWD | Direct Reuse | direct | Denton | 0 | 0 | 560 | 1,121 | 2,240 | 2,240 |
| Wise County Mining Reuse | Wise County Mining Reuse | direct | Wise | 0 | 14,133 | 22,428 | 19,652 | 24,648 | 28,520 |
| **Total** | | | | **1,937** | **257,036** | **275,628** | **276,688** | **292,539** | **300,574** |

***** NOTE: Lists recommended reuse strategies for Region C and does not include existing reuse projects.

(a) County reflects location of reuse project.

Table 4B.3 shows a regional summary of estimated water savings from recommended water conservation and reuse strategies. By 2060, the projected water supplies and/or savings from water conservation are expected to be over one million acre-feet per year. Estimated costs for these strategies by entity are included in Appendix Q. The recommended water conservation for each water user group is shown in Appendix C.

**Table 4B.3**
**Summary of Existing and Recommended Conservation (Including Reuse) for Region C**
- Values in Acre-Feet per Year –

| Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| ***Municipal Conservation*** | | | | | | |
| Low flow plumbing fixture rules [a] | 22,029 | 69,122 | 86,663 | 105,067 | 151,981 | 211,201 |
| Municipal Recommended Conservation | 46,690 | 106,835 | 151,586 | 192,720 | 235,718 | 284,916 |
| | | | | | | |
| ***Non-Municipal Conservation*** | | | | | | |
| Efficient new steam electric power plants | 3,262 | 7,824 | 14,545 | 26,725 | 43,403 | 65,619 |
| Non-Municipal conservation strategies [b] | 57 | 1,069 | 3,334 | 4,518 | 5,147 | 5,737 |
| | | | | | | |
| ***Reuse Strategies*** | | | | | | |
| Existing Reuse | 203,974 | 246,510 | 289,995 | 312,992 | 321,405 | 336,082 |
| Proposed Reuse Strategies | 1,937 | 257,036 | 275,628 | 276,688 | 292,539 | 300,574 |
| | | | | | | |
| **Total Conservation and Reuse** | 277,949 | 688,396 | 821,750 | 918,710 | 1,050,192 | 1,204,128 |
| | | | | | | |
| Total Region C Municipal Demands | 1,546,970 | 1,833,671 | 2,087,597 | 2,344,115 | 2,612,176 | 2,924,157 |
| Total Municipal Demand without Conservation | 1,572,261 | 1,910,617 | 2,188,805 | 2,475,907 | 2,807,560 | 3,200,977 |

a. The Total Region C Demands on the line above includes projected conservation savings from low flow plumbing fixtures and efficient new steam electric power plants. These savings were added to the Region C Demands to obtain “Total Demand without Conservation”, a projection of Region C’s demands if no conservation occurred.

b. Non-municipal water conservation measures include estimated conservation savings from manufacturing and irrigation rebates.

# SECTION 4B
# LIST OF REFERENCES

(1) Texas Water Code, Chapter 11 Water Rights, Austin, [Online], Available URL: http://www.capitol.state.tx.us/statutes/wa.toc.htm, May 2005.

(2) Freese and Nichols, Inc., Alan Plummer Associates, Inc, CP&Y, Inc., *Region C Water Conservation and Reuse Study*, prepared for the Region C Water Planning Group, Fort Worth, April 2009.

(3) GDS Associates, Inc., Chris Brown Consulting, Axiom-Blair Engineering, Inc., and Tony Gregg, P.E.: *Texas Water Development Board Report 362 Water Conservation Best Management Practices Guide*, prepared for the Water Conservation Implementation Task Force, Austin, [Online], Available URL: http://www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITFBMPGuide.pdf, November 2004.

(4) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

# 4C. Methodology for Evaluation and Selection of Water Management Strategies

Section 4B discusses the evaluation and selection of water conservation and reuse strategies to meet needs in Region C. This section describes the process to determine potentially feasible strategies for Region C and the methods used in evaluation of potentially feasible strategies and the selection of recommended strategies. The steps in the evaluation and selection of water management strategies for Region C include the following:

- Review of previous plans for water supply in Region C, including locally developed plans and the 2007 State Water Plan [(1)]
- Consideration of the types of water management strategies required by Senate Bill One regional planning guidelines [(2)]
- Development of evaluation criteria for management strategies
- Selection for evaluation of potentially feasible water management strategies that could meet needs in Region C
- Environmental evaluation of individual strategies
- Development of cost information for individual strategies
- Discussions with regional wholesale water providers
- Selection of recommended strategies for Region C

## Major Water Management Strategies Implemented since the *2006 Region C Water Plan*

Region C water suppliers are diligently working to implement strategies that will meet the future water needs of Region C. This is evidenced by the following major strategies that have been implemented since the publication of the *2006 Region C Water Plan*:

- Dallas Water Utilities has developed agreements that allow it to use return flows in the Lake Lewisville watershed.
- Dallas Water Utilities has completed a pipeline from Lake Fork Reservoir to Lake Tawakoni that allows use of a portion of its supply from Lake Fork.
- North Texas Municipal Water District has received permits for additional reuse in Lake Lavon.
- North Texas Municipal Water District has developed the East Fork Reuse Project.
- North Texas Municipal Water District has connected to its Upper Sabine Basin supply.

- North Texas Municipal Water District has obtained additional water rights from Lake Texoma.
- Tarrant Regional Water District has completed the Eagle Mountain Connection to deliver East Texas water to Eagle Mountain Lake.
- Several suppliers have obtained water rights allowing for future development of reuse projects.

### Previous Planning Efforts

Appendix B is a list of previous water-related plans and reports for Region C. The region has a long history of successful local water supply planning and development. When the update to the Senate Bill One planning process began in 2008, pre-existing plans for future water supply in Region C included the following:

- Dallas Water Utilities was planning to connect its currently unused supply in Lake Palestine to its system, and expand its transmission system from Lake Tawakoni and Lake Fork Reservoirs.
- Tarrant Regional Water District was planning to expand its diversion of return flows from the Trinity River into Cedar Creek Reservoir and Richland-Chambers Reservoir to increase the yield of its system.
- North Texas Municipal Water District was planning to expand its existing reuse project and seek additional water supplies, including Lower Bois d'Arc Creek Reservoir.
- Several Region C water suppliers were considering the development of water supplies in the Sulphur River Basin to the east. Dallas Water Utilities has completed an update of its long-range water supply plan (3), including development and implementation of major water conservation and water reuse programs (4, 5).
- Tarrant Regional Water District and Dallas Water Utilities are collaborating on joint facilities to deliver water from East Texas reservoirs.
- North Texas Municipal Water District, Dallas Water Utilities, and Tarrant Regional Water District have implemented major public information campaigns as part of overall conservation efforts.
- North Texas Municipal Water District and Upper Trinity Regional Water District plan to expand their regional water treatment and treated water delivery systems.
- Corsicana has completed construction of a pipeline to Richland-Chambers Reservoir and plans to complete a pump station and treatment plant to use this supply.
- Midlothian, Waxahachie, and Ennis are developing connections to obtain raw water from the Tarrant Regional Water District through the Trinity River Authority.
- Athens Municipal Water Authority has obtained a permit for indirect reuse through Lake Athens.

- The City of Muenster has constructed Lake Muenster.
- Many Region C suppliers have developed updated water conservation and drought contingency plans.
- As discussed in Chapter 6, several Region C water suppliers have received permits to allow reuse of return flows.
- Other Region C suppliers were planning and developing smaller water supply projects to meet local needs, whether by connecting to regional water suppliers or developing independent resources.

### Most Recent State Water Plan

Plans for Region C in the most recent state water plan, *Water for Texas – 2007* (1), were based on the *2006 Region C Water Plan* (6). Table 4C.1 lists major water management strategies recommended in the *2006 Region C Water Plan.* The plan also included many smaller water management strategies.

## 4C.1 Types of Water Management Strategies and Potentially Feasible Strategies for Water Supply in Region C

Senate Bill One guidelines require that certain types of water management strategies be considered as means of developing additional water supplies. The types of strategies that must be considered include the following (2):

- Water conservation and drought response planning
- Reuse of wastewater
- Expanded use or acquisition of existing supplies, including system optimization and conjunctive use
- Reallocation of reservoir storage to new uses
- Voluntary redistribution of water resources
- Voluntary subordination of water rights
- Enhancement of yields of existing sources
- Control of naturally occurring chlorides
- Brush control, precipitation enhancement, and desalination
- Water right cancellation
- Aquifer storage and recovery
- New supply development
- Interbasin transfers

- Other measures.

**Table 4C.1**
**Recommended Major Water Management Strategies**
**in the *2006 Region C Water Plan***

| Strategy | Sponsor | Supply Available from Strategy in Acre-Feet per Year |
|---|---|---|
| Conservation | Multiple Entities | 539,562 |
| Marvin Nichols Reservoir | North Texas Municipal Water District, Tarrant Regional Water District, and Upper Trinity Regional Water District | 489,840 |
| Toledo Bend Reservoir | North Texas Municipal Water District, Tarrant Regional Water District | 400,000 |
| TRWD 3rd Pipeline and Reuse | Tarrant Regional Water District | 188,765 |
| Lower Bois d'Arc Creek Reservoir | North Texas Municipal Water District | 123,000 |
| Lake Fork Reservoir | Dallas Water Utilities | 120,000 |
| Oklahoma Water | North Texas Municipal Water District, Tarrant Regional Water District, and Upper Trinity Regional Water District | 115,000 |
| New Lake Texoma (Blend) | North Texas Municipal Water District | 113,000 |
| Lake Fastrill | Dallas Water Utilities | 112,100 |
| Wright Patman Lake - Flood Pool | Dallas Water Utilities | 112,100 |
| Lake Palestine | Dallas Water Utilities | 111,460 |
| East Fork Reuse Project | North Texas Municipal Water District | 102,000 |
| Return Flows above DWU Lakes | Dallas Water Utilities and Upper Trinity Regional Water District | 79,605 |
| Southside (Lake Ray Hubbard) Reuse | Dallas Water Utilities | 67,253 |
| Lewisville Lake Reuse | Dallas Water Utilities | 67,253 |
| Lake Ralph Hall and Reuse | Upper Trinity Regional Water District | 50,740 |

The Region C Water Planning Group reviewed each of these types of water management strategies and determined whether there were potentially feasible strategies to develop water supply in Region C within each type. Water conservation and drought response planning and reuse strategies are discussed in Section 4B and Chapter 6. Other types of management strategies are discussed below, and a more detailed listing of potentially feasible water management strategies for Region C is included in Appendix O. The impacts of potential water management strategies are considered in Appendix P. Because a detailed quantitative analysis of the impact of each strategy was beyond the scope of this project, each strategy's impacts were rated qualitatively (as low, medium, or high). The rating for each strategy was based on specific attributes of the strategy location (example: estimated acreage impacted, current land use, population density, etc.).

### Reservoir System Operation

System operation is the coordinated use of multiple sources of supply, usually surface water reservoirs. System operation is widely used throughout Region C, and can be implemented for many purposes, including gaining yield, reducing pumping costs, or maintaining acceptable water quality. Most of the systems in Region C are operated primarily to reduce pumping costs. For the purpose of the Region C planning process, only system operation that results in increased yield will be considered as potentially feasible water management strategies. The following system operations were adopted as potentially feasible strategies to gain additional supplies for Region C:

- Dallas Water Utilities reservoirs
- Tarrant Regional Water District reservoirs
- System operation of Wright Patman Lake and Chapman Lake to gain additional yield.

*Summary of Decision: System operation is widely used in Region C, primarily to reduce pumping costs. Potentially feasible system operation strategies to provide additional yield should be investigated.*

### Connecting Existing Supplies

The connection of existing supplies that are not yet being fully utilized was a major element of the *2006 Region C Water Plan* [(6)]. There are several sources of water supply that have long been committed for use in Region C and could be connected to provide additional water supply. Region C water suppliers could also connect to currently uncommitted supplies in other regions, but these supplies are not necessarily available for use in Region C.

Table 4C.2 lists potentially feasible water management strategies for Region C based on the connection of existing sources that would supply over 25,000 acre-feet per year. In addition to the strategies listed in Table 4C.2, smaller potentially feasible strategies to connect existing supplies are listed in Appendix O. There are also several general categories of strategies to connect existing supplies that are considered to be potentially feasible in Region C:

- Connections to other water user groups or wholesale water providers
- Expansion and renovation of existing connections and transmission systems
- New, renewed, and increased contracts for water
- Water treatment plant expansions.

The development (or continued development) of regional water systems was also an important part of the *2006 Region C Water Plan* [6]. The following regional systems were in the 2006 Plan and are potentially feasible strategies for this plan:

- North Texas Municipal Water District
- Upper Trinity Regional Water District
- Trinity River Authority Tarrant County Water Supply Project
- Trinity River Authority Ellis County Project
- Cooke County
- Grayson County
- Fannin County
- Southeast Wise County (Walnut Creek SUD).

*Summary of Decision: Include connection of existing supplies as a major component of the Region C plan. Evaluate specific potentially feasible strategies for connection of existing supplies.*

**Table 4C.2**
**Major Potentially Feasible Water Management Strategies for Connecting Existing Supplies**

| Strategy | Potential Sponsor(s) [a] | Maximum Supply Available to Region C from Strategy in Acre-Feet per Year | Recommended Included in 2006 Plan? |
|---|---|---|---|
| Toledo Bend Reservoir | SRA, NTMWD, TRWD, DWU, TRA and UTRWD | 600,000 (part of Texas' share) | Yes |
| Gulf of Mexico with Desalination | DWU, NTMWD, and TRWD | Unlimited [b] | No |
| Wright Patman Lake – System | DWU, NTMWD, TRWD, UTRWD, and Irving | 390,000 | No |
| Lake Texoma Not Yet Authorized - Blend | DWU, NTMWD, TRWD, or UTRWD | about 220,000 (full use of Texas' share) | No |
| Lake Texoma Not Yet Authorized - Desalination | DWU, NTMWD, or TRWD | about 220,000 (full use of Texas' share) | No |
| Lake Livingston | DWU, NTMWD, or TRWD | 200,000 | No |
| Wright Patman Lake – Raise Flood Pool | DWU, NTMWD, TRWD, UTRWD, or Irving | 180,000 | Yes |
| Oklahoma Water | DWU, NTMWD, TRWD, UTRWD, Irving, and Denton | 165,000 or more | Yes |
| Lake Texoma - Blend | NTMWD, DWU, and UTRWD | 113,000 | Yes |
| Lake Palestine | DWU | 112,881 | Yes |
| Lake Texoma - Desalination | NTMWD, DWU, or TRWD | 105,000 | No |
| Wright Patman Lake – Texarkana | DWU, NTMWD, TRWD, UTRWD, or Irving | 100,000 | No |
| Carrizo-Wilcox Groundwater (Brazos County) | TRWD, DWU or NTMWD | 100,000 | No |
| DWU Cypress River Basin Supplies (Lake O' the Pines) | DWU, NTMWD, or TRWD | 89,600 | No |
| LakeTawakoni Pipeline | DWU | 77,994 | Yes |
| GTUA Lake Texoma Already Authorized | GTUA | 56,500 | Yes |
| Ellis County Project | TRA / TRWD | 53,189 | Yes |
| Expanded NTMWD/GTUA Collin Grayson Municipal Alliance | Multiple | 27,412 | Yes |

Notes:
a. Recommended and alternative strategies for wholesale water providers are discussed in Section 4E.
b. This strategy was evaluated for the transmission of 200,000 acre-feet per year of treated water to the Metroplex.

## Conjunctive Use of Groundwater and Surface Water

In Region C, only 5 percent of the water used comes from groundwater. Groundwater is sometimes used to meet peak demands in systems that have both groundwater and surface water supplies. This does not, however, increase total supply on a yearly basis. Therefore, conjunctive use should not be considered as a potentially feasible water management strategy to provide additional supplies for Region C.

*Summary of Decision: Do not include the conjunctive use of ground water and surface water as a source of additional supplies for Region C. Conjunctive use to meet peak needs is appropriate and should continue.*

## Reallocation of Reservoir Storage

There are two types of reallocation of existing reservoir storage. Reallocation among various water supply uses (municipal, industrial, irrigation, etc.) is a relatively simple matter. It is considered to be a minor water right amendment by Texas Commission on Environmental Quality (TCEQ). This type of reallocation should be allowed at the discretion of the owner of the water right and should be considered to be consistent with the Region C plan.

The more complex type of reallocation is to transfer water from other uses such as hydropower generation or flood control to water supply. There are three reservoirs that have the potential for this type of storage reallocation and might provide supplies for Region C:

- Wright Patman Lake in the Sulphur River Basin in Region D has storage allocated to flood control that could be reallocated for municipal use. This would require environmental studies by the Corps of Engineers and Congressional approval.
- In Lake Texoma in the Red River Basin, Congress has already approved the reallocation of 150,000 acre-feet of storage from hydropower to municipal use in Texas and 150,000 acre-feet of storage from hydropower to municipal use in Oklahoma. Actual reallocation requires environmental studies which were completed in May 2006 [(7)]. Additional reallocation from hydropower storage to conservation storage is possible in Lake Texoma, and this would require additional Congressional approval.
- The reallocation of flood storage to municipal storage in Bardwell Lake in Ellis County has also been considered.

Most other Region C reservoirs with flood control or hydropower storage already have sufficient conservation storage to develop their potential supplies. Therefore, the reallocation of storage in other reservoirs is not likely to provide significant additional supplies for the region.

*Summary of Decision: Permit transfers among types of water use at the discretion of the water right holder. Evaluate reallocation to municipal use for Lake Texoma, Wright Patman Lake, and Bardwell Lake.*

### Voluntary Redistribution of Water Resources

In many cases, the connection of existing sources and the development of new sources require the voluntary redistribution of water resources by sale from the owner of the supply to the proposed user. (This would be true unless the proposed user is also the owner of the supply.) Emergency transfers of non-municipal use surface water are not considered a viable strategy for Region C. The water management strategies involving the voluntary redistribution of water resources are discussed under other categories and the impacts from voluntary redistributions of water supplies are considered in Appendix P.

*Summary of Decision: Evaluate potentially feasible strategies involving the voluntary redistribution of water resources under other categories.*

### Voluntary Subordination of Water Rights

Voluntary subordination of water rights is most useful where senior water rights limit reservoir yields under the prior appropriations doctrine. Very little additional yield is available for existing reservoirs in Region C by voluntary subordination. This strategy is appropriate for new water supply sources that would have junior water rights. In Region C, subordination of water rights is necessary to obtain the permitted amount for Muenster Lake in Cooke County.

*Summary of Decision: Include voluntary subordination of water rights as a source of water supply for Muenster Lake.*

### Enhancement of Yields of Existing Sources

Examples of ways to enhance the yield of existing sources might include the following:

- Artificial recharge of aquifers
- System operation of reservoirs
- Conjunctive use of surface water and groundwater

System operation of reservoirs and conjunctive use are discussed separately above. Artificial recharge of aquifers has not been implemented or studied in depth in Region C. If artificial recharge were to be implemented, it would probably be as part of an aquifer storage and recovery (ASR) program, which is discussed separately below.

*Summary of Decision: Do not include enhancement of yields of existing sources as a source of water supply for Region C except as discussed under other categories.*

### Control of Naturally Occurring Chlorides

The Brazos and Red River Basins have chloride concentrations in excess of desirable levels for municipal use. Much of the chloride in these basins is naturally occurring. Chloride control has been studied in the Brazos and Red River Basins and partially implemented in the Red River Basin. Current plans call for additional chloride control in the Lake Kemp watershed in Region B. If that project is successful, additional chloride control in the Lake Texoma watershed is possible. However, it does not appear likely that chloride control will have a significant impact on chloride levels in Lake Texoma during the current planning horizon. Chloride control projects should continue to be monitored. The Texas Commission on Environmental Quality and the Texas Railroad Commission should continue efforts to control chloride resulting from man-made conditions.

*Summary of Decision: Monitor chloride control projects. Do not include control of naturally occurring chlorides as a source of water supply for Region C.*

### Brush Control

Brush control is the process of removing non-native brush from the banks along rivers and streams and upland areas in order to reduce water consumption by vegetation and increase stream flows and groundwater availability. Studies and pilot projects on brush control in West Texas show promising results. The first large-scale projects are currently underway. Undertaking and maintaining brush control is expensive and requires landowner participation.

The Texas State Soil and Water Conservation Board published the *State Brush Control Plan* in 2002 [8]. This plan identifies areas that could potentially benefit from brush control programs. Two reservoirs in Region C, Lake Jacksboro and Lake Weatherford, were listed in the *State Brush Control Plan* as potential watersheds where brush control could enhance supplies. No formal studies have been conducted for either watershed. Given that there is no quantifiable evidence that brush control would increase water supply in either reservoir, brush control is not recommended as a potentially feasible water management strategy for any specific water user group (WUG) in Region C. However, brush control may be a management strategy for localized areas within the region, especially as a means to help meet localized livestock water supply needs.

*Summary of Decision: Allow for studies and localized pilot projects to further investigate brush control. Do not consider brush control as a potentially feasible strategy for the development of additional water supplies.*

### Precipitation Enhancement

Precipitation enhancement involves seeding clouds with silver iodide to promote rainfall. Such programs are generally located within areas where the rainfall is lower than in Region C. Given that Region C has adequate rainfall, and that there are no studies showing what impact precipitation enhancement would have on streamflow and reservoirs in Region C, precipitation enhancement is not recommended as a potentially feasible water management strategy for Region C. However, there may be localized areas in Region C who might benefit from such a management strategy.

*Summary of Decision: Do not include precipitation enhancement as a potentially feasible strategy for the development of additional water supplies. Allow for studies and localized pilot projects to further investigate precipitation enhancement.*

### Desalination

The salinity of water in Lake Texoma and the Red River is too high for municipal use, and the water must be desalinated or blended with higher quality water in order to meet drinking water standards. The cost of desalination has decreased in recent years, and the process is being used more frequently. Desalination is a potentially feasible strategy to use supplies from the following sources:

- Lake Texoma and the Red River
- Brackish groundwater
- Water from the Brazos River
- Water from the Gulf of Mexico
- Local projects from other sources, if pursued by water suppliers.

A special study on the use of saline water in Region C was conducted as part of this round of planning. A summary of that report is in Section 4H of this report, and the complete text is in Appendix R of this report.

*Summary of Decision: Include desalination as a potentially feasible management strategy in order to utilize supplies from the sources listed above.*

### Water Rights Cancellation

The Texas Commission on Environmental Quality has the power to cancel water rights after ten years of non-use, but this involuntary cancellation authority has seldom been used. The Water Availability Models showed that very little additional supply would be gained from water right cancellation in Region C [9, 10]. Therefore, water rights cancellation is not recommended as a potentially feasible water management strategy for Region C.

*Summary of Decision: Do not consider water rights cancellation as a potentially feasible strategy for the development of additional water supplies.*

### Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) involves storing excess water in aquifers and retrieving this water when needed. The water to be stored can be introduced through enhanced recharge or injected through a well into the aquifer. The excess water to be stored can be treated water or raw water with some pre-treatment.

ASR has the potential to store large volumes of water at lower costs than traditional surface storage. Other benefits of aquifer storage and recovery include elimination of evaporation losses, minimization of environmental impacts, and elimination of storage loss due to sedimentation. ASR requires suitable geological conditions for implementation and can cause contamination of groundwater. The water injected into the aquifer must be treated so that it will not cause damage to the existing groundwater system.

It is premature to determine the suitability of ASR as a source of supply for Region C at this time. Studies of ASR should continue, and pilot projects should be implemented if the strategy appears to be promising.

*Summary of Decision: Studies of ASR should continue, and pilot projects should be implemented if the strategy appears promising.*

### Development of New Surface Water Supplies

Over the years, many new reservoirs have been considered as sources of water supply for Region C. New reservoirs represent a large source of potential supply for Region C, but environmental impacts of reservoir development are a concern. Potential impacts of reservoir development include:

- Inundation of wetlands and other wildlife habitat, including bottomland hardwoods
- Changes to streamflows and streamflow patterns downstream
- Impacts on inflows to bays and estuaries
- Impacts on threatened and endangered species.

In the *2006 Region C Water Plan*, the following reservoirs were selected for detailed analysis after a preliminary screening:

- Upper Bois d'Arc Creek Lake
- Lower Bois d'Arc Creek Reservoir
- Lake Tehuacana
- Muenster Lake (has now been constructed)
- Lake Ralph Hall
- George Parkhouse Lake (North)
- George Parkhouse Lake (South)
- Marvin Nichols Reservoir
- Fastrill Reservoir
- Marvin Nichols Lake (South).

Since the completion of the *2006 Region C Water Plan*, there have been several developments in planning for new surface water supply sources for Region C:

- The Upper Trinity Regional Water District has conducted additional studies of Lake Ralph Hall and has filed applications for a water right permit from the Texas Commission on Environmental Quality and a Section 404 permit from the U.S. Corps of Engineers.
- Dallas Water Utilities was considering supplies from Fastrill Reservoir in the Neches River Basin, but recent court rulings have caused this to no longer be considered a feasible strategy.
- North Texas Municipal Water District is considering supplies from Lower Bois d'Arc Creek Reservoir and has filed application for a water right permit from the Texas Commission on Environmental Quality and a Section 404 permit from the U.S. Corps of Engineers.
- Tarrant Regional Water District is considering supplies from Lake Tehuacana.

Table 4C.3 shows the new reservoirs adopted as potentially feasible sources of additional water supply for Region C by the Region C Water Planning Group. Figure 4C.1 shows the location of these potentially feasible reservoir projects.

The Region C Water Planning Group also adopted the additional use of local surface water supplies as potentially feasible if needed and practical.

*Summary of Decision: Evaluate Marvin Nichols Reservoir, Lower Bois d'Arc Creek Reservoir, Lake Ralph Hall, George Parkhouse Lake (North and South), Lake Columbia, and Lake Tehuacana as potentially feasible strategies.*

**Table 4C.3**
**Potentially Feasible Strategies for New Reservoirs**

| Strategy | Potential Region C Sponsor(s) | Maximum Supply Available to Region C from Strategy in Acre-Feet per Year | Recommended in 2006 Plan? |
|---|---|---|---|
| Marvin Nichols Reservoir | DWU, NTMWD, TRWD, UTRWD, and Irving | 489,840 | Yes |
| George Parkhouse Lake (South) | DWU, NTMWD, UTRWD, or Irving | 135,600 | No (alternate) |
| Lower Bois d'Arc Creek Reservoir | NTMWD | 123,000 | Yes |
| George Parkhouse Lake (North) | DWU, NTMWD, UTRWD, or Irving | 118,960 | No (alternate) |
| Tehuacana Reservoir | TRWD | 56,800 | No (alternate) |
| Lake Columbia | DWU | 35,800 | No (alternate) |
| Lake Ralph Hall | UTRWD | 34,050 | Yes |

## Development of New Groundwater Supplies

New groundwater supplies within Region C are limited, since the majority of the available supplies are already developed. The Region C Water Planning Group identified a number of relatively small additional groundwater supplies as potentially feasible strategies, and these are listed in Appendix O. The planning group also authorized development of new wells as needed and as groundwater is available as a potentially feasible strategy.

Two major strategies for the importation of groundwater were also identified as potentially feasible:

- The importation of up to 200,000 acre-feet per year from the Ogallala aquifer in Roberts County (Region A)
- The importation of up to 100,000 acre-feet per year from the Carrizo-Wilcox aquifer in Brazos County and surrounding counties (Region G).

*Summary of Decision: Evaluate the importation of groundwater from the Ogallala aquifer in Roberts County and the importation of groundwater from the Carrizo-Wilcox aquifer in Brazos County and surrounding counties. Evaluate specific potentially feasible groundwater supplies within Region C.*

## Interbasin Transfers

Table 4C.4 shows the potentially feasible strategies for Region C that would require interbasin transfer permits. (Under Texas law, interbasin transfer permits are required to transfer surface water from one river basin to another. They are not required for the transfer of groundwater.) Several of the strategies listed in Table 4C.4 have already been granted interbasin transfer permits, including Dallas' Lake Tawakoni pipeline and connection to Lake Palestine and NTMWD's supply from Lake Texoma. Existing sources with the potential to provide supply to Region C that would require interbasin transfer permits include the Brazos River Authority system, Wright Patman Lake, Toledo Bend Reservoir, additional Lake Palestine water, Cypress River Basin water (Lake O' the Pines), Oklahoma reservoirs, and the Gulf of Mexico. Potential new surface water supplies that would need interbasin transfer permits include Marvin Nichols Reservoir, George Parkhouse North and South Lakes, Lower Bois d'Arc Creek Reservoir, Lake Columbia, and

Lake Ralph Hall. Overall water supplies in the Trinity and Brazos River Basins are mostly or completely allocated, while the Red, Sulphur, Cypress Creek, Sabine, and Neches Basins may have supplies in excess of their projected demands. Detailed studies of water needs in the receiving and the source basins will be required as part of the permitting process for new interbasin transfers. Development of adequate supplies for Region C and the other growing areas of Texas will require interbasin transfers.

*Summary of Decision: Include interbasin transfers as part of the management strategies considered in the Region C plan.*

### Other Measures - Renewal of Contracts

Many of the water users in Region C purchase water from a regional wholesale water provider or from another water supplier through contractual arrangements. For this plan it was assumed that existing water supply contracts will be renewed unless either entity indicated they were not planning to continue the contract. Renewal of a contract was not treated as a specific management strategy. In most cases in Region C, both the seller and the purchaser plan to renew existing contracts, and their long-term plans are based on the renewal of contracts. Contract increases are potentially feasible with the agreement of both parties.

*Summary of Decision: Assume that existing contracts are renewed upon their expiration and do not consider renewal to be a water management strategy. Assume an increase in the amount of the contracts to meet projected needs with the agreement of both parties.*

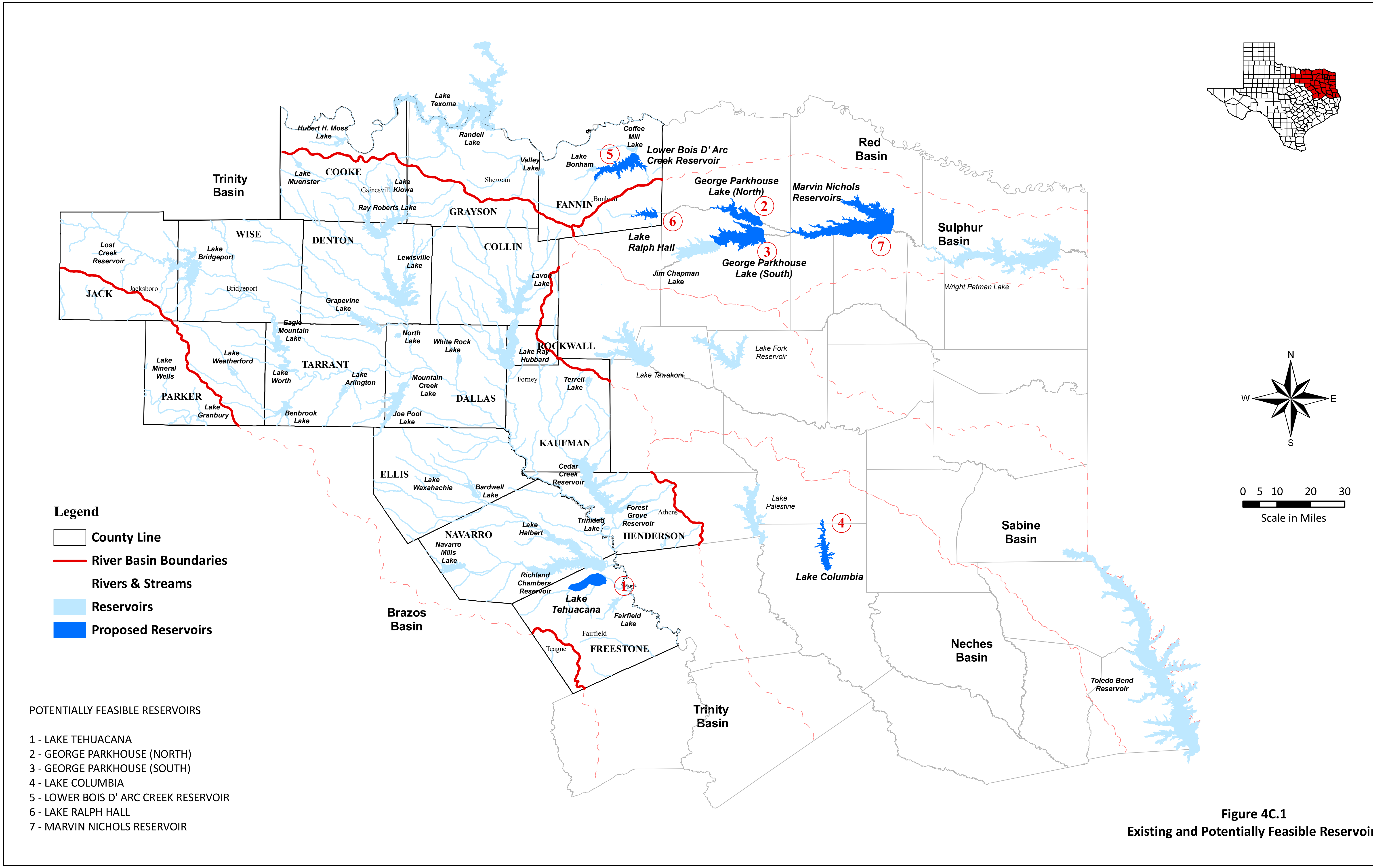



**Figure 4C.1**
**Existing and Potentially Feasible Reservoirs**

**Table 4C.4**
**Potentially Feasible Interbasin Transfers for 2011 Region C Plan**

| Source | Basin of Origin | Receiving Basin | Maximum Amount (Ac-Ft/Yr) | Comments |
|---|---|---|---|---|
| Lake Palestine | Neches | Trinity | 112,881 | Already permitted |
| Lake Tawakoni Pipeline (additional Fork Reservoir water) | Sabine | Trinity | 77,994 | Already permitted |
| Toledo Bend Reservoir | Sabine | Trinity | 600,000 | Connection of Existing Supply |
| Oklahoma Water | Red | Trinity | 165,000 or more | Connection of Existing Supply |
| Wright Patman Lake | Sulphur | Trinity | 184,000 | Connection of Existing Supply, Reallocation |
| Wright Patman Lake – System Operation with Chapman Lake | Sulphur | Trinity | 390,000 | Connection of Existing Supply, Reallocation |
| Forest Grove Reservoir | Trinity | Neches | 2,500 | Connection of Existing Supply |
| Gulf of Mexico Desalination | Gulf of Mexico | Trinity | unlimited | Connection of Existing Supply, Desalination |
| GTUA Lake Texoma and Grayson County Project | Red | Trinity | 56,500 | Connection to Existing Supply, Desalination, Reallocation |
| Lake Texoma Not Yet Authorized with or without Desalination | Red | Trinity | 220,000 | Connection of Existing Supply, Reallocation, Desalination |
| Lake Texoma Not Yet Authorized – Blending with Elm Fork Reservoirs | Red | Trinity | 20,000 | Connection of Existing Supply, Reallocation |
| Cypress River Basin Supplies | Cypress | Trinity | 89,600 | Connection of Existing Supply |
| Marvin Nichols Reservoir | Sulphur | Trinity | 489,840 | New Surface Water |
| Lower Bois d'Arc Creek Reservoir | Red | Trinity | 123,000 | New Surface Water |
| Lake Ralph Hall | Sulphur | Trinity | 34,050 | New Surface Water |
| George Parkhouse North Lake | Sulphur | Trinity | 118,960 | New Surface Water |
| George Parkhouse South Lake | Sulphur | Trinity | 135,600 | New Surface Water |
| Neches River Run-of-River Supplies | Neches | Trinity | 112,100 | Connection of Existing Supply |
| Lake Columbia | Neches | Trinity | 35,800 | New Surface Water |

## Other Measures – Temporary Overdrafting

In several Region C counties, the current use of groundwater exceeds or is near the estimate of long-term reliable groundwater supply. In order to reduce the demand on overused groundwater resources, water suppliers will need to develop alternate sources of supply. However, the development of alternate sources will take some time. Temporary overdrafting of some groundwater supplies will continue in order to provide water in the interim. Temporary overdrafting of surface water reservoirs may also occur on a short-term basis while water suppliers are connecting to other supply sources.

*Summary of Decision: Temporary overdrafting of groundwater resources and surface water reservoirs can be used as an interim measure while other water supplies are developed.*

### Other Measures – Groundwater Conservation Districts

Texas law allows for the establishment of groundwater conservation districts to help control the development and use of groundwater resources. Groundwater conservation districts can control well size and use, well spacing, and groundwater pumping. There are currently four active groundwater conservation districts in Region C and three newly created districts that have not yet begun operation. These groundwater conservation districts may be an appropriate way to share a limited resource in areas where groundwater use exceeds or approaches the long-term reliable supply. Participation in such districts is a local decision and should be considered by water suppliers and government officials in areas of heavy groundwater use.

*Summary of Decision: Local water suppliers and government officials should consider becoming active participants in groundwater conservation districts in areas of heavy groundwater use.*

### Other Measures – Supplemental Wells

Over time the efficiency of groundwater wells decreases due to siltation, declining water levels, and aging materials. Water providers with groundwater sources will periodically replace existing wells or add new wells to maintain the same level of supply currently produced from their systems. To ensure the continued availability of groundwater it was assumed that supplemental wells would be installed over the planning period.

*Summary of Decision: Include supplemental wells for all groundwater users in Region C at a replacement rate of 20 percent per decade.*

### Other Measures – Sediment Control Structures

The accumulation of sediment in existing reservoirs can have a significant impact on the reliable supply from those reservoirs over time. For reservoirs in Region C, there is a projected reduction in reservoir yield of 37,000 acre-feet per year over the 50-year period from 2010 to 2060. For reservoirs outside Region C that supply water to Region C, there is a projected reduction in yield of 16,000 acre-feet per year over the same period.

Since the 1950s numerous dams and structures in Texas have been constructed to help reduce the amount of sediment carried downstream into water supply sources. Many of these structures are approaching the end of their useful life and will require rehabilitation or new structures. Studies conducted by the Tarrant Regional Water District in the Trinity River Basin estimate that existing Natural Resources Conservation Service (NRCS) control structures provide considerable reductions in sediment loading to downstream reservoirs. In the West Fork System watershed, the cost per acre-foot of sediment retained was estimated by the District at $435. Based on the projected sediment accumulation in the lakes and the corresponding reduction in yield, the cost of water saved would be about $200 per acre-foot. This indicates sediment control structures can be very cost effective in selected watersheds. The control of sediment by these NRCS structures can also have water quality benefits for downstream streams and reservoirs.

*Summary of Decision: Recommend the state support both federal and state efforts to rehabilitate existing sediment control structures and encourage funding and support for the construction of new structures in watersheds that would have the greatest benefits.*

### Summary of Potentially Feasible Strategies

Appendix O includes a listing of potentially feasible water management strategies for Region C for Wholesale Water Providers and for all Water User Groups by County. Table 4C.5 lists potentially feasible strategies that would supply over 25,000 acre-feet per year for Region C. As the table shows, Region C considered and evaluated a wide variety of potentially feasible water management strategies. The results of the evaluation and the recommended strategies for Region C are discussed in Sections 4D, 4E, and 4F, and summarized in Appendix P. The methodology for the evaluation is discussed below.

## 4C.2 Methodology for Evaluating Water Management Strategies

The TWDB guidelines set forth certain factors that are to be considered by the regional water planning groups in the evaluation of water management strategies [2]:

- Evaluation of quantity, reliability, and cost of water delivered and treated

- Environmental factors including:
    - Environmental water needs
    - Wildlife habitat
    - Threatened and endangered species
    - Cultural resources
    - Bays and estuaries
- Impacts on other water resources
- Impacts on threats to agricultural and natural resources
- Other factors deemed relevant by the planning group
- Equitable comparison of all feasible strategies
- Consideration of interbasin transfer requirements in the Texas Water Code and other regulatory requirements
- Consideration of third party social and economic impacts of voluntary redistributions of water.

This subsection discusses the specific evaluation factors selected by the Region C Water Planning Group for the potentially feasible water management strategies, including the environmental evaluation of alternatives and the development of costs. Additional details on the environmental evaluations, the development of costs, and the evaluation of strategies are included in various appendices.

**Table 4C.5**
**Potentially Feasible Water Management Strategies for Region C**
**Supplying 25,000 Acre-Feet per Year or More**

| Strategy | Potential Sponsor(s) | Maximum Supply Available to Region C in Acre-Feet per Year | Recommended in 2006 Plan? |
|---|---|---|---|
| Conservation and Reuse (Including reuse projects listed below) | Multiple | 1,190,200 | Yes |
| Toledo Bend Reservoir | SRA, NTMWD, TRWD, DWU, and UTRWD | 600,000 | Yes |
| Gulf of Mexico with Desalination | DWU, NTMWD, and TRWD | Unlimited | No |
| Marvin Nichols Reservoir | DWU, NTMWD, TRWD, UTRWD, and Irving | 489,840 | Yes |
| Wright Patman Lake – System | DWU, NTMWD, and TRWD | 390,000 | No |

**Table 4C.5, Continued**

| | | | |
|---|---|---|---|
| Lake Texoma Not Yet Authorized - Blend | DWU, NTMWD, TRWD, or UTRWD | 220,000 | No (alternate) |
| Lake Texoma - Desalination | NTMWD | 207,000 | No |
| Lake Livingston | DWU, NTMWD, or TRWD | 200,000 | No (alternate) |
| Ogallala Groundwater (Roberts County) | DWU, NTMWD, or TRWD | 200,000 | No (alternate) |
| Wright Patman Lake – Raise Flood Pool | DWU, NTMWD, or TRWD | 180,000 | Yes |
| Oklahoma Water | DWU, NTMWD, TRWD, UTRWD, Irving, and Denton | 165,000 or more | Yes |
| Lower Bois d'Arc Creek Reservoir | NTMWD | 123,000 | Yes |
| George Parkhouse Lake (North) | DWU, NTMWD, UTRWD, or Irving | 118,960 | No (alternate) |
| Lake Texoma - Blend | NTMWD | 113,000 | Yes |
| Lake Palestine (Integrated Pipeline with TRWD) | DWU | 112,881 | Yes |
| Neches River Run of River | DWU | 112,100 | No |
| George Parkhouse Lake (South) | DWU, NTMWD, UTRWD, or Irving | 108,480 | No (alternate) |
| TRWD Integrated Pipeline and Reuse | TRWD | 105,500 | Yes |
| Lake Texoma Desalination | NTMWD | 105,000 | No (alternate) |
| Wright Patman Lake – Texarkana | DWU, NTMWD, TRWD, or UTRWD | 100,000 | No |
| Carrizo-Wilcox Groundwater (Brazos County) | TRWD, DWU or NTMWD | 100,000 | No (alternate) |
| Carrizo-Wilcox Groundwater (Brazos County) | TRWD and NTMWD | 100,000 | No (alternate) |
| DWU Cypress River Basin Supplies (Lake O' the Pines) | DWU, NTMWD, or TRWD | 89,600 | No |
| Lake Tawakoni Pipeline | DWU | 77,994 | Yes |
| DWU Southside (Lake Ray Hubbard) Reuse | DWU | 67,253 | Yes |
| DWU Lewisville Lake Reuse | DWU | 67,253 | Yes |
| Main Stem Trinity River Pump Station | DWU and NTMWD | 66,512 | No |
| Tehuacana Reservoir | TRWD | 56,800 | No (alternate) |
| GTUA Lake Texoma Already Authorized | GTUA | 56,500 | Yes |
| Ellis County Water Supply Project | TRA/ TRWD/Ellis County Suppliers | 53,189 | Yes |
| Lake Ralph Hall and Reuse | UTRWD | 52,437 | Yes |
| Lake Columbia | DWU | 35,800 | No |
| TRA Contract with Irving for Reuse | TRA and Irving | 28,000 | No |
| Neches River Run-of-River Supplies | DWU | 112,100 | No |
| NTMWD/GTUA Collin Grayson Municipal Alliance | Multiple | 27,412 | Yes |

## Factors Considered in Evaluation

Table 4C.6 sets out the factors specifically considered by the Region C Water Planning Group in the evaluation of potential water management strategies. As required, the evaluation of water management strategies includes the quantitative reporting of quantity, reliability, costs and environmental factors. While the quantitative reporting of water made available and the unit cost of delivered and treated water can readily be developed, data for the quantitative reporting of environmental factors are limited. The detailed quantitative assessment of environmental factors requires data from site-specific studies, which are often not conducted at the planning level. Available data for environmental factors are used in the evaluation. For factors that could not currently be quantified, the potential impacts are evaluated qualitatively, with a rating of low, medium, high, or positive.

Consistency with plans of Region C water suppliers is an important factor in the evaluation of strategies. It is the intent of the Region C Water Planning Group to build the Region C Water Plan considering the existing plans of the water suppliers in the region, especially the regional wholesale water providers.

Equitable comparison of all feasible strategies is not included as an explicit evaluation factor because it describes the way that the entire evaluation was conducted. This factor was considered in the development of the methodology for evaluations. Interbasin transfer requirements in the Texas Water Code were considered in the development of strategies. Appendix P gives more details on the evaluation of potentially feasible water management strategies for Region C.

**Table 4C.6**
**Factors Used to Evaluate Water Management Strategies for Region C**

| |
|---|
| Quantity of Water Made Available |
| Reliability of Supply |
| Unit Cost of Delivered and Treated Water |
| Environmental Factors |
| - Total Acres Impacted |
| - Wetland Acres |
| - Environmental Water Needs |
| - Wildlife Habitat |
| - Threatened and Endangered Species |
| - Cultural Resources |
| - Bay and Estuary Flows |
| - Water Quality |
| - Other |
| Impacts on Agricultural and Rural Areas |
| Impacts on Natural Resources |
| Impacts on Other Water Management Strategies and Possible Third Party Impacts |
| Impacts to Key Water Quality Parameters |
| Consistency with Plans of Region C Water Suppliers |
| Consistency with Other Regions |

## Environmental Evaluation

The environmental evaluation of potentially feasible management strategies is summarized in Appendix P. Factors reported quantitatively include the total acres impacted by the strategy and the number of threatened and endangered species listed in the counties of the proposed water source. For existing water sources, only the species that are water dependent are included in the count of threatened and endangered species. Other factors were assigned a high, moderate, or low rating based on existing data and the potential to avoid or mitigate each of the environmental categories listed in Table 4C.6. If a strategy would have a positive impact to the respective environmental factor, this was noted as "positive". These evaluations were summarized in an overall environmental evaluation for the strategy. Certain management strategies were evaluated as a category rather than individually because their environmental effects do not vary greatly. Examples of evaluation by category include purchasing water from another provider, development of new wells in aquifers with additional water available, and temporary overdrafting of aquifers.

### Agricultural Resources and Other Natural Resources

The evaluation of impacts to agricultural resources and rural areas assesses the ability to continue current agricultural and livestock activities. Strategies that move considerable amounts of water from rural to urban areas were also considered under this category. The impacts of recommended strategies on these factors are discussed in more detail in Chapter 5.

Impacts to other natural resources include potential impacts to water resources that are not the direct source for the strategy and impacts to mineral resources, oil and gas, timber resources, and parks and public lands. (Impacts to the water resources that are the source for the strategy are included under environmental factors.) The considerations of the impacts to agricultural and natural resources are used to assess how the regional water plan is consistent with the protection of the state's resources. This discussion is summarized in Chapter 7 of the plan.

### Costs of Water Management Strategies

Appendix Q contains more detailed information on the development of cost estimates for individual water management strategies. Development of cost estimates followed guidelines provided by the Texas Water Development Board. The assumptions used for the cost estimates are outlined in Appendix Q. For equitable comparison of the water management strategies, capital costs for all strategies were assumed to be financed by 30–year bonds. The discounted present value of each potentially feasible strategy will be calculated by the Texas Water Development Board. The costs shown in Appendix Q are the unit costs during and after payment of debt service.

### Recommended Water Management Strategies

Water management strategies are recommended based on the overall factors set forth in the strategy evaluations. As discussed above, consistency with the on-going water development plans of regional water providers is an important factor in the strategy selection. All factors listed in Table 4C.6 were considered in the selection process. The recommended strategies are based on the ability to supply the quantity of water needed at a reasonable cost, while providing long-term protection of the state's resources. Recommended strategies for Region C are discussed in the following Sections 4E and 4F.

## SECTION 4C
## LIST OF REFERENCES


(1) Texas Water Development Board: *Water for Texas – 2007*, Austin, adopted November 14, 2006.

(2) Texas Water Development Board: *Chapter 357, Regional Water Planning Guidelines*, Austin, September 2008.

(3) Chiang, Patel and Yerby, Inc.: *2005 Update - Long Range Water Supply Plan*, Dallas, December 31, 2005.

(4) Alan Plummer Associates, Inc.: *City of Dallas 5-Year Strategic Plan for Water Conservation*, Dallas, April 2005.

(5) Alan Plummer Associates, Inc.: *Recycled Water Implementation Plan*, Dallas, August 2005. https://www.twdb.state.tx.us/RWPG/rpgm_rpts/2003483486_Recycled_Water_Implementation_Plan_Vol_I.pdf

(6) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, Fort Worth, January 2006.

(7) U.S. Army Corps of Engineers, Tulsa District, *Final Environmental Assessment, Lake Texoma Storage Reallocation Study, Lake Texoma, Oklahoma and Texas*, Tulsa, May 2006. Available URL: http://www.swt.usace.army.mil/library/Lake%20Texoma%20Reallocation%20Study/2006/FINAL%20LAKE%20TEXOMA%20EA%20060106.pdf

(8) Texas State Soil and Water Conservation Board, *State Brush Control Plan,* Temple, [Online], Available URL: http://www.tsswcb.state.tx.us/reports/brushplan2001.pdf, 2002.

(9) R.J. Brandes Company, *Final Report – Water Availability Modeling for the Sulphur River Basin*, prepared for the Texas Water Development Board, Austin, June 1999.

(10) Espey Consultants, Inc., Brown and Root, Inc., Freese and Nichols, Inc. GSG, Inc., Crespo Consulting Services, Inc., *Final – Water Availability Models for the Trinity, Trinity-San Jacinto, and Neches Trinity Basins*, prepared for the Texas Water Development Board, Austin, March 2002.

# 4D. Evaluation of Major Water Management Strategies

This section of the report reviews the evaluation of major potentially feasible water management strategies. Major strategies are defined as those that would supply more than 60,000 acre-feet per year and those that involve the construction of a new reservoir supplying over 1,000 acre-feet per year. Table 4D.1 lists the major potentially feasible water management strategies for Region C, and Figure 4D.1 shows the location of the water supplies for the major strategies considered.

As discussed in Section 4C, potentially feasible water management strategies for Region C were evaluated on the basis of quantity, reliability, cost, environmental factors, impacts on agricultural and rural areas, impacts on natural resources, impacts on other water management strategies and third party impacts, impacts to key water quality parameters, consistency with plans of Region C water suppliers, and consistency with the plans of other regions. Table 4D.2 summarizes the evaluation of the potentially feasible strategies listed in Table 4D.1. Figure 4D.2 shows the comparative unit costs of the strategies. Appendix P gives more details on non-cost evaluations for the strategies, and Appendix Q contains detailed cost estimates. The costs shown in Table 4D.2 and Figure 4D.2 should be used with caution. The costs for a given source can vary a great deal based on the amount used and where the water is delivered.

The remainder of this section discusses the evaluations of the specific potentially feasible major water management strategies for Region C. (Conservation strategies are discussed in Section 4B and Chapter 6.)

## *4D.1 Toledo Bend Reservoir*

Toledo Bend Reservoir is an existing impoundment located in the Sabine River Basin on the border between Texas and Louisiana. It was built in the 1960s by the Sabine River Authority of Texas (SRA) and the Sabine River Authority of Louisiana. The yield of the project is split equally between the two states, and Texas' share of the yield is slightly over 1,000,000 acre-feet per year [(2)]. The SRA holds a Texas water right to divert 750,000 acre-feet per year from Toledo Bend and is seeking the right to divert an additional 293,300 acre-feet per year.

**Table 4D.1**
**Major Potentially Feasible Water Management Strategies for Region C**

| Strategy | Maximum Supply Available to Region C in Acre-Feet per Year | Location Number in Figure 4D.1 |
|---|---|---|
| Conservation and Reuse (Includes Projects Listed below) | 1,190,200 | N/A |
| Toledo Bend Reservoir | 600,000 | 22 |
| Gulf of Mexico with Desalination | Unlimited | 5 |
| Marvin Nichols Reservoir | 489,840 | 19 |
| Wright Patman Lake – System | 390,000 | 21 |
| Lake Texoma Not Yet Authorized - Blend | 220,000 | 3 |
| Lake Texoma Not Yet Authorized - Desalination | 207,000 | 3 |
| Lake Livingston | 200,000 | 17 |
| Ogallala Groundwater (Roberts County) | 200,000 | 1 |
| Wright Patman Lake - Raise Flood Pool | 180,000 | 21 |
| Oklahoma Water | 165,000 or more | 16 |
| TRWD Integrated Pipeline | 150,000 | 10 |
| Lower Bois d'Arc Creek Reservoir | 123,000 | 9 |
| George Parkhouse Lake (North) | 118,960 | 12 |
| Lake Palestine (DWU Integrated Pipeline with TRWD) | 114,337 | 14 |
| Lake Texoma - Blend | 113,000 | 3 |
| Neches River Run-of-the-River Diversion | 112,100 | 15 |
| George Parkhouse Lake (South) | 108,480 | 13 |
| TRWD Wetlands | 105,500 | 8 |
| Lake Texoma - Desalination | 105,000 | 3 |
| Wright Patman Lake - Texarkana | 100,000 | 21 |
| Carrizo-Wilcox Groundwater (Brazos County) | 100,000 | 6 |
| Cypress Basin Supplies (Lake O' the Pines) | 89,600 | 20 |
| Tawakoni Pipeline | 77,994 | 2 |
| DWU Southside (Lake Ray Hubbard) Reuse | 67,253 | 24 |
| DWU Lake Lewisville Reuse | 67,253 | 23 |
| Main Stem Trinity River Pump Station[a] | 66,512/41,029 | 4 |
| Tehuacana Reservoir | 56,800 | 7 |
| Lake Ralph Hall and Reuse | 52,437 | 11 |
| Lake Columbia | 35,800 | 18 |

Note: The maximum supply of 66,512 acre-feet per year includes temporary supplies. The long term supply is 41,029 acre-feet per year.

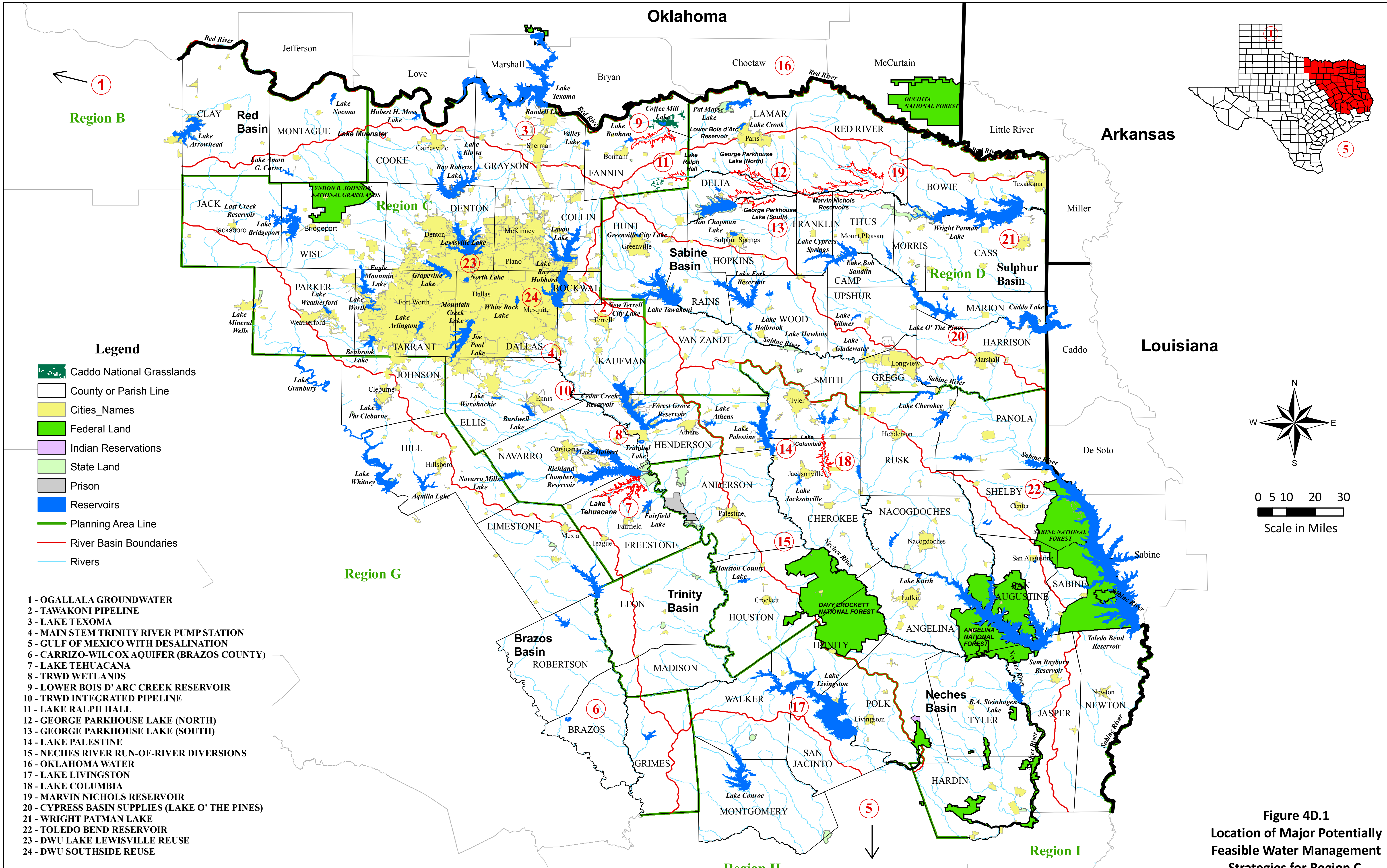



**Figure 4D.1**
**Location of Major Potentially Feasible Water Management Strategies for Region C**

**Figure 4D.2**
**Unit Costs of Potentially Feasible Major Strategies for Region C**

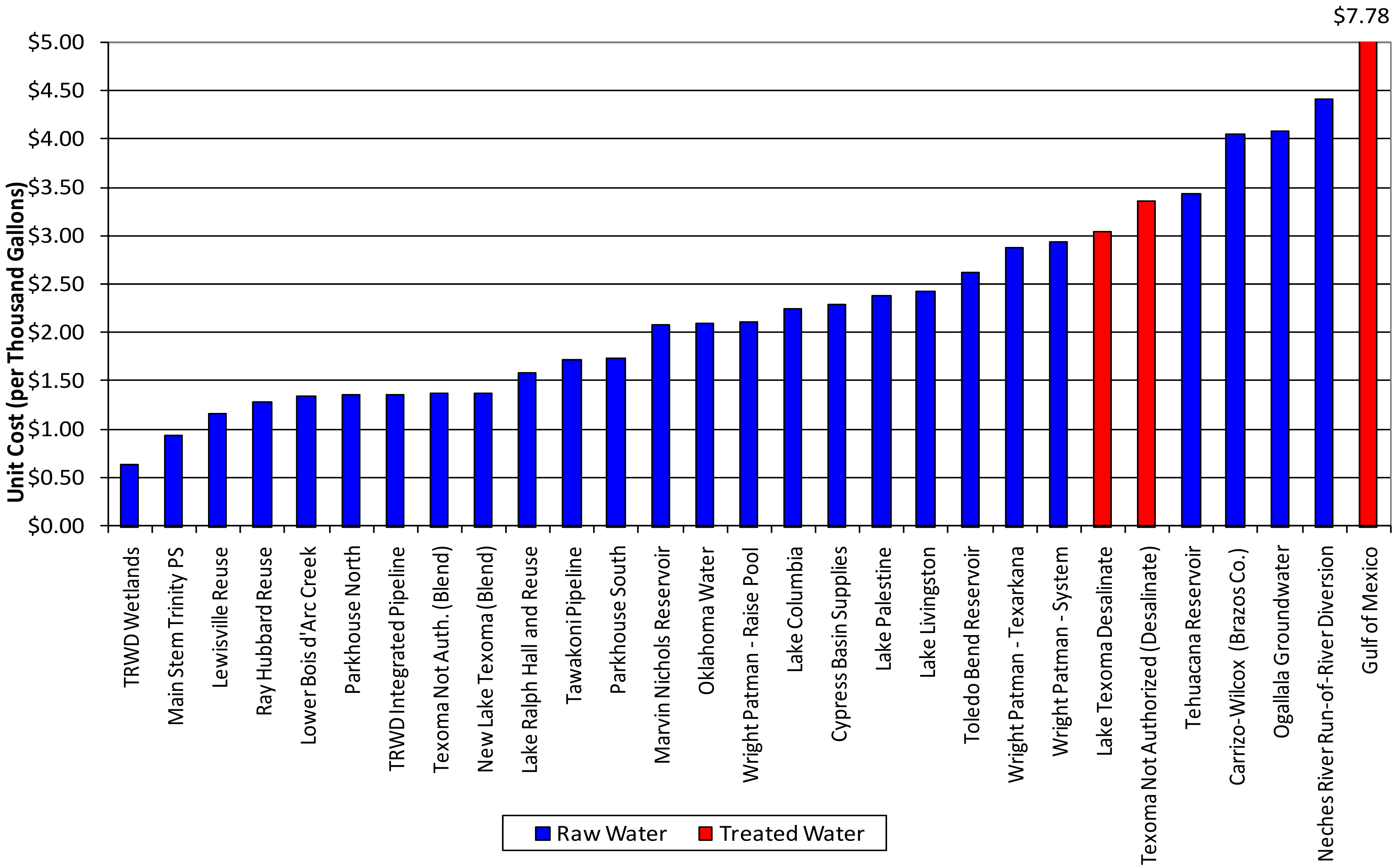


**Table 4D.2**
**Summary of Costs and Impacts of Major Potentially Feasible Strategies for Region C**

| Strategy | Potential Supplier(s) | Potential Region C Supply (Acre-Feet per Year) | Region C Share of Capital Cost | Unit Cost for Region C ($/1,000 Gal.) | | Reliability | Environ-mental Factors | Agricultural/ Rural Impacts | Other Natural Resources | 3rd Party Impacts | Key Water Quality Parameters | Consistency | | Implementation Issues | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Paid | | | | | | | Suppliers | Other Regions | | |
| Toledo Bend Reservoir | DWU, NTMWD, SRA, & TRWD | 600,000 | $4,504,906,000 | $2.61 | $0.94 | High | Medium low | Low | Low | Medium low | Low | Yes | Yes | Requires IBT and agreements with multiple users. | Costs are weighted average for all four potential participants. |
| Gulf of Mexico | DWU, NTMWD, or TRWD | Unlimited (costs for 200,000 acre-feet per year) | $4,367,727,000 | $7.78 | $2.91 | Medium | Medium | Low | Medium low | Low | Low | No | N/A | Technology is still developing for this application at this scale. May require state water right permit and IBT. | Strategy was costed to central location. Capital cost was based on one supplier. Supply is treated water. |
| Marvin Nichols Reservoir | DWU, Irving, NTMWD, TRWD and UTRWD | 489,840 | $3,300,565,000 | $2.08 | $0.57 | High | High | High | Medium high | High | Medium | Yes | Not inconsistent | Requires new water rights permit and IBT. Known public opposition. | Costs are weighted average for all five potential participants. |
| Wright Patman - System | DWU, NTMWD, and TRWD | 390,000 | $3,085,722,000 | $2.93 | $0.85 | High | Medium | Low | Medium | Medium | Medium low | No (alternate) | Not inconsistent | Requires IBT, contract with USACE, contract with Texarkana, and new or amended water right permit. | Costs are based on 130,000 acre-feet per year for each potential participant. |
| Lake Texoma Not Yet Authorized (Blend) | DWU or TRWD | 220,000 (Costs for 113,000 acre-feet per year) | $551,378,000 | $1.37 | $0.32 | High | Medium low | Low | Medium low | Medium low | Medium | No (alternate) | N/A | Requires IBT, state water right, Congressional authorization, and contract with USACE. | |
| Lake Texoma Not Yet Authorized (Desalinate) | DWU or TRWD | 207,000 (Costs are for 105,000) | $925,918,000 | $3.37 | $1.41 | High | Medium | Low | Medium | Medium low | Medium | No (alternate) | N/A | Requires IBT, Congressional authorization, state water right, contract with USACE and brine discharge permit (or deep well injection). | Delivers treated water. |
| Lake Livingston | DWU, NTMWD, or TRWD | 200,000 | $1,321,975,000 | $2.42 | $0.91 | High | Low | Low | Low | Medium low | Low | No (alternate) | Unknown | Requires contract with TRA. | May be competing interest in supply in other region. Cost is the average of costs for the three suppliers. |
| Ogallala Groundwater (Roberts County) | DWU, NTMWD, or TRWD | 200,000 | $2,850,685,000 | $4.07 | $0.88 | High | Medium low | Medium | Medium | Medium low | Medium | No (alternate) | Not inconsistent | Requires additional water rights. | Assumes 400,000 acres of water rights. Seller will need additional rights. Cost is the average of costs for the three suppliers. |
| Wright Patman - Raise Flood Pool | DWU, NTMWD, or TRWD | 180,000 | $1,197,468,000 | $2.11 | $0.63 | High | Medium | Low | Medium low | Medium low | Medium low | Yes | Not inconsistent | Requires IBT, contract with USACE and new or amended water right permit. | |
| Oklahoma Water | DWU, NTMWD, TRWD, Irving, and/or UTRWD | 165,000 or more (costs based on 115,000) | $756,044,000 | $2.09 | $0.64 | High | Low | Low | Low | Medium low | Medium low | Yes | N/A | Oklahoma has moritorium for export of water out of state. | |
| TRWD Integrated Pipeline | TRWD | 179,000 (based on 200 mgd capacity, 1.25 peaking) | $702,008,046 | $1.36 | $0.48 | High | Low | Low | Low | Medium low | Low | Yes | N/A | | Pipeline delivers existing supplies. |

### Table 4D.2, Continued

| Strategy | Potential Supplier(s) | Potential Region C Supply (Acre-Feet per Year) | Region C Share of Capital Cost | Unit Cost for Region C ($/1,000 Gal.) | | Reliability | Environ-mental Factors | Agricultural/ Rural Impacts | Other Natural Resources | 3rd Party Impacts | Key Water Quality Parameters | Consistency | | Implementation Issues | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Paid | | | | | | | Suppliers | Other Regions | | |
| Lower Bois d'Arc Creek Reservoir | NTMWD | 123,000 | $615,498,000 | $1.33 | $0.21 | High | Medium high | High | Medium | Medium | Low | Yes | N/A | Requires new water rights permit and IBT. | |
| George Parkhouse Lake North | DWU, NTMWD, and/or UTRWD | 118,960 | $518,083,000 | $1.35 | $0.35 | High | Medium high | Medium high | Medium | Medium | Low | No (alternate) | Not inconsistent | Requires new water rights permit and IBT. | Costs are the average of NTMWD and DWU. |
| Lake Palestine (DWU Integrated Pipeline with TRWD) | DWU | 114,337 | $887,954,087 | $2.37 | $0.60 | High | Low | Low | Low | Medium low | Low | Yes | Yes | DWU has IBT permit. | |
| New Lake Texoma (Blend) | NTMWD | 113,000 | $531,378,000 | $1.37 | $0.32 | High | Medium low | Low | Medium low | Medium low | Medium | Yes | N/A | Requires contract with USACE. | NTMWD has received a water right and is negotiating with USACE. |
| Neches River Run-of-River Diversion | DWU | 112,100 | $1,980,278,000 | $4.41 | $1.13 | High | Medium high | Medium | Medium high | Medium | Medium | Yes | Not inconsistent | Requires new water rights permit and IBT. | |
| George Parkhouse Lake (South) | NTMWD and/or UTRWD | 108,480 | $669,360,000 | $1.73 | $0.39 | High | Medium high | Medium high | Medium | Medium | Low | No (alternate) | Not inconsistent | Requires new water rights permit and IBT. | |
| TRWD Wetlands | TRWD | 105,500 | $212,416,000 | $0.63 | $0.18 | Low | Low | Low | Low | Low | Medium | Yes | N/A | TRWD has permit for reuse. | |
| Lake Texoma Desalinate | NTMWD | 105,000 | $736,391,000 | $3.05 | $1.36 | High | Medium | Low | Medium | Medium low | Medium | No (alternate) | N/A | Requires IBT, state water right, contract with USACE and brine discharge permit (or deep well injection). | Delivers treated water. |
| Lake Wright Patman - Texarkana | DWU, NTMWD, or TRWD | 100,000 | $842,003,000 | $2.87 | $0.99 | High | Low | Low | Low | Medium low | Medium low | No (alternate) | Not inconsistent | Requires agreement with Texarkana and IBT. | Costs are the average for the three suppliers. |
| Carrizo-Wilcox Groundwater (Brazos County and vicinity) | DWU or NTMWD | 100,000 | $857,398,000 | $4.05 | $1.66 | High | Medium | Medium | Medium high | Medium | Low | No (alternate) | No | Requires coordination with local groundwater districts. Competing uses for water. | Costs are the average for DWU and NTMWD. |
| Cypress Basin Supplies (Lake O' the Pines) | DWU, NTMWD, or TRWD | 89,600 | $564,157,000 | $2.28 | $0.86 | High | Low | Low | Low | Medium low | Low to medium low | No (alternate) | Not inconsistent | Requires IBT, renegotiating exsting contracts, and contract with NETMWD. | Costs are the average for the three suppliers. |
| Tawakoni Pipeline | DWU | 77,994 | $496,243,000 | $1.71 | $0.29 | High | Low | Low | Low | Low | Low | Yes | Yes | | |
| DWU Southside (Lake Ray Hubbard) Reuse | DWU | 67,253 | $292,327,000 | $1.27 | $0.30 | High | Low | Low | Medium low | Low | Medium | No | N/A | DWU has water right permit. | |
| DWU Lake Lewisville Reuse | DWU | 67,253 | $282,453,000 | $1.15 | $0.21 | High | Low | Low | Medium low | Low | Medium | No | N/A | DWU has water right permit. Difficult construction through urban area. | |
| Main Stem Trinity River Pump Station [(a)] | DWU and NTMWD | 66,512/41,029 [(a)] | $142,567,000 | $0.94 | $0.16 | High | Low | Low | Low | Low | Medium | Yes | N/A | Requires water right permit amendment. | |
| Tehuacana Reservoir | TRWD | 56,800 | $746,345,000 | $3.43 | $0.50 | High | Medium high | Medium high | Medium | Medium | Low | No (alternate) | N/A | Requires new water rights permit. | |
| Lake Ralph Hall and Reuse | UTRWD | 52,437 | $316,756,000 | $1.58 | $0.23 | High | Medium high | Medium | Medium | Medium | Medium | Yes | N/A | Requires new water right and IBT. | |
| Lake Columbia | DWU | 35,800 | $294,119,000 | $2.24 | $0.41 | High | Medium high | Medium | Medium | Medium | Medium | No (alternate) | Yes | Requires contract with ANRA and IBT. | |

Note: (a) The Main Stem Trinity River Pump Station supplies up to 66,512 acre-feet per year including interim supplies. The long term supplies are 41,029 acre-feet per year. Long term supplies are used for unit costs.

The SRA and Metroplex water suppliers have been investigating the possibility of developing substantial water supplies from Toledo Bend Reservoir, with up to 100,000 acre-feet per year delivered to SRA customers in the upper Sabine River Basin (Region D, the North East Texas Region) and up to 600,000 acre-feet per year delivered to Region C. (Toledo Bend Reservoir is located in Region I, the East Texas Region.) The development of this supply will require an agreement among the SRA and Metroplex suppliers, an interbasin transfer permit from the Sabine River Basin to the Trinity River Basin, and development of water transmission facilities. Because Toledo Bend Reservoir is so far from Region C (about 200 miles), this is a relatively expensive source of supply for the Region. However, it does offer a substantial water supply, and environmental impacts will be limited because it is an existing source.

As discussed in Section 4E, getting water from Toledo Bend Reservoir is a recommended strategy for the North Texas Municipal Water District (200,000 acre-feet per year) and the Tarrant Regional Water District (200,000 acre-feet per year). It is an alternative strategy for Dallas Water Utilities and the Upper Trinity Regional Water District. The recommended strategy involves the use of 500,000 acre-feet per year (100,000 for SRA customers in the upper Sabine River Basin and 400,000 for the Metroplex). The Region C capital cost of the recommended strategy is $3.18 billion. (This differs from the cost in Table 4D.2 because the recommended strategy develops less supply from Toledo Bend Reservoir than is potentially feasible.)

### *4D.2 Gulf of Mexico with Desalination*

The cost of desalination has been decreasing in recent years, and some municipalities in Florida and California have been developing desalinated seawater as a supply source. The State of Texas has sponsored initial studies of potential seawater desalination projects [3], and this is seen as a potential future supply source for the state. Because of the cost of desalination and the distance to the Gulf of Mexico, seawater desalination is not a particularly promising source of supply for Region C. However, seawater desalination has been mentioned through public input during the planning process, and it was evaluated in response to that input.

The supply from seawater desalination is essentially unlimited, but the cost is a great deal higher than the cost of other water management strategies for Region C. Developing water from the Gulf of Mexico with desalination is not a recommended or alternative strategy for any water supplier in Region C.

### *4D.3 Marvin Nichols Reservoir*

The proposed Marvin Nichols Reservoir is located on the Sulphur River in the Sulphur River Basin in Senate Bill One Planning Region D, the North East Texas Region. The proposed reservoir is about 115 miles from the Metroplex. Development of Marvin Nichols Reservoir was a recommended strategy for Region C in the 2001 and 2006 *Region C Water Plans* (1,12). Using the Sulphur River Basin Water Availability Model (4) and assuming that the proposed Lake Ralph Hall is in place as a senior water right, the estimated yield of Marvin Nichols Reservoir is 612,300 acre-feet per year after allowing for downstream water rights and environmental releases as required by the Texas Water Development Board's environmental flow criteria. (The yield analysis assumes that the reservoir will be operated as a system with Wright Patman Lake, protecting Wright Patman Lake's senior water right while minimizing impacts on the yield of Marvin Nichols Reservoir. The cooperative operation assumed in this report will require negotiations between the operators of Marvin Nichols Reservoir and the City of Texarkana, which holds a Texas water right in Wright Patman Lake.)

Assuming that 20 percent of the yield is used to provide water in Region D and 80 percent is made available to Region C, Marvin Nichols Reservoir will provide 489,840 acre-feet per year of additional water supply for Region C.

As a major reservoir project, Marvin Nichols Reservoir will have significant environmental impacts. The reservoir would inundate about 68,000 acres. The 1984 U.S. Fish and Wildlife Service *Bottomland Hardwood Preservation Program* (5) classified some of the land that would be flooded as a Priority 1 bottomland hardwood site, which is "excellent quality bottomlands of high value to key waterfowl species." The proposed new location of the dam will reduce but not eliminate the impact on bottomland hardwoods and will slightly increase the acreage required for the reservoir. Permitting the project and developing appropriate mitigation for the unavoidable impacts will require years, and it is important that water suppliers start that process well in advance of the need for water from the project. Development of the Marvin Nichols Reservoir will require an interbasin transfer permit to bring the water from the Sulphur River Basin to the Trinity River Basin. The project will include a major water transmission system to bring the new supply to the Metroplex. The project will make a substantial water supply available to the Metroplex, and the unit cost is less than that of most other major water management strategies.

As discussed in Section 4E, the proposed Marvin Nichols Reservoir is a recommended strategy for the North Texas Municipal Water District (174,840 acre-feet per year), the Tarrant Regional Water District (280,000 acre-feet per year), and Upper Trinity Regional Water District (35,000 acre-feet per year). It is an alternative strategy for Dallas Water Utilities and the city of Irving. The Region C capital cost of the recommended strategy is $3.43 billion. (This differs from the value in Table 4D.2 because the delivery locations of the recommended strategy are different from the delivery locations assumed in Table 4D.2.)

### *4D.4 Wright Patman Lake*

Wright Patman Lake is an existing reservoir on the Sulphur River in the Sulphur River Basin, about 150 miles from the Metroplex. It is located in Region D, the North East Texas Region, and owned and operated by the U.S. Army Corps of Engineers. The City of Texarkana has contracted with the Corps of Engineers for storage in the lake and holds a Texas water right to use up to 180,000 acre-feet per year from the lake. (In order to obtain a reliable supply of 180,000 acre-feet per year from the lake, Texarkana would have to activate a contract with the Corps of Engineers to increase the conservation storage in the lake.)

There are three different ways in which water could be made available from Wright Patman Lake for water suppliers in Region C:

- Water could be purchased from the City of Texarkana under its existing water right.
- Flood storage in Wright Patman Lake could be converted to conservation storage, and the increased yield could be used in Region C.
- Wright Patman Lake could be operated as a system with Jim Chapman Lake (formerly Cooper Lake) upstream to further increase yield.

Each of these approaches to developing supplies from Wright Patman Lake is discussed below.

***Purchase from Texarkana.*** The 180,000 acre-feet per year for which Texarkana currently has a water right is in excess of their projected demands. Texarkana could sell 100,000 acre-feet per year and still have sufficient supplies to meet its projected needs. It is assumed that development of this supply would require activating the contract between Texarkana and the Corps of Engineers for additional conservation storage (which would require some environmental studies and mitigation) and improvements to Texarkana's pump station on the lake as well as a contract with Texarkana.

***Conversion of Flood Storage to Conservation Storage.*** According to a recent study conducted for the Corps of Engineers, increasing the top of conservation storage in Wright Patman Lake to elevation 228.64 feet msl and allowing diversions as low as elevation 215.25 feet msl would increase the yield of the project to 364,000 acre-feet per year (6). It was assumed that 180,000 acre-feet per year of the additional supply developed could be made available to water suppliers in the Metroplex. The yield of Wright Patman Lake could be increased to much more than 364,000 acre-feet per year by converting additional flood storage to conservation storage and increasing the top of conservation storage. However, increases beyond elevation 228.64 feet msl will inundate portions of the White Oak Creek mitigation area, located upstream from Wright Patman Lake. (Approximately 500 acres of the mitigation area are below elevation 230 feet msl, and about 3,800 acres are below elevation 240 (6).)

***System Operation with Jim Chapman Lake (formerly Cooper Lake).*** The recent study conducted for the Corps of Engineers indicated that system operation of Wright Patman Lake and Jim Chapman Lake could increase the yield from the two projects by about 108,000 acre-feet per year (6). It was assumed that the combination of purchasing water from Texarkana, converting flood storage to conservation storage, and system operation with Jim Chapman Lake could make 390,000 acre-feet per year available for Region C from Wright Patman Lake.

As discussed in Section 4E, converting Wright Patman Lake flood storage to conservation storage is a recommended water management strategy for Dallas Water Utilities, providing 112,100 acre-feet per year. The capital cost of this recommended strategy is $896,478,000. Wright Patman Lake is an alternative water management strategy for Irving, North Texas Municipal Water District, Tarrant Regional Water District, and Upper Trinity Regional Water District.

### *4D.5 Lake Texoma*

Lake Texoma is an existing Corps of Engineers reservoir on the Red River on the border between Texas and Oklahoma. Under the terms of the Red River Compact, the yield of Lake Texoma is divided equally between Texas and Oklahoma. Lake Texoma is used for water supply, hydropower generation, flood control, and recreation. In Texas, the North Texas Municipal Water District, the Greater Texoma Utility Authority, the City of Denison, TXU, and the Red River Authority have contracts with the Corps of Engineers and Texas water rights allowing them to use water from Lake Texoma (7).

The U.S. Congress has passed a law allowing the Corps to reallocate an additional 300,000 acre-feet of storage in Lake Texoma from hydropower use to water supply, 150,000 acre-feet for Texas and 150,000 acre-feet for Oklahoma. The North Texas Municipal Water District is purchasing 100,000 of the 150,000 acre-feet of storage for Texas and has received a Texas water right to divert an additional 113,000 acre-feet per year from Lake Texoma. The remaining 50,000 acre-feet of storage was reserved by Congress for the Greater Texoma Utility Authority, which is purchasing storage and has received a Texas water right for the supply.

Further reallocation of hydropower storage to water supply in Lake Texoma would provide additional yield. According to the Corps of Engineers, the firm yield of Lake Texoma with all hydropower storage reallocated to water supply would be 1,088,500 acre-feet per year (8). Texas' share would be 544,250 acre-feet per year, leaving about 220,000 acre-feet per year of additional supply available to Texas by the reallocation of more hydropower storage to municipal use (beyond the supplies already contracted for and the currently authorized reallocation). Further reallocation would require a new authorization by Congress.

Lake Texoma is only about 50 miles from the Metroplex. The lake has elevated levels of dissolved solids, and the water must be blended with higher quality water or desalinated for municipal use. The elevated dissolved solids in Lake Texoma would have some environmental impacts whether the water is used by blending or desalination. Use for most Region C needs will require an interbasin transfer permit. Blending water from Lake Texoma with water from other sources provides an inexpensive supply for Region C. Desalination provides treated water but is a more expensive strategy, and there are uncertainties in the long-term costs.

The estimated costs for desalination of water from Lake Texoma are based on current cost information for large desalination facilities. However, they are more uncertain than other cost estimates in this plan for a couple of reasons. There is not an established track record of success in the development of large brackish water desalination facilities. Most of the large desalination facilities built to date are located on or near the coast. If a 100 million gallon per day or larger plant were to be developed for Lake Texoma water, it would be the largest inland desalination facility in the world. In addition, the method and cost of brine disposal for such a facility are uncertain. Brine disposal has the potential to significantly increase the estimated cost for desalination. Detailed studies to solidify the cost estimates will be required if this strategy is pursued.

As discussed in Section 4E, Lake Texoma is a recommended source of additional water supply for the North Texas Municipal Water District (113,000 acre-feet per year) and the Greater Texoma Utility Authority (56,500 acre-feet per year). It is an alternative source of supply for Dallas Water Utilities and the Upper Trinity Regional Water District.

### *4D.6 Lake Livingston*

Lake Livingston is an existing reservoir on the Trinity River in Region H. The Trinity River Authority (TRA) and the City of Houston hold the water rights for Lake Livingston. The TRA has indicated that as much as 200,000 acre-feet per year might be available to water suppliers in Region C from the lake. Lake Livingston is about 180 miles from the Metroplex. Region H may be considering other potential uses of the supply from Lake Livingston.

Because this is an existing supply, the environmental impacts of this water management strategy are relatively low. Since Lake Livingston is in the Trinity River Basin, no interbasin transfer permit would be needed for this water management strategy, but a transmission system would be required. Water from Lake Livingston is not a recommended strategy for any Region C supplier, but it is an alternative strategy for Dallas Water Utilities, the North Texas Municipal Water District, and the Tarrant Regional Water District.

### *4D.7 Ogallala Groundwater (Roberts County)*

Mesa Water, Incorporated, is interested in selling groundwater from the Ogallala aquifer in Roberts County to water suppliers in Region C. (Roberts County is in Region A, the Panhandle Region.) Mesa Water controls rights to 150,000 acre-feet per year of groundwater in Roberts County with options for additional supply and has permits from the local groundwater conservation district to export groundwater. Mesa Water has indicated that they can develop a reliable supply of 200,000 acre-feet per year for water suppliers in Region C through 2060 and beyond. The groundwater in Roberts County is about 250 miles from the Metroplex.

Because of the distance, this is a relatively expensive source of supply for Region C, with raw water costing about $4.07 per thousand gallons until the debt service is paid on the initial construction. Since this is a groundwater supply, no interbasin transfer permit would be required. Ogallala groundwater from Roberts County is not a recommended strategy for any Region C supplier. It is an alternative strategy for Dallas Water Utilities and the North Texas Municipal Water District.

### *4D.8 Water from Oklahoma*

Metroplex water suppliers have been pursuing the purchase of water from existing sources in Oklahoma in recent years. Water from Oklahoma was a recommended strategy for North Texas Municipal Water District, Tarrant Regional Water District, and Upper Trinity Regional Water District in the *2006 Region C Water Plan* [12]. The strategy was also recommended in the in the 2001 *Region C Water Plan* [1]. At the present time, the Oklahoma Legislature has established a moratorium on the export of water from the state. The Tarrant Regional Water District and the City of Irving have both filed suits in Federal court seeking to overturn the moratorium. In the long run, Oklahoma remains a promising source of water supply for Region C.

Raw water from Oklahoma would cost about $2.09 per thousand gallons and would have relatively low environmental impacts because of the use of existing sources. Water from Oklahoma is a recommended strategy for Irving (25,000 acre-feet per year), North Texas Municipal Water District (50,000 acre-feet per year), the Tarrant Regional Water District (50,000 acre-feet per year) and the Upper Trinity Regional Water District (15,000 acre-feet per year), with a capital cost of $941,080,000. It is an alternative strategy for Dallas Water Utilities and Irving.

### *4D.9 Tarrant Regional Water District and Dallas Integrated Pipeline*

The Tarrant Regional Water District (TRWD) and Dallas Water Utilities (DWU) are cooperating to construct the Integrated Pipeline, which will deliver water to Tarrant and Dallas Counties from Lake Palestine, Cedar Creek Lake, and Richland-Chambers Reservoir. The pipeline will have a capacity of about 350 mgd, with about 200 mgd for TRWD and 150 mgd for Dallas. Dallas's share of the project will deliver water from Lake Palestine and is discussed in Section 4D.12 below. TRWD's share will deliver about 179,000 acre-feet per year from Cedar Creek Lake and Richland-Chambers Lake (assuming a 1.25 peaking factor). The project is a recommended water management strategy for TRWD and DWU, and TRWD's share of the capital cost is $812,305,000.

### *4D.10 Lower Bois d'Arc Creek Reservoir*

The proposed Lower Bois d'Arc Creek Reservoir was a recommended strategy for the North Texas Municipal Water District in the 2001 and 2006 *Region C Water Plans* [1,12]. The project is located in Region C on Bois d'Arc Creek in Fannin County, upstream from the Caddo National Grasslands. It would yield 123,000 acre-feet per year and would provide an inexpensive source of supply for Region C. The project would inundate 16,358 acres. The 1984 Fish and Wildlife Service *Texas Bottomland Hardwood Preservation Program* [5] report classified the Bois d'Arc Creek bottoms in the reservoir area as Priority 4 bottomland hardwoods, which are "moderate quality bottomlands with minor waterfowl benefits." NTMWD has applied for a water right permit, an interbasin transfer permit, and a Federal Section 404 permit for the project. Lower Bois d'Arc Creek Reservoir is a recommended water management strategy for the North Texas Municipal Water District and would have a capital cost of $615,489,000, including water transmission facilities.

### 4D.11 George Parkhouse Lake (North)

George Parkhouse Lake (North) is a potential reservoir located in Region D on the North Sulphur River in Lamar and Delta Counties. It would yield 148,700 acre-feet per year (with 118,960 acre-feet per year available for Region C), but its yield would be reduced substantially by development of Lake Ralph Hall or Marvin Nichols Reservoir. George Parkhouse Lake (North) would provide an inexpensive source of supply for Region C. The project would inundate 12,250 acres. Ninety percent of the land impacted is cropland or pasture. There are no designated priority bottomland hardwoods located within or adjacent to the site. Development would require a water right permit and an interbasin transfer permit. George Parkhouse Lake (North) is not a recommended water management strategy for any Region C water supplier. It is an alternative strategy for the Dallas Water Utilities, North Texas Municipal Water District, the Upper Trinity Regional Water District, and Irving.

### 4D.12 Lake Palestine

Dallas Water Utilities has a contract with the Upper Neches River Municipal Water Authority for 114,337 acre-feet per year of water from Lake Palestine and an interbasin transfer permit allowing the use of water from the lake in the Trinity River Basin. DWU's share of the yield of Lake Palestine will provide a supply of 111,766 in 2020, decreasing to 107,347 in 2060 due to sedimentation. Lake Palestine is located in East Texas Region on the Neches River. Dallas Water Utilities plans to connect Lake Palestine to its water supply system as part of the Integrated Pipeline Project being developed jointly with Tarrant Regional Water District. Development of a supply from Lake Palestine provides water at a low cost and with a low environmental impact, and it is a recommended water management strategy for Dallas Water Utilities. The capital cost for the strategy is $910,831,000.

### 4D.13 Neches River Run-of-the-River Diversion

Lake Fastrill was a recommended water management strategy in the approved 2006 Region C Water Plan [12] and the 2007 State Water Plan [14] and was designated by the Texas Legislature as a unique site for reservoir development. The lake was intended to meet projected water supply needs for the Dallas and water user groups in Anderson, Cherokee, Henderson, and Smith Counties in Region I. A decision of the United States Supreme Court on February 22, 2010 not to hear the appeals of the State of Texas and Dallas has effectively supported the creation of the Neches River National Wildlife Refuge (NRNWR) and rendered the development of Lake Fastrill extremely unlikely.

The Neches Run-of-the-River Diversion strategy is one potential alternatives to Lake Fastrill. It would involve run-of-the-river diversions from the Neches River in Anderson and Cherokee Counties downstream of Lake Palestine and the Neches River National Wildlife Refuge and upstream of the Weches Dam site. The run-of-the-river diversions would be subject to senior water rights and environmental flow restrictions and would not be available at all times. Hence, the run-of-the-river project would include one or more "off-channel" storage reservoirs located on tributaries of the Neches River in Anderson and Cherokee Counties which would be refilled during periods when water is available for diversion from the Neches River. Based on an off-channel storage capacity of about 540,000 acre-foot firm water supplies of approximately 134,500 acre-foot per year would be available from the off-channel reservoirs to meet Dallas and Region I needs. A firm supply of 112,100 acre-feet per year would be delivered from off-channel storage to the proposed pump station at Lake Palestine and then on to Dallas and firm supplies of 22,400 acre-feet per year from the off-channel storage for Region I [13].

### 4D.14 George Parkhouse Lake (South)

George Parkhouse Lake (South) is a potential reservoir located in Region D on the South Sulphur River in Hopkins and Delta Counties. It is located downstream from Jim Chapman Lake and would yield 135,600 acre-feet per year (with 108,480 acre-feet per year available for Region C). Its yield would be reduced substantially by the development of Marvin Nichols Reservoir. George Parkhouse Lake (South) would inundate 29,740 acres. Ninety percent of the land impacted is cropland or pasture. There are no designated priority bottomland hardwoods located within or adjacent to the site. Development would require a water right permit and an interbasin transfer permit. George Parkhouse Lake (South) is not a recommended water management strategy for any Region C water supplier. It is an alternative strategy for Dallas Water Utilities, the North Texas Municipal Water District, the Upper Trinity Regional Water District, and Irving.

### 4D.15 Tarrant Regional Water District Wetlands Project

The Tarrant Regional Water District has a water right permit from the Texas Commission on Environmental Quality allowing the diversion of return flows of treated wastewater from the Trinity River. The water will be pumped from the river into constructed wetlands for treatment and then pumped into Richland-Chambers Reservoir and Cedar Creek Reservoir. Full development of the project will provide 115,500 acre-feet per year of new supply for TRWD. TRWD has already developed 10,000 acre-feet per year of this supply, leaving 105,500 acre-feet per year of additional supply as a water management strategy for future development.

This is a relatively inexpensive source of new supply for the Tarrant Regional Water District, and the environmental impacts are low. It is a recommended strategy for the Tarrant Regional Water District, and the estimated capital cost to TRWD is $212,416,000.

### 4D.16 Carrizo-Wilcox Aquifer Groundwater (Brazos County and Vicinity)

The Carrizo-Wilcox aquifer covers a large area of east, central, and south Texas. Organizations and individuals have been studying the development of water supplies in Brazos County and surrounding counties for export. Metroplex water suppliers have been approached as possible customers for the water. (The supplies under discussion are located in Region G, called the Brazos G Region, and these supplies have also been studied for use by communities in that region.) Brazos County is about 150 miles from the Metroplex.

This is a relatively expensive source of supply for Region C, with delivered raw water costing about $4.05 per thousand gallons until the debt service is paid on the initial construction. Since this is a groundwater supply, no interbasin transfer permit would be required.  Carrizo-Wilcox groundwater from Brazos County and vicinity is not a recommended strategy for any Region C supplier.  It is an alternative strategy for the North Texas Municipal Water District.

### *4D.17 Cypress Basin Supplies (Lake O' the Pines)*

Lake O' the Pines is an existing Corps of Engineers reservoir, with Texas water rights held by the Northeast Texas Municipal Water District.  The lake is on Cypress Creek in the Cypress Basin in Senate Bill One water planning Region D, the North East Texas Region. Some Metroplex water suppliers have explored the possibility of purchasing supplies in excess of local needs from the Cypress Basin for use in the Metroplex.  There could be as much as 89,600 acre-feet per year available for export from the basin.  Development of this source would require contracts with the Northeast Texas Municipal Water District and other Cypress River Basin suppliers with excess supplies and an interbasin transfer permit. Since this water management strategy obtains water from an existing source, the environmental impacts would be low.

Lake O' the Pines is about 120 miles from the Metroplex, and the distance and limited supply make this a relatively expensive water management strategy.  Obtaining water from the Cypress River Basin is not a recommended strategy for any Region C supplier.  It is an alternative strategy for Dallas Water Utilities and the North Texas Municipal Water District.

### *4D.18 Tawakoni Pipeline*

Dallas Water Utilities has substantial water supplies in Lake Tawakoni and Lake Fork Reservoir in the Sabine Basin. The currently available supplies from these two sources are limited to about 224,000 acre-feet per year (200 mgd) by the capacity of the existing 84-inch and 72-inch pipelines from Lake Tawakoni to Dallas. DWU is planning to replace these lines with a 144-inch pipeline, making the full supply from the two reservoirs available. This will increase supplies for DWU by about 78,000 acre-feet in 2020. The capital cost of this project is estimated as $496,240,000.

### 4D.19 Southside (Lake Ray Hubbard) Reuse

The *2006 Region C Water Plan* [12] included development of the Dallas Southside Reuse Plan as a recommended water management strategy for Dallas Water Utilities. This strategy was further analyzed in Dallas Water Utilities' recent recycled water implementation plan [11]. Water would be pumped from the Southside wastewater treatment plant to into a constructed wetland for treatment. After treatment, water would be pumped into Lake Ray Hubbard, diverted from the lake, and treated for municipal use. The strategy would provide 67,253 acre-feet per year. This strategy is not recommended in this plan. It has been replaced by the main stem pump station discussed below in Section 4D.20.

### 4D.20 Lewisville Lake Reuse

Indirect reuse through Lewisville Lake was analyzed in Dallas Water Utilities' recycled water implementation plan [11]. The strategy would provide 67,253 acre-feet per year. Treated wastewater at the Central Wastewater Treatment Plant would receive further treatment for reuse. Water would then be pumped into Lewisville Lake, diverted from the lake, and treated for municipal use. This strategy would be difficult to implement because of the need for pipeline development through an urbanized area. This is not a recommended strategy in this round of regional water planning. Reuse in Lake Lewisville will be developed on the basis of return flows from wastewater treatment plants in the watershed.

### 4D.21 Main Stem Trinity River Pump Station

The Main Stem Trinity River Pump Station will divert water from the Trinity River for delivery to the North Texas Municipal Water District (NTMWD) East Fork Wetlands. By agreement between DWU and NTMWD, DWU will then retain return flows from NTMWD wastewater treatment plants discharging in the Lake Ray Hubbard and Lake Lewisville watersheds and develop indirect reuse through the lakes. This project will provide an additional 41,029 acre-feet per year from Lake Ray Hubbard for DWU by 2060. The project will also provide an interim supply for NTMWD. This is a recommended strategy for both DWU and NTMWD.

### *4D.22 Tehuacana Reservoir*

Tehuacana Reservoir is a proposed reservoir on Tehuacana Creek in Freestone County in Region C. It was an alternative strategy for the Tarrant Regional Water District in the 2001 and 2006 *Region C Water Plans* (1,12). Tehuacana Reservoir would flood about 15,000 acres adjacent to Richland-Chambers Reservoir and would have a yield of 56,800 acre-feet per year. There are no priority bottomland hardwoods within the site. Development of this supply would require a new water right permit, construction of the reservoir, and up-sizing TRWD's third pipeline to deliver that water to Tarrant County. Tehuacana Reservoir is not a recommended water management strategy for any Region C supplier. It is an alternative strategy for the Tarrant Regional Water District.

### *4D.23 Lake Ralph Hall and Reuse*

The Upper Trinity Regional Water District has applied for a water right permit for the proposed Lake Ralph Hall, located on the North Fork of the Sulphur River in Fannin County in Region C. The reservoir would flood 7,600 acres. The yield of the project would be 34,050 acre-feet per year, and Upper Trinity Regional Water District plans to apply for the right to reuse return flows from water originating from the project, providing an additional 18,387 acre-feet per year. Developing Lake Ralph Hall and the related reuse is a recommended strategy for the Upper Trinity Regional Water District.

### *4D.24 Lake Columbia*

The Angelina and Neches River Authority has a Texas water right for the development of the proposed Lake Columbia on Mud Creek in the Neches River Basin in East Texas Region. The Authority is pursuing development of the reservoir and has applied for a Federal 404 permit from the Corps of Engineers. In its most recent long-range planning effort, Dallas Water Utilities studied purchasing 35,800 acre-feet per year from Lake Columbia and delivering the water through Lake Palestine (10). Lake Columbia would flood about 11,500 acres. Lake Columbia is not a recommended water management strategy for any Region C supplier. It is an alternative strategy for Dallas Water Utilities.

### 4D.25 Summary of Recommended Major Water Management Strategies

Table 4D.3 is a summary of the recommended major water management strategies for Region C. There are 12 recommended major strategies, supplying a total of 1.77 million acre-feet per year to Region C at a capital cost of $12.15 billion.

**Table 4D.3**
**Recommended Major Water Management Strategies for Region C**

| Strategy | Supplier | Supply (Ac-Ft/Yr) | Supplier Capital Cost | Supplier Unit Cost ($/1000 gal.) | |
|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Paid |
| Toledo Bend Reservoir | NTMWD | 200,000 | $1,239,762,000 | $2.24 | $0.86 |
| | TRWD | 200,000 | $1,937,420,000 | $3.43 | $1.27 |
| Marvin Nichols Reservoir | NTMWD | 174,840 | $830,894,000 | $1.45 | $0.39 |
| | TRWD | 280,000 | $2,371,116,000 | $2.63 | $0.74 |
| | UTRWD | 35,000 | $225,628,000 | $1.99 | $0.56 |
| TRWD Integrated Pipeline | TRWD | 179,000* | $702,008,000 | $1.36 | $0.48 |
| Lower Bois d'Arc Creek Reservoir | NTMWD | 123,000 | $615,498,000 | $1.33 | $0.21 |
| Oklahoma Water | NTMWD | 50,000 | $208,624,000 | $1.43 | $0.49 |
| | TRWD | 50,000 | $441,548,000 | $2.77 | $0.79 |
| | Irving | 25,000 | $194,825,000 | $2.49 | $0.75 |
| | UTRWD | 15,000 | $96,083,000 | $2.04 | $0.61 |
| Lake Palestine | DWU | 111,776 | $887,954,000 | $2.37 | $0.60 |
| New Lake Texoma (Blend) | NTMWD | 113,000 | $336,356,000 | $0.93 | $0.27 |
| Wright Patman Lake - Raise Flood Pool | DWU | 112,100 | $896,478,000 | $2.34 | $0.56 |
| TRWD Wetlands | TRWD | 105,500 | $212,416,000 | $0.63 | $0.18 |
| Tawakoni Pipeline | DWU | 77,994 | $496,243,000 | $1.71 | $0.29 |
| Lake Ralph Hall and Reuse | UTRWD | 52,437 | $316,756,000 | $1.58 | $0.23 |
| Main Stem Trinity River Pump Station | DWU and NTMWD | 41,029 | $142,567,000 | $0.94 | $0.16 |
| **Region C Total** | | **1,766,676** | **$12,152,176,000** | | |

Note: The costs and unit costs in Table 4D.3 may be different from those in Table 4D.2 because the amounts and participants may be different. * The TRWD Integrated Pipeline is not a new supply to the region and is not included in the Region C Total supply.

## SECTION 4D
## LIST OF REFERENCES


(1) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2001.

(2) Brown and Root, Inc., *Yield Study Toledo Bend Reservoir*, prepared for the Sabine River Authority of Texas and the Sabine River Authority of Louisiana, Houston, July 1991.

(3) Texas Water Development Board, Large-Scale Demonstration Seawater Desalination in Texas, Report of Recommendations for the Office of Governor Rick Perry, Austin, [Online], Available URL: http://www.twdb.state.tx.us/Desalination/FINAL%2012-16-02.pdf, May 2005.

(4) R.J. Brandes Company, *Final Report – Water Availability Modeling for the Sulphur River Basin*, prepared for the Texas Water Development Board, Austin, June 1999.

(5) U.S. Fish and Wildlife Service: Department of the Interior Final Concept Plan, *Texas Bottomland Hardwood Preservation Program*, Albuquerque, 1984.

(6) Freese and Nichols, Inc., *System Operation Assessment of Lake Wright Patman and Lake Jim Chapman*, prepared for the U.S. Army Corps of Engineers, Fort Worth District, Fort Worth, January 2003.

(7) Freese and Nichols, Inc., *Report in Support of Amending Permit 5003*, prepared for the North Texas Municipal Water District, Fort Worth, February 2005.

(8) U.S. Army Corps of Engineers, Tulsa District, *Draft Environmental Assessment, Lake Texoma Storage Reallocation Study, Lake Texoma, Oklahoma and Texas*, Tulsa, January 2005.

(9) HDR Engineering, Inc.: "Fastrill Reservoir - Preliminary Technical Information for 2006 Region C Regional Water Plan," Austin, April 2005.

(10) Chiang, Patel and Yerby, Inc.: *2005 Update - Long Range Water Supply Plan*, Dallas, December 31, 2005.

(11) Alan Plummer Associates, Inc.: *Draft Recycled Water Implementation Plan*, Dallas, August 2004.

(12) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

(13) HDR, Inc.: "Neches River Run-of-the-River Diversions Project Preliminary Technical Information for 2011 Region C Regional Water Plan," Austin, March 2010.

(14) Texas Water Development Board: *Water for Texas 2007*. [Online] Available URL: http://www.twdb.state.tx.us/wrpi/swp/swp.htm, April 2006.

# 4E. Recommended Water Management Strategies for Wholesale Water Providers

As discussed in earlier chapters, the Region C Water Planning Group has designated 41 wholesale water providers – 12 classified as regional wholesale water providers and 29 classified as local wholesale water providers. The majority of the water supplied in Region C is provided by the 12 regional wholesale water providers, nine of which are based in the region, with three located in other regions. Collectively, the nine regional wholesale water providers located in Region C (Dallas Water Utilities, Tarrant Regional Water District, North Texas Municipal Water District, Fort Worth, Upper Trinity Regional Water District, Greater Texoma Utility Authority, Trinity River Authority, Corsicana, and Dallas County Park Cities Municipal Utility District) provide over 90 percent of the total water needs in the region. These entities are expected to continue to provide over 90 percent of the water supply for Region C through 2060, and they will also develop most of the new supplies for the region during that time period.

The three regional wholesale water providers located in other regions (Sabine River Authority, Sulphur River Water District, and Upper Neches River Municipal Water Authority) also play an important role in water supply for Region C. These providers own and/or operate major sources of current water supply for Region C.

The 29 local wholesale water providers supply considerable quantities of water to water user groups in their areas and are expected to continue meeting these local water needs. Several of the local wholesale providers obtain water exclusively from a regional wholesale provider. It is assumed that these entities will continue to purchase water from the regional provider. Other local water providers will develop new water management strategies to meet their needs and those of their customers.

This section discusses the recommended water supply plans for each regional wholesale water provider (Section 4E.1) and local wholesale water provider (Section 4E.2). Evaluations of specific water management strategies are included in Appendix P, and detailed costs are shown in Appendix Q. Cost estimates for conservation strategies were developed for individual water user groups and are discussed in Chapter 4B and shown in

Appendix Q. Detailed listings of demands by customer for each of the wholesale water providers and the projected need for additional water by provider are included in Appendix H.

In general, the Region C Water Planning Group has adopted strategies that will develop a total supply for wholesale water providers between 20 and 30 percent greater than the projected demands. This policy was adopted for several reasons:

- The additional supply provides a margin of safety in case climate change reduces the supply available from existing sources.
- The additional supply provides a margin of safety in case of a drought more severe than the previous drought of record, on which yield estimates are based.
- The additional supply provides a margin of safety in case demands grow more rapidly than projected.
- The additional supply provides a margin of safety in case some proposed management strategies cannot be developed or are developed more slowly than anticipated.

### *4E.1 Recommended Strategies for Regional Wholesale Water Providers*

The recommended strategies for the regional wholesale water providers include conservation, reuse, connections to existing sources already under contract, connections to other existing sources, and the development of new supplies. These strategies are described in greater detail below.

#### Strategies for Multiple Wholesale Water Providers

**Marvin Nichols Reservoir**. The Marvin Nichols Reservoir is a recommended strategy for the Tarrant Regional Water District (TRWD), the North Texas Municipal Water District (NTMWD) and the Upper Trinity Regional Water District (UTRWD). Marvin Nichols Reservoir was a recommended project in the 2001 *Region C Water Plan*[4] and the *2006 Region C Water Plan*[9]. The project would provide a large source of additional supply for the Metroplex at a relatively low cost. Marvin Nichols Reservoir is an alternative source of supply for Dallas Water Utilities and the City of Irving. The total yield of Marvin Nichols Reservoir is 612,300 acre-feet per year, assuming that Lake Ralph Hall is senior to Marvin Nichols Reservoir and that Marvin Nichols Reservoir is operated as a system with Wright

Patman Lake. The division of the 489,840 acre-feet per year assumed to be available to Region C from the reservoir in the recommended strategy is:

- 280,000 acre-feet per year for Tarrant Regional Water District
- 174,840 acre-feet per year for North Texas Municipal Water District
- 35,000 acre-feet per year for Upper Trinity Regional Water District.

The delivery system from Marvin Nichols Reservoir (which accounts for three-quarters of the total cost of the project) will be developed in phases. Phase 1 would be developed by 2030 and would include the reservoir and the initial pipelines and pump stations. Phase 2, planned for 2050, includes parallel pipelines and additional pump stations to deliver the remainder of the supply from the project.

**Toledo Bend Reservoir**. The use of water from Toledo Bend Reservoir in East Texas for water supply in North Texas is a recommended strategy for the Tarrant Regional Water District and North Texas Municipal Water District in Region C. Toledo Bend Reservoir is an alternative strategy for Dallas Water Utilities and Upper Trinity Regional Water District. For the recommended strategy with participation from the NTMWD and the TRWD, the project would include the delivery of 500,000 acre-feet per year of water:

- 100,000 acre-feet per year for the Sabine River Authority in the upper Sabine Basin (North East Texas Region, Region D)
- 200,000 acre-feet per year for Tarrant Regional Water District
- 200,000 acre-feet per year for North Texas Municipal Water District.

The facilities to deliver the water would be developed in phases, with Phase 1 planned for 2050 and Phase 2 planned after 2060.

**Oklahoma.** Several wholesale water providers in the Metroplex have been pursuing the purchase of water from Oklahoma. At the present time, the Oklahoma Legislature has established a temporary moratorium on the export of water from the state. The Tarrant Regional Water District is pursuing a case in Federal Court to determine whether this moratorium can be overturned. For the long term, Oklahoma remains a promising source of water supply for Region C. At this time, water from Oklahoma is a recommended strategy for the North Texas Municipal Water District, the Tarrant Regional Water District, and the Upper Trinity Regional Water District. (Water from Oklahoma is also a recommended strategy for the City of Irving, which is not a wholesale water provider.) Water from Oklahoma is an alternative strategy for Dallas Water Utilities. There are two recommended projects from Oklahoma. Irving plans to get 25,000 acre-feet per year from Oklahoma by 2030. The project for NTMWD, TRWD, and UTRWD is planned for 2060 and includes 50,000 acre-feet per year each for TRWD and NTMWD and 15,000 acre-feet per year for UTRWD.

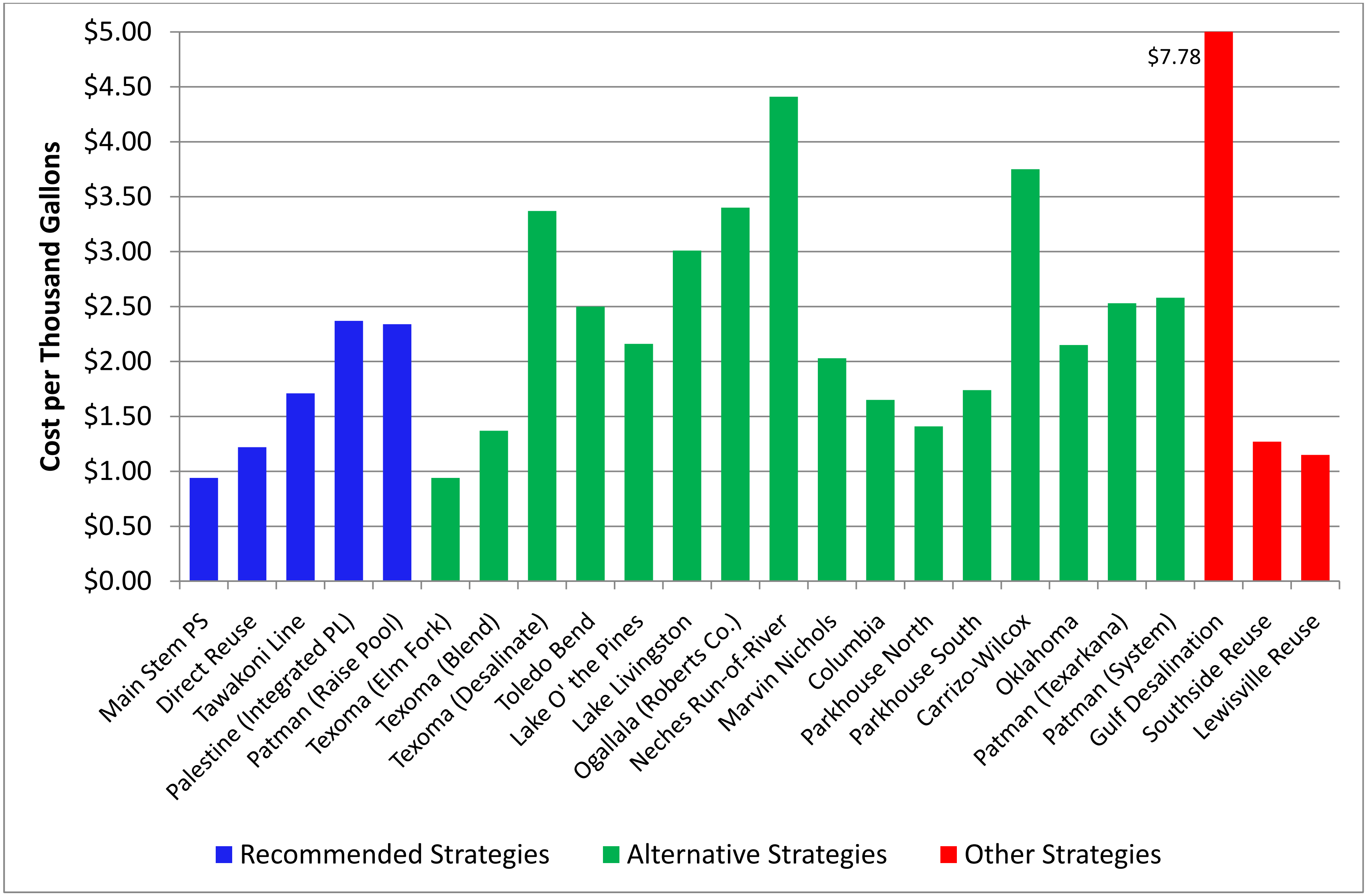
### Dallas Water Utilities

Dallas Water Utilities (DWU) provides treated and raw water for most of the demands in Dallas County and for demands in several surrounding counties. Since the *2006 Region C Water Plan* was completed, DWU has constructed a pipeline from Lake Fork Reservoir to Lake Tawakoni and a Lake Fork Pump Station, allowing the use of some of the supplies in Lake Fork. DWU has also secured agreements with several entities for the use of return flows.

The water demands on DWU are projected to increase from 607,000 acre-feet per year in 2010 to 994,000 acre-feet per year by 2060. The supply currently available to DWU is slightly less than 560,000 acre-feet per year, which includes 49,800 acre-feet per year from a temporary right for additional water from Lake Ray Hubbard that Dallas currently holds and which will expire December 31, 2011. DWU's current supply is anticipated to decrease to slightly over 543,000 acre-feet per year by 2060. As a result, DWU will need to develop 49,000 acre-feet per year of additional water supplies by 2010 to meet projected demands and 451,000 acre-feet per year of additional water supplies by 2060. Some of these needs will be met by conservation and reuse and the connection of existing sources currently under contract. Twenty-four potentially feasible water management strategies for new supplies were identified and evaluated for DWU. Figure 4E.1 shows the unit cost for each strategy, and the full evaluations are summarized in Appendix P. The recommended water management strategies for DWU are as follows:

**Figure 4E.1**

**Unit Costs of Potentially Feasible Strategies for DWU**



- Conservation
- Additional Dry Year Supply
- Additional Supply for Operational Efficiency from Lake Ray Hubbard (2011)
- Main Stem Trinity River Pump Station (Lake Ray Hubbard Reuse - 2013)
- Direct Non-Potable Reuse (2015)
- Additional Pipeline from Lake Tawakoni (2015)
- Connect Lake Palestine (Integrated Pipeline with TRWD - 2018)
- Wright Patman Lake – Flood Pool Reallocation (2035)
- Lake Fastrill Replacement (2055)
- Southwest Treated Water Pipeline
- Water Treatment Plant Expansions

These strategies are discussed individually below.

**DWU Conservation.** The conservation savings for DWU's retail and wholesale customers are based on the Region C recommended water conservation program. Not including savings from low-flow plumbing fixtures (which are built into the demand projections) and not including reuse, conservation by DWU retail and wholesale customers is projected to reach 97,700 acre-feet per year by 2060.

**Additional Dry Year Supply.** DWU's existing permits allow diversion of more than the firm yield from several of their lakes. These extra diversions can be used to meet demands during the driest years of an extended drought. The additional use in dry years is offset by reduced use in years of lower demand during the drought.

**Lake Ray Hubbard Operational Efficiency Supply.** Dallas has a water right to divert up to 89,700 acre-feet per year from Lake Ray Hubbard. According to the Trinity WAM, the yield of Lake Ray Hubbard based on historical flows is 57,427 acre-feet per year as of 2010. The watershed of Lake Ray Hubbard is largely urbanized, and the flows in the watershed have been increasing over time. In July 2007, DWU applied for a water right to divert additional water from Lake Ray Hubbard. DWU plans to divert more than the WAM yield from the reservoir when flows are available, saving pumping costs from more distant sources and preserving supplies in other reservoirs for drought conditions. The additional supply from this source may vary and be greater than DWU's current permitted diversion; pending the results of water right permitting.

**Main Stem Trinity River Pump Station.** DWU is currently designing a pump station to deliver water from the Main Stem of the Trinity River to the North Texas Municipal Water District (NTMWD) East Fork Wetlands. By agreement between DWU and NTMWD, DWU will then retain return flows from NTMWD wastewater treatment plants discharging to Lake Ray Hubbard and develop indirect reuse through the lake. This project will provide an additional 41,029 acre-feet per year for DWU by 2060.

**Additional Direct Reuse.** DWU plans to develop a direct non-potable reuse system before 2020. The system will supply an additional 20,458 acre-feet per year of direct reuse for landscaping and industrial purposes [1, 2, 5].

**Additional Pipeline from Lake Tawakoni.** DWU is designing a new pipeline from Lake Tawakoni to the East Side Water Treatment Plant. The pipeline will deliver water from Lake Fork and Lake Tawakoni and allow use of the full yield from these two sources. The additional supply made available is 69,128 acre-feet per year as of 2060.

**Connect Lake Palestine.** DWU is currently working with Tarrant Regional Water District (TRWD) to develop integrated transmission facilities to connect Lake Palestine with the DWU system by 2018. DWU has a contract for 114,337 acre-feet per year of water from Lake Palestine. Based on the firm yield of the reservoir, the available supply to DWU in 2060 is 107,347 acre-feet per year.

**Wright Patman Lake – Flood Pool Reallocation.** By 2035, DWU plans to develop 100 mgd from raising the flood pool in Wright Patman Lake [1, 2]. This would require a transmission system back to Dallas and would supply 112,100 acre-feet per year.

**Lake Fastrill Replacement.** The Lake Fastrill Water Management Strategy would have allowed the Upper Neches River Municipal Water Authority (UNRMWA) and the City of Dallas (Dallas) to operate Lake Fastrill and Lake Palestine as a system due to its proximity to Lake Palestine, resulting in increased operational flexibility, efficiencies, and associated economies of scale. Lake Fastrill was a recommended water management strategy in the approved 2006 Region C Water Plan [9] and the 2007 State Water Plan [10] and was designated by the Texas Legislature as a unique site for reservoir development. The lake was intended to meet projected water supply needs for the Dallas and water user groups in Anderson, Cherokee, Henderson, and Smith Counties in Region I. A decision of the United States Supreme Court on February 22, 2010, not to hear the appeals of the State of Texas and Dallas has effectively supported the creation of the Neches River National Wildlife Refuge (NRNWR) and rendered the development of Lake Fastrill extremely unlikely. As Dallas and the Upper Neches River Municipal Water Authority (UNRMWA) were planning on a firm water supply of at least 120 mgd (100 mgd for Dallas and 20 mgd for Region I) from the Lake Fastrill project, a new water management alternative strategy identified as the Lake Fastrill Replacement project is discussed herein.

Since it is now unlikely that Lake Fastrill will ever be built, Dallas will need to find the additional 112,100 acre feet of water supply Dallas and its customer cities need from other sources. Due to the timing of the recent Supreme Court decision, the City of Dallas has not had an opportunity to reevaluate its alternative water management strategies to determine the best replacement strategy for Dallas. The alternative strategies that are being considered by DWU as the Lake Fastrill Replacement include but are not limited to additional water conservation, Lake Texoma, Toledo Bend Reservoir, Lake O' the Pines, Lake Livingston, Ogallala groundwater in Roberts County (Region A), Marvin Nichols Reservoir, Lake Columbia, George Parkhouse Reservoir (North), George Parkhouse Reservoir (South), Oklahoma Water and Neches River Run-of-the-River.

**Southwest Treated Water Pipeline.** By 2016, DWU plans to construct a 32 mile long 120-inch and 96-inch treated water transmission line from its Eastside Water Treatment Plant to provide treated water to the southwest portion of Dallas and its southern wholesale customers while increasing the reliability of the DWU's system.

**Water Treatment Plant Expansions.** DWU will need to increase its water treatment plant capacity (by building new plants and expanding existing plants) in order to keep up with demand.

Table 4E.1 and Figure 4E.2 show the recommended plan by decade for DWU, and Table 4E.2 presents the costs associated with the recommended strategies.

Figure 4E.3 shows the distribution of DWU's additional 2060 supplies by type (conservation and reuse, connecting existing supplies, and new reservoirs). The estimated capital costs for DWU's recommended water management strategies are shown in Table 4E.2.

In addition, the following alternative water management strategies are designated for DWU in case water demand is higher than projected or one or more of DWU's recommended water management strategies is not developed in a timely manner:

- Additional water conservation
- Lake Texoma
- Toledo Bend Reservoir
- Lake O' the Pines
- Lake Livingston
- Ogallala groundwater in Roberts County (Region A)
- Marvin Nichols Reservoir
- Lake Columbia
- Neches River Run-of-River
- George Parkhouse Reservoir (North)
- George Parkhouse Reservoir (South)
- Oklahoma Water
- Carrizo-Wilcox Groundwater

Costs for the alternative strategies are shown in Table 4E.3.

**Table 4E.1**
**Summary of Recommended Water Management Strategies for DWU**

| Planned Supplies (Ac-Ft per Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Projected Demands** | **606,630** | **688,693** | **732,512** | **786,911** | **863,119** | **994,168** |
| ***Existing*** | | | | | | |
| *Elm Fork System* | *184,801* | *183,733* | *182,665* | *181,597* | *180,529* | *179,459* |
| *Grapevine Lake* | *7,583* | *7,367* | *7,150* | *6,933* | *6,717* | *6,500* |

**Table 4E.1, Continued**

| Planned Supplies (Ac-Ft per Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| *Lake Ray Hubbard* | *57,427* | *56,113* | *54,800* | *53,487* | *52,173* | *50,860* |
| *Lake Ray Hubbard Temporary* | *49,800* | *0* | *0* | *0* | *0* | *0* |
| *Lake Tawakoni* | *183,619* | *182,251* | *180,882* | *179,515* | *178,146* | *176,777* |
| *Lake Fork* | *40,581* | *41,949* | *43,318* | *44,685* | *46,054* | *47,423* |
| *Direct Reuse (Golf courses)* | *561* | *561* | *561* | *561* | *561* | *561* |
| *White Rock Lake (Irrigation Only)* | *3,500* | *3,200* | *2,900* | *2,600* | *2,300* | *2,000* |
| *Return Flow** | *29,961* | *42,046* | *53,147* | *60,646* | *69,861* | *85,000* |
| ***Total Available Supplies*** | ***557,833*** | ***517,220*** | ***525,423*** | ***530,024*** | ***536,341*** | ***548,580*** |
| | | | | | | |
| ***Need (Demand-Supply)*** | ***48,797*** | ***171,473*** | ***207,089*** | ***256,887*** | ***326,778*** | ***445,588*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (DWU Retail) | 18,432 | 26,522 | 28,154 | 34,134 | 41,528 | 52,987 |
| Conservation (Wholesale Customers) | 7,211 | 16,032 | 25,739 | 31,242 | 36,956 | 44,627 |
| Additional Dry Year Supply | 25,000 | 0 | 0 | 0 | 0 | 0 |
| Lake Ray Hubbard Operational Efficiency Supply** | 0 | 153,187 | 154,500 | 155,813 | 157,127 | 158,440 |
| Main Stem Trinity Pump Station (Lake Ray Hubbard Indirect Reuse) | 0 | 31,612 | 35,872 | 39,459 | 40,244 | 41,029 |
| Additional Direct Reuse | 0 | 20,458 | 20,458 | 20,458 | 20,458 | 20,458 |
| Additional Pipeline from Lake Tawakoni (More Lk. Fork Supply) | | 77,994 | 75,777 | 73,563 | 71,346 | 69,128 |
| Connect Lake Palestine (Integrated Pipeline with TRWD) | | 111,776 | 110,670 | 109,563 | 108,455 | 107,347 |
| Wright Patman Lake | | | | 112,100 | 112,100 | 112,100 |
| Fastrill Replacement Strategy | | | | | | 112,100 |
| Southwest Treated Water Pipe | | 0 | 0 | 0 | 0 | 0 |
| WTP Expansions | | | 0 | 0 | 0 | 0 |

**Table 4E.1, Continued**

| Planned Supplies (Ac-Ft per Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Total Supplies from Strategies** | **50,643** | **284,394** | **296,670** | **420,519** | **431,087** | **559,776** |
| **Total Supplies** | **608,476** | **801,614** | **822,093** | **950,543** | **967,428** | **1,108,356** |
| **Reserve or (Shortage)** | **1,846** | **112,921** | **89,581** | **163,632** | **104,309** | **114,188** |

Notes:
* Includes return flows from Flower Mound, Lewisville, Denton, NTMWD and UTRWD.
** Lake Ray Hubbard Operational Efficiency Supply is not considered to be a firm yield supply and is not included in the totals.

**Figure 4E.2**
**Recommended Water Management Strategies for Dallas Water Utilities**

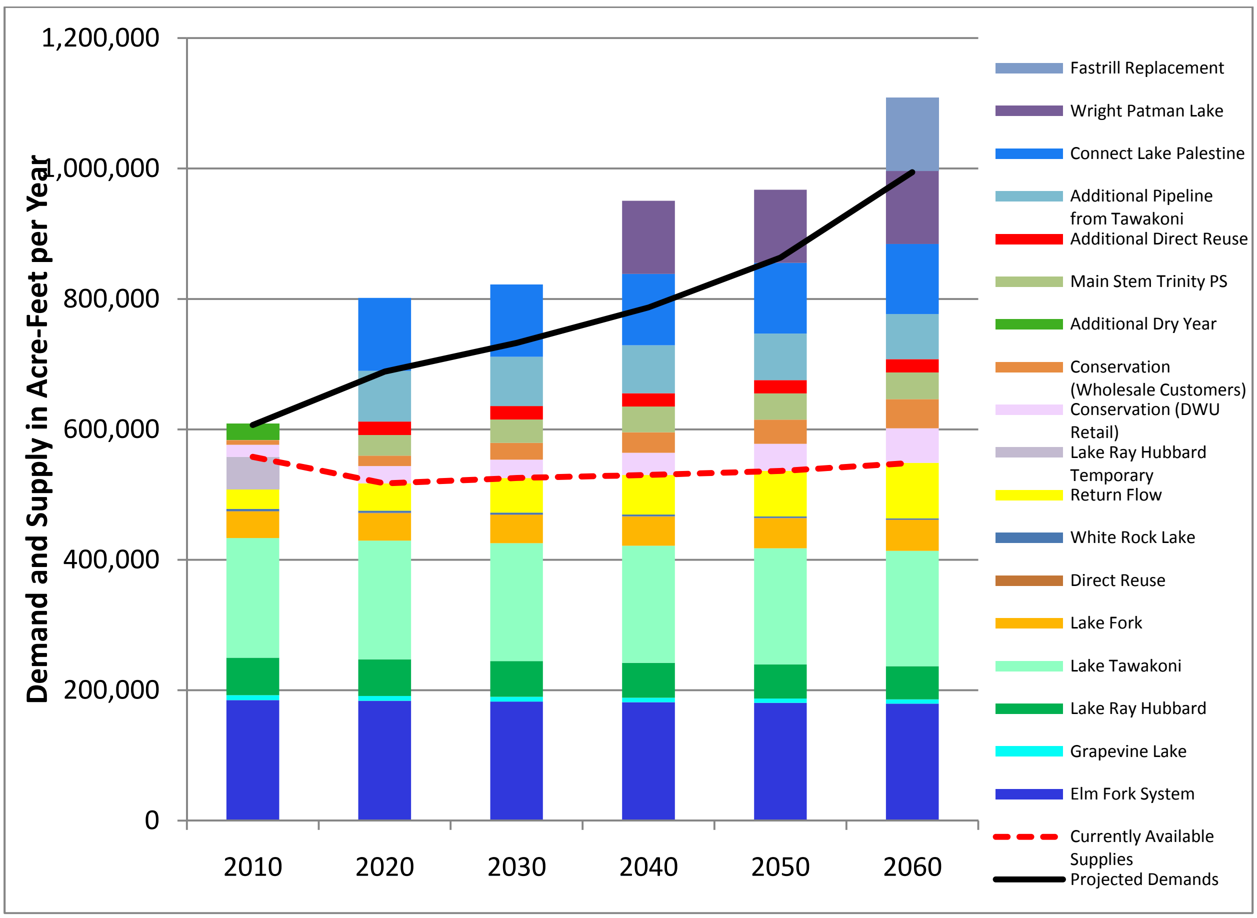


**Table 4E.2**
**Summary of Costs for DWU Recommended Strategies**

| Strategy | Date to Be Developed | Quantity for DWU (Ac-Ft/Yr) | DWU Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010-2060 | 52,987 | $0*** | $0.40 | $0.40 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010-2060 | 44,677 | Included under County Summaries in Section 4F. | | | |
| Additional Ray Hubbard | 2010 | 158,440** | $1,750,000 | N/A | N/A | None |
| Additional Dry Year Supply | 2010 | 25,000 | $0 | N/A | N/A | None |
| 100 mgd WTP Expansion | 2012 | 56,050* | $146,318,000 | $1.28 | $0.70 | Q-67 |
| Main Stem Trinity PS | 2013 | 41,029 | $142,567,000 | $0.94 | $0.16 | Q-37 |
| Additional Direct Reuse | 2015 | 20,458 | $82,920,000 | $1.22 | $0.32 | Q-65 |
| Additional Pipeline from Tawakoni | 2015 | 69,128 | $496,243,000 | $1.71 | $0.29 | Q-36 |
| Southwest Treated Water Pipeline | 2016 | N/A | $260,000,000 | N/A | N/A | None |
| Connect Lake Palestine | 2018 | 107,347 | $887,954,000 | $2.37 | $0.60 | Q-41 |
| New WTP (100 mgd) | 2018 | 56,050* | $190,125,000 | $1.46 | $0.70 | Q-67 |
| 100 mgd WTP Expansion | 2025 | 56,050* | $146,318,000 | $1.28 | $0.70 | Q-67 |
| Wright Patman Lake | 2035 | 112,100 | $896,478,000 | $2.34 | $0.56 | Q-24 |
| 100 mgd WTP Expansion | 2035 | 56,050* | $146,318,000 | $1.28 | $0.70 | Q-67 |
| 100 mgd WTP Expansion | 2045 | 56,050* | $146,318,000 | $1.28 | $0.70 | Q-67 |
| 100 mgd WTP Expansion | 2052 | 56,050* | $146,318,000 | $1.28 | $0.70 | Q-67 |
| Fastrill Replacement Strategy | 2055 | 112,100 | Unknown | | | None |
| 100 mgd WTP Expansion | 2058 | 56,050* | $146,318,000 | $1.28 | $0.70 | Q-67 |

**Table 4E.2, Continued**

| Strategy | Date to Be Developed | Quantity for DWU (Ac-Ft/Yr) | DWU Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| **Total DWU Capital Costs** | | | **$3,835,945,000** | | | |

* Water treatment plant expansions are needed to use the supplies developed by other strategies, but they do not develop additional supplies.
** Lake Ray Hubbard Operational Efficiency Supply is not considered to be a firm yield supply.
***DWU has already made significant capital investment to implement its conservation programs. In the future, all costs will be annual operating costs which are estimated to range from $3.5 million in 2010 to $7.0 million in 2060.

**Figure 4E.3**
**Dallas Water Utilities' 2060 Additional Supply by Type (Acre-Feet per Year)**

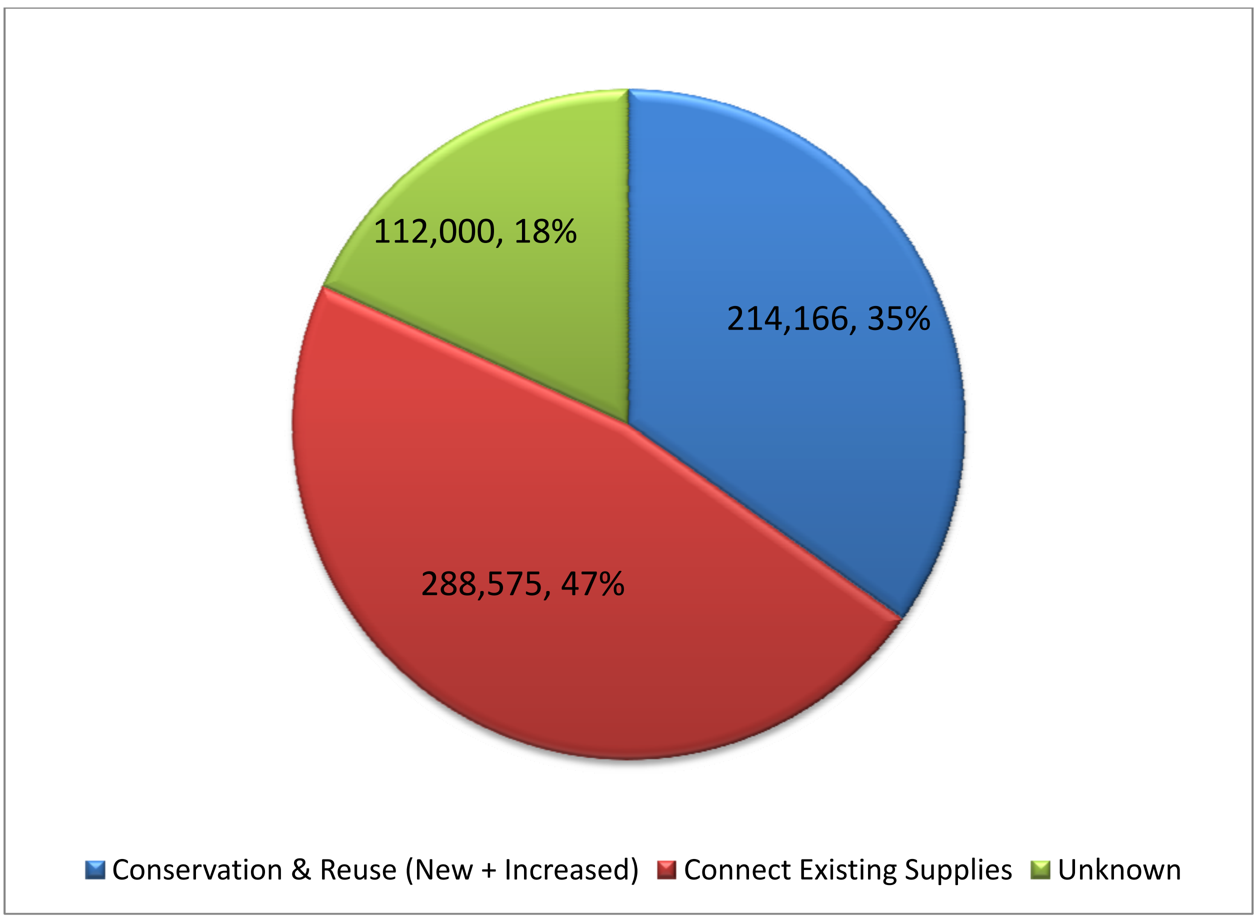


**Table 4E.3**
**Summary of Costs for DWU Alternative Strategies**

| Strategy | Quantity for DWU (Ac-Ft/Yr) | DWU Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|
| | | | With Debt Service | After Debt Service | |
| Additional Conservation | Unknown | Unknown | Unknown | Unknown | N/A |
| Lake Texoma - Elm Fork | 20,000 | $56,334,000 | $0.94 | $0.31 | Q-66 |
| Lake Texoma - Blend | 113,000 | $531,378,300 | $1.37 | $0.32 | Q-31 |
| Lake Texoma - Desalinate | 105,000 | $925,918,000 | $3.37 | $1.41 | Q-32 |
| Toledo Bend Reservoir | 200,000 | $1,433,774,000 | $2.50 | $0.90 | Q-16 |
| Lake O' the Pines | 89,600 | $541,534,000 | $2.16 | $0.82 | Q-57 |
| Lake Livingston | 200,000 | $1,855,538 ,000 | $3.01 | $0.95 | Q-33 |
| Roberts County Groundwater | 200,000 | $2,435,534,000 | $3.40 | $0.69 | Q-38 |
| Neches River Run-of-River | 112,100 | $1,980,278,000 | $4.41 | $1.13 | Q-51 |
| Marvin Nichols Reservoir | 95,931 | $634,154,000 | $2.03 | $0.55 | Q-19 |
| Lake Columbia | 35,800 | $179,945,000 | $1.65 | $0.52 | Q-64 |
| George Parkhouse Reservoir (North) | 112,100 | $521,281,000 | $1.41 | $0.37 | Q-48 |
| George Parkhouse Reservoir (South) | 115,260 | $692,921,000 | $1.74 | $0.40 | Q-53 |
| Oklahoma Water | 50,000 | $343,934,000 | $2.15 | $0.62 | Q-42 |
| Carrizo-Wilcox Groundwater | 100,000 | $801,451,000 | $3.75 | $1.52 | Q-54 |

## Tarrant Regional Water District

Tarrant Regional Water District (TRWD) owns and operates a system of reservoirs in the Trinity River Basin. The TRWD system provides water either directly or indirectly to over a hundred water user groups and is expected to provide water to additional water user groups in the future. The projected 2010 demand on TRWD is 448,800 acre-feet per year, increasing to 985,600 acre-feet per year by 2060. The total supply currently available from the TRWD system is 511,700 acre-feet per year in 2010, decreasing to 508,300 acre-feet per year by 2060 due to sedimentation in the reservoirs. By 2020, TRWD has a projected need for about 50,000 acre-feet per year in new supplies, increasing to about 477,000 acre-feet per year by 2060. TRWD is in developing its permitted reuse projects at

Richland-Chambers Reservoir and Cedar Creek Reservoir. The TRWD will also need to develop other supplies over time. Sixteen infrastructure projects were evaluated for TRWD, and the unit costs for these are shown on Figure 4E.4. The full evaluations are summarized in Appendix P. The recommended water management strategies for TRWD are as follows:

- Water Conservation and Reuse
- Integrated Pipeline Project
- Marvin Nichols Reservoir
- Toledo Bend Reservoir
- Oklahoma Water.

The development of the Marvin Nichols Reservoir, connection to Toledo Bend Reservoir, and connection to Oklahoma water sources are multi-provider strategies and are discussed on pages 4.E.2 and 4.E.3. The other recommended strategies are discussed individually below.

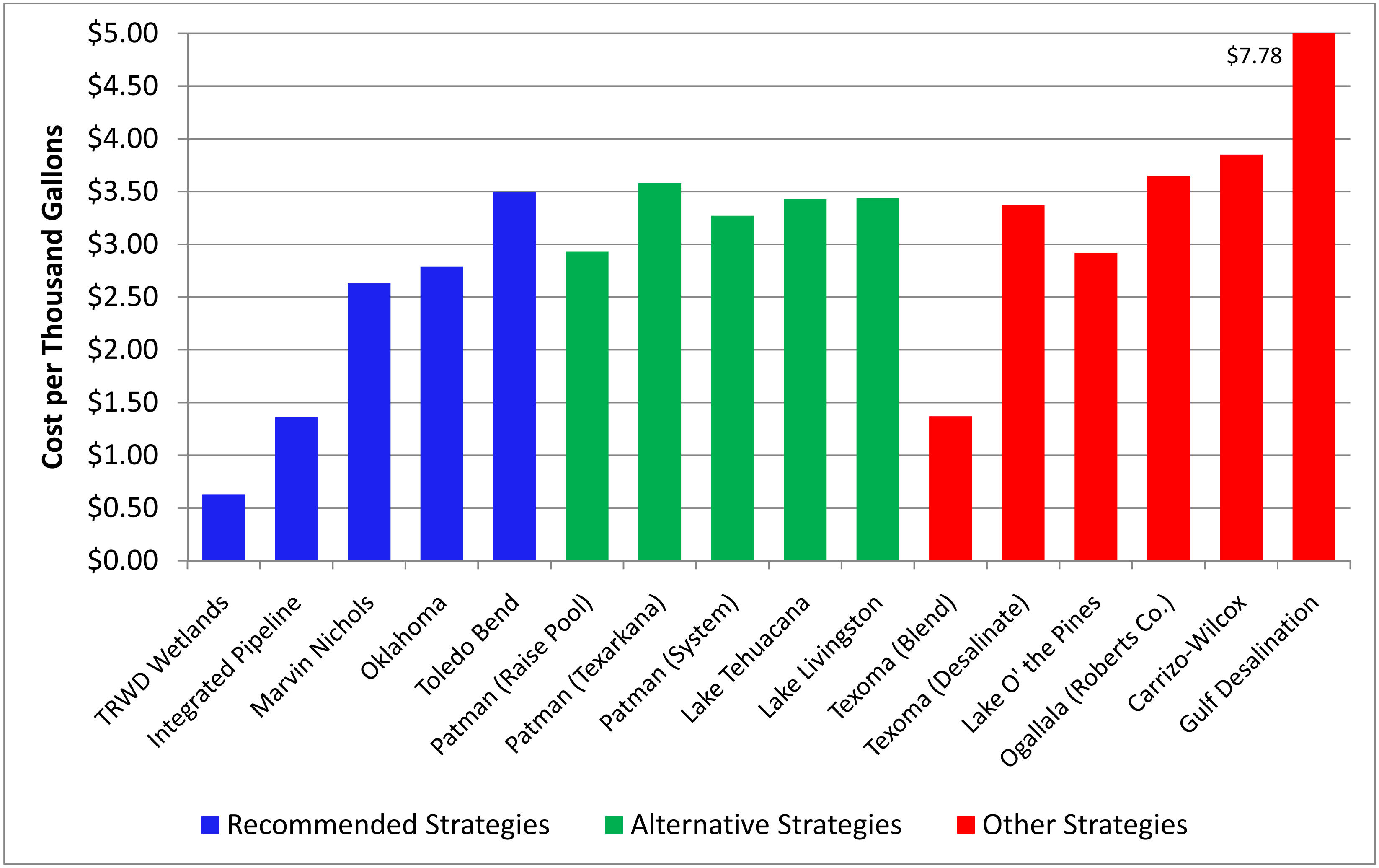
**Conservation.** Conservation for TRWD is the projected water savings from the Region C recommended water conservation program for TRWD's existing and potential customers. Not including savings from low-flow plumbing fixtures (which amount to about 5 percent of demand and are built into the demand projections) and not including reuse, conservation by TRWD customers is projected to reach 86,898 acre-feet per year by 2060.

**Wetlands Project.** TRWD has a Texas water right allowing the diversion of return flows of treated wastewater from the Trinity River. The water will be pumped from the river into constructed wetlands for treatment and then pumped into Richland-Chambers Reservoir and Cedar Creek Reservoir. The wetlands project will ultimately provide 115,500 acre-feet per year, of which 10,000 acre-feet per year can be supplied from existing facilities.

**Integrated Pipeline.** In order to deliver currently available supplies and the remaining supplies to be developed from the reuse projects, TRWD will need to construct the Integrated Pipeline Project from Richland-Chambers Lake and Cedar Creek Reservoir to

**Figure 4E.4**

**Unit Costs of Potentially Feasible Strategies for TRWD**



Tarrant County. The Integrated Pipeline Project involves TRWD, in cooperation with Dallas Water Utilities (DWU), constructing and operating an integrated transmission system to deliver water from Lake Palestine to Dallas and to deliver water from Richland-Chambers and Cedar Creek Reservoirs for TRWD. Current plans call for the TRWD reuse projects and the Integrated Pipeline Project to be completed by 2020.

The total projected additional 2060 supply from conservation and reuse for TRWD is 192,398 acre-feet per year. This does not include conservation from low-flow plumbing fixtures, which is built into TWDB demand projections.

In addition to these water management strategies for additional supply, TRWD is considering water right amendments to allow greater system operation, with resulting savings in pumping cost and electricity. Improved system operation for TRWD is consistent with the Region C Water Plan.

Table 4E.4 and Figure 4E.5 show the recommended plan for TRWD by decade. Figure 4E.6 shows the distribution of TRWD's new supplies by strategy type. A summary of costs for the recommended strategies is presented in Table 4E.5. TRWD's share of the total capital cost for the recommended plan is $4.7 billion.

The alternative water management strategies for TRWD are as follows:

- Toledo Bend Reservoir Phase 2 (accelerated to occur before 2060)
- Wright Patman Lake
- Lake Tehuacana
- Lake Livingston

Costs for the alternative strategies are presented in Table 4E.6.

**Table 4E.4**
**Summary of Recommended Water Management Strategies for TRWD**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Projected Demands** | **448,806** | **560,680** | **657,866** | **754,210** | **860,389** | **985,584** |
| ***Existing Supplies*** | | | | | | |
| *West Fork System* | *109,833* | *109,167* | *108,500* | *107,833* | *107,167* | *106,500* |
| *Benbrook Lake* | *6,833* | *6,833* | *6,833* | *6,833* | *6,833* | *6,833* |
| *Cedar Creek Lake* | *175,000* | *175,000* | *175,000* | *175,000* | *175,000* | *175,000* |
| *Richland-Chambers Reservoir* | *210,000* | *210,000* | *210,000* | *210,000* | *210,000* | *210,000* |
| *Richland-Chambers Reuse* | *10,000* | *10,000* | *10,000* | *10,000* | *10,000* | *10,000* |
| ***Total Available Supplies*** | ***511,666*** | ***511,000*** | ***510,333*** | ***509,666*** | ***509,000*** | ***508,333*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***0*** | ***49,680*** | ***147,533*** | ***244,544*** | ***351,389*** | ***477,251*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (Wholesale Customers) | 11,456 | 28,749 | 42,733 | 55,379 | 69,543 | 86,898 |
| Integrated Pipeline and Reuse | | 105,500 | 105,500 | 105,500 | 105,500 | 105,500 |
| Marvin Nichols Reservoir | | | 140,000 | 140,000 | 280,000 | 280,000 |
| Toledo Bend Reservoir | | | | | 100,000 | 100,000 |
| Oklahoma Water | | | | | | 50,000 |
| **Supplies from Strategies** | **11,456** | **134,249** | **288,233** | **300,879** | **555,043** | **622,398** |
| **Total Supplies** | **523,122** | **645,249** | **798,566** | **810,545** | **1,064,043** | **1,130,731** |
| **Reserve or (Shortage)** | **74,315** | **84,569** | **140,700** | **56,334** | **203,654** | **145,147** |

**Figure 4E.5**
**Recommended Water Management Strategies for Tarrant Regional Water District**

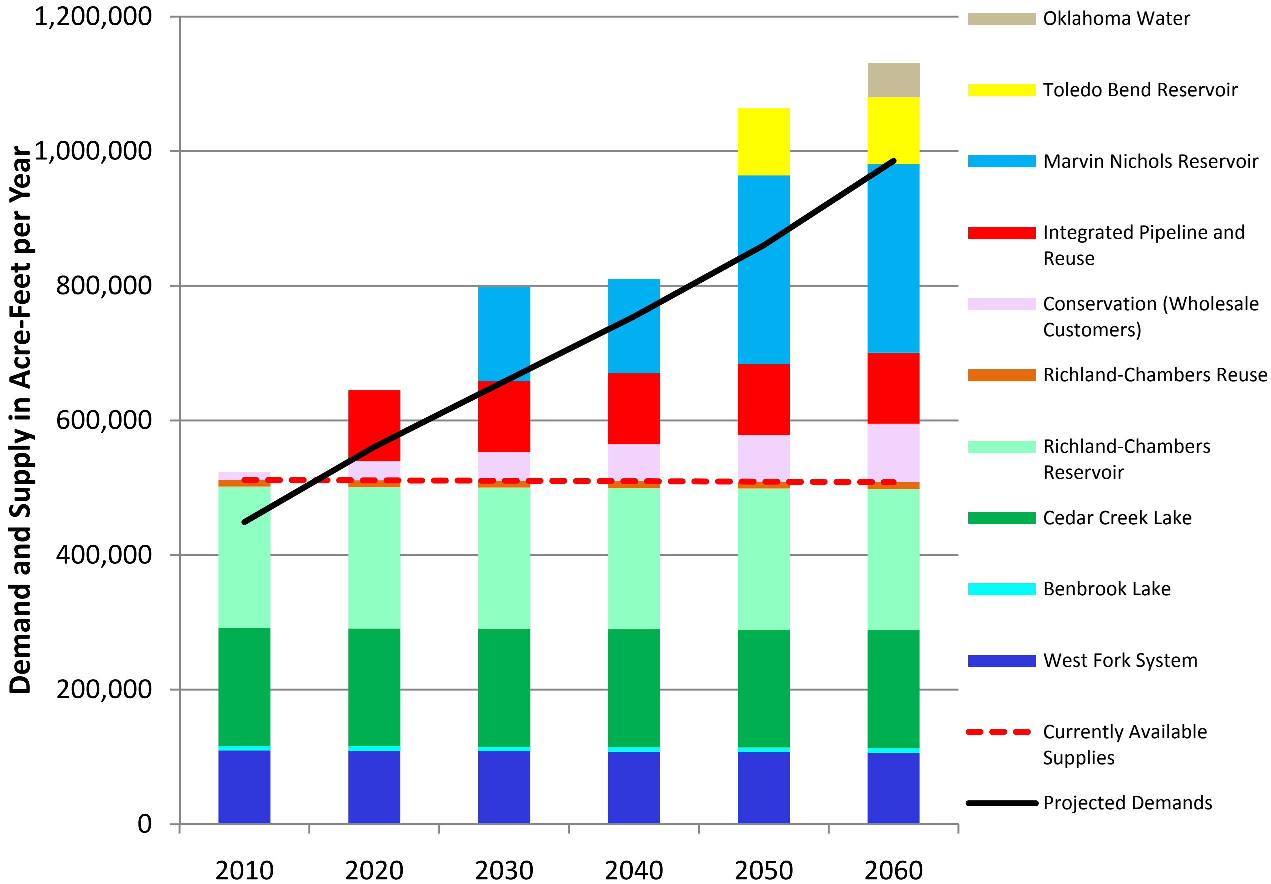


**Figure 4E.6**
**Tarrant Regional Water District's 2060 Additional Supply by Type (Acre-Feet per Year)**

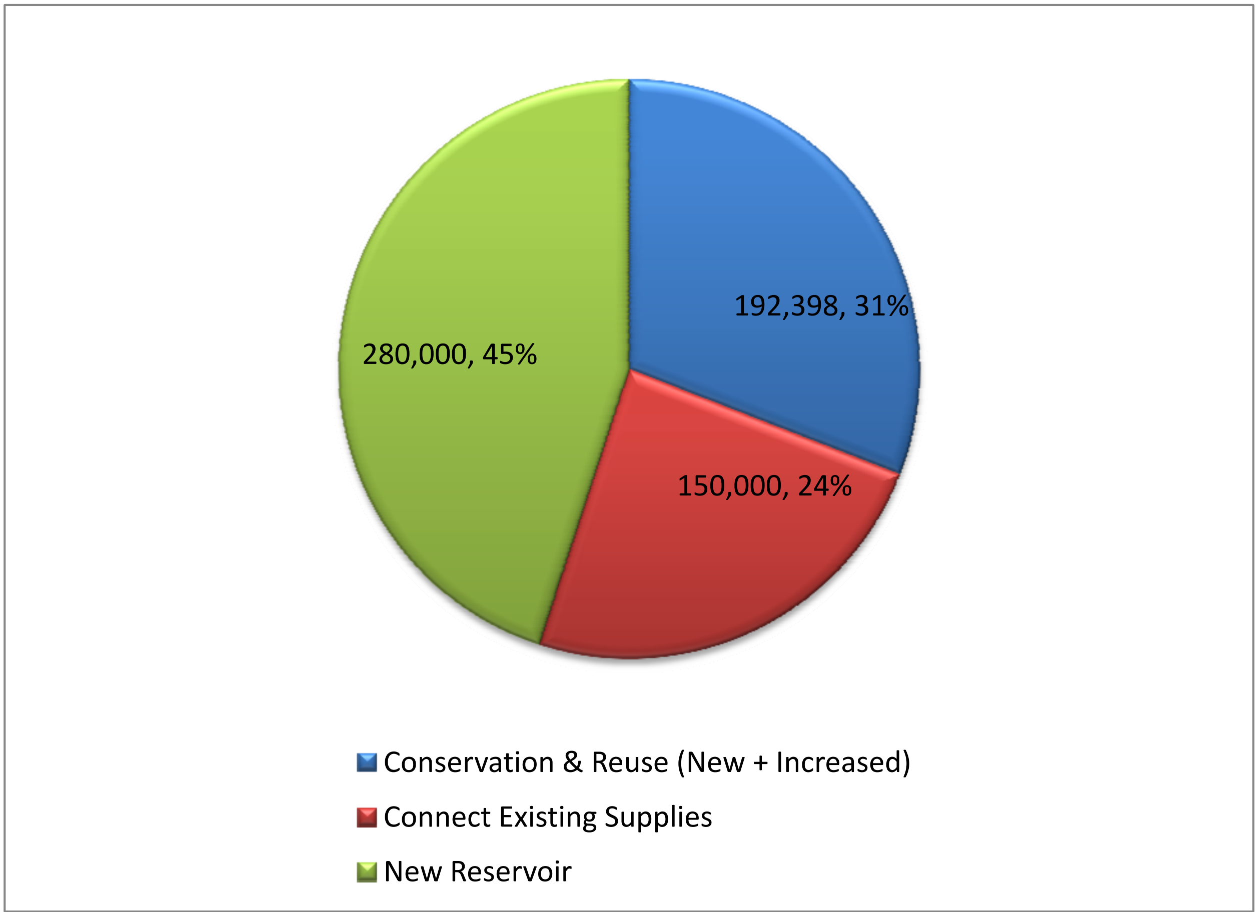


**Table 4E.5**
**Summary of Costs for TRWD Recommended Strategies**

| Strategy | Date to be Developed | Quantity for TRWD (Ac-Ft/Yr) | TRWD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010-2060 | 86,898 | Included under County Summaries in Section 4F. | | | |
| Reuse | 2018 | 105,500 | $212,416,000 | $0.63 | $0.18 | Q-50 |
| Integrated Pipeline Project | 2018 | 179,000* | $702,008,000 | $1.36 | $0.48 | Q-41 |
| Marvin Nichols Reservoir | 2030 | 280,000 | $2,371,116,000 | $2.63 | $0.74 | Q-20 |
| Toledo Bend Reservoir Phase I | 2040 | 100,000 | $1,000,766,000 | $3.50 | $1.27 | Q-17 |
| Oklahoma | 2050 | 50,000 | $448,332,000 | $2.77 | $0.79 | Q-44 |
| **Total TRWD Capital Costs** | | | **$4,734,638,000** | | | |

*This supply is not a new supply for TRWD. The pipeline will transmit 179,000 af/y of existing supply and water supply made available by other strategies.

**Table 4E.6**
**Summary of Costs for TRWD Alternative Strategies**

| Strategy | Quantity for TRWD (Ac-Ft/Yr) | TRWD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|
| | | | With Debt Service | After Debt Service | |
| Toledo Bend Phase II | 100,000 | $936,654,000 | $3.66 | $1.27 | Q-17 |
| Lake Wright Patman - Texarkana | 100,000 | $1,081,475,000 | $3.58 | $1.17 | Q-23 |
| Lake Wright Patman - Raise Pool | 180,000 | $1,694,140,000 | $2.93 | $0.83 | Q-27 |
| Lake Wright Patman - System | 130,000 | $1,282,327,000 | $3.27 | $1.07 | Q-28 |
| Lake Tehuacana | 56,800 | $746,345,000 | $3.43 | $0.50 | Q-62 |
| Lake Livingston | 200,000 | $2,084,210,000 | $3.44 | $1.11 | Q-35 |

## North Texas Municipal Water District

The North Texas Municipal Water District (NTMWD) serves much of the rapidly growing suburban area north and east of Dallas. Demands on the NTMWD are expected to more than double from 2010 to 2060, and NTMWD needs more than 368,000 acre-feet per year in additional supplies by 2060. NTMWD has developed several reuse strategies since the completion of the *2006 Region C Water Plan*, and supplies from these strategies will grow with increasing return flows. The potentially feasible strategies considered for NTMWD and their unit costs are shown on Figure 4E.7. The recommended water management strategies for NTMWD include:

- Conservation
- Lake Texoma Pump Station Expansion
- Renewed Interim Purchase of Lake Texoma Water from GTUA/Sherman
- Main Stem Pump Station
- Chapman Booster Pump Station
- Lower Bois d'Arc Creek Reservoir
- Additional Lake Texoma Supplies
- Fannin County Water Supply System
- Marvin Nichols Reservoir
- Toledo Bend Reservoir
- Oklahoma Water
- Water Treatment Plant and Distribution Improvements

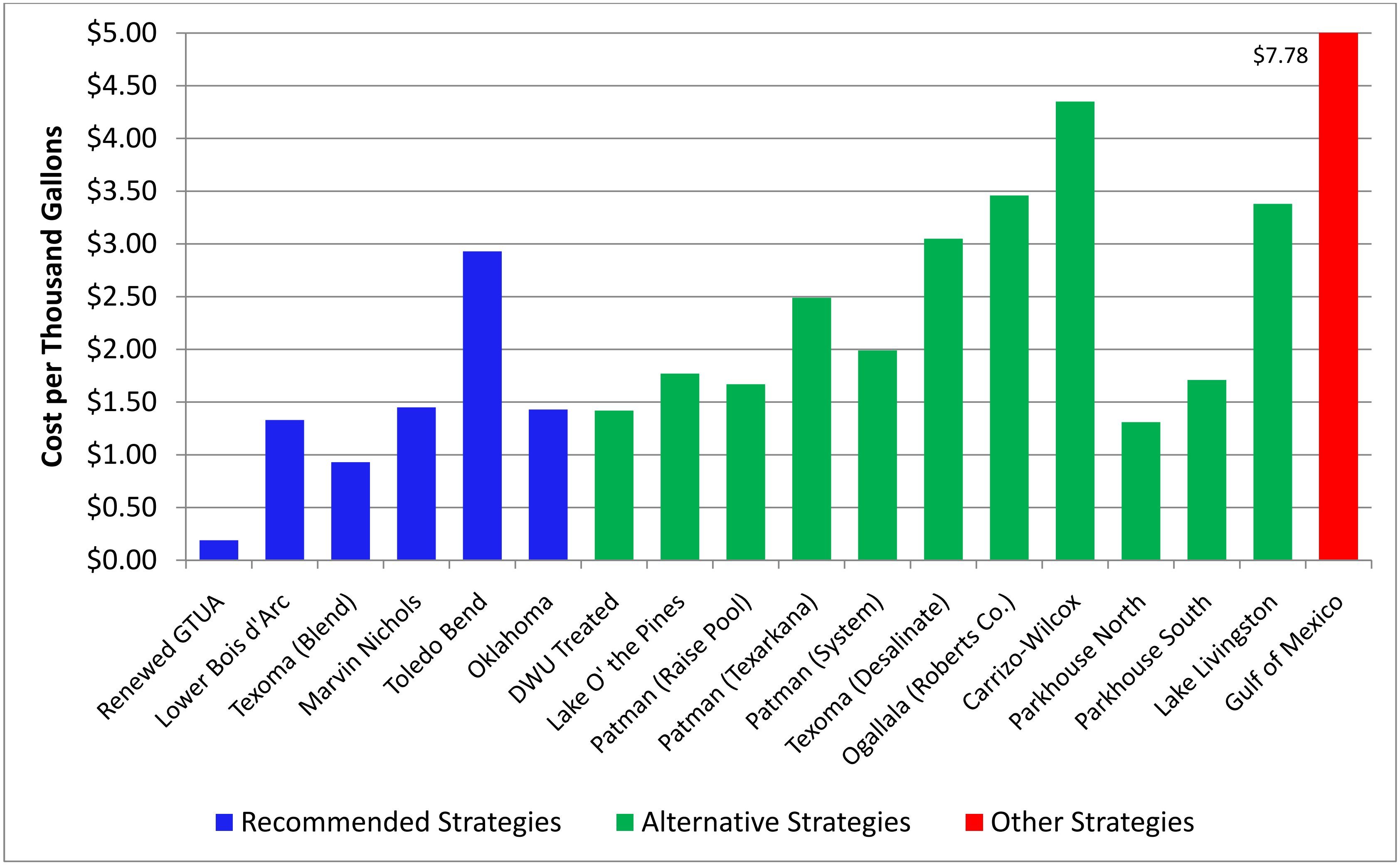
The development of the Marvin Nichols Reservoir, connection to Toledo Bend Reservoir, and connection to Oklahoma water sources are multi-provider strategies and are discussed on pages 4.E.2 and 4.E.3. The other recommended strategies are discussed individually below.

**NTMWD Conservation.** Conservation is the projected conservation savings for NTMWD's existing and potential customers, based on the Region C recommended water conservation program. Not including savings from low-flow plumbing fixtures (which are built into the demand projections) and not including reuse, conservation by NTMWD customers is projected to reach 80,372 acre-feet per year by 2060.

**Lake Texoma Pump Station Expansion.** NTMWD is currently constructing an expansion of the Lake Texoma Pump Station to increase pumping capacity from Lake

**Figure 4E.7**

**Unit Costs of Potentially Feasible Strategies for NTMWD**



Texoma and allow greater flexibility in the pipeline operation. NTMWD is constructing this expansion in conjunction with the Greater Texoma Utility Authority.

**Renewed Interim Purchase of Lake Texoma Water from GTUA/Sherman.** NTMWD has an agreement with the City of Sherman and the Greater Texoma Utility Authority (GTUA) to purchase surplus Lake Texoma water. The water is delivered through NTMWD's existing pump station and pipeline from Lake Texoma. Only water surplus to the in-basin needs of GTUA and Sherman is used by NTMWD. NTMWD plans to seek to renew this contract with some additional supplies when it expires in 2015.

**Main Stem Trinity River Pump Station.** DWU is currently designing a pump station to deliver water from the Main Stem of the Trinity River to the NTMWD East Fork Wetlands. This will allow DWU to retain return flows from NTMWD wastewater treatment plants discharging to Lake Ray Hubbard and develop indirect reuse. DWU will replace these discharges with water pumped from the main stem (based on DWU return flows in the main stem). NTMWD is also planning to purchase some additional water from DWU to supplement supplies from Lake Lavon on an interim basis. This project will provide an additional 34,900 acre-feet per year for NTMWD in 2020 and lesser amounts in later years. (NTMWD's supplies from this strategy decrease over time as return flows from other sources increase.) NTMWD and DWU have completed a contract specifying the rights of the parties pursuant to this strategy.

**Chapman Booster Pump Station.** NTMWD's current facilities to deliver water from Lake Chapman must be operated over 90 percent of the time to deliver NTMWD's full allotment of water from Lake Chapman. This does not allow sufficient down time for maintenance and repairs or sufficient capacity to provide for peak needs. To increase the capacity in this pipeline, NTMWD (in cooperation with Irving, which shares the facilities) will build a booster pump station.

**Lower Bois d'Arc Creek Reservoir.** Lower Bois d'Arc Creek Reservoir is a proposed reservoir on Bois d'Arc Creek in the Red River Basin. It was included in the 2001 and 2006 *Region C Water Plans* [4, 9] as a supply for NTMWD, and NTMWD has now applied for a Texas water right and necessary permits for the project. Lower Bois d'Arc Creek Reservoir would provide up to 123,000 acre-feet per year for NTMWD and Fannin County. Lower Bois d'Arc Creek Reservoir would be developed by 2020.

**New Supply from Lake Texoma.** NTMWD has received a Texas water right to impound up to 100,000 acre-feet in Lake Texoma and divert up to 113,000 acre-feet per year from the lake. The District has also negotiated a contract for additional storage in Lake Texoma with the Tulsa District of the Corps of Engineers. NTMWD will use the new supply for municipal purposes and will either blend the water with higher quality supplies from other sources or develop a desalination plant. At this time, blending appears to be the more economical approach. It is assumed that NTMWD will use one part of Lake Texoma supply for two parts of other imported water. NTMWD will deliver the water directly from Lake Texoma and/or from the Red River downstream of the lake. (Downstream diversions would require a longer pipeline but offer the advantage of reduced levels of dissolved solids.)

**Fannin County Water Supply System.** NTMWD would cooperate with Fannin County entities to develop a treated water supply system for Fannin County water users after the Lower Bois d'Arc Creek Reservoir is developed in 2020. The system would involve one or more water treatment plants and a treated water distribution system.

As shown on Table 4E.7 and Figure 4E.8, over 600,000 acre-feet per year of new supplies are recommended for NTMWD, leading to a total supply of 1.05 million acre-feet per year in 2060. Over 250,000 acre-feet per year of NTMWD's 2060 water supply will be from conservation and reuse - 24 percent of NTMWD's total supplies. Figure 4E.9 shows the new supplies for NTMWD in 2060 by the type of supply. A summary of costs for the recommended strategies is presented in Table 4E.8.

The following alternative water management strategies are recommended for NTMWD:

- Toledo Bend Reservoir Phase 2 (accelerated to occur before 2060)
- Treated water from Dallas Water Utilities
- Lake O' the Pines
- Wright Patman Lake
- Lake Texoma with desalination rather than blending

- Ogallala groundwater in Roberts County (Region A)
- Carrizo-Wilcox groundwater in Brazos County Area (Region G)
- George Parkhouse Reservoir (North)
- George Parkhouse Reservoir (South)
- Lake Livingston

Costs for the alternative strategies are shown in Table 4E.9.

**Table 4E.7**
**Summary of Recommended Water Management Strategies for NTMWD**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Projected Demands (including losses for Treatment & Delivery)** | **387,574** | **492,647** | **580,733** | **667,711** | **736,064** | **789,466** |
| ***Existing*** | | | | | | |
| *Lake Lavon* | *112,033* | *110,767* | *109,500* | *108,233* | *106,967* | *105,700* |
| *Lake Texoma* | *77,300* | *77,300* | *77,300* | *77,300* | *77,300* | *77,300* |
| *Lake Chapman* | *47,132* | *47,132* | *47,132* | *47,132* | *47,132* | *47,132* |
| *Wilson Creek Reuse* | *50,000* | *60,941* | *71,882* | *71,882* | *71,882* | *71,882* |
| *Lake Bonham* | *5,340* | *5,340* | *5,340* | *5,340* | *5,340* | *5,340* |
| *East Fork Reuse (with Ray Hubbard Pass through)* | *51,790* | *67,148* | *87,102* | *102,000* | *102,000* | *102,000* |
| *Interim GTUA* | *15,500* | *0* | *0* | *0* | *0* | *0* |
| *Upper Sabine Basin* | 49,718 | 29,646 | 9,573 | 9,501 | 9,428 | 9,356 |
| *Direct Reuse for Irrigation (Collin & Rockwall Co)* | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 |
| ***Total Available Supplies*** | ***411,508*** | ***400,968*** | ***410,524*** | ***424,083*** | ***422,744*** | ***421,405*** |
| | | | | | | |
| ***Need (Demand-Supply)*** | ***0*** | ***91,679*** | ***170,209*** | ***243,628*** | ***313,320*** | ***368,061*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (Wholesale Customers) | 5,180 | 27,104 | 45,757 | 58,937 | 70,535 | 80,372 |
| Texoma Pump Station Expansion | 0 | 0 | 0 | 0 | 0 | 0 |
| Additional Direct Reuse - Rockwall Co. Irrigation | 64 | 64 | 64 | 64 | 64 | 64 |
| Renewed Interim GTUA | | 21,900 | 21,900 | 21,900 | | |
| Main Stem PS (additional East Fork) | | 34,900 | 15,100 | 0 | 0 | 0 |
| Chapman Booster Pump Station | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 4E.7, Continued**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Lower Bois d'Arc Creek Res. | | 56,050 | 120,200 | 118,000 | 115,800 | 113,600 |
| Additional Lake Texoma - Blend with new Supplies | | | 69,200 | 68,500 | 113,000 | 113,000 |
| Fannin County Water Supply System | | 0 | 0 | 0 | 0 | 0 |
| Marvin Nichols | | | 87,400 | 87,400 | 174,800 | 174,800 |
| Toledo Bend Phase 1 | | | | | 100,000 | 100,000 |
| Oklahoma | | | | | | 50,000 |
| **Total Supplies from Strategies** | **5,244** | **140,018** | **359,621** | **354,801** | **574,199** | **631,836** |
| **Total Supplies** | **416,752** | **540,987** | **770,145** | **778,884** | **996,943** | **1,053,241** |
| **Reserve or (Shortage)** | **29,178** | **48,340** | **189,412** | **111,173** | **260,878** | **263,775** |

**Figure 4E.8**
**Recommended Water Management Strategies for North Texas Municipal Water District**

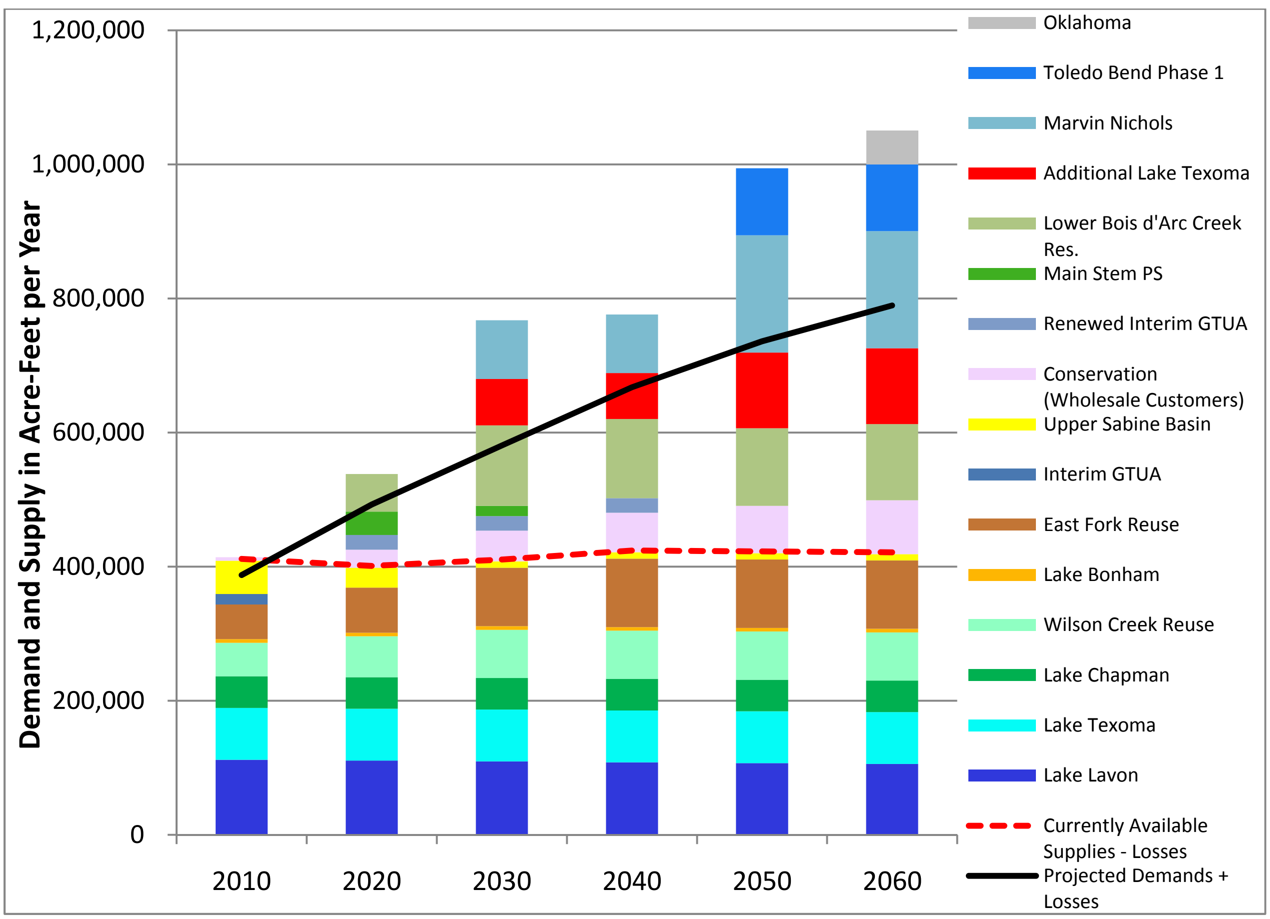


**Figure 4E.9**
**North Texas Municipal's Water District's 2060 Additional Supply by Type (Acre-Feet per Year)**

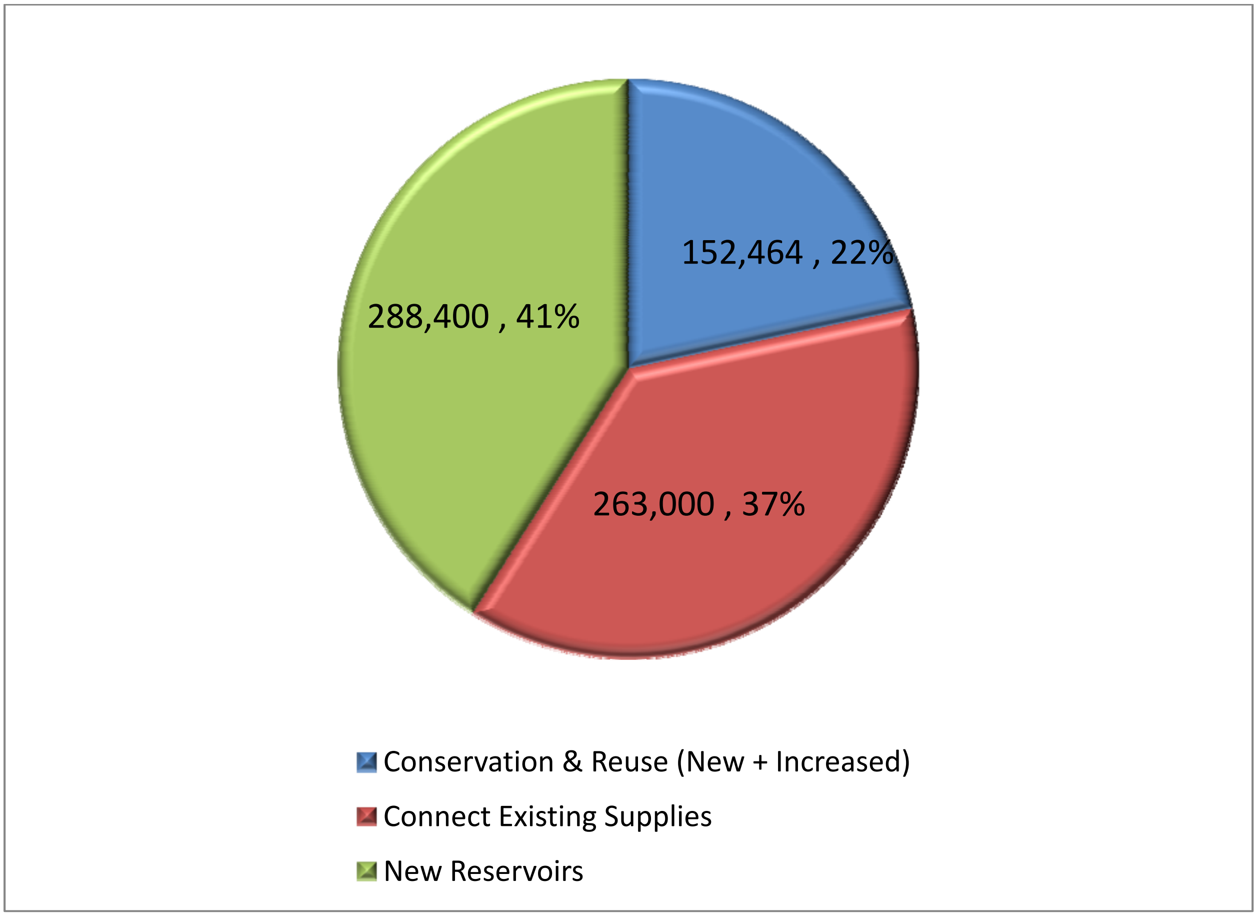



**Table 4E.8**
**Summary of Costs for NTMWD Recommended Strategies**

| Strategy | Date to be Developed | Quantity for NTMWD (Ac-Ft/Yr) | NTMWD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010-2060 | 80,372* | Included under County Summaries in Section 4F. | | | |
| Texoma Pump Station Expansion | 2011 | 0 | $8,283,000 | $0.00 | $0.00 | Q-71 |
| Renewed Interim GTUA | 2016 | 21,900 | none | N/A | $0.19 | Q-70 |
| Main Stem Trinity PS | 2013 | 34,900 | Costs included in DWU - Table 4E.2 | | | |
| Chapman Booster PS | 2016 | 0 | $27,276,000 | N/A | N/A | Q-68 |
| Lower Bois d'Arc Creek | 2018 | 123,000 | $615,498,000 | $1.33 | $0.21 | Q-47 |

**Table 4E.8, Continued**

| Strategy | Date to be Developed | Quantity for NTMWD (Ac-Ft/Yr) | NTMWD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Fannin Co. Water Supply System | 2020 | 6,744 | $38,471,000 | $2.19 | $0.92 | Q-73 |
| Additional Lake Texoma | 2025 | 113,000 | $336,356,000 | $0.93 | $0.27 | Q-29 |
| Marvin Nichols | 2030 & 2050 | 174,800 | $830,894,000 | $1.45 | $0.39 | Q-20 |
| Toledo Bend Phase 1 | 2050 | 100,000 | $929,822,000 | $2.93 | $0.86 | Q-17 |
| Oklahoma | 2060 | 50,000 | $210,354,000 | $1.43 | $0.49 | Q-46 |
| Treatment and Distribution Improvements | 2010-2060 | N/A | $2,269,363,000 | N/A | N/A | Q-72 |
| **Total NTMWD Capital Costs** | | | **$5,266,317,000** | | | |

* NTMWD has no retail sales, so conservation savings are reflected in their customers' conservation savings. NTMWD has an extensive water conservation program, the costs for which are not reflected in this table.

**Table 4E.9**
**Summary of Costs for NTMWD Alternative Strategies**

| Strategy | Quantity for NTMWD (Ac-Ft/Yr) | NTMWD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|
| | | | With Debt Service | After Debt Service | |
| Toledo Bend Reservoir Phase 2 | 100,000 | $309,941,000 | $1.55 | $0.86 | Q-17 |
| DWU Treated Water | 11,200 | $1,777,000 | $1.42 | $1.38 | Q-69 |
| Lake O' the Pines | 87,900 | $402,431,000 | $1.77 | $0.75 | Q-58 |
| Lake Wright Patman - Texarkana | 100,000 | $684,966,000 | $2.49 | $0.97 | Q-22 |
| Lake Wright Patman - Raise Pool | 180,000 | $905,929,000 | $1.67 | $0.55 | Q-26 |
| Lake Wright Patman - System | 130,000 | $781,741,000 | $1.99 | $0.65 | Q-28 |
| Lake Texoma - Desalinate | 105,000 | $796,532,000 | $3.05 | $1.36 | Q-30 |
| Roberts County Groundwater | 200,000 | $2,434,529,000 | $3.46 | $0.75 | Q-39 |
| Carrizo-Wilcox Groundwater | 100,000 | $913,344,000 | $4.35 | $1.80 | Q-55 |
| George Parkhouse Reservoir (North) | 118,960 | $516,585,000 | $1.31 | $0.35 | Q-49 |
| George Parkhouse Res. (South) | 108,480 | $645,810,000 | $1.71 | $0.39 | Q-52 |
| Lake Livingston | 200,000 | $2,115,111,000 | $3.38 | $1.03 | Q-34 |

## City of Fort Worth

The City of Fort Worth obtains raw water from the Tarrant Regional Water District (TRWD) and treats and distributes treated water to a number of other water user groups in Tarrant County and surrounding counties. The currently available supply to Fort Worth is limited by Fort Worth's current treatment capacity and by TRWD's raw water sources and transmission capacity. As Fort Worth increases treatment capacity and TRWD develops additional raw water supplies, Fort Worth's available supply will increase. The city also plans to implement five direct reuse projects, which would be used for industry, landscape irrigation, and steam electric power. The recommended water management strategies for the city of Fort Worth are:

- Conservation
- Expansion of water treatment plants
- Expansion of transmission pipelines
- New water treatment plants
- Additional supply from Tarrant Regional Water District
- Direct reuse for industry, landscape irrigation, and steam electric power

These strategies are discussed individually below.

**Conservation.** Conservation is the projected conservation savings for Fort Worth and its existing and potential customers, based on the Region C recommended water conservation program. Not including savings from low-flow plumbing fixtures (which are built into the demand projections), conservation by Fort Worth and its customers is projected to reach 51,775 acre-feet per year by 2060.

**Expansions of Water Treatment Plants.** The City of Fort Worth has four water treatment plants: North Holly, South Holly, Rolling Hills, and Eagle Mountain. The current combined capacity of the existing water treatment plants is 495 mgd. In order to meet the projected demands, Fort Worth will expand water treatment plants and add new plants to reach a total treatment capacity of 1,020 mgd by 2060.

**Expansion of Transmission Pipelines.** The City of Fort Worth plans to expand portions of the current transmission system. A pipeline connecting the proposed new

Southwest Water Treatment Plant to the TRWD's pipeline will be needed when the treatment plant is developed. The City of Fort Worth plans to assist some of their customers in developing additional pipelines. Projects to serve customer cities will be included as strategies for the customer cities.

**New Water Treatment Plants.** The City of Fort Worth plans to construct two more water treatment plants that will be known as the West Water Treatment Plant and the Southwest Water Treatment Plant. The West plant will be designed to treat 12 mgd initially, with room for expansions. The Southwest plant will be designed to treat 25 mgd initially with room for expansions.

**Additional Supply from Tarrant Regional Water District.** As the Tarrant Regional Water District develops new supplies and increases transmission capacity, Fort Worth's allocation of supply from the District will increase to meet projected demands.

**Direct Reuse.** Fort Worth plans to implement the following direct reuse projects:

- Village Creek Direct Reuse: Effluent from the Village Creek Wastewater Treatment Plant will be used to meet non-potable water needs in the Cities of Arlington and Euless, Dallas-Fort Worth International Airport, and other potential retail customers within the City of Fort Worth. Conveyance facilities are currently under construction to transport the water to user delivery points by the end of 2010.
- Alliance Corridor Direct Reuse: This project would involve a partnership between the City of Fort Worth, Trinity River Authority and Hillwood Corporation to serve developments in the Alliance Airport area. It would use effluent supplied from the Trinity River Authority's Denton Creek Regional Wastewater System.
- Fort Worth Future Direct Reuse: Fort Worth plans to further expand its direct reuse system by constructing additional conveyance and/or treatment facilities in other areas of the City.

Table 4E.10 shows the recommended plan by decade for the city, and Table 4E.11 presents the costs associated with the recommended strategies. The estimated capital cost for Fort Worth's recommended water management strategies is approximately $1.06 billion, based on 2008 construction costs.

**Table 4E.10**
**Summary of Recommended Water Management Strategies for Fort Worth**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **256,732** | **314,875** | **377,372** | **444,688** | **523,473** | **618,676** |
| ***Existing Supplies*** | | | | | | |
| *TRWD Raw Water* | *247,979* | *279,288* | *280,871* | *288,470* | *299,134* | *309,882* |
| *Water Treatment Capacity (495 mgd Total)* | *277,748* | *277,748* | *277,748* | *277,748* | *277,748* | *277,748* |
| *TRWD Limited by Treatment* | *247,979* | *277,748* | *277,748* | *277,748* | *277,748* | *277,748* |
| *Direct Reuse (Village Creek)* | *897* | *897* | *897* | *897* | *897* | *897* |
| ***Total Existing Supplies*** | ***248,876*** | ***278,645*** | ***278,645*** | ***278,645*** | ***278,645*** | ***278,645*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***7,856*** | ***36,230*** | ***98,727*** | ***166,043*** | ***244,828*** | ***340,031*** |
| | | | | | | |
| **Water Management Strategies (Raw Water for All but Reuse from TRWD)** | | | | | | |
| Conservation (retail) | 4,872 | 10,755 | 17,004 | 23,922 | 32,402 | 43,549 |
| Conservation (wholesale) | 1,432 | 3,666 | 5,323 | 6,283 | 7,260 | 8,226 |
| Village Creek Direct Reuse | 1,552 | 3,469 | 3,526 | 3,526 | 3,526 | 3,526 |
| Alliance Direct Reuse | 0 | 1,120 | 4,694 | 4,694 | 4,694 | 4,694 |
| Fort Worth Future Direct Reuse | 0 | 0 | 3,460 | 7,979 | 7,979 | 7,979 |
| 12 mgd West Plant | | 6,726 | 6,726 | 6,726 | 6,726 | 6,726 |
| Rolling Hills 50 mgd expansion | | 10,494 | 28,025 | 28,025 | 28,025 | 28,025 |
| New 25 mgd Southwest Plant | | 0 | 14,013 | 14,013 | 14,013 | 14,013 |
| Eagle Mountain 35 mgd exp. | | 0 | 15,956 | 19,618 | 19,618 | 19,618 |
| West Plant 23 mgd expansion | | | 0 | 12,065 | 12,892 | 12,892 |
| West Plant 35 mgd expansion | | | 0 | 19,618 | 19,618 | 19,618 |
| Eagle Mountain 70 mgd exp. | | | | 19,574 | 39,235 | 39,235 |
| Southwest Plant 25 mgd exp. | | | | | 14,013 | 14,013 |
| 50 mgd expansion | | | | | 28,025 | 28,025 |
| 50 mgd expansion | | | | | 6,802 | 28,025 |
| 50 mgd expansion | | | | | | 28,025 |
| 50 mgd expansion | | | | | | 28,025 |
| 50 mgd expansion | | | | | | 5,817 |
| **Total Supplies from Strategies** | **7,856** | **36,230** | **98,727** | **166,043** | **244,828** | **340,031** |
| **Total Supplies** | **256,732** | **314,875** | **377,372** | **444,688** | **523,473** | **618,676** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.11**
**Summary of Costs for Fort Worth Recommended Strategies**

| Strategy | Developed Before: | Quantity for Fort Worth (Ac-Ft/Yr) | Fort Worth Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 43,549 | $0* | $0.25 | $0.25 | Q-10 & Q-12 |
| Conservation (wholesale) | 2010 | 8,226 | Included under County Summaries in Section 4F. | | | |
| Village Creek Direct Reuse | 2010 | 3,526 | $16,095,000 | $0.93 | $0.23 | Q-106 |
| Alliance Direct Reuse | 2020 | 4,694 | $21,828,000 | $1.27 | $0.23 | Q-105 |
| Fort Worth Future Direct Reuse | 2020 | 7,979 | $144,779,000 | $5.19 | $1.14 | Q-104 |
| 12 mgd West Plant | 2020 | 6,726 | $57,915,000 | $2.62 | $0.70 | Q-15 |
| Rolling Hills 50 mgd exp. | 2020 | 28,025 | $77,883,000 | $1.21 | $0.70 | Q-15 |
| New 25 mgd Southwest Plant | 2020 | 14,013 | $42,702,000 | $1.38 | $0.70 | Q-15 |
| Eagle Mountain 35 mgd exp. | 2020 | 19,618 | $58,126,000 | $2.49 | $0.70 | Q-15 |
| West Plant 23 mgd expansion | 2030 | 12,892 | $41,490,000 | $2.49 | $0.70 | Q-15 |
| West Plant 35 mgd expansion | 2030 | 19,618 | $58,126,000 | $2.49 | $0.70 | Q-15 |
| Eagle Mountain 70 mgd exp. | 2040 | 39,235 | $103,367,000 | $1.19 | $0.70 | Q-15 |
| Southwest Plant 25 mgd exp. | 2050 | 14,013 | $44,239,000 | $1.28 | $0.70 | Q-15 |
| 50 mgd expansion | 2050 | 28,025 | $77,883,000 | $1.21 | $0.70 | Q-15 |
| 50 mgd expansion | 2050 | 28,025 | $77,883,000 | $1.21 | $0.70 | Q-15 |
| 50 mgd expansion | 2060 | 28,025 | $77,883,000 | $1.21 | $0.70 | Q-15 |
| 50 mgd expansion | 2060 | 28,025 | $77,883,000 | $1.21 | $0.70 | Q-15 |
| 50 mgd expansion | 2060 | 28,025 | $77,883,000 | $1.21 | $0.70 | Q-15 |
| **Total Capital Costs** | | | **$1,055,965,000** | | | |

* Fort Worth has already made significant capital investment to implement its conservation programs. In the future, all costs will be annual operating costs which are estimated to range from $1.4 million in 2010 to $3.6 million in 2060.

### Trinity River Authority

The Trinity River Authority (TRA) currently provides water to Region C users in several ways:

- TRA provides water from its own water rights in four different lakes (Lakes Bardwell, Navarro Mills, Joe Pool, and Livingston).
- TRA purchases and treats water from the Tarrant Regional Water District (TRWD) and supplies Tarrant County cities through the Tarrant County Water Supply Project.
- TRA contracts with TRWD and provides raw water to water users in Ellis and Freestone Counties.
- TRA provides reuse water to entities in Dallas and Ellis Counties.

The Authority also owns and operates several wastewater treatment plants, and has plans to develop a number of direct and indirect reuse projects in Region C. The following water management strategies are recommended for TRA:

- Conservation
- Expansions to the Tarrant County Water Supply Project
- Further development of the Ellis County Water Supply Project
- Additional steam electric supply in Freestone County through existing facilities
- Expansion of the existing Las Colinas reuse project in Dallas County with additional transmission facilities
- Development of indirect reuse for Ennis from Lake Bardwell
- Development of reuse for steam electric power generation in Dallas County
- Development of reuse for steam electric power generation in Ellis County
- Development of reuse for steam electric power generation in Freestone County
- Development of reuse for steam electric power generation in Kaufman County
- Development of a reuse project from the Denton Creek WWTP for irrigation in Denton and Tarrant Counties and municipal use in Tarrant County
- Development of indirect reuse through Joe Pool Lake

These projects are discussed below.

**Conservation.** Conservation is the projected conservation savings for existing and potential customers of the TRA, based on the Region C recommended water conservation program. Not including savings from low-flow plumbing fixtures (which are built into the demand projections) and not including reuse, conservation by TRA customers is projected to reach 14,551 acre-feet per year by 2060.

**Expansions to the Tarrant County Water Supply Project.** The Tarrant County Water Supply Project water treatment plant can be expanded two more times, from a current capacity of 87 mgd to a fully developed capacity of 117 mgd. These expansions are currently planned for 2014 and 2020. Raw water for the Tarrant County Water Supply Project is provided by the Tarrant Regional Water District.

**Development of the Ellis County Water Supply Project.** The Ellis County Water Supply Project delivers raw water from the Tarrant Regional Water District (TRWD) pipelines to water suppliers in Ellis County. Raw water will be diverted from the TRWD pipelines and treated at water treatment plants operated by Ennis, Waxahachie and Midlothian. The Waxahachie plant began operation in August 2009. Midlothian plans to complete a treatment plant to use water from TRWD through TRA by 2014. Ennis is already using water from TRWD through TRA. Table 4E.12 shows the proposed supply from TRWD through TRA for the Ellis County Water Supply Project, which is 53,151 acre-feet per year by 2060.

**Additional Steam Electric Supply in Freestone County through Existing Facilities.** The Trinity River Authority currently has a contract with TRWD to divert water from Richland-Chambers Reservoir to be used for steam electric power generation in Freestone County. The current contract is for 6,726 acre-feet per year, and the proposed water management strategy would supply 1,000 acre-feet per year of additional water through existing facilities.

**Expansion of the Existing Las Colinas Reuse Project in Dallas County with Additional Transmission Facilities.** The Trinity River Authority currently supplies treated wastewater to Las Colinas in Irving for golf course irrigation, landscape irrigation, and lake level maintenance. This project would allow expansion of that supply by 7,000 acre-feet per year. It is assumed to be developed by 2020.

**Development of Indirect Reuse for Ennis.** Ennis currently discharges its treated wastewater downstream from Lake Bardwell. TRA has a water right that allows the reuse of up to 3,696 acre-feet per year of wastewater actually discharged into Lake Bardwell. The existing direct reuse transmission line from the Ennis wastewater plant to a nearby power plant runs past Lake Bardwell, and water could be discharged from that pipeline to the lake for reuse. Ennis plans to implement this strategy as part of their water supply beginning in 2040.

**Table 4E.12**
**Supplies from TRWD through TRA for the Ellis County Water Supply Project**

| Water User Group | Demands and Supplies (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Ennis Municipal | 3,497 | 4,358 | 5,504 | 6,949 | 8,834 | 11,308 |
| Community WC (Ellis Co.) | 116 | 171 | 201 | 230 | 264 | 304 |
| Rice WSC (part) | 50 | 50 | 50 | 50 | 50 | 50 |
| Ellis Co. Other (East Garrett WSC) | 56 | 56 | 56 | 56 | 56 | 56 |
| Bardwell | 0 | 17 | 42 | 69 | 100 | 135 |
| Ellis Co. Manufacturing (10%) | 347 | 367 | 384 | 399 | 409 | 391 |
| Ellis Co. Steam Electric | 1,401 | 1,401 | 1,401 | 1,401 | 1,401 | 1,401 |
| **Total** | **5,467** | **6,420** | **7,638** | **9,154** | **11,114** | **13,645** |
| Other Supplies | 5,512 | 5,284 | 5,057 | 5,163 | 7,123 | 8,071 |
| Conservation | 188 | 441 | 649 | 894 | 1,215 | 1,653 |
| **Ennis Supply from ECWSP** | **0** | **695** | **1,932** | **3,097** | **2,776** | **3,921** |
| Midlothian Municipal | 3,438 | 6,765 | 9,174 | 11,151 | 13,178 | 15,206 |
| Alvarado (Reg. G, net of Groundwater) | 0 | 444 | 484 | 521 | 580 | 658 |
| Grand Prairie (part) | 0 | 7,287 | 7,287 | 7,287 | 7,287 | 7,287 |
| Mountain Peak SUD (net of Groundwater) | 155 | 586 | 658 | 856 | 1,224 | 1,701 |
| Rockett SUD | 1,926 | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 |
| Venus (Region G)] | 363 | 358 | 349 | 344 | 342 | 342 |
| Ellis Co. Manufacturing (40%) | 1,386 | 1,468 | 1,536 | 1,595 | 1,636 | 1,565 |
| Ellis Co. Steam Electric | 224 | 224 | 224 | 224 | 224 | 224 |
| **Total** | **7,492** | **19,374** | **21,954** | **24,220** | **26,713** | **29,225** |
| Other Supplies | 7,258 | 7,105 | 6,951 | 6,798 | 6,644 | 6,490 |
| Conservation | 234 | 1,432 | 1,927 | 2,346 | 2,780 | 3,245 |
| **Midlothian Supply from ECWSP** | **0** | **10,837** | **13,076** | **15,076** | **17,289** | **19,490** |
| Rockett SUD Municipal | 4,713 | 5,985 | 7,436 | 8,636 | 9,240 | 9,320 |
| Ellis Co. Other (Boyce WSC & Bristol WSC) | 70 | 70 | 70 | 70 | 70 | 70 |
| Ennis (part) | 17 | 17 | 17 | 17 | 17 | 17 |
| Ferris (net of Groundwater) | 174 | 220 | 268 | 328 | 403 | 473 |
| Lancaster (part) | 90 | 90 | 90 | 90 | 90 | 90 |

**Table 4E.12, Continued**

| Water User Group | Demands and Supplies (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Oak Leaf (part) | 55 | 55 | 55 | 55 | 55 | 55 |
| Palmer (net of Groundwater) | 0 | 2 | 13 | 24 | 40 | 42 |
| Pecan Hill | 160 | 183 | 205 | 228 | 254 | 285 |
| Red Oak (part) | 118 | 201 | 246 | 263 | 281 | 299 |
| Sardis-Lone Elm WSC (net of Groundwater) | 0 | 2,155 | 2,934 | 2,890 | 2,867 | 2,867 |
| Waxahachie (part) | 613 | 613 | 613 | 613 | 613 | 613 |
| **Total** | **6,010** | **9,591** | **11,947** | **13,214** | **13,930** | **14,131** |
| Other Supplies (Midlothian) | 1,926 | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 |
| Conservation | 110 | 522 | 784 | 931 | 1,044 | 1,124 |
| **Rockett SUD Supply from ECWSP** | **3,974** | **6,827** | **8,921** | **10,041** | **10,644** | **10,765** |
| Waxahachie Municipal | 6,855 | 8,781 | 10,330 | 13,090 | 16,672 | 21,341 |
| Buena Vista-Bethel SUD (net of Groundwater) | 1,043 | 1,466 | 1,967 | 2,536 | 3,158 | 3,836 |
| Ellis County Other | 242 | 240 | 237 | 236 | 235 | 235 |
| Files Valley WSC (part) | 0 | 100 | 100 | 100 | 100 | 100 |
| Italy (part) | 0 | 43 | 75 | 110 | 152 | 202 |
| Maypearl (part) | 0 | 23 | 67 | 61 | 57 | 57 |
| Ellis Co. Manufacturing (28%) | 970 | 1,028 | 1,075 | 1,116 | 1,145 | 1,095 |
| Ellis Co. Steam Electric | 0 | 0 | 0 | 2,116 | 4,129 | 4,454 |
| **Total** | **9,110** | **11,681** | **13,851** | **19,365** | **25,648** | **31,320** |
| Other Supplies (Limited by South Plant Capacity) | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 |
| Conservation | 175 | 857 | 1,365 | 1,866 | 2,499 | 3,332 |
| **Waxahachie Supply from ECWSP (minimum 2,500 ac-ft per year)** | **2,500** | **2,500** | **3,473** | **8,486** | **14,136** | **18,975** |
| **Total** | **6,474** | **20,859** | **27,402** | **36,700** | **44,845** | **53,151** |

**Development of Reuse for Steam Electric Power Generation in Dallas County.** The projected 2060 demand for Dallas County Steam Electric Power is 12,000 acre-feet per year. It is assumed that TRA will supply up to 6,760 acre-feet per year of reuse water for part of that need (with most of the rest coming from Dallas Water Utilities). The project cost is based on delivery of the water from the TRA Central Wastewater Treatment Plant to Mountain Creek Lake. It is assumed that the project will be developed by 2030. (TRA reuse projects may be located elsewhere in Dallas County, depending on the development of steam electric power generation facilities and/or the occurrence of other opportunities to meet water needs with reuse water.  If that were to occur, then costs for the project might differ, but the project should still be considered consistent with the Region C Water Plan.)

**Development of Reuse for Steam Electric Power Generation in Ellis County.** The projected 2060 demand for Ellis County Steam Electric Power is 7,878 acre-feet per year.  It is assumed that TRA will supply up to 2,200 acre-feet per year of reuse water for that need, beginning in 2060.  The project cost is based on delivering water about 20 miles.  (TRA reuse projects may be located anywhere in Ellis County, depending on the development of steam electric power generation facilities and/or the occurrence of other opportunities to meet water needs with reuse water.  The costs for the project may differ, but the project should still be considered consistent with the Region C Water Plan.)

**Development of Reuse for Steam Electric Power Generation in Freestone County.** The projected 2060 demand for Freestone County Steam Electric Power is 33,398 acre-feet per year.  The Trinity River Authority is already supplying 26,726 acre feet per year for steam electric power in Freestone County (from upstream Lake Livingston diversions and raw water provided by TRWD).  It is assumed that TRA may supply up to 6,760 acre-feet per year of indirect reuse water to meet the remaining need.  The project cost is based on diverting TRA treated return flows from the Trinity River and delivering the water about 15 miles.  (TRA reuse projects may be located anywhere in Freestone County, depending on the development of steam electric power generation facilities and/or the occurrence of other opportunities to meet water needs with reuse water.  The costs for the project may differ, but the project should still be considered consistent with the Region C Water Plan.)

**Development of Reuse for Steam Electric Power Generation in Kaufman County.** The projected 2060 demand for Freestone County Steam Electric Power is 10,000 acre-feet per year.   It is assumed that TRA may supply up to 1,000 acre-feet per year of indirect reuse water for that need (with the remainder coming from other sources).  The project cost is based on diverting TRA treated return flows from the Trinity River and delivering the water about 15 miles.  (TRA reuse projects may be located anywhere in Kaufman County, depending on the development of steam electric power generation facilities and/or the occurrence of other opportunities to meet water needs with reuse water.  The costs for the project may differ, but the project should still be considered consistent with the Region C Water Plan.)

**Development of Reuse Projects from the Denton Creek WWTP for Irrigation and Municipal Use in Denton and Tarrant Counties.** The Trinity River Authority has been in discussions with potential water users regarding the development of up to 15,000 acre-feet per year of reuse water from TRA's Denton Creek WWTP for irrigation and municipal use in Denton and Tarrant Counties. Costs for this strategy are based on 7,500 acre-feet per year direct reuse for irrigation and 7,500 acre-feet per year as indirect reuse through Grapevine Lake.

**Development of a Reuse Project for Joe Pool Lake.** The Trinity River Authority has received a reuse permit for up to 4,368 acre-feet per year from a wastewater treatment plant in the watershed of Joe Pool Lake. Water would be discharged upstream of the lake for subsequent use from Joe Pool Lake. This project is assumed to be developed by 2020.

Table 4E.13 and Figure 4E.11 provide information on the recommended management strategies for TRA. A summary of the capital and unit cost for the strategies is shown in Table 4E.14.

**Table 4E.13**
**Summary of Recommended Water Management Strategies for Trinity River Authority**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **107,937** | **135,520** | **154,266** | **166,089** | **182,022** | **201,874** |
| | | | | | | |
| **Currently Available Supplies** | | | | | | |
| *Joe Pool Lake (Midlothian and Grand Prairie)* | *5,954* | *7,104* | *6,951* | *6,798* | *6,644* | *6,491* |
| *Joe Pool Lake (Grand Prairie Raw)* | *300* | *300* | *300* | *300* | *300* | *300* |
| *Navarro Mills Lake* | *19,342* | *18,333* | *17,325* | *16,317* | *15,308* | *14,300* |
| *Lake Bardwell* | *9,600* | *9,600* | *9,295* | *8,863* | *8,432* | *8,000* |
| *Lake Livingston* | *20,000* | *20,000* | *20,000* | *20,000* | *20,000* | *20,000* |
| *Current Reuse* | *13,248* | *13,379* | *13,379* | *13,379* | *13,379* | *13,379* |
| *Current TRWD (Tarrant Co.)* | *42,133* | *43,659* | *39,156* | *34,433* | *30,548* | *26,991* |
| *Current TRWD (East Texas)* | *14,323* | *28,620* | *31,110* | *34,086* | *35,644* | *36,361* |

**Table 4E.13, Continued**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| ***Currently Available Supplies*** | ***124,900*** | ***140,995*** | ***137,516*** | ***134,176*** | ***130,255*** | ***125,822*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***0*** | ***0*** | ***16,750*** | ***31,913*** | ***51,767*** | ***76,052*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation | 1,723 | 5,713 | 8,180 | 10,118 | 12,173 | 14,551 |
| Tarrant Co. WSP (TRWD) | 0 | 1,627 | 7,841 | 12,949 | 17,108 | 20,949 |
| Ellis Co. WSP and Other East Texas (TRWD) | 0 | 1,521 | 7,735 | 15,374 | 23,626 | 33,157 |
| Additional Freestone County Raw Water (TRWD) | 0 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| **Planned Supplies (Ac-Ft/Yr)** | | | | | | |
| Additional Los Colinas Reuse | 0 | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 |
| Ennis Indirect Reuse (through TRA) | 0 | 0 | 0 | 333 | 2,521 | 3,696 |
| Dallas County Reuse (SE Power) | 0 | 0 | 6,760 | 6,760 | 6,760 | 6,760 |
| Ellis County Reuse (SE Power) | 0 | 0 | 0 | 0 | 0 | 2,200 |
| Freestone Co. Reuse (SE Power) | 0 | 0 | 0 | 0 | 6,760 | 6,760 |
| Kaufman Co. Reuse (SE Power) | 0 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Tarrant and Denton Co. Reuse | 0 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Joe Pool Lake Reuse | 0 | 4,368 | 4,368 | 4,368 | 4,368 | 4,368 |
| **Total Supplies from Strategies** | **1,723** | **37,229** | **58,884** | **73,902** | **97,316** | **116,441** |
| **Total Supplies** | **126,623** | **178,224** | **196,400** | **208,078** | **227,571** | **242,263** |
| **Reserve or (Shortage)** | **18,685** | **42,705** | **42,134** | **41,989** | **45,549** | **40,389** |

**Figure 4E.10**
**Recommended Water Management Strategies for the Trinity River Authority in Region C**

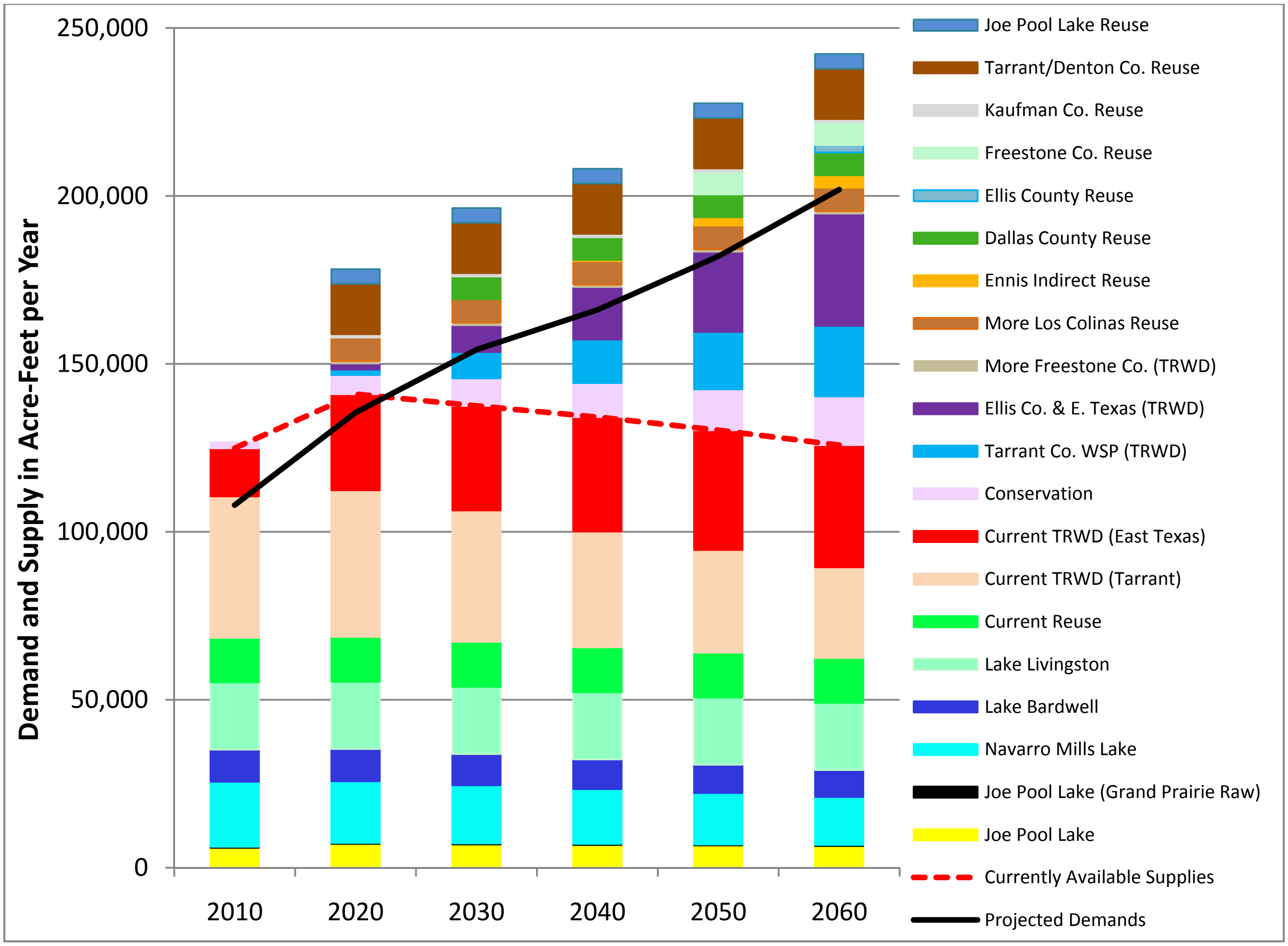


**Table 4E.14**
**Summary of Costs for TRA Recommended Strategies**

| Strategy | Date to be Developed | Quantity for TRA (Ac-Ft/Yr) | TRA Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010 | 14,551** | Included under County Summaries in Section 4F. | | | |
| Tarrant County System - More TRWD Water | 2020 | 20,949 | N/A | N/A | $0.69 | None |
| Tarrant County System - Expansion to 102 mgd | 2020 | 7,473 | $29,504,000 | $1.91 | $1.03 | Q-80 |
| Tarrant County System - Expansion to 117 mgd | 2020 | 7,473 | $29,504,000 | $1.91 | $1.03 | Q-80 |
| Ellis County Project and Other East Texas Additional TRWD | 2020 | 53,222 | $50,912,000 | $6.44 | $0.43 | Q-74 |
| Freestone County Raw Water | 2020 | 1,000 | N/A | $0.82 | $0.82 | None |
| Additional Los Colinas Reuse | 2015 | 7,000 | $14,530,000 | $0.87 | $0.41 | Q-75 |
| Ennis Indirect Reuse (through TRA) | 2040 | 3,696 | Included in Ennis costs in Table 43.43 | | | |
| Dallas County Steam Electric Reuse | 2030 | 6,760 | $14,895,000 | $1.19 | $0.46 | Q-76 |
| Ellis County Steam Electric Reuse | 2060 | 2,200 | $10,384,000 | $1.55 | $0.50 | Q-77 |
| Freestone County Steam Electric Reuse | 2050 | 6,700 | $17,266,000 | $0.96 | $0.41 | Q-78 |
| Kaufman County Steam Electric Reuse | 2020 | 1,100 | $9,761,000 | $2.77 | $0.59 | Q-78 |
| Tarrant and Denton County Reuse | 2020 | 15,000 | $9,506,000 | $1.49 | $0.92 | Q-81 |
| Joe Pool Lake Reuse* | 2020 | 4,368 | N/A | N/A | N/A | None |
| **Total TRA Capital Costs** | | | **$186,262,000** | | | |

* There is no cost to get water in the lake. Capital costs and purchase costs to get the supply out of the lake are to be determined by who uses the supply.
** TRA has no retail sales, so conservation savings are reflected in their customers' conservation savings.

## Upper Trinity Regional Water District

The Upper Trinity Regional Water District (UTRWD) currently supplies treated water to users in Denton County and Collin County. The UTRWD also provides direct reuse for irrigation in Denton County. The currently available supplies for UTRWD include water purchased from Sulphur River Water District and Commerce out of Lake Chapman, purchased raw water from Denton and Dallas Water Utilities (DWU) and reuse. UTRWD's currently available supplies range between 33,158 and 63,463 acre-feet per year from 2010 to 2060. (The changes in supply over time are due primarily to changes in water availability from DWU.) Considering losses associated with treatment and distribution, UTRWD needs to develop an additional 100,520 acre-feet per year by 2060. UTRWD will also need to develop additional treatment and distribution capacity to serve the growing demands of its current and future customers. The recommended water management strategies for UTRWD include the following:

- Conservation
- Additional supplies from DWU under current contracts
- Lake Ralph Hall
- Indirect reuse of return flows from Lake Ralph Hall
- Marvin Nichols Reservoir
- Additional DWU supplies
- Oklahoma water
- Water treatment plant and distribution system improvements.

Marvin Nichols Reservoir and water from Oklahoma are multi-provider strategies and are discussed on pages 4E.2 to 4E.4. The other strategies identified for UTRWD are discussed individually below:

**Conservation.** Conservation is the projected conservation savings for UTRWD's existing and potential customers, based on the Region C recommended water conservation program. Not including savings from low-flow plumbing fixtures and not including reuse, conservation by UTRWD customers is projected to reach 13,202 acre-feet per year by 2060.

**Additional Supplies from DWU under Current Contracts.** UTRWD's current contracts with DWU indicate that DWU will supply (1) water needed for several specific water suppliers in Denton County plus an additional 10 mgd and (2) an additional amount equal to 40 percent of UTRWD's supplies from Lake Chapman. Based on projected demands, the contracts would provide up to 61,638 acre-feet per year in 2060. UTRWD is currently using less than the amount in this contract (due to the availability of other interim water supplies) but plans to eventually use the full contracted amount.

**Lake Ralph Hall.** UTRWD has applied for a water right permit to develop the proposed Lake Ralph Hall on the North Sulphur River in Fannin County. The project would yield 34,050 acre-feet per year, up to 90 percent of which would be delivered to Denton County. Water would be pumped from the lake to the existing balancing reservoir on the pipeline from Lake Chapman to UTRWD's Harpool Water Treatment Plant and Lewisville Lake. From there, it would be delivered through existing facilities to the Harpool plant and the lake. (The existing facilities have sufficient capacity for the supply.)

**Indirect Reuse of Return Flows from Lake Ralph Hall.** UTRWD plans to apply for the right to reuse return flows from the Lake Ralph Hall project, which are assumed to be 60 percent of the supply delivered to Denton County from the project, or 18,387 acre-feet per year.

**Additional Direct Reuse.** UTRWD plans to develop up to an additional 2,240 acre-feet per year of direct reuse in Denton County. The specific location of this supply is uncertain and will depend on demands in UTRWD's service area.

**Additional Water from Dallas Water Utilities.** In addition to the water supplied by DWU under the existing contract between UTRWD and DWU and the additional supplies associated with Lake Chapman reuse, UTRWD plans to contract for additional surface water supplies from DWU. This supply is expected to amount to 11,200 acre-feet per year by 2060.

**Water Treatment and Distribution Improvements.** UTRWD will need to make improvements to its water treatment and distribution system to meet the demands of its customers. UTRWD has developed a capital improvement plan with specific projects through 2029, and estimated costs for improvements after 2029 are also included.

Table 4E.15 and Figure 4E.11 show the recommended plan for water supply development for UTRWD. Based on the recommended plan, 26 percent of the projected 2060 supply for UTRWD will be from conservation and reuse. Table 4E.16 gives information on the capital and unit costs for the recommended water management strategies.

If any of the projects identified in the recommended plan are not implemented, the UTRWD may wish to pursue alternative strategies. The following alternative water management strategies are recommended for UTRWD:

- Toledo Bend Reservoir
- Wright Patman Lake
- George Parkhouse Reservoir (North)
- George Parkhouse Reservoir (South)
- Lake Texoma
- Additional reuse.

Information on the alternative strategies is shown on Table 4E.17.

**Table 4E.15**
**Summary of Recommended Water Management Strategies**
**for Upper Trinity Regional Water District**

| Planned Supplies by Source (Acre-Feet per Year) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Projected Demands** | **34,902** | **58,104** | **85,674** | **110,308** | **137,411** | **156,545** |
| **Existing Supplies** | | | | | | |
| *DWU** | *8,290* | *36,549* | *42,664* | *41,267* | *39,087* | *35,226* |
| *Denton* | *4,069* | *0* | *0* | *0* | *0* | *0* |
| *Chapman* | *13,268* | *13,268* | *13,268* | *13,268* | *13,268* | *13,268* |
| *Chapman Reuse* | *6,634* | *6,634* | *6,634* | *6,634* | *6,634* | *6,634* |
| *Direct Reuse* | *897* | *897* | *897* | *897* | *897* | *897* |
| ***Total Existing Supplies*** | ***33,158*** | ***57,348*** | ***63,463*** | ***62,066*** | ***59,886*** | ***56,025*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | **1,744** | **756** | **22,211** | **48,242** | **77,525** | **100,520** |
| | | | | | | |
| **Contracted Amount from DWU*** | **38,815** | **46,290** | **56,656** | **58,438** | **60,066** | **61,638** |

**Table 4E.15, Continued**

| Planned Supplies by Source (Acre-Feet per Year) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **New Supplies** | | | | | | |
| Conservation (wholesale customers) | 1,211 | 3,549 | 6,062 | 8,308 | 10,922 | 13,202 |
| Additional Supplies from DWU (Up to Current Contracts)* | 710 | 9,741 | 13,992 | 17,171 | 20,979 | 26,412 |
| Lake Ralph Hall | | 34,050 | 34,050 | 34,050 | 34,050 | 34,050 |
| Lake Ralph Hall Indirect Reuse | | 6,129 | 12,258 | 18,387 | 18,387 | 18,387 |
| Additional Direct Reuse | | | 560 | 1,121 | 2,240 | 2,240 |
| Marvin Nichols** | | | | | 17,500 | 17,500 |
| Additional DWU (New Contract) | | | | | | 11,200 |
| Oklahoma | | | | | | 15,000 |
| **Supplies from Strategies** | **1,921** | **53,469** | **66,923** | **79,037** | **104,078** | **137,990** |
| **Total Supplies** | **35,079** | **110,817** | **130,386** | **141,103** | **163,964** | **194,015** |
| **Reserve or (Shortage)** | **177** | **52,713** | **44,712** | **30,795** | **26,553** | **37,470** |

* Under the existing contracts, UTRWD is entitled to 38,815 acre-feet per year from Dallas in 2010. However, given limited Dallas supplies in 2010 and other supplies available to UTRWD, a total supply of 9,000 acre-feet per year from Dallas to UTRWD is assumed for 2010 (including existing supplies).

** UTRWD intends to secure a supply of 35,000 acre-feet per year from the Marvin Nichols project, but the full amount will not be connected until beyond this planning period.

**Figure 4E.11**
**Recommended Water Management Strategies for the Upper Trinity Regional Water District**

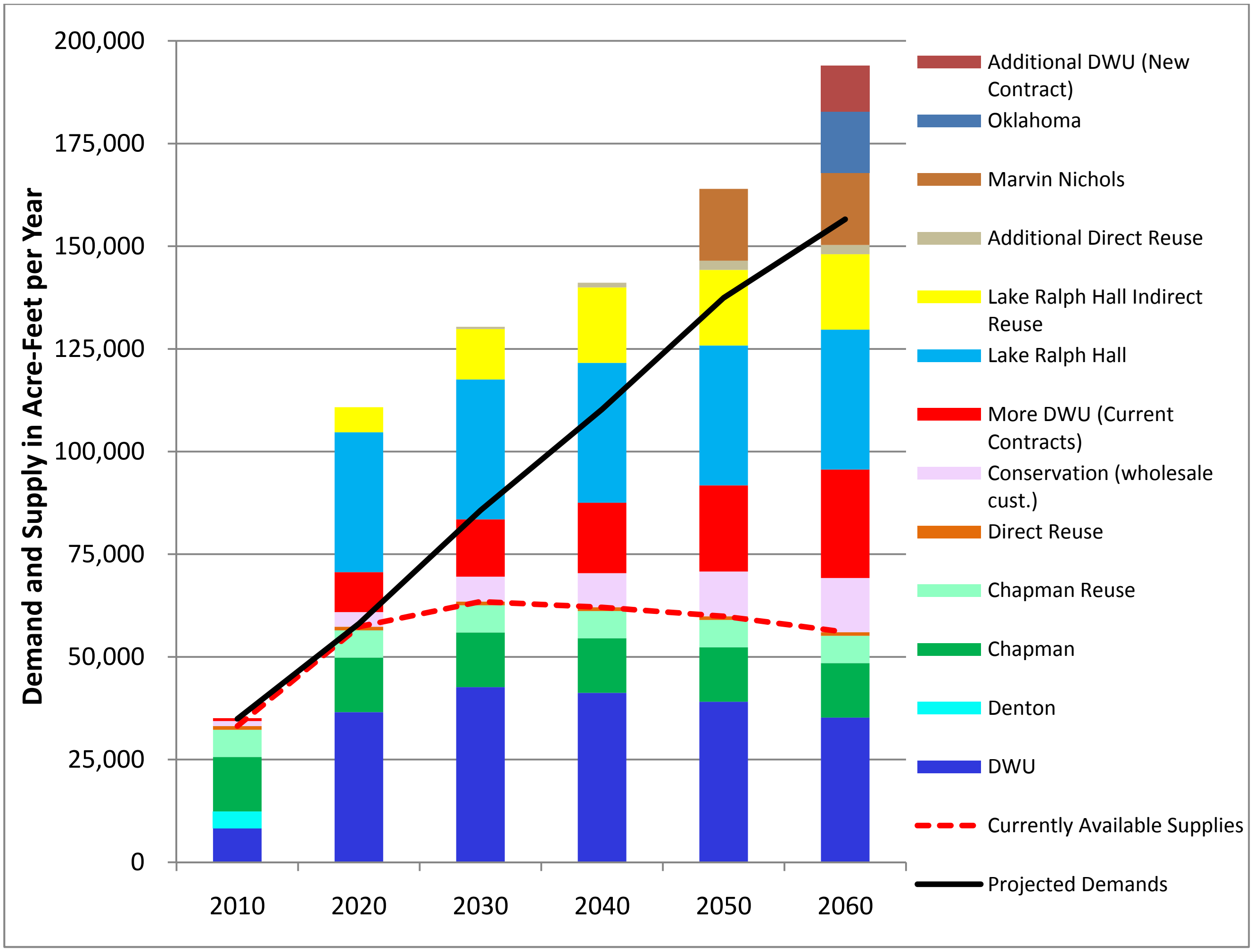


**Table 4E.16**
**Summary of Costs for UTRWD Recommended Strategies**

| Strategy | Date to be Developed | Quantity for UTRWD (Ac-Ft/Yr) | UTRWD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010-2060 | 13,202* | Included under County Summaries in Section 4F. | | | |
| Additional Supplies from DWU (to Current Contracts) | 2010-2060 | 26,412 | $0 | $0.4971 | $0.4971 | None |
| Lake Ralph Hall and Indirect Reuse | 2020 | 52,437 | $286,401,000 | $1.45 | $0.23 | Q-63 |
| Additional Direct Reuse | 2030 | 2,240 | $11,313,000 | $1.62 | $0.50 | Q-83 |
| Marvin Nichols | 2050 | 17,500 | $143,042,000 | $2.41 | $0.56 | Q-20 |
| Oklahoma | 2060 | 15,000 | $97,359,000 | $2.06 | $0.61 | Q-46 |
| Additional DWU (New Contract) | 2060 | 11,200 | $0 | $0.4971 | $0.4971 | None |
| Treatment and Distribution System Improvements | 2020 | 0 | $590,686,000 | N/A | N/A | Q-84 |
| **Total UTRWD Capital Costs** | | | **$1,128,801,000** | | | |

*UTRWD has no retail sales, so conservation savings are reflected in their customers' conservation savings.

**Table 4E.17**
**Summary of Costs for UTRWD Alternative Strategies**

| Strategy | Date to be Developed | Quantity for UTRWD (Ac-Ft/Yr) | UTRWD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Toledo Bend Reservoir | 2050 | 48,000 | $297,543,000 | $2.34 | $0.96 | Q-85 |
| Wright Patman Lake | 2035 | 38,000 | $890,872,000 | $2.48 | $0.74 | Q-85 |
| Lake Texoma | Unknown | 25,000 | $117,562,000 | $1.37 | $0.32 | Q-85 |
| George Parkhouse Reservoir (North) | Unknown | 35,000 | $151,988,000 | $1.41 | $0.45 | Q-85 |
| George Parkhouse Reservoir (South) | Unknown | 35,000 | $208,364,000 | $1.81 | $0.49 | Q-85 |
| Additional Reuse | Unknown | 15,000 | $1,000,000 | $0.01 | $0.00 | Q-85 |

## Greater Texoma Utility Authority

The Greater Texoma Utility Authority (GTUA) provides water to Pottsboro, Sherman, manufacturing in Grayson County (through Sherman), customers of the Collin-Grayson Municipal Alliance and NTMWD. The Collin-Grayson Municipal Alliance is a pipeline to deliver water from NTMWD to Anna, Howe, Melissa and Van Alstyne in southern Grayson and Northern Collin Counties. GTUA is planning to participate in the Grayson County Water Supply Project and is expected to provide water to 21 water user groups in Grayson and Collin Counties by 2060. The GTUA has an existing water right for 25,000 acre-feet per year from Lake Texoma. Of this amount, 8,000 acre-feet per year (limited by the Sherman water treatment plant capacity) is available to existing customers as potable water. Another 5,600 acre-feet per year is available as raw water for a proposed steam electric power plant near Sherman. Any unused raw water is available for sale to NTMWD as raw water. GTUA has also a Texas water right for an additional 56,500 acre-foot per year diversion from Lake Texoma.

Considering existing and future demands, the GTUA will need to develop about 57,000 acre-feet per year of supplies by 2060. To meet these needs, the following strategies are recommended:

- Conservation
- Lake Texoma Pump Station Expansion
- Additional Power Plant delivery
- Collin-Grayson Municipal Alliance East-West Pipeline
- Collin-Grayson Municipal Alliance Parallel Pipeline
- Grayson County Water Supply Project

These strategies are discussed individually below.

**Conservation**. Conservation is the projected conservation savings for the GTUA's existing and potential customers, based on the recommended Region C water conservation program. Water savings by the GTUA and customers is projected to reach 4,958 acre-feet per year by 2060.

**Lake Texoma Pump Station Expansion.** GTUA is currently constructing an expansion of the Lake Texoma Pump Station to increase pumping capacity from Lake Texoma and allow greater flexibility in the pipeline operation. GTUA is constructing this expansion in conjunction with the North Texas Municipal Water District.

**Additional Power Plant Delivery.** GTUA will supply up to 5,600 acre-feet per year of Lake Texoma water to Sherman for delivery to a proposed power plant. It is assumed that the delivery of additional power plant water supplies will require the construction of facilities to divert water from Lake Texoma. For the purposes of estimating costs, a peak delivery of 12 mgd and a pipeline length of 15 miles is assumed. The new power plant or plants may be located anywhere in Grayson County, depending on the development of steam electric power generation facilities. The costs for the project may differ from the estimate, but the project should still be considered consistent with the Region C Water Plan.

**Grayson County Water Supply Project.** The Grayson County Water Supply Project will provide water to Grayson County water suppliers. The project includes expansions to Sherman's existing water treatment plant, a new Sherman plant, two other treatment plants in the county, and pipelines to deliver treated water to suppliers.

**Collin-Grayson Municipal Alliance Pipeline East-West Pipeline.** GTUA is purchasing water from NTMWD for customers of the Collin-Grayson Municipal Alliance Pipeline Project (Anna, Howe, Melissa, and Van Alstyne). These supplies are currently transferred through McKinney's distribution system on a temporary basis (delivery of up to 5,400 acre-feet per year or so). The proposed east-west pipeline will replace the transfer through McKinney's system and increase the delivery to about 16,800 acre-feet per year.

**Collin-Grayson Municipal Alliance Parallel Pipeline.** The proposed parallel pipeline for the Collin-Grayson Municipal Alliance is needed to increase the delivery capacity for the system beyond 16,800 acre-feet per year.

In addition to these strategies, GTUA may participate in the Fannin County Water Supply Project (described in the section under North Texas Municipal Water District) and the Cooke County Water Supply Project (described in this section under Gainesville).

Table 4E.18 and Figure 4E.12 show the recommended plan for water supply development for the GTUA. Table 4E.19 presents the capital and unit costs for the recommended water management strategies.

**Table 4E.18**
**Recommended Water Management Strategies**
**for the Greater Texoma Utility Authority**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **16,037** | **30,134** | **42,683** | **52,299** | **63,409** | **76,316** |
| **Currently Available Supplies** | | | | | | |
| *Lake Texoma (Potable)* | *8,000* | *8,000* | *8,000* | *8,000* | *8,000* | *8,000* |
| *Usable Lake Texoma Raw* | *5,600* | *5,600* | *5,600* | *5,600* | *5,600* | *5,600* |
| *Supply for Pottsboro (from Denison)* | *560* | *560* | *560* | *560* | *560* | *560* |
| *Collin-Grayson Municipal Alliance Pipeline Project (From NTMWD)* | *1,928* | *5,400* | *5,400* | *5,400* | *5,400* | *5,400* |
| ***Potable Water Available*** | ***10,488*** | ***13,960*** | ***13,960*** | ***13,960*** | ***13,960*** | ***13,960*** |
| ***Currently Available Supplies*** | ***16,088*** | ***19,560*** | ***19,560*** | ***19,560*** | ***19,560*** | ***19,560*** |
| | | | | | | |
| ***Need (Demand-Supply)*** | ***0*** | ***10,574*** | ***23,123*** | ***32,739*** | ***43,849*** | ***56,756*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (Wholesale Customers) | 68 | 592 | 1,271 | 2,176 | 3,457 | 4,958 |
| Lake Texoma Pump Station | 0 | 0 | 0 | 0 | 0 | 0 |
| Additional SEP Supply (Raw) | 0 | 6,726 | 6,726 | 6,726 | 6,726 | 6,726 |
| Grayson County Water Supply Project (more potable) | 200 | 7,560 | 10,920 | 13,440 | 19,040 | 24,640 |
| More NTMWD (Current Facilities) | 65 | 0 | 0 | 0 | 0 | 0 |
| CGMA-East West Pipeline (NTMWD) | 0 | 3,255 | 8,614 | 11,400 | 11,400 | 11,400 |
| Parallel CGMA Pipeline (NTMWD) | 0 | 0 | 0 | 2,792 | 9,204 | 16,012 |
| **Supplies from Strategies** | **333** | **18,133** | **27,531** | **36,534** | **49,827** | **63,736** |
| **Total Supplies** | **16,421** | **37,693** | **47,091** | **56,094** | **69,387** | **83,296** |
| **Total Potable Supplies** | **10,821** | **25,367** | **34,765** | **43,768** | **57,061** | **70,970** |
| **Reserve or (Shortage)** | **384** | **7,559** | **4,408** | **3,795** | **5,978** | **6,980** |

**Figure 4E.12**
**Recommended Water Management Strategies for GTUA**

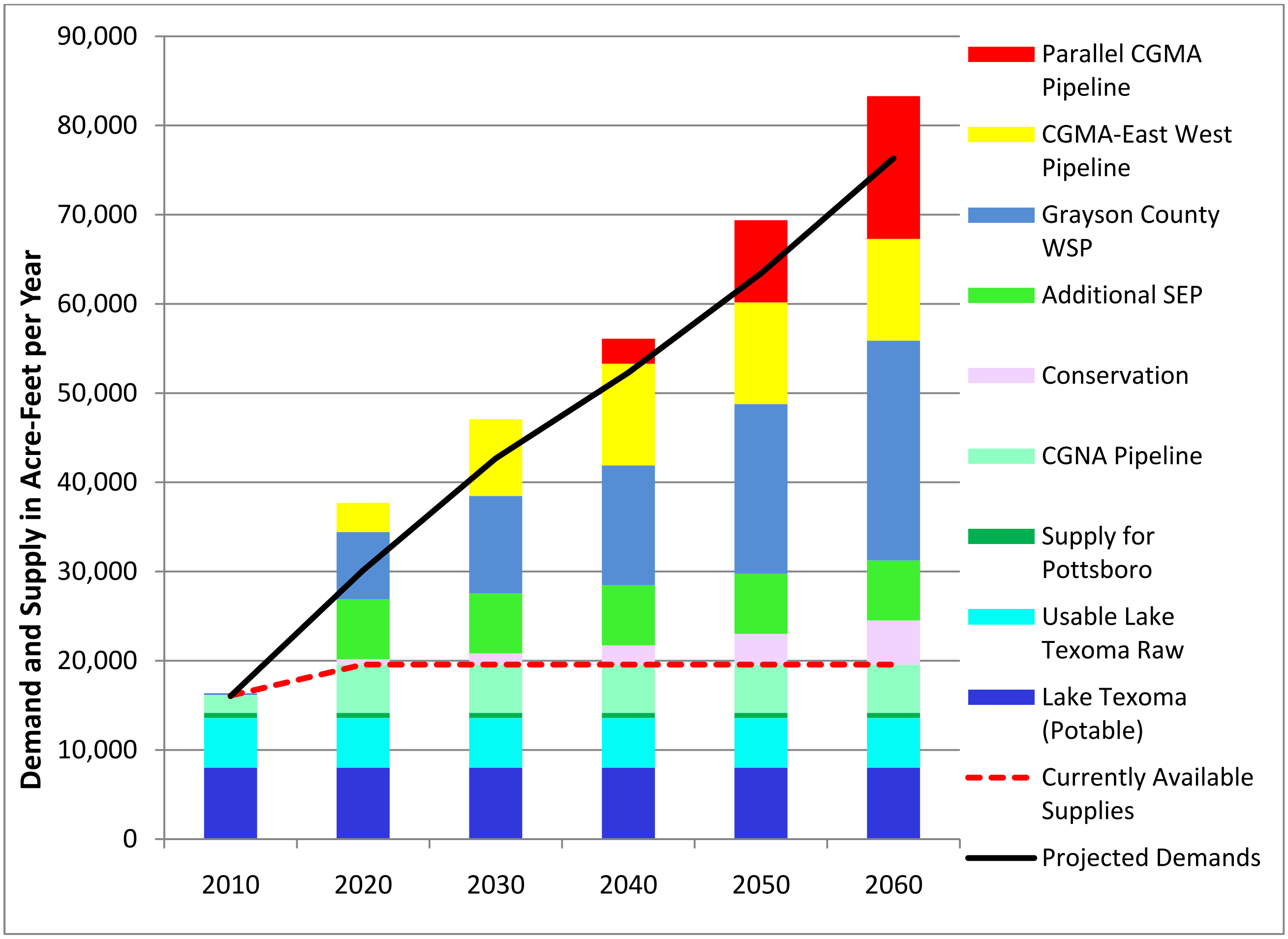



**Table 4E.19**
**Summary of Costs for GTUA Recommended Strategies**

| Strategy | Date to be Developed | Quantity for GTUA (Ac-Ft/Yr) | GTUA Share of Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|
| Conservation | 2010 | 4,958* | Included under County Summaries in Section 4F. | | | |
| Lake Texoma Pump Station | 2011 | 0 | $2,071,000 | $0.00 | $0.00 | Q-71 |
| Additional SEP Supply | 2020 | 6,726 | $24,780,000 | $1.30 | $0.48 | Q-98 |

**Table 4E.19, Continued**

| Strategy | Date to be Developed | Quantity for GTUA (Ac-Ft/Yr) | GTUA Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Grayson County Water Supply Project | 2020 | 5,023 | $136,016,000 | $1.66 | $0.43 | Q-86 |
| More NTMWD (Current Facilities) | 2010 | 65 | N/A | $1.30 | $1.30 | None |
| CGMA-East West Pipeline | 2020 | 11,400 | $3,251,000 | $2.67 | $2.60 | Q-87 |
| Parallel CGMA Pipeline | 2040 | 16,012 | $74,115,000 | $3.41 | $2.73 | Q-88 |
| **Total GTUA Capital Costs** | | | **$240,233,000** | | | |

* GTUA has no retail sales, so conservation savings are reflected in their customers' conservation savings.

## Dallas County Park Cities Municipal Utility District

Dallas County Park Cities MUD supplies treated water to Highland Park and University Park and plans to continue doing so through the planning period. The MUD gets its water supplies from Lake Grapevine and has enough supply to meet projected demands through the planning period. The only strategy proposed for the MUD is the implementation of water conservation measures by its wholesale customers. Dallas County Park Cities MUD also supplies reuse water to the City of Grapevine.

Table 4E.20 shows the projected demand and supplies for Dallas County Park Cities MUD. Table 4E.21 gives information on the costs for the recommended water management strategy.

**Table 4E.20**
**Recommended Water Management Strategies**
**for the Dallas County Park Cities Municipal Utility District**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **15,371** | **15,858** | **16,178** | **16,366** | **16,548** | **16,735** |
| | | | | | | |
| **Currently Available Supplies** | | | | | | |
| *Lake Grapevine (Potable)* | 17,050 | 16,900 | 16,750 | 16,600 | 16,450 | 16,300 |
| *Reuse* | *3,317* | *3,696* | *3,964* | *4,142* | *4,276* | *4,386* |
| ***Currently Available Supplies*** | ***20,367*** | ***20,596*** | ***20,714*** | ***20,742*** | ***20,726*** | ***20,686*** |
| | | | | | | |
| ***Need (Demand-Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (Wholesale Customers) | 67 | 192 | 270 | 315 | 358 | 402 |
| **Supplies from Strategies** | **67** | **192** | **270** | **315** | **358** | **402** |
| **Total Supplies** | **20,434** | **20,788** | **20,984** | **21,057** | **21,084** | **21,088** |
| **Total Potable Supplies** | **17,117** | **17,092** | **17,020** | **16,915** | **16,808** | **16,702** |
| **Reserve or (Shortage)** | **5,063** | **4,930** | **4,806** | **4,691** | **4,536** | **4,353** |

**Table 4E.21**
**Summary of Costs for Dallas County Park Cities MUD Recommended Strategy**

| **Strategy** | **Date to be Developed** | **Quantity for DCPCMUD (Ac-Ft/Yr)** | **DCPCMUD Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation | 2010 | 402* | Included under County Summaries in Section 4F. | | | |
| **Total DCPCMUD Capital Costs** | | | **$0** | | | |

* DCPCMUD has no retail sales, so conservation savings are reflected in their customers' conservation savings.

## City of Corsicana

The City of Corsicana provides municipal and manufacturing water to much of Navarro County. The city's current water sources include Lake Halbert and Navarro Mills Lake. The city also has a water right for 13,650 acre-feet per year from Richland-Chambers Reservoir. Future projected demands include steam electric power generation as well as municipal and manufacturing demands. The supply currently available to Corsicana from Navarro Mills Reservoir is limited to 11,210 acre-feet per year because of the existing water treatment plant capacity. The supply from Lake Halbert and Richland Chambers is limited to 2,240 acre-feet per year for the same reason. To meet the projected water demands, the city will need to develop almost 17,000 acre-feet per year of additional supplies by 2060. The recommended strategies to meet these needs include:

- Conservation
- Pump station to deliver water from Richland-Chambers Lake and new Lake Halbert Water Treatment Plant
- Raw water supply from Richland-Chambers Lake for Proposed Power Plant
- Raw water supply from Richland-Chambers Lake for second Proposed Power Plant
- Expansion of Lake Halbert Water Treatment Plant
- Purchase of water from Tarrant Regional Water District (when the need for water from Richland-Chambers Reservoir exceeds Corsicana's 13,650 acre-feet per year supply).

These strategies are discussed individually below.

**Conservation.** Conservation is the projected conservation savings for the City of Corsicana and its existing and potential customers, based on the Region C recommended water conservation program. Not including savings from low-flow plumbing fixtures (which are built into the demand projections), conservation by Corsicana and its customers is projected to reach 1,309 acre-feet per year by 2060.

**Pump Station to Deliver Water from Richland-Chambers Lake and New Water Treatment Plant.** The existing Water Treatment Plant at Lake Halbert has a capacity of 4 mgd. The facilities are aging, and Lake Halbert has no reliable supply. Corsicana has already built a pipeline from Richland-Chambers reservoir to Lake Halbert. In order to increase the reliable water supply, the city will complete the pump station for this pipeline and construct a new 8 mgd water treatment plant, taking the existing 4 mgd plant out of service.

**Raw Water for Power Plant.** Corsicana's projected demands include raw water for steam electric power generation in Navarro County. For the purpose of this plan, it is assumed that there will be two power plants, one with a demand of 8,000 acre-feet per year and a second with a demand of 5,440 acre-feet per year. In each case, the facilities will include a pump station in Richland-Chambers Lake and a 10 mile pipeline. If the supplies needed for the plants or the distance from the lake are different from the assumed values, the cost of these strategies will change.

**Raw Water for Second Power Plant and Purchase from TRWD.** As discussed in the preceding paragraph, this water management strategy is assumed to provide 5,440 acre-feet per year, and facilities include a pump station and 10-mile pipeline. Since Corsicana's use from Richland-Chambers Lake will exceed its water right once this strategy is implemented, Corsicana will begin to purchase raw water from TRWD.

**Water Treatment Plant Expansion and Purchase from TRWD.** As demands for treated water increase, Corsicana will expand the Lake Halbert Water Treatment Plant (by an additional 8 mgd) and purchase additional water from TRWD.

**Purchase of Water from Tarrant Regional Water District.** Corsicana will purchase water from Tarrant Regional Water District when Corsicana's need for water from Richland-Chambers Reservoir exceeds the City's 13,650 acre-feet per year water right. Corsicana is projected to begin purchasing water by 2030 and to need almost 4,000 acre-feet per year by 2060.

Table 4E.22 and Figure 4E.13 show the recommended water management strategies for Corsicana. Table 4E.23 provides the capital and unit costs for the recommended strategies. The estimated cost for Corsicana's recommended water management strategies is approximately $81.6 million, based on 2008 construction costs. Table 4E.24 shows the estimated cost for Corsicana's alternative strategy, which is the expansion of the existing Navarro Mills Water Treatment Plant.

**Table 4E.22**
**Summary of Recommended Water Management Strategies for Corsicana**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **10,865** | **20,384** | **26,693** | **27,604** | **28,750** | **30,212** |
| **Currently Available Supplies (Limited by Treatment Capacity and Yield)** | | | | | | |
| Lake Halbert/Richland-Chambers | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 |
| *Navarro Mills Lake* | *11,210* | *11,210* | *11,210* | *11,210* | *11,210* | *11,210* |
| ***Total Currently Available Supplies*** | ***13,452*** | ***13,452*** | ***13,452*** | ***13,452*** | ***13,452*** | ***13,452*** |
| | | | | | | |
| **Need (Demand - Supply)** | ***0*** | ***6,932*** | ***13,241*** | ***14,152*** | ***15,298*** | ***16,760*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 90 | 183 | 241 | 492 | 647 | 751 |
| Conservation (wholesale customers) | 57 | 199 | 290 | 376 | 458 | 558 |
| Pump Station from Richland-Chambers and New Halbert/ Richland-Chambers WTP (8 mgd, 4 mgd increase from current plant) | | 2,242 | 2,242 | 2,242 | 2,242 | 2,242 |
| Raw Water for Power Plant | | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Raw Water for Second Power Plant | | | 5,440 | 5,440 | 5,440 | 5,440 |
| 8 mgd WTP Expansion | | | | 4,484 | 4,484 | 4,484 |
| **Total Supplies from Strategies** | **147** | **10,624** | **16,213** | **21,034** | **21,271** | **21,475** |
| Treated Water Supply | 13,599 | 16,076 | 16,225 | 21,046 | 21,283 | 21,487 |
| Raw Water Supply | 0 | 8,000 | 13,440 | 13,440 | 13,440 | 13,440 |
| **Total Supplies** | **13,599** | **24,076** | **29,665** | **34,486** | **34,723** | **34,927** |
| **Surplus or (Shortage)** | **2,734** | **3,692** | **2,972** | **6,882** | **5,973** | **4,715** |
| **Purchase from TRWD** | | | | | | |
| Supply Available from Halbert/ Richland-Chambers Supply | 2,242 | 12,484 | 17,924 | 22,408 | 22,408 | 22,408 |
| Planned Use from Halbert/Richland-Chambers Supply | 0 | 8,792 | 14,952 | 15,526 | 16,435 | 17,693 |
| Corsicana's Halbert/Richland-Chambers Yield | 13,872 | 13,864 | 13,855 | 13,847 | 13,838 | 13,830 |
| **Purchase from TRWD** | **0** | **0** | **1,097** | **1,680** | **2,597** | **3,863** |

**Figure 4E.13**
**Recommended Water Management Strategies for Corsicana**

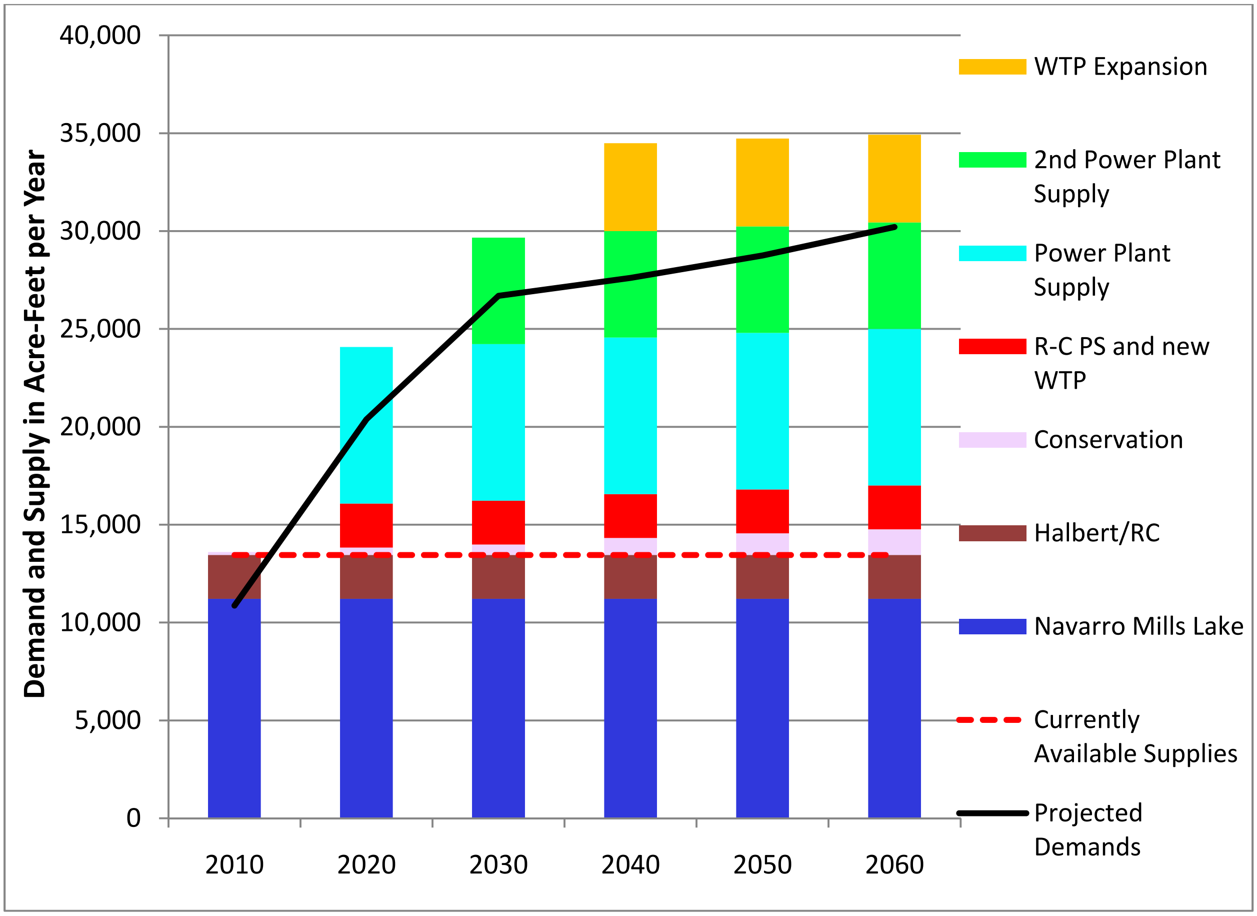



**Table 4E.23**
**Summary of Costs for Corsicana Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Corsicana (Ac-Ft/Yr) | Corsicana Share of Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|
| Conservation (retail) | 2010-2060 | 751 | $37,000 | $0.45 | $0.45 | Q-10 & Q-11 |
| Conservation (wholesale customers) | 2010-2060 | 558 | Included under County Summaries in Section 4F. | | | |

**Table 4E.23, Continued**

| Strategy | Date to be Developed | Quantity for Corsicana (Ac-Ft/Yr) | Corsicana Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Pump Station from Richland-Chambers and New Halbert/Richland-Chambers WTP (8 mgd) | 2014 | 2,242 | $32,388,000 | $1.71 | $0.10 | Q-97 |
| Raw Water for Power Plant | 2018 | 8,000 | $15,300,000 | $1.27 | $0.85 | Q-122 |
| Raw Water for Second Power Plant and purchase from TRWD | 2010-2060 | 5,440 | $12,860,000 | $1.40 | $0.87 | Q-123 |
| 8 mgd WTP Expansion and purchase from TRWD | 2020 | 4,484 | $19,970,000 | $1.69 | $0.70 | Q-97 |
| **Total Corsicana Capital Costs** | | | **$80,555,000** | | | |

**Table 4E.24**
**Summary of Costs for Corsicana Alternative Strategies**

| Strategy | Date to be Developed | Quantity for Corsicana (Ac-Ft/Yr) | Corsicana Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Navarro Mills WTP Expansion | Unknown | 5,605 | $14,548,000 | $1.86 | $0.70 | Q-96 |
| **Total Corsicana Capital Costs** | | | **$14,548,000** | | | |

## Sabine River Authority

The Sabine River Authority (SRA) is based in the Northeast Texas Region (D) and the East Texas Region (I), with a small area in the Sabine Basin in Region C. The SRA currently provides water from its Upper Basin reservoirs (Lake Tawakoni and Lake Fork Reservoir) to water users in Region C. These sources are fully contracted and SRA has requests for additional water in the Upper Basin. The SRA plans to participate in the Toledo Bend Reservoir project that would transport water to the Upper Basin area and Region C. The

Sabine River Authority is also seeking an amendment to its existing water right in Toledo Bend Reservoir for an additional 293,300 acre-feet per year of water supply. This amendment has been submitted to the Texas Commission on Environmental Quality and declared administratively complete. The Northeast Texas Region and the East Texas Region will develop management strategies for the Sabine River Authority.

### Sulphur River Water District

The Sulphur River Water District is located primarily in the Northeast Texas Region (D). The District supplies water to Upper Trinity River Water District (by contract with Commerce) and North Texas Municipal Water District (by contract with Cooper) in Region C. The Northeast Texas Region will develop any water management strategies needed for the Sulphur River Water District.

### Upper Neches River Municipal Water Authority

The Upper Neches River Municipal Water Authority (UNRMWA) is located in the East Texas Region (Region I). UNRMWA has a contract to provide water from Lake Palestine for Dallas Water Utilities, and DWU is planning to connect that supply during the planning cycle. The East Texas Region will be responsible for developing any water management strategies needed for the UNRMWA.

## *4E.2 Recommended Strategies for Local Wholesale Water Providers*

### Argyle Water Supply Corporation

The Argyle Water Supply Corporation provides retail service in Denton County. The WSC supplies water to the residents of Argyle as retail customers and is therefore considered to be a wholesale water provider for Argyle. The Argyle WSC uses local groundwater and purchases treated water from Upper Trinity Regional Water District. Increased demands for Argyle WSC are expected to be supplied by Upper Trinity Regional Water District. Table 4E.25 summarizes the recommended water management strategies for Argyle WSC. The only capital costs anticipated for Argyle WSC are the costs of replacing aging wells, which are shown on Table 4E.26.

**Table 4E.25**
**Summary of Recommended Water Management Strategies for Argyle WSC**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **2,490** | **4,161** | **5,456** | **5,929** | **6,483** | **7,039** |
| **Existing Supplies** | | | | | | |
| *Groundwater* | *841* | *841* | *841* | *841* | *841* | *841* |
| *Currently Available from UTRWD* | *1,779* | *1,251* | *1,179* | *1,018* | *911* | *882* |
| ***Currently Available Supplies*** | ***2,620*** | ***2,092*** | ***2,020*** | ***1,859*** | ***1,752*** | ***1,723*** |
| | | | | | | |
| **Needs (Demands - Supplies)** | **0** | **2,069** | **3,436** | **4,070** | **4,731** | **5,316** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 14 | 38 | 50 | 84 | 95 | 105 |
| Conservation (wholesale) | 34 | 135 | 239 | 307 | 387 | 477 |
| Additional UTRWD | | 2,070 | 3,388 | 3,986 | 4,623 | 5,175 |
| **Total from Strategies** | **48** | **2,243** | **3,677** | **4,377** | **5,105** | **5,757** |
| **Total Supplies** | **2,668** | **4,335** | **5,697** | **6,236** | **6,857** | **7,480** |
| **Surplus or (Shortage)** | **178** | **174** | **241** | **307** | **374** | **441** |

**Table 4E.26**
**Summary of Costs for Argyle WSC Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for Argyle WSC (Ac-Ft/Yr)** | **Argyle WSC Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail) | 2010 | 105 | $0 | $0.59 | $0.59 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 477 | Included under County Summaries in Section 4F. | | | |
| Additional UTRWD | 2020 | 5,175 | $0 | $2.64 | $2.64 | None |
| Supplemental Wells | 2010-2060 | N/A | $2,836,000 | N/A | N/A | Q-13 |
| **Total Argyle WSC Capital Costs** | | | **$2,836,000** | | | |

## City of Arlington

Arlington does not currently have any wholesale customers. This plan calls for Arlington to provide wholesale water supplies to Grand Prairie, Bethesda Water Supply Corporation, and Pantego. Arlington purchases all of its raw water from the Tarrant Regional Water District (TRWD). Sources of this water are Lake Arlington and the TRWD reservoir system. As shown on Table 4E.27, Arlington will continue to obtain raw water from the TRWD system and Lake Arlington. The city will also obtain some direct reuse supplies from Fort Worth, replacing treated water used for irrigation. Arlington also plans to expand the existing John F. Kubala Water Treatment Plant by 32.5 mgd, which will build it to full capacity. Table 4E.28 shows the capital costs for Arlington's recommended strategies.

**Table 4E.27**
**Summary of Recommended Water Management Strategies for Arlington**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **80,186** | **94,355** | **99,181** | **103,374** | **103,758** | **104,727** |
| | | | | | | |
| **Existing Supplies** | | | | | | |
| *Lake Arlington (TRWD)* | *9,850* | *9,700* | *9,550* | *9,400* | *9,250* | *9,100* |
| *TRWD* | *68,006* | *77,114* | *69,406* | *62,992* | *55,473* | *48,949* |
| *Limit of Current Plant Capacity (75 mgd PB South; 97.5 mgd John F. Kubala)* | *96,686* | *96,686* | *96,686* | *96,686* | *96,686* | *96,686* |
| ***Total Currently Available Supplies*** | ***77,856*** | ***86,814*** | ***78,956*** | ***72,392*** | ***64,723*** | ***58,049*** |
| | | | | | | |
| **Needs (Demands - Supplies)** | **2,330** | **7,541** | **20,225** | **30,982** | **39,035** | **46,678** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 2,123 | 4,236 | 5,789 | 6,908 | 7,659 | 8,426 |
| Conservation (wholesale) | 0 | 395 | 520 | 595 | 647 | 695 |
| Fort Worth Direct Reuse Project | 207 | 602 | 602 | 602 | 602 | 602 |
| Additional TRWD (to Current Plant Capacity) | | 2,308 | 13,314 | 22,877 | 30,127 | 36,955 |
| Expand John F. Kubala WTP & Add'l TRWD | | | | 0 | 0 | 0 |
| **Total Supplies from Strategies** | **2,330** | **7,541** | **20,225** | **30,982** | **39,035** | **46,678** |
| **Total Supplies** | **80,186** | **94,355** | **99,181** | **103,374** | **103,758** | **104,727** |
| **Surplus or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.28**
**Summary of Costs for Arlington Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Arlington (Ac-Ft/Yr) | Arlington Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 8,426 | $0* | $0.28 | $0.28 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 695 | Included under County Summaries in Section 4F. | | | |
| Additional TRWD | 2020 | 37,073 | $0 | $0.69 | $0.69 | None |
| Expand John F. Kubala Plant and Additional TRWD | 2040 | 18,200 | $54,618,000 | $1.25 | $0.70 | Q-15 |
| **Total Arlington Capital Costs** | | | **$54,618,000** | | | |

*Arlington has already made significant capital investment to implement its conservation programs. In the future, all costs will be annual operating costs.

## Athens Municipal Water Authority

Athens Municipal Water Authority supplies water to meet municipal and manufacturing demands in the City of Athens. The Authority also supplies local demand for lawn irrigation around Lake Athens and is contracted to supply 3,023 acre-feet per year for the Athens Fish Hatchery, located at Lake Athens (and in Region I, the East Texas Region). Athens MWA has a right to divert 8,500 ac-ft per year from Lake Athens. Due to operational constraints of the hatchery's intake structure, the operational yield of Lake Athens is currently 2,900 ac-ft per year. The fish hatchery returns approximately 95 percent of the water it diverts to Lake Athens, which serves to increase the supply from the lake, but the hatchery is under no contractual obligation to continue this practice. The total projected shortages for Athens MWA are 5,521 acre-feet per year by 2060.

Recognizing the limitations of its existing supplies, Athens MWA has obtained a reuse permit that allows the City of Athens to discharge its treated wastewater effluent to Lake Athens for reuse. The reuse permit is for 2,677 ac-ft per year, but a recent study by Region C shows that this strategy is less economically feasible than other alternatives. At this time, Athens MWA and the City of Athens are not pursuing reuse of City of Athens wastewater through Lake Athens.

The recommended water management strategies for Athens MWA are as follows:

- Conservation
- New wells in the Carrizo-Wilcox
- Indirect reuse to Lake Athens from fish hatchery
- Water from Forest Grove Reservoir
- Construct new 4 mgd treatment plant near city of Athens and expansions

These strategies are discussed in greater detail below.

**Conservation.** Conservation is the projected conservation savings for the City of Athens. These savings are based on the Region C recommended water conservation program for the City of Athens. Not including savings from low-flow plumbing fixtures (already built into the projected demands) conservation by AMWA is projected to reach 791 acre-feet per year by 2060.

**New Wells.** Athens MWA plans to construct new wells in the Carrizo-Wilcox before 2020. Water from these new wells will be piped to the existing water treatment plant at Lake Athens where it will enter the distribution system.

**Indirect Reuse to Lake Athens from Fish Hatchery.** To assure adequate supplies for the fish hatchery and other uses, Athens MWA should work with the fish hatchery to assure that the hatchery continues to return diverted water to Lake Athens for subsequent reuse. For purposes of this plan, it is assumed that 95 percent of the contracted water will be returned. This equates to 2,872 ac-ft per year of additional supply.

**Forest Grove Reservoir and New Treatment Plant**. This strategy assumes that up to 4,500 acre-feet per year would be diverted from Forest Grove Reservoir. This water would be treated at a new water treatment plant. The water treatment plant will be constructed for 4 mgd initially, supplying 2,240 acre-feet per year (2040), and be expanded to supply and additional 2,240 acre-feet per year by 2060. This strategy requires a change in permitted use from the lake and an agreement with Luminant to acquire the Forest Grove water rights.

Table 4E.29 and Figure 4E.14 show the recommended plan for Athens MWA. Table 4E.30 gives a summary of costs for the recommended strategies.

Alternative water management strategies for Athens MWA include:

- Connecting to Dallas' pipeline from Lake Palestine
- Buying Cedar Creek water from TRWD
- Reuse of City of Athens Discharges
- Developing additional yield from Lake Athens by building a new fish hatchery intake and expanding the existing water treatment plant.

Table 4E.31 gives capital costs for those alternative strategies.

**Table 4E.29**
**Recommended Water Management Strategies for Athens MWA**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | | | | | | |
| Treated Water from Athens MWA | 2,284 | 2,803 | 3,430 | 4,142 | 5,072 | 6,219 |
| Raw Water from Athens MWA | 3,182 | 3,187 | 3,192 | 3,197 | 3,202 | 3,208 |
| **Total from Athens MWA** | **5,466** | **5,990** | **6,622** | **7,339** | **8,274** | **9,427** |
| **Currently Available Supplies** | | | | | | |
| *Lake Athens (Operational Yield)* | *2,900* | *2,900* | *2,900* | *2,900* | *2,900* | *2,900* |
| *Fish Hatchery Return Flows* | *2,872* | *0* | *0* | *0* | *0* | *0* |
| ***Total Currently Available Supplies*** | ***5,772*** | ***2,900*** | ***2,900*** | ***2,900*** | ***2,900*** | ***2,900*** |
| | | | | | | |
| ***Need (Demand - Current Supplies)*** | ***0*** | ***3,090*** | ***3,722*** | ***4,439*** | ***5,374*** | ***6,527*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation | 46 | 209 | 344 | 452 | 589 | 761 |
| New Wells (Carrizo-Wilcox) | | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 |
| Fish Hatchery Reuse | | 2,872 | 2,872 | 2,872 | 2,872 | 2,872 |
| Forest Grove Reservoir and WTP | | | | 2,240 | 2,240 | 2,240 |
| New WTP Expansion | | | | | | 2,240 |
| **Supplies from Strategies** | **46** | **4,481** | **4,616** | **6,964** | **7,101** | **9,513** |
| **Total Supplies** | **5,818** | **7,381** | **7,516** | **9,864** | **10,001** | **12,413** |
| **Surplus or (Shortage)** | **352** | **1,391** | **894** | **2,525** | **1,727** | **2,986** |

Note: Treated demands are demands for Athens and part of Henderson County manufacturing less Athens groundwater supplies. Demands for raw water are for the fish hatchery and lawn irrigation around Lake Athens. Conservation is City of Athens conservation in Regions C and I.

**Figure 4E.14**
**Recommended Water Management Strategies for Athens MWA**

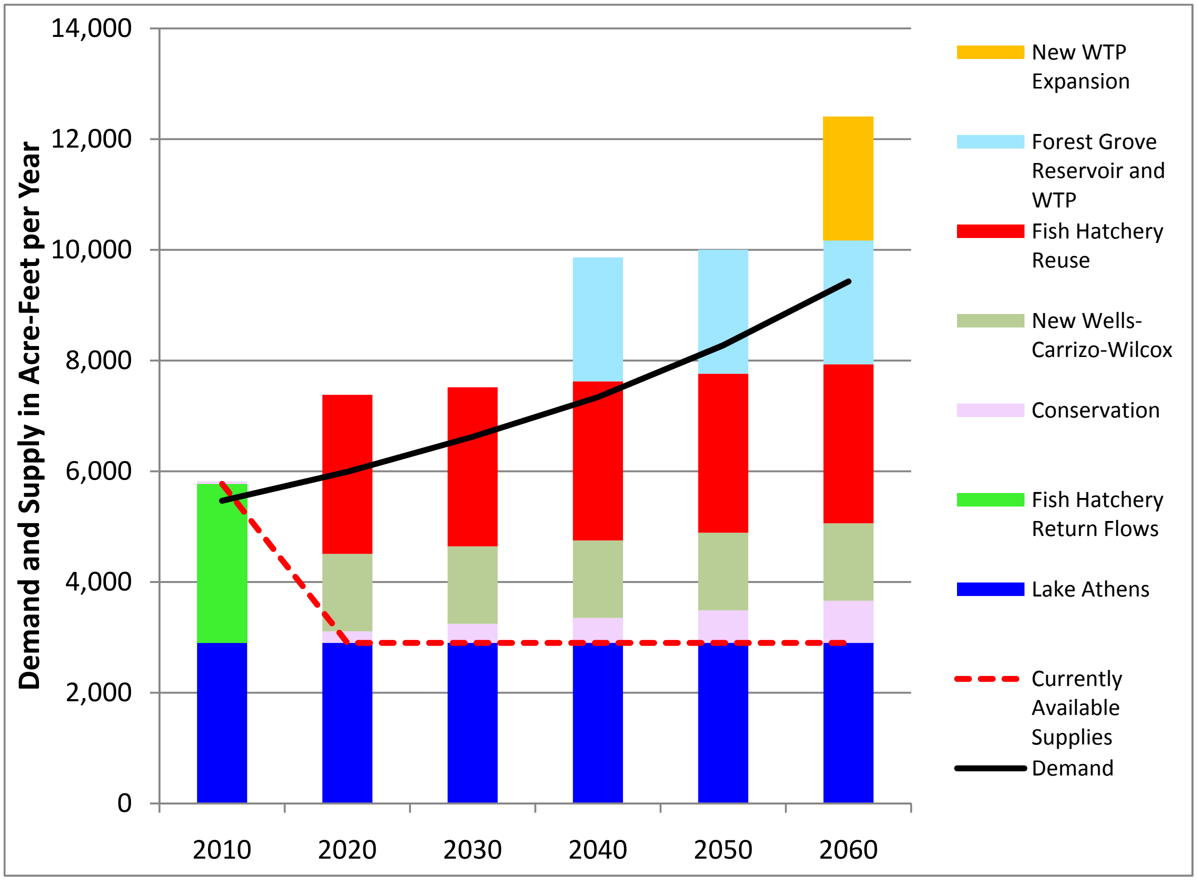



**Table 4E.30**
**Summary of Costs for Athens MWA Recommended Strategies**

| Strategy | Date to Be Developed | Quantity for Athens MWA (Ac-Ft/Yr) | Athens MWA Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010 | 791* | Included under County Summaries in Section 4F. | | | |
| New Wells | 2015 | 1,400 | $3,799,000 | $1.13 | $0.53 | Q-89 |
| Fish Hatchery Reuse | 2020 | 2,872 | N/A | $0.10 | $0.10 | None |
| Forest Grove Reservoir and WTP | 2040 | 2,240 | $26,619,000 | $2.18 | $0.86 | Q-91 |
| New WTP Expansion | 2060 | 2,240 | $12,387,000 | $1.72 | $0.70 | Q-15 |
| **Total Athens MWA Capital Costs** | | | **$42,805,000** | | | |

*Athens MWA has no retail sales, so conservation savings are reflected in their customers' conservation savings.

**Table 4E.31**
**Summary of Costs for Athens MWA Alternative Strategies**

| Strategy | Quantity for Athens MWA (Ac-Ft/Yr) | Athens MWA Share of Capital Costs | Unit Cost ($/ 1000 gal) | | Table for Details |
|---|---|---|---|---|---|
| | | | With Debt Service | After Debt Service | |
| Dallas Lake Palestine | 4,000 | $15,343,000 | $1.20 | $0.34 | Q-94 |
| TRWD Cedar Creek | 4,480 | $33,000,000 | $3.24 | $1.60 | Q-93 |
| Reuse - City of Athens | 1,938 | $20,075,000 | $2.83 | $0.52 | Q-90 |
| Additional Lake Athens | 840 | $7,409,000 | $2.81 | $0.84 | Q-253 |

## Bartonville Water Supply Corporation

The Bartonville Water Supply Corporation provides retail service in Denton County. The WSC supplies water to the residents of Bartonville, Copper Canyon, and Double Oak as retail customers and is therefore considered to be a wholesale water provider. The Bartonville WSC uses local groundwater and purchases treated water from Upper Trinity Regional Water District. Increased demands for Bartonville WSC are expected to be supplied by Upper Trinity Regional Water District. Table 4E.32 summarizes the recommended water management strategies for Bartonville WSC. The only capital costs anticipated for Bartonville WSC are the costs of replacing aging wells, which are shown on Table 4E.33.

**Table 4E.32**
**Summary of Recommended Water Management Strategies for Bartonville WSC**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **1,662** | **2,428** | **2,628** | **2,730** | **2,834** | **2,940** |
| **Existing Supplies** | | | | | | |
| *Groundwater* | *449* | *449* | *449* | *449* | *449* | *449* |
| *Currently Available from UTRWD* | *1,170* | *708* | *540* | *447* | *381* | *355* |
| ***Currently Available Supplies*** | ***1,619*** | ***1,157*** | ***989*** | ***896*** | ***830*** | ***804*** |
| | | | | | | |
| ***Needs (Demands - Supplies)*** | ***43*** | ***1,271*** | ***1,639*** | ***1,834*** | ***2,004*** | ***2,136*** |

**Table 4E.32, Continued**

| **Water Management Strategies** | | | | | | |
|---|---|---|---|---|---|---|
| Conservation (retail) | 3 | 10 | 15 | 18 | 20 | 35 |
| Conservation (wholesale) | 40 | 108 | 144 | 169 | 194 | 221 |
| Additional UTRWD | | 1,153 | 1,525 | 1,736 | 1,925 | 2,060 |
| **Total from Strategies** | **43** | **1,271** | **1,684** | **1,923** | **2,139** | **2,316** |
| **Total Supplies** | **1,662** | **2,428** | **2,673** | **2,819** | **2,969** | **3,120** |
| **Reserve or (Shortage)** | **0** | **0** | **45** | **89** | **135** | **180** |

**Table 4E.33**
**Summary of Costs for Bartonville WSC Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for Bartonville WSC (Ac-Ft/Yr)** | **Bartonville WSC Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail) | 2010 | 35 | $0 | $0.68 | $0.68 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 221 | Included under County Summaries in Section 4F. | | | |
| Additional UTRWD | 2020 | 2,060 | $0 | $2.64 | $2.64 | None |
| Supplemental Wells | 2010-2060 | 0 | $6,016,000 | N/A | N/A | Q-13 |
| **Total Bartonville WSC Capital Costs** | | | **$6,016,000** | | | |

## Bolivar Water Supply Corporation

Bolivar Water Supply Corporation currently provides potable water to its retail customers in Denton Cooke and Wise Counties and to Sanger as a wholesale customer. Bolivar WSC uses groundwater and uses UTRWD water to supply a part of Sanger's demands. The WSC is expected to begin purchasing treated water from Upper Trinity Regional Water District for its retail customers before 2020. Bolivar WSC is also expected to participate in the Cooke County Water Supply Project (described under Gainesville below) to meet part of its projected demands in Cooke County. Table 4E.34 shows the recommended water management strategies for Bolivar WSC, and Table 4E.35 shows the estimated costs of the strategies.

**Table 4E.34**
**Summary of Recommended Water Management Strategies for Bolivar WSC**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Demand** | **2,038** | **3,274** | **5,763** | **9,796** | **14,200** | **18,197** |
| **Existing Supplies** | | | | | | |
| *Groundwater* | *1,548* | *1,548* | *1,548* | *1,548* | *1,548* | *1,548* |
| *UTRWD* | *794* | *720* | *1,120* | *1,660* | *2,023* | *2,328* |
| ***Currently Available Supplies*** | ***2,342*** | ***2,268*** | ***2,668*** | ***3,208*** | ***3,571*** | ***3,876*** |
| | | | | | | |
| **Needs (Demands - Supplies)** | **0** | **1,006** | **3,095** | **6,588** | **10,629** | **14,321** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | | 84 | 189 | 412 | 689 | 981 |
| Conservation (wholesale) | 20 | 123 | 207 | 276 | 342 | 390 |
| Additional UTRWD | | 1,084 | 3,098 | 6,457 | 10,310 | 13,819 |
| Cooke County WSP | | 18 | 83 | 104 | 127 | 149 |
| **Total from Strategies** | **20** | **1,309** | **3,577** | **7,249** | **11,468** | **15,339** |
| **Total Supplies** | **2,362** | **3,577** | **6,245** | **10,457** | **15,039** | **19,215** |
| **Surplus or (Shortage)** | **324** | **303** | **482** | **661** | **839** | **1,018** |

Note: 2010 supply from UTRWD is for Sanger only. Bolivar WSC does not currently get other supplies from UTRWD, but will by 2020.

**Table 4E.35**
**Summary of Costs for Bolivar WSC Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for Bolivar WSC (Ac-Ft/Yr)** | **Bolivar WSC Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail) | 2010 | 981 | $5,000 | $0.08 | $0.08 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 390 | Included under County Summaries in Section 4F. | | | |
| More Water from UTRWD | 2020 | 13,819 | $0 | $2.64 | $2.64 | None |
| Cooke County WSP | 2020 | 149 | Included in Gainesville - Table 4E.48 | | | |
| Supplemental wells | 2010-2060 | 0 | $10,842,000 | N/A | N/A | Q-13 |
| **Total Bolivar WSC Capital Costs** | | | **$10,842,000** | | | |

## Dallas County Water Control and Improvement District Number 6

Dallas County Water Control and Improvement District Number 6 provides retail service to the residents of Balch Springs. All of the District's customers live in Balch Springs, and the District provides water to the entire city. Dallas County WCID #6 gets all of its water from Dallas Water Utilities and will continue to do so. Table 4E.36 shows the recommended water management strategies for the District, and Table 4E.37 shows the estimated costs of the strategies.

**Table 4E.36**
**Summary of Recommended Water Management Strategies for Dallas Co. WCID #6**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **2,621** | **2,730** | **2,805** | **2,852** | **2,934** | **3,028** |
| **Currently Available Supplies** | | | | | | |
| ***Dallas Water Utilities*** | ***2,410*** | ***2,050*** | ***2,012*** | ***1,920*** | ***1,823*** | ***1,654*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***211*** | ***680*** | ***793*** | ***932*** | ***1,111*** | ***1,374*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation | 28 | 95 | 132 | 149 | 164 | 180 |
| Additional DWU | 183 | 585 | 661 | 783 | 947 | 1,194 |
| **Total from Strategies** | **211** | **680** | **793** | **932** | **1,111** | **1,374** |
| **Total Supplies** | **2,621** | **2,730** | **2,805** | **2,852** | **2,934** | **3,028** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.37**
**Summary of Costs for Dallas County WCID #6 Recommended Strategies**

| **Strategy** | **Date to Be Developed** | **Quantity for DCWCID #6 (Ac-Ft/Yr)** | **DCWCID #6 Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (Balch Springs) | 2010 | 180 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Additional DWU | 2010 | 1,194 | N/A | $0.88 | $0.88 | None |
| **Total DCWCID #6 Capital Costs** | | | **$0** | | | |

## City of Denton

The City of Denton currently provides treated water to its retail customers and manufacturing in Denton County. The city also provides treated wastewater effluent to steam electric power and irrigation users in Denton County. The projected demands for Denton more than triple between 2010 and 2060. Denton's current sources of water supply include Ray Roberts Lake, Lewisville Lake, and direct and indirect reuse. Denton also has a contract to purchase raw water from Dallas Water Utilities (DWU). Denton's available supply in Ray Roberts Lake and Lewisville Lake is the city's share of the firm yield of the reservoirs. The yield of each reservoir decreases over time due to sedimentation. Denton will need to develop 64,000 acre-feet per year of new water supplies by 2060. The proposed future strategies for Denton are to implement water conservation measures, expand water treatment plant capacity, and purchase additional water from DWU. A summary of the recommended water plan for Denton is shown on Table 4E.38. Table 4E.39 shows the cost of Denton's recommended water management strategies.

**Table 4E.38**
**Summary of Recommended Water Management Strategies for Denton**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **26,138** | **36,587** | **47,473** | **60,214** | **73,903** | **100,666** |
| **Existing** | | | | | | |
| *Lake Lewisville* | *7,918* | *7,817* | *7,715* | *7,613* | *7,512* | *7,410* |
| *Lake Ray Roberts* | *18,980* | *18,720* | *18,460* | *18,200* | *17,940* | *17,680* |
| *Direct Reuse* | *1,233* | *2,242* | *2,690* | *3,251* | *3,924* | *4,708* |
| *Indirect Reuse* | *1,682* | *8,861* | *11,557* | *12,907* | *12,726* | *12,545* |
| *Dallas Water Utilities* | *0* | *0* | *5,310* | *12,883* | *20,694* | *33,332* |
| ***Currently Available Supplies*** | ***29,813*** | ***37,640*** | ***45,732*** | ***54,854*** | ***62,796*** | ***75,675*** |
| ***Available Supplies Limited by Treatment Capacity*** | ***29,813*** | ***34,191*** | ***34,639*** | ***35,200*** | ***35,873*** | ***36,657*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***0*** | ***2,396*** | ***12,834*** | ***25,014*** | ***38,030*** | ***64,009*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 394 | 1,892 | 3,292 | 4,800 | 6,542 | 9,776 |

**Table 4E.38, Continued**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Conservation (manufacturing) | 0 | 1 | 13 | 20 | 22 | 24 |
| 20 mgd Ray Roberts Plant Expansion | | 503 | 9,529 | 11,200 | 11,200 | 11,200 |
| 30 mgd Ray Roberts Plant Expansion and DWU Supplies | | | 0 | 8,994 | 16,800 | 16,800 |
| 20 mgd Ray Roberts Plant Expansion and DWU Supplies | | | | 0 | 3,466 | 11,200 |
| 30 mgd Ray Roberts Plant Expansion and DWU Supplies | | | | | 0 | 15,009 |
| 25 mgd Treatment Plant Expansion and DWU Supplies | | | | | | 0 |
| 25 mgd Treatment Plant Expansion and DWU Supplies | | | | | | 0 |
| **Total from Strategies** | **394** | **2,396** | **12,834** | **25,014** | **38,030** | **64,009** |
| **Total Supplies** | **30,207** | **36,587** | **47,473** | **60,214** | **73,903** | **100,666** |
| **Reserve or (Shortage)** | **4,069** | **0** | **0** | **0** | **0** | **0** |
| Additional DWU Supply | | | | 560 | 4,565 | 15,215 |
| Total DWU Supply | 0 | 0 | 5,310 | 13,443 | 25,259 | 48,547 |

**Table 4E.39**
**Summary of Costs for Denton Recommended Strategies**

| Strategy | Date to Be Developed | Quantity for Denton (Ac-Ft/Yr) | Denton Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 9,776 | $20,000 | $0.35 | $0.35 | Q-10 & Q-11 |
| Conservation (manufacturing) | 2010 | 24 | Included under County Summaries in Section 4F. | | | |
| 20 mgd Ray Roberts Plant Expansion and DWU Supplies | 2020 | 11,200 | $37,367,000 | $1.31 | $0.70 | Q-15 |
| 30 mgd Ray Roberts Plant Expansion and DWU Supplies | 2030 | 16,800 | $51,111,000 | $1.26 | $0.70 | Q-15 |
| 20 mgd Ray Roberts Plant Expansion and DWU Supplies | 2040 | 11,200 | $37,367,000 | $1.31 | $0.70 | Q-15 |

**Table 4E.39, Continued**

| Strategy | Date to Be Developed | Quantity for Denton (Ac-Ft/Yr) | Denton Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| 30 mgd Ray Roberts Plant Expansion and DWU Supplies | 2050 | 16,800 | $51,111,000 | $1.26 | $0.70 | Q-15 |
| 25 mgd Treatment Plant Expansion and DWU Supplies | 2060 | 14,000 | $44,239,000 | $2.56 | $0.70 | Q-15 |
| 25 mgd Treatment Plant Expansion and DWU Supplies | 2060 | 14,000 | $44,239,000 | $1.28 | $0.70 | Q-15 |
| **Total Denton Capital Costs** | | | **$265,454,000** | | | |

## East Cedar Creek Fresh Water Supply District

East Cedar Creek FWSD provides retail supplies to its service area, which includes a part of Gun Barrel City. The District plans to continue selling water to the city in the future. The rest of Gun Barrel City is currently in the retail service area of the City of Mabank, which does not plan to continue supplying Gun Barrel City. Both Gun Barrel City and East Cedar Creek FWSD are seeking to serve the meters currently supplied by Mabank. East Cedar Creek FWSD obtains raw water from Tarrant Regional Water District (TRWD), and current supplies are limited by contract amounts. The recommended water management strategies include implementing water conservation measures, increasing the contract and purchasing additional water from TRWD, and increasing water treatment capacity. A summary of the recommended water management strategies for East Cedar Creek FWSD is shown on Table 4E.40. Table 4E.41 shows the cost of the water management strategies.

**Table 4E.40**
**Summary of Recommended Water Management Strategies for East Cedar Creek FWSD**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **2,402** | **2,843** | **3,319** | **3,625** | **3,991** | **4,409** |
| **Currently Available Supplies (Limited by Treatment Capacity and Contract)** | | | | | | |
| *TRWD (Cedar Creek)* | *2,330* | *2,608* | *2,587* | *2,446* | *2,358* | *2,271* |
| ***Total Currently Available Supplies*** | ***2,330*** | ***2,608*** | ***2,587*** | ***2,446*** | ***2,358*** | ***2,271*** |
| | | | | | | |
| **Need (Demand - Supply)** | **72** | **235** | **732** | **1,179** | **1,633** | **2,138** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 61 | 120 | 175 | 211 | 249 | 292 |
| Conservation (wholesale) | 11 | 72 | 105 | 136 | 174 | 224 |
| Additional TRWD (to WTP capacity) | | 26 | 47 | 188 | 276 | 363 |
| 2 mgd Treatment Plant Expansion & Add’l TRWD | | 17 | 405 | 644 | 934 | 1,120 |
| 2 mgd Treatment Plant Expansion & Add’l TRWD | | | | | | 139 |
| **Total Supplies from Strategies** | **72** | **235** | **732** | **1,179** | **1,633** | **2,138** |
| **Total Supplies** | **2,402** | **2,843** | **3,319** | **3,625** | **3,991** | **4,409** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.41**
**Summary of Costs for East Cedar Creek FWSD Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for ECCFWSD (Ac-Ft/Yr)** | **ECCWSD Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail) | 2010 | 292 | $5,000 | $0.62 | $0.62 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 224 | Included under County Summaries in Section 4F. | | | |
| Additional TRWD | 2020 | 363 | $0 | $0.71816 | $0.71816 | None |
| 2 mgd Treatment Plant Expansion and Additional TRWD | 2020 | 1,120 | $7,270,000 | $1.90 | $0.70 | Q-15 |

**Table 4E.41, Continued**

| Strategy | Date to be Developed | Quantity for ECCFWSD (Ac-Ft/Yr) | ECCWSD Share of Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|
| 2 mgd Treatment Plant Expansion and Additional TRWD | 2060 | 1,120 | $7,270,000 | $1.30 | $0.70 | Q-15 |
| **Total ECCFWSD Capital Costs** | | | **$14,545,000** | | | |

## City of Ennis

The current water supplies for the City of Ennis are Bardwell Lake (Trinity River Authority) and water purchased from Tarrant Regional Water District through the TRA as part of the Ellis County Water Supply Project. Ennis also sells reclaimed water in Ellis County for steam electric power purposes. Ennis intends to increase its purchases from TRWD through TRA and to develop indirect reuse through Lake Bardwell in cooperation with TRA. Ennis sells water to Community Water Company in Ellis County, East Garrett WSC (Ellis County-Other), Rice WSC, Ellis County Steam Electric and Ellis County Manufacturing. Ennis is expected to continue providing water supplies to these customers through the planning period and to provide treated water to Bardwell. The recommended water management strategies for Ennis include implementing water conservation measures, developing indirect reuse from Bardwell Lake, purchasing additional TRWD raw water through TRA as part of the Ellis County Water Supply Project, and expanding its water treatment plant.

A summary of the recommended water plan for Ennis is shown on Table 4E.42. The capital costs for the management strategies are shown on Table 4E.43. Costs for the Ellis County Water Supply Project (other than treatment plant expansions) are presented under the Trinity River Authority above.

**Table 4E.42**
**Summary of Recommended Water Management Strategies for Ennis**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **5,467** | **6,420** | **7,638** | **9,154** | **11,114** | **13,645** |
| **Currently Available Supplies** | | | | | | |
| *Bardwell*[(a)] | *4,712* | *4,484* | *4,257* | *4,030* | *3,802* | *3,575* |
| *Direct Reuse (Steam Electric-Suez)* | *800* | *800* | *800* | *800* | *800* | *800* |
| *Contracted amount from TRWD* | *3,991* | *3,991* | *3,991* | *3,991* | *3,991* | *3,991* |
| *Expected Use from TRWD* | *0* | *695* | *1,932* | *3,097* | *2,776* | *3,921* |
| ***Total Currently Available Supplies with Expected Use from TRWD Limited by Water Treatment Plant Capacity*** | ***5,512*** | ***5,979*** | ***6,989*** | ***7,526*** | ***7,378*** | ***7,526*** |
| | | | | | | |
| ***Need (Supply - Demand)*** | ***0*** | ***441*** | ***649*** | ***1,628*** | ***3,736*** | ***6,119*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 185 | 430 | 633 | 876 | 1,194 | 1,627 |
| Conservation (wholesale customers) | 3 | 11 | 16 | 18 | 21 | 26 |
| Indirect reuse (requires WTP expansions) | | | | 333 | 2,521 | 3,696 |
| Other Additional Supply made Usable by WTP Expansions | | | | 401 | | 770 |
| **Total Supplies from Strategies** | **188** | **441** | **649** | **1,628** | **3,736** | **6,119** |
| **Total Supplies** | **5,700** | **6,420** | **7,638** | **9,154** | **11,114** | **13,645** |
| **Reserve or (Shortage)** | **233** | **0** | **0** | **0** | **0** | **0** |

(a) Ennis has a contract with the Trinity River Authority for 5,200 acre-feet per year. The yield of Bardwell is decreasing over time due to sedimentation, and Ennis' share of the reduced yield is shown here.

**Table 4E.43**
**Summary of Costs for Ennis Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Ennis (Ac-Ft/Yr) | Ennis Share of Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|
| Conservation (retail) | 2010 | 1,627 | $33,000 | $0.67 | $0.67 | Q-11 & Q-12 |
| Conservation (wholesale) | 2010 | 26 | Included under County Summaries in Section 4F. | | | |
| Indirect Reuse | 2040 | 3,696 | $31,779,000 | $4.08 | $2.16 | Q-161 |
| Additional TRWD (Ellis County WSP) | 2040 | 468 | Included under Ellis County WSP in TRA, Table 4E.14. | | | |
| 6 mgd Treatment Plant Expansion | 2040 | 3,363 | $16,980,000 | $1.83 | $0.70 | Q-74 |
| 6 mgd Treatment Plant Expansion | 2060 | 3,363 | $16,980,000 | $1.83 | $0.70 | Q-74 |
| **Total Ennis Capital Costs** | | | **$65,772,000** | | | |

## City of Forney

The City of Forney currently purchases water from the North Texas Municipal Water District (NTMWD). Forney also purchases reuse water from Garland, which it then sells as a supply for Kaufman County Steam Electric Power. Forney currently supplies water to High Point WSC, Talty WSC, Kaufman County Manufacturing, and Kaufman County Other as well as Kaufman County Steam Electric. Demands on Forney are expected to double between 2010 and 2060, creating shortages of 38 acre-feet per year in 2010 which increase to 6,649 acre-feet per year by 2060. NTMWD plans to continue providing water to Forney and its retail customers. As NTMWD develops new projects, Forney should have sufficient supplies. The recommended water management strategies for Forney include implementing water conservation measures, expanding infrastructure for its reuse supply, and purchasing additional water from NTMWD.

A summary of the recommended water plan for Forney is shown in Table 4E.44, and the estimated costs for recommended water management strategies are summarized in Table 4E.45.

**Table 4E.44**
**Summary of Recommended Water Management Strategies for Forney**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand (includes current reuse)** | **12,734** | **16,704** | **18,344** | **19,912** | **21,531** | **23,357** |
| | | | | | | |
| **Existing Supplies** | | | | | | |
| *Garland Reuse* | *8,979* | *8,979* | *8,979* | *8,979* | *8,979* | *8,979* |
| *NTMWD* | *3,717* | *6,367* | *6,692* | *7,007* | *7,265* | *7,729* |
| ***Total Currently Available Supplies*** | ***12,696*** | ***15,346*** | ***15,671*** | ***15,986*** | ***16,244*** | ***16,708*** |
| | | | | | | |
| **Need (Demand - Supply)** | **38** | **1,358** | **2,673** | **3,926** | **5,287** | **6,649** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 28 | 230 | 348 | 454 | 560 | 673 |
| Conservation (wholesale) | 10 | 86 | 150 | 217 | 307 | 427 |
| Additional NTMWD | | 1,042 | 2,175 | 3,255 | 4,420 | 5,549 |
| **Supplies from Strategies** | **38** | **1,358** | **2,673** | **3,926** | **5,287** | **6,649** |
| **Total Supplies** | **12,734** | **16,704** | **18,344** | **19,912** | **21,531** | **23,357** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.45**
**Summary of Costs for Forney Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for Forney (Ac-Ft/Yr)** | **Forney Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail) | 2010 | 673 | $0 | $0.49 | $0.49 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 427 | Included under County Summaries in Section 4F. | | | |
| Additional NTMWD | 2020 | 5,549 | $0 | $1.25 | $1.25 | None |
| **Total Forney Capital Costs** | | | **$0** | | | |

## City of Gainesville

The City of Gainesville currently provides treated water for its retail customers and Cooke County Manufacturing. The city also provides a small amount of direct reuse for irrigation. Gainesville is expected to be a sponsor of the Cooke County Water Supply

Project, which will serve other water user groups in Cooke County. Bolivar Water Supply Corporation, Cooke County Other, Kiowa Lake Homeowners Association, Lindsay, Valley View, Woodbine Water Supply Corporation, Cooke County Manufacturing, and Cooke County Mining are all expected to get water from Gainesville through the Cooke County Water Supply Project. Gainesville currently obtains water from the Trinity aquifer and Moss Lake. Water supplies from Moss Lake are limited by treatment capacity to 1,120 acre-feet per year. The city will need to overdraft the Trinity aquifer in 2010 to meet dry-year demands. Gainesville needs to develop an additional 4,800 acre-feet per year of supplies by 2060. The recommended water management strategies to meet these needs include:

- Conservation
- Overdraft Trinity Aquifer in 2010
- Cooke County Raw Water Supply Project
- Additional direct reuse
- Supplemental wells

These strategies are discussed individually below.

**Conservation.** Conservation is the projected conservation savings for Gainesville and its customers, based on the recommended Region C water conservation program. Not including savings from low-flow plumbing fixtures (already built into the projected demands) conservation is projected to reach 463 acre-feet per year by 2060.

**Overdraft Trinity Aquifer in 2010.** To meet dry year demands, Gainesville will overdraft the Trinity Aquifer in 2010 while additional surface supplies are being developed.

**Cooke County Water Supply Project.** Gainesville and other entities are expected to develop the Cooke County Water Supply Project by 2020. Groundwater supplies are insufficient to meet projected demands in Cooke County, and the project will make surface water available to other suppliers in the county. Table 4E.46 shows the projected demands for the Cooke County Water Supply Project. The project will include:

- Moss Creek Raw Water Delivery Expansions

- Water Treatment Plant Expansions
- Transmission facilities to deliver treated water to other suppliers in Cooke County.

The Cooke County Water Supply project will be developed by a combination of Gainesville, Greater Texoma Utility Authority, and other suppliers in Cooke County. For this plan, the capital costs are included under Gainesville.

**Additional Direct Reuse.** Gainesville will develop additional direct reuse supplies to provide water for Cooke County Irrigation and Cooke County Mining.

**Supplemental Wells.** During the planning period, Gainesville will drill supplemental wells as necessary to maintain the city's groundwater supply.

Table 4E.47 shows the recommended water management strategies for the City of Gainesville. Table 4E.48 gives information on the capital and unit costs for the recommended water management strategies.

The City of Gainesville has purchased a portion of GTUA's water supply from Lake Texoma and plans to utilize it in the future.

**Table 4E.46**
**Supplies from the Cooke County Water Supply Project (from Gainesville)**

| Water User Group | Supplies from the Cooke Co. WSP (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Bolivar WSC | 0 | 18 | 83 | 104 | 127 | 149 |
| Cooke County Other | 0 | 125 | 125 | 125 | 125 | 125 |
| Gainesville | 0 | 1,537 | 1,204 | 1,979 | 2,435 | 1,914 |
| Kiowa Homeowners WSC | 0 | 100 | 100 | 100 | 100 | 100 |
| Lindsay | 0 | 40 | 50 | 50 | 50 | 50 |
| Valley View | 0 | 150 | 400 | 650 | 1,200 | 1,600 |
| Woodbine WSC | 0 | 40 | 80 | 120 | 170 | 230 |
| Cooke County Irrigation | 0 | 70 | 70 | 70 | 70 | 70 |
| Cooke County Manufacturing | 0 | 61 | 60 | 91 | 128 | 164 |
| Cooke County Mining | 0 | 99 | 68 | 71 | 75 | 78 |
| **Total for Cooke County WSP** | **0** | **2,240** | **2,240** | **3,360** | **4,480** | **4,480** |

**Table 4E.47**
**Recommended Water Management Strategies for Gainesville**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Projected Demands** | **3,619** | **4,821** | **5,536** | **6,283** | **7,380** | **8,386** |
| **Currently Available Supplies** | | | | | | |
| *Moss Lake (Treatment Capacity)* | *1,120* | *1,120* | *1,120* | *1,120* | *1,120* | *1,120* |
| *Direct Reuse* | *9* | *9* | *9* | *9* | *9* | *9* |
| *Trinity Aquifer* | *2,360* | *2,360* | *2,360* | *2,360* | *2,360* | *2,360* |
| ***Total Currently Available Supplies*** | ***3,489*** | ***3,489*** | ***3,489*** | ***3,489*** | ***3,489*** | ***3,489*** |
| | | | | | | |
| ***Need (Demand - Current Supplies)*** | ***130*** | ***1,332*** | ***2,047*** | ***2,794*** | ***3,891*** | ***4,897*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 14 | 56 | 94 | 113 | 129 | 143 |
| Conservation (wholesale) | 13 | 39 | 144 | 194 | 250 | 320 |
| Overdraft Trinity Aquifer (existing wells) | 103 | 0 | 0 | 0 | 0 | 0 |
| Cooke County Water Supply Project | | 2,240 | 2,240 | 3,360 | 4,480 | 4,480 |
| Additional Direct Reuse | 0 | 169 | 137 | 141 | 144 | 147 |
| **Total Supplies from Strategies** | **130** | **2,504** | **2,615** | **3,808** | **5,003** | **5,090** |
| **Total Supplies** | **3,619** | **5,993** | **6,104** | **7,297** | **8,492** | **8,579** |
| **Reserve or (Shortage)** | **0** | **1,172** | **568** | **1,014** | **1,112** | **193** |

**Table 4E.48**
**Summary of Costs for Gainesville Recommended Strategies**

| Strategy | Date to Be Developed | Quantity for Gainesville (Ac-Ft/Yr) | Gainesville Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010-2060 | 143 | $0 | $0.55 | $0.55 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010-2060 | 320 | Included under County Summaries in Section 4F. | | | |
| Overdraft Trinity Aquifer (existing wells) | 2010 | 103 | $0 | $0.47 | $0.47 | Q-127 |
| Cooke County Water Supply Project | 2020 | 4,480 | $50,280,000 | $3.75 | $1.25 | Q-99 |
| Additional Direct Reuse | 2020 | 169 | $1,828,000 | $3.18 | $0.76 | Q-101 |
| Supplemental Wells | 2010-2060 | 0 | $5,468,000 | N/A | N/A | Q-13 |
| **Total Gainesville Capital Costs** | | | **$57,576,000** | | | |

## City of Garland

The City of Garland currently purchases treated water from the North Texas Municipal Water District (NTMWD). Garland sells water for Dallas County Manufacturing, Collin County Steam Electric Power, and Dallas County Steam Electric Power. The City of Garland sells some of its treated wastewater effluent to Forney for use for Kaufman County Steam Electric Power. Due to limits on the current supplies from NTMWD, Garland would have a projected shortage of 22,685 acre-feet per year by 2060 if NTMWD does not develop additional supplies. As NTMWD develops new water supplies, these shortages will be met. The recommended strategies for Garland are to implement water conservation measures and continue purchasing water from the North Texas Municipal Water District. A summary of the recommended water plan for Garland is shown in Table 4E.49, and the estimated costs are in Table 4E.50.

**Table 4E.49**
**Summary of Recommended Water Management Strategies for Garland**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Treated & Raw Water Demand** | | | | | | |
| Treated Water (NTMWD) | 45,621 | 45,542 | 46,730 | 46,681 | 46,633 | 46,658 |
| Raw Water (Collin SEP - NTMWD) | 771 | 715 | 1,000 | 1,200 | 1,600 | 2,000 |
| **Total** | **46,392** | **46,257** | **47,730** | **47,881** | **48,233** | **48,658** |
| | | | | | | |
| ***Currently Available Supplies*** | | | | | | |
| *NTMWD* | *45,634* | *37,649* | *33,741* | *30,411* | *27,702* | *25,973* |
| ***Total Currently Available Treated Water Supplies*** | ***45,634*** | ***37,649*** | ***33,741*** | ***30,411*** | ***27,702*** | ***25,973*** |
| | | | | | | |
| ***Need (Demand - Supply)**** | ***758*** | ***8,608*** | ***13,989*** | ***17,470*** | ***20,531*** | ***22,685*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 758 | 2,813 | 3,987 | 4,393 | 4,724 | 5,075 |
| Conservation (wholesale) | 0 | 6 | 70 | 102 | 109 | 113 |
| Additional NTMWD | | 5,789 | 9,932 | 12,975 | 15,698 | 17,497 |
| **Total Treated Water Supplies from Strategies** | **758** | **8,608** | **13,989** | **17,470** | **20,531** | **22,685** |
| **Total Treated Water Supplies** | **46,392** | **46,257** | **47,730** | **47,881** | **48,233** | **48,658** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | |
| **Reuse** | | | | | | |
| Reuse Demand (Kaufman Co SEP) | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 |
| Currently Available Reuse Supply | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 |
| | | | | | | |
| **Reuse Need (Reuse Demand – Reuse Supply** | **0** | **0** | **0** | **0** | **0** | **0** |

Note: *Development of NTMWD water management strategies recommended in this plan will fully meet needs for Garland and other NTMWD customers.

**Table 4E.50**
**Summary of Costs for Garland Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Garland (Ac-Ft/Yr) | Garland Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 5,075 | 91,000 | $0.33 | $0.33 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 113 | Included under County Summaries in Section 4F. | | | |
| Additional NTMWD | 2020 | 17,497 | $0 | $1.25 | $1.25 | None |
| **Total Garland Capital Costs** | | | **$91,000** | | | |

## City of Grand Prairie

The City of Grand Prairie does not currently have any wholesale customers, but the City has signed a contract to supply water to the Johnson County Special Utility District, which will make it a wholesale water provider. Grand Prairie currently gets most of its water from Dallas Water Utilities, with smaller supplies from Fort Worth, groundwater, and Joe Pool Lake (for irrigation). Grand Prairie has entered into contracts to obtain supplies from Midlothian and Mansfield, and is investigating an Arlington supply. All of these sources will obtain raw water from Tarrant Regional Water District (TRWD). All of these supplies will be implemented before 2020. Grand Prairie will also obtain additional supplies from Dallas. Grand Prairie's recommended water management strategies include the following:

- Conservation
- Connect to Midlothian
- Connect to Mansfield
- Connect to Arlington
- Additional supplies from DWU.

A summary of the recommended water plan for Grand Prairie is shown in Table 4E.51, and the estimated costs are in Table 4E.52.

**Table 4E.51**
**Summary of Recommended Water Management Strategies for Grand Prairie**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **29,434** | **40,292** | **45,452** | **50,277** | **55,351** | **55,351** |
| | | | | | | |
| **Currently Available Supplies** | | | | | | |
| *Groundwater* | *4,200* | *4,200* | *4,200* | *4,200* | *4,200* | *4,200* |
| *Joe Pool Raw Water* | *300* | *300* | *300* | *300* | *300* | *300* |
| *Fort Worth (TRWD)* | *1,065* | *1,028* | *874* | *757* | *662* | *578* |
| *DWU* | *21,897* | *12,147* | *15,303* | *17,615* | *19,404* | *17,062* |
| ***Currently Available Supplies*** | ***27,462*** | ***17,676*** | ***20,677*** | ***22,872*** | ***24,566*** | ***22,140*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***1,972*** | ***22,616*** | ***24,775*** | ***27,405*** | ***30,785*** | ***33,211*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (all retail) | 1,242 | 3,030 | 4,060 | 4,960 | 5,956 | 6,366 |
| DWU Pipeline and Additional DWU | 674 | 996 | 1,971 | 3,583 | 5,873 | 7,804 |
| Additional Fort Worth (TRWD) | 56 | 93 | 247 | 365 | 459 | 544 |
| Midlothian (GP Joe Pool) | 0 | 1,272 | 1,239 | 1,207 | 1,174 | 1,141 |
| Midlothian (TRWD) | 0 | 6,015 | 6,048 | 6,080 | 6,113 | 6,146 |
| Mansfield (TRWD) | 0 | 6,726 | 6,726 | 6,726 | 6,726 | 6,726 |
| Arlington (TRWD) | 0 | 4,484 | 4,484 | 4,484 | 4,484 | 4,484 |
| **Total from Strategies** | **1,972** | **22,616** | **24,775** | **27,405** | **30,785** | **33,211** |
| **Total Supplies** | **29,434** | **40,292** | **45,452** | **50,277** | **55,351** | **55,351** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |
| Total DWU Supply | 22,571 | 13,144 | 17,274 | 21,199 | 25,277 | 24,866 |
| Total TRWD Supply | 1,121 | 18,346 | 18,379 | 18,411 | 18,444 | 18,478 |
| Other Supplies | 5,742 | 8,802 | 9,799 | 10,667 | 11,630 | 12,007 |

**Table 4E.52**
**Summary of Costs for Grand Prairie Recommended Strategies**

| Strategy | Date to Be Developed | Quantity for Grand Prairie (Ac-Ft/Yr) | Grand Prairie Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010 | 6,366 | $10,000 | $0.51 | $0.51 | Q-10 & Q-11 |
| Connection to Midlothian | 2020 | 7,287 | $14,150,000 | $3.06 | $2.62 | Q-149 |
| Connection to Mansfield | 2020 | 6,726 | $15,447,000 | $3.15 | $2.64 | Q-148 |
| Connection to Arlington | 2020 | 4,484 | $4,127,000* | $2.76 | $2.55 | Q-149A |
| Additional DWU | 2010 | 7,804 | $0 | $1.37 | $1.37 | None |
| Supplemental Wells | 2060 | 0 | $3,000,000 | N/A | N/A | ** |
| **Total Grand Prairie Capital Costs** | | | **$36,734,000** | | | |

* City of Grand Prairie has estimated their share of capital costs this project to be closer to $2.5 million.
** Supplemental well costs provided by City of Grand Prairie.

## Lake Cities Municipal Utility Authority

The current supplies for Lake Cities Municipal Utility Authority (MUA) include groundwater from the Trinity and Woodbine aquifers and surface water purchased from the Upper Trinity Regional Water District (UTRWD). Lake Cities MUA currently serves and plans to continue serving water to Lake Dallas, Hickory Creek, and Shady Shores. The demands of these wholesale customers are expected to more than double over the planning period. UTRWD will continue to provide water to Lake Cities MUA to meet the projected demands. The need for additional supplies identified for Lake Cities MUA is 2,750 acre-feet per year in 2060. The recommended water management strategies include implementing water conservation measures, drilling supplemental wells, and purchasing additional water from UTRWD. A summary of the recommended water plan for Lake Cities MUA is shown on Table 4E.53. The capital costs for infrastructure projects are shown on Table 4E.54.

**Table 4E.53**
**Summary of Recommended Water Management Strategies for Lake Cities MUA**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Demand** | **2,464** | **3,094** | **3,473** | **3,704** | **3,689** | **3,689** |
| **Currently Available** | | | | | | |
| *Groundwater* | *474* | *474* | *474* | *474* | *474* | *474* |
| *Currently Available from UTRWD* | *2,099* | *995* | *775* | *651* | *525* | *465* |
| ***Currently Available Supplies*** | ***2,573*** | ***1,469*** | ***1,249*** | ***1,125*** | ***999*** | ***939*** |
| | | | | | | |
| **Needs (Demands - Supplies)** | **0** | **1,625** | **2,224** | **2,579** | **2,690** | **2,750** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation | 69 | 169 | 221 | 267 | 295 | 322 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| Additional UTRWD | 52 | 1,786 | 2,416 | 2,803 | 2,945 | 3,036 |
| **Total from Strategies** | **121** | **1,955** | **2,637** | **3,070** | **3,240** | **3,358** |
| **Total Supplies** | **2,694** | **3,424** | **3,886** | **4,195** | **4,239** | **4,297** |
| **Reserve or (Shortage)** | **230** | **330** | **413** | **491** | **550** | **608** |

**Table 4E.54**
**Summary of Costs for Lake Cities MUA Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Lake Cities MUA (Ac-Ft/Yr) | Lake Cities MUA Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010 | 322* | Included under County Summaries in Section 4F. | | | |
| Additional UTRWD | 2020 | 3,036 | $0 | $2.64 | $2.64 | None |
| Supplemental Wells | 2020 | 0 | $2,355,000 | NA | NA | Q-13 |
| **Total Lake Cities MUA Capital Costs** | | | **$2,355,000** | | | |

* Lake Cities MUA has no retail sales, so conservation savings are reflected in their customers' conservation savings.

## City of Mansfield

The City of Mansfield currently purchases raw water from the Tarrant Regional Water District (TRWD), and has a 30 mgd water treatment plant. Mansfield sells water to Johnson

County SUD and plans to continue selling to the SUD through the planning period. In the future, Mansfield plans to sell water to Grand Prairie as well. With the additional demands on the city, Mansfield has a projected need for additional supply of 33,663 acre-feet per year by 2060. The recommended water management strategies for Mansfield include implementing water conservation measures, purchasing additional water from the TRWD, expanding its water treatment plant, and constructing and expanding a second water treatment plant. A summary of the recommended water plan for Mansfield is shown on Table 4E.55, and Table 4E.56 shows the estimated costs of the recommended strategies.

**Table 4E.55**
**Summary of Recommended Water Management Strategies for Mansfield**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **15,487** | **29,313** | **38,169** | **43,106** | **46,794** | **50,478** |
| **Currently Available Supplies (Limited by Treatment Capacity and Yield)** | | | | | | |
| Available from TRWD | 14,956 | 26,894 | 29,756 | 29,081 | 27,643 | 26,001 |
| TRWD (Constrained by Treatment Plant Capacity) | 14,956 | 16,815 | 16,815 | 16,815 | 16,815 | 16,815 |
| ***Total Currently Available Supplies*** | ***14,956*** | ***16,815*** | ***16,815*** | ***16,815*** | ***16,815*** | ***16,815*** |
| | | | | | | |
| **Need (Demand - Supply)** | ***531*** | ***12,498*** | ***21,354*** | ***26,291*** | ***29,979*** | ***33,663*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 524 | 1,322 | 2,012 | 2,691 | 3,308 | 3,984 |
| Conservation (wholesale customers) | 7 | 592 | 697 | 768 | 838 | 905 |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | | 8,408 | 8,408 | 8,408 | 8,408 | 8,408 |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | | 2,176 | 8,408 | 8,408 | 8,408 | 8,408 |
| 15 MGD New Water Treatment Plant and TRWD Supply | | | 1,829 | 6,016 | 8,408 | 8,408 |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | | | | 0 | 609 | 3,550 |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | | | | | | 0 |
| **Total Supplies from Strategies** | **531** | **12,498** | **21,354** | **26,291** | **29,979** | **33,663** |
| **Total Supplies** | **15,487** | **29,313** | **38,169** | **43,106** | **46,794** | **50,478** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.56**
**Summary of Costs for Mansfield Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Mansfield (Ac-Ft/Yr) | Mansfield Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail ) | 2010-2060 | 3,984 | $29,000 | $0.22 | $0.22 | Q-10 & Q-11 |
| Conservation (wholesale customers) | 2010-2060 | 905 | Included under County Summaries in Section 4F. | | | |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | 2011 | 8,408 | $29,504,000 | $1.35 | $0.70 | Q-15 |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | 2017 | 8,408 | $29,504,000 | $1.35 | $0.70 | Q-15 |
| 15 MGD New Water Treatment Plant and TRWD Supply | 2027 | 8,408 | $29,504,000 | $1.35 | $0.70 | Q-15 |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | 2040 | 8,408 | $29,504,000 | $1.35 | $0.70 | Q-15 |
| 15 mgd Water Treatment Plant Expansion and TRWD Supply | 2060 | 8,408 | $29,504,000 | $1.35 | $0.70 | Q-15 |
| **Total Mansfield Capital Costs** | | | **$147,549,000** | | | |

## City of Midlothian

The City of Midlothian currently obtains water supplies from the Trinity River Authority (TRA) supply in Joe Pool Lake. The City supplies water to Mountain Peak WSC, Rockett SUD, Venus (in Region G), Ellis County Manufacturing, and Ellis County Steam Electric Power. Alvarado (in Region G) and Grand Prairie plan to get water from Midlothian in the future. Midlothian will need to develop 22,700 acre-feet per year of additional supply by 2060. The recommended water management strategies for Midlothian include implementing water conservation measures and building and expanding a water treatment plant to use TRWD water (purchased through TRA). A summary of the recommended water plan for Midlothian is shown on Table 4E.57, and the capital costs of the recommended strategies for Midlothian are shown on Table 4E.58.

**Table 4E.57**
**Summary of Recommended Water Management Strategies for Midlothian**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **7,492** | **19,374** | **21,954** | **24,220** | **26,713** | **29,225** |
| **Currently Available Supplies (Limited by Yield)** | | | | | | |
| *Joe Pool Lake* | *5,954* | *5,833* | *5,712* | *5,591* | *5,470* | *5,349* |
| *Joe Pool Lake from Grand Prairie* | *1,304* | *1,272* | *1,239* | *1,207* | *1,174* | *1,141* |
| ***Total Currently Available Supplies*** | ***7,258*** | ***7,104*** | ***6,951*** | ***6,798*** | ***6,644*** | ***6,490*** |
| | | | | | | |
| **Need (Demand - Supply)** | ***234*** | ***12,270*** | ***15,003*** | ***17,422*** | ***20,069*** | ***22,735*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 194 | 665 | 1,030 | 1,373 | 1,737 | 2,133 |
| Conservation (wholesale customers) | 40 | 767 | 897 | 973 | 1,043 | 1,112 |
| New Water Treatment Plant (9 mgd) and Supply from TRWD | | 5,045 | 5,045 | 5,045 | 5,045 | 5,045 |
| WTP Expansion (9 mgd) and Supply from TRWD | | 5,045 | 5,045 | 5,045 | 5,045 | 5,045 |
| WTP Expansion (9 mgd) and Supply from TRWD | | 748 | 2,986 | 4,986 | 5,045 | 5,045 |
| WTP Expansion (9 mgd) and Supply from TRWD | | | | 0 | 2,154 | 4,355 |
| **Total Supplies from Strategies** | **234** | **12,270** | **15,003** | **17,422** | **20,069** | **22,735** |
| **Total Supplies** | **7,492** | **19,374** | **21,954** | **24,220** | **26,713** | **29,225** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |
| Purchase from TRWD | 0 | 10,838 | 13,076 | 15,076 | 17,289 | 19,490 |

**Table 4E.58**
**Summary of Costs for Midlothian Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Midlothian (Ac-Ft/Yr) | Midlothian Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010-2060 | 2,133 | $28,000 | $0.49 | $0.49 | Q-10 & Q-11 |
| Conservation (wholesale customers) | 2010-2060 | 1,112 | Included under County Summaries in Section 4F. | | | |
| New WTP (9 mgd) and Supply from TRWD | 2011 | 5,045 | $30,590,000 | $2.05 | $0.70 | Q-74 |
| WTP Expansion (9 mgd) and Supply from TRWD | 2015 | 5,045 | $22,050,000 | $1.67 | $0.70 | Q-74 |
| WTP Expansion (9 mgd) and Supply from TRWD | 2019 | 5,045 | $22,050,000 | $1.67 | $0.70 | Q-74 |
| WTP Expansion (9 mgd) and Supply from TRWD | 2040 | 3,832 | $22,050,000 | $1.67 | $0.70 | Q-74 |
| **Total Midlothian Capital Costs** | | | **$96,768,000** | | | |

## Mustang Special Utility District

Mustang Special Utility District (SUD) is currently supplied from the Trinity aquifer and surface water purchased from the Upper Trinity Regional Water District (UTRWD). The SUD provides water to Cross Roads, Krugerville, and Oak Point and is expected to continue these water sales through the planning period. Mustang SUD has a projected need for 9,041 acre-feet per year of additional supplies in 2060. The UTRWD plans to continue providing water to Mustang SUD, and projects developed by UTRWD will be able to supply the MUD's needs. The recommended water management strategies for Mustang SUD include implementing water conservation measures, drilling supplemental wells in the Trinity aquifer, and purchasing additional water from the UTRWD. A summary of the recommended water plan for Mustang SUD is shown on Table 4E.59, and costs are summarized in Table 4E.60.

**Table 4E.59**
**Summary of Recommended Water Management Strategies for Mustang SUD**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Demand** | **2,285** | **4,313** | **5,493** | **7,502** | **9,566** | **11,660** |
| **Existing Supplies** | | | | | | |
| *Groundwater* | *1,162* | *1,162* | *1,162* | *1,162* | *1,162* | *1,162* |
| *Currently Available UTRWD* | *1,096* | *1,128* | *1,080* | *1,239* | *1,325* | *1,457* |
| ***Currently Available Supplies*** | ***2,258*** | ***2,290*** | ***2,242*** | ***2,401*** | ***2,487*** | ***2,619*** |
| | | | | | | |
| **Needs (Demands - Supplies)** | **27** | **2,023** | **3,251** | **5,101** | **7,079** | **9,041** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 23 | 75 | 115 | 228 | 353 | 485 |
| Conservation (wholesale) | 31 | 151 | 231 | 284 | 345 | 417 |
| Additional UTRWD Supplies | 0 | 1,797 | 3,021 | 4,821 | 6,730 | 8,604 |
| **Total from Strategies** | **54** | **2,023** | **3,367** | **5,333** | **7,428** | **9,506** |
| **Total Supplies** | **2,312** | **4,313** | **5,609** | **7,734** | **9,915** | **12,125** |
| **Reserve or (Shortage)** | **27** | **0** | **116** | **232** | **349** | **465** |

**Table 4E.60**
**Summary of Costs for Mustang SUD Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for Mustang SUD (Ac-Ft/Yr)** | **Mustang SUD Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail) | 2010 | 485 | $5,000 | $0.08 | $0.08 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 417 | Included under County Summaries in Section 4F. | | | |
| Additional UTRWD Supplies | 2010 | 8,604 | $0 | $2.64 | $2.64 | None |
| Supplemental Wells | 2020 | 0 | $4,444,000 | N/A | N/A | Q-13 |
| **Total Mustang SUD Capital Costs** | | | **$4,449,000** | | | |

## City of North Richland Hills

The current water supplies for the City of North Richland Hills include groundwater from the Trinity aquifer, water purchased from the City of Fort Worth (from the Tarrant Regional Water District), and water purchased from the Trinity River Authority (from the Tarrant Regional Water District). North Richland Hills sells water to Watauga and Tarrant County Manufacturing. The city is expected to continue supplying water to these customers. North Richland Hills has a projected need for an additional 9,614 acre-feet per year by 2060. The proposed water management strategies for North Richland Hills are implementing water conservation measures, purchasing additional water from Fort Worth (from TRWD), adding another pipeline to Fort Worth, and purchasing additional water from the Trinity River Authority (from TRWD). A summary of the recommended water plan for North Richland Hills is shown in Table 4E.61, and the costs of the recommended strategies are shown in Table 4E.62.

**Table 4E.61**
**Summary of Recommended Water Management Strategies for North Richland Hills**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **16,278** | **17,773** | **18,726** | **19,254** | **19,679** | **20,059** |
| **Currently Available Supplies** | | | | | | |
| *Groundwater* | *233* | *233* | *233* | *233* | *233* | *233* |
| *TRA (from TRWD)* | *8,673* | *8,883* | *8,055* | *7,228* | *6,491* | *5,779* |
| *Fort Worth (from TRWD)* | *7,233* | *7,209* | *6,365* | *5,607* | *4,998* | *4,435* |
| ***Total Currently Available Supplies*** | ***16,139*** | ***16,325*** | ***14,653*** | ***13,068*** | ***11,722*** | ***10,447*** |
| | | | | | | |
| **Need (Demand - Supply)** | ***139*** | ***1,448*** | ***4,073*** | ***6,186*** | ***7,957*** | ***9,612*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 103 | 815 | 1,232 | 1,421 | 1,594 | 1,762 |
| Conservation (customers) | 36 | 122 | 165 | 178 | 189 | 200 |
| Additional TRA (from TRWD) | | 282 | 1,493 | 2,582 | 3,487 | 4,327 |
| Additional Fort Worth (from TRWD) | | 229 | 1,183 | 2,005 | 2,687 | 3,323 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Supplies from Strategies** | **139** | **1,448** | **4,073** | **6,186** | **7,957** | **9,612** |
| **Total Supplies** | **16,278** | **17,773** | **18,726** | **19,254** | **19,679** | **20,059** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.62**
**Summary of Costs for North Richland Hills Recommended Strategies**

| Strategy | Date to be Developed | Quantity for NRH (Ac-Ft/Yr) | NRH Share of Capital Costs | Unit Cost ($/ 1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010-2060 | 1,762 | $54,000 | $0.35 | $0.35 | Q-10 & Q-11 |
| Conservation (customers) | 2010-2060 | 200 | Included under County Summaries in Section 4F. | | | |
| Additional TRA (from TRWD) | 2011 | 4,327 | $0 | $2.27 | $2.27 | None |
| Additional Fort Worth (from TRWD) and New Pipeline | 2015 | 3,323 | $11,803,000 | $0.94 | $0.15 | Q-228 |
| **Total NRH Capital Costs** | | | **$11,857,000** | | | |

## City of Princeton

The City of Princeton supplies water to Culleoka Water Supply Corporation. Princeton obtains all of its water supplies from the North Texas Municipal Water District and plans to continue to do so. Table 4E.63 shows the recommended water management strategies for Princeton, and Table 4E.64 shows the costs for the recommended strategies.

**Table 4E.63**
**Summary of Recommended Water Management Strategies for Princeton**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **2,237** | **4,007** | **5,496** | **8,335** | **12,938** | **18,636** |
| **Existing Supplies** | | | | | | |
| *NTMWD* | *2,207* | *3,261* | *3,885* | *5,294* | *7,431* | *9,948* |
| ***Total Currently Available Supplies*** | ***2,207*** | ***3,261*** | ***3,885*** | ***5,294*** | ***7,431*** | ***9,948*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***30*** | ***746*** | ***1,611*** | ***3,041*** | ***5,507*** | ***8,688*** |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 12 | 119 | 215 | 413 | 777 | 1,300 |
| Conservation (wholesale) | 18 | 74 | 102 | 126 | 154 | 185 |
| Additional NTMWD | | 553 | 1,294 | 2,502 | 4,576 | 7,203 |
| **Total Supplies from Strategies** | **30** | **746** | **1,611** | **3,041** | **5,507** | **8,688** |
| **Total Supplies** | **2,237** | **4,007** | **5,496** | **8,335** | **12,938** | **18,636** |
| Surplus or (Shortage) | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 4E.64**
**Summary of Costs for Princeton Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Princeton (Ac-Ft/Yr) | Princeton Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 1,300 | $0 | $0.30 | $0.30 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 185 | Included under County Summaries in Section 4F. | | | |
| Additional NTMWD | 2020 | 7,203 | $0 | $1.25 | $1.25 | None |
| **Total Princeton Capital Costs** | | | **$0** | | | |

## Rockett Special Utility District

Rockett Special Utility District supplies water to Ferris, Palmer, Pecan Hill, and Ellis County Other (Boyce WSC and Bristol WSC). The SUD also provides retail supplies within the city limits of a number of other cities in Ellis County. In the future, Rockett SUD plans to sell water to Sardis-Lone Elm WSC. The current supplies for Rockett Special Utility District (SUD) include the Trinity aquifer and water purchased from Midlothian. Rockett SUD also has a contract with the Trinity River Authority (TRA) for water from the Tarrant Regional Water District (TRWD), which is treated at Waxahachie's new Sokoll Water Treatment Plant. Rockett SUD plans to discontinue the use of groundwater as it phases in supplies from the new Sokoll Plant. The recommended water management strategies for Rockett SUD include implementing water conservation measures and purchasing additional TRWD water from TRA through the Ellis County Water Supply Project. As part of the Ellis County Water Supply Project, Rockett SUD will expand the Sokoll Water Treatment Plant to treat the additional raw water from TRWD through TRA. A summary of the recommended water plan for Rockett SUD is shown on Table 4E.65, and the costs for Rockett SUD are shown on Table 4E.66. Capital costs for the Ellis County Water Supply Project (other than treatment plant expansions) are shown in Table 4E.14 for TRA.

**Table 4E.65**
**Summary of Recommended Water Management Strategies for Rockett SUD**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **6,010** | **9,591** | **11,947** | **13,214** | **13,930** | **14,131** |
| **Currently Available Supplies** | | | | | | |
| *Midlothian* | *1,926* | *2,242* | *2,242* | *2,242* | *2,242* | *2,242* |
| *TRWD through TRA* | *4,356* | *7,256* | *8,003* | *7,779* | *7,235* | *6,413* |
| *TRWD Limited by WTP Capacity* | *4,356* | *5,600* | *5,600* | *5,600* | *5,600* | *5,600* |
| ***Total Currently Available Supplies*** | ***6,282*** | ***7,842*** | ***7,842*** | ***7,842*** | ***7,842*** | ***7,842*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***0*** | ***1,749*** | ***4,105*** | ***5,372*** | ***6,088*** | ***6,289*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail ) | 97 | 276 | 422 | 526 | 597 | 633 |
| Conservation (wholesale customers) | 13 | 246 | 362 | 405 | 447 | 491 |
| Sokoll Plant Expansion (10 MGD to Rockett - from TRWD though TRA) | | 1,227 | 3,321 | 4,441 | 5,044 | 5,165 |
| Sokoll Plant Expansion (10 MGD to Rockett - from TRWD though TRA) | | | | | | 0 |
| **Total Supplies from Strategies** | **110** | **1,749** | **4,105** | **5,372** | **6,088** | **6,289** |
| **Total Supplies** | **6,392** | **9,591** | **11,947** | **13,214** | **13,930** | **14,131** |
| **Reserve or (Shortage)** | **382** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.66**
**Summary of Costs for Rockett SUD Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for Rockett SUD (Ac-Ft/Yr)** | **Rockett SUD Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail ) | 2010 | 633 | $5,000 | $0.09 | $0.09 | Q-10 & Q-11 |
| Conservation (wholesale customers) | 2010 | 491 | Included under County Summaries in Section 4F. | | | |

**Table 4E.66, Continued**

| Strategy | Date to be Developed | Quantity for Rockett SUD (Ac-Ft/Yr) | Rockett SUD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Sokoll Plant Expansion (10 MGD to Rockett - from TRWD though TRA) | 2015 | 5,600 | $19,230,000 | $1.46 | $0.70 | Q-74 |
| Sokoll Plant Expansion (10 MGD to Rockett - from TRWD though TRA) | 2045 | 5,600 | $19,230,000 | $1.46 | $0.70 | Q-74 |
| **Total Rockett SUD Capital Costs** | | | **$38,465,000** | | | |

## City of Rockwall

Rockwall's current water supply is water purchased from North Texas Municipal Water District (NTMWD). Rockwall sells water to Blackland WSC, McLendon-Chisholm (through R-C-H WSC), R-C-H WSC, Rockwall County-Other, and Rockwall County Manufacturing. Current plans call for Blackland WSC and R-C-H WSC to develop direct connections to NTMWD by 2020, which will remove them and McClendon-Chisholm as customers of Rockwall. The recommended water management strategies for Rockwall are shown on Table 4E.67. The costs of these strategies are shown in Table 4E.68.

**Table 4E.67**
**Summary of Recommended Water Management Strategies for Rockwall**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **11,553** | **17,900** | **21,901** | **25,466** | **26,132** | **26,134** |
| | | | | | | |
| **Existing Supplies** | | | | | | |
| *NTMWD* | *11,444* | *14,568* | *15,481* | *16,174* | *15,009* | *13,950* |
| ***Total Currently Available Supplies*** | ***11,444*** | ***14,568*** | ***15,481*** | ***16,174*** | ***15,009*** | ***13,950*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***109*** | ***3,332*** | ***6,420*** | ***9,292*** | ***11,123*** | ***12,184*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 88 | 820 | 1,260 | 1,684 | 1,948 | 2,163 |
| Conservation (wholesale) | 21 | 7 | 11 | 12 | 12 | 14 |

**Table 4E.67, Continued**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Additional NTMWD | | 2,505 | 5,149 | 7,596 | 9,163 | 10,007 |
| **Total Supplies from Strategies** | **109** | **3,332** | **6,420** | **9,292** | **11,123** | **12,184** |
| **Total Supplies** | **11,553** | **17,900** | **21,901** | **25,466** | **26,132** | **26,134** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.68**
**Summary of Costs for Rockwall Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Rockwall (Ac-Ft/Yr) | Rockwall Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 2,163 | $0* | $0.27 | $0.27 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 14 | Included under County Summaries in Section 4F. | | | |
| Additional NTMWD | 2020 | 10,007 | $0 | $1.25 | $1.25 | None |
| **Total Rockwall Capital Costs** | | | **$0** | | | |

* Rockwall has already made an initial capital investment to implement its conservation programs. In the future, all costs will be annual operating costs.

## City of Seagoville

The City of Seagoville provides water to Combine WSC and through Combine WSC to the City of Combine. Seagoville currently obtains its water supply from Dallas Water Utilities (DWU). Over the planning period, the sales to Combine WSC and the City of Combine are expected to exceed 1,000 acre-feet per year. In addition, the City of Crandall is considering obtaining water from Dallas, either through Seagoville or by a direct connection. Seagoville will continue to obtain all of its water supply from DWU. The recommended water management strategies for Seagoville are shown in Table 4E.69. The costs of these strategies are shown in Table 4E.70.

**Table 4E.69**
**Summary of Recommended Water Management Strategies for Seagoville**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Demand** | **2,829** | **3,920** | **4,867** | **5,852** | **6,934** | **8,080** |
| | | | | | | |
| **Existing Supplies** | | | | | | |
| *DWU* | *2,601* | *2,944* | *3,491* | *3,941* | *4,308* | *4,414* |
| ***Total Currently Available Supplies*** | ***2,601*** | ***2,944*** | ***3,491*** | ***3,941*** | ***4,308*** | ***4,414*** |
| | | | | | | |
| ***Need (Demand - Supply)*** | ***228*** | ***976*** | ***1,376*** | ***1,911*** | ***2,626*** | ***3,666*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 61 | 73 | 112 | 144 | 174 | 201 |
| Conservation (wholesale) | 12 | 69 | 125 | 179 | 251 | 349 |
| Additional DWU | 155 | 834 | 1,139 | 1,588 | 2,201 | 3,116 |
| **Total Supplies from Strategies** | **228** | **976** | **1,376** | **1,911** | **2,626** | **3,666** |
| **Total Supplies** | **2,829** | **3,920** | **4,867** | **5,852** | **6,934** | **8,080** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.70**
**Summary of Costs for Seagoville Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Seagoville (Ac-Ft/Yr) | Seagoville Share of Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|
| Conservation (retail) | 2010 | 201 | $0* | $0.53 | $0.53 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 349 | Included under County Summaries in Section 4F. | | | |
| Additional DWU | 2010 | 3,116 | $0 | $1.37 | $1.37 | None |
| **Total Seagoville Capital Costs** | | | **$0** | | | |

*Seagoville has already made an initial capital investment to implement its conservation programs. In addition, Seagoville is a customer of Dallas Water Utilities and thus is included in DWU's conservation efforts. In the future, all costs will be annual operating costs.

## City of Sherman

The City of Sherman provides water to Grayson County Steam Electric Power, Grayson County Manufacturing, Grayson County Other and Marilee Special Utility District. In the future, Sherman is expected to provide water for other water suppliers in Grayson County through the Grayson County Water Supply Project. Sherman uses groundwater from the Trinity and Woodbine Aquifers and water from Lake Texoma purchased from the Greater Texoma Utility Authority (GTUA) and treated at Sherman's desalination treatment plant. In the future, Sherman is expected to participate in the Grayson County Water Supply Project, which will include obtaining additional supplies from Lake Texoma, expanding Sherman's existing water treatment plant, developing and expanding a new desalination treatment plant, and providing supplies to other Grayson County Water User Groups. It is not clear how the participating entities will divide the development or the cost of the Grayson County Water Supply Project. For this plan, the costs (other than for Sherman's treatment plants) are shown under Greater Texoma Utility Authority in the section beginning on page 4E.47.

The recommended water management strategies for Sherman are shown in Table 4E.71. The costs of these strategies are shown in Table 4E.72.

**Table 4E.71**
**Recommended Water Management Strategies for Sherman**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **21,030** | **23,672** | **26,669** | **29,842** | **33,480** | **38,504** |
| **Currently Available Supplies** | | | | | | |
| *Lake Texoma (GTUA)* | *25,000* | *25,000* | *25,000* | *25,000* | *25,000* | *25,000* |
| *Lake Texoma (GTUA) Treated*** | *8,000* | *8,000* | *8,000* | *8,000* | *8,000* | *8,000* |
| *Lake Texoma (GTUA)* | *5,600* | *5,600* | *5,600* | *5,600* | *5,600* | *5,600* |
| *Texoma Supply Needing Additional Facilities** | *11,400* | *11,400* | *11,400* | *11,400* | *11,400* | *11,400* |
| *Groundwater (Trinity)* | *4,083* | *4,083* | *4,083* | *4,083* | *4,083* | *4,083* |
| *Groundwater (Woodbine)* | *3,463* | *3,463* | *3,463* | *3,463* | *3,463* | *3,463* |
| ***Total Currently Available Supplies*** | ***21,146*** | ***21,146*** | ***21,146*** | ***21,146*** | ***21,146*** | ***21,146*** |

**Table 4E.71, Continued**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| ***Need (Demand-Supply)*** | ***0*** | ***2,526*** | ***5,523*** | ***8,696*** | ***12,334*** | ***17,358*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation | 67 | 217 | 333 | 958 | 1,513 | 1,968 |
| WTP Expansion - Grayson County WSP (10 mgd) | | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 |
| WTP Expansion - Grayson County WSP (5 mgd) | | | 2,800 | 2,800 | 2,800 | 2,800 |
| New WTP - Grayson County WSP (10 mgd) and Additional Texoma (GTUA) | | | | | 5,600 | 5,600 |
| WTP Expansion - Grayson County WSP (10 mgd) and Additional Texoma (GTUA) | | | | | | 5,600 |
| Supplemental wells | | | | | | |
| **Total Supplies from Strategies** | **67** | **5,817** | **8,733** | **9,358** | **15,513** | **21,568** |
| **Total Supplies** | **21,213** | **26,963** | **29,879** | **30,504** | **36,659** | **42,714** |
| **Reserve (or Shortage)** | **183** | **3,291** | **3,210** | **662** | **3,179** | **4,210** |

Notes: * These supplies are made available by Treatment Plant expansions.
** Existing Sherman water treatment plant is assumed to be operated as a base load plant, with peaking from groundwater.

**Table 4E.72**
**Summary of Costs for Sherman Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Sherman (Ac-Ft/Yr) | Sherman Share of Capital Costs | Unit Cost ($/ 1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation | 2010 | 1,968 | $33,000 | $0.58 | $0.58 | Q-10 & Q-11 |
| Supplemental wells | 2010-2060 | 0 | $33,822,000 | N/A | N/A | Q-13 |
| Grayson County Water Supply Project (Water Treatment Plant Expansions) | 2020 | 19,618 | $146,071,000 | $2.58 | $1.25 | Q-86 |
| **Total Sherman Capital Costs** | | | **$179,926,000** | | | |

### City of Terrell

The City of Terrell supplies water to College Mound WSC, High Point WSC, Kaufman County Manufacturing, and a number of Water Supply Corporations and other suppliers included in Hunt County Other and Kaufman County Other. Terrell gets all of its water supplies from the North Texas Municipal Water District and plans to continue to obtain water from NTMWD through the planning period. As shown in Table 4E.73, the recommended water management strategies for Terrell include implementing water conservation measures, purchasing treated water from NTMWD, and constructing facilities to take water from NTMWD and to deliver water to Terrell's customers. The costs for these recommended strategies are shown on Table 4E.74.

**Table 4E.73**
**Summary of Recommended Water Management Strategies for Terrell**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Demand** | **5,536** | **12,385** | **17,046** | **21,631** | **24,557** | **27,931** |
| | | | | | | |
| **Existing Supplies** | | | | | | |
| *NTMWD* | *5,490* | *10,081* | *12,050* | *13,739* | *14,103* | *14,910* |
| ***Total Currently Available Supplies*** | ***5,490*** | ***10,081*** | ***12,050*** | ***13,739*** | ***14,103*** | ***14,910*** |
| | | | | | | |
| **Need (Demand - Supply)** | **46** | **2,304** | **4,996** | **7,892** | **10,454** | **13,021** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 28 | 556 | 1,085 | 1,593 | 2,000 | 2,475 |
| Conservation (wholesale) | 18 | 64 | 99 | 118 | 138 | 164 |
| Additional NTMWD | | 1,684 | 3,812 | 6,181 | 8,316 | 10,382 |
| Wholesale Water System Expansions and Upgrades | 0 | 0 | 0 | 0 | 0 | 0 |
| Additional Connection to NTMWD | Included in "Additional NTMWD" above | | | | | |
| **Total Supplies from Strategies** | **46** | **2,304** | **4,996** | **7,892** | **10,454** | **13,021** |
| **Total Supplies** | **5,536** | **12,385** | **17,046** | **21,631** | **24,557** | **27,931** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.74**
**Summary of Costs for Terrell Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Terrell (Ac-Ft/Yr) | Terrell Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 2,475 | $22,000 | $0.30 | $0.30 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010 | 164 | Included under County Summaries in Section 4F. | | | |
| Additional NTMWD | 2020 | 10,382 | $0 | $1.25 | $1.25 | None |
| Wholesale Water System Expansions and Upgrades | 2010-2020 | 0 | $12,673,000 | $0.66 | $0.30 | Q-205, Q-206, Q-207, Q-208, Q-209, Q-211 |
| Additional Connection to NTMWD | 2012 | Included in NTMWD amount above | $19,878,000 | $0.82 | $0.16 | Q-210 |
| **Total Terrell Capital Costs** | | | **$32,573,000** | | | |

## Walnut Creek Special Utility District (SUD)

Walnut Creek Special Utility District (SUD) purchases raw water from Tarrant Regional Water District (TRWD) and provides treated water to its own retail customers and to suppliers in Parker and Wise Counties. Its current wholesale customers include Boyd, Reno, Rhome, and West Wise Rural SUD. Walnut Creek SUD also provides retail service to the residents of Paradise and Sanctuary. The SUD plans to provide treated water to Aurora, Newark, and New Fairfield through Rhome before 2020. To meet the projected demands Walnut Creek SUD will need to purchase more water from TRWD and develop additional treatment capacity. The recommended water management strategies for Walnut Creek SUD include implementing water conservation measures, expanding their current water treatment facilities, constructing new treatment facilities, building a second pipeline to Boyd and Rhome, and purchasing additional water from TRWD. Table 4E.75 shows the recommended plan for Walnut Creek SUD. Table 4E.76 shows the capital and unit costs for the recommended strategies.

In addition, Walnut Creek SUD has the following alternative water supply strategies:

- Construction of a new water treatment plant on Lake Bridgeport and associated transmission facilities

- Purchase of treated water from Azle.

The costs for these alternative strategies are shown in Table 4E.77.

**Table 4E.75**
**Summary of Recommended Water Management Strategies**
**for Walnut Creek Special Utility District**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **3,663** | **5,584** | **8,588** | **10,849** | **12,244** | **13,588** |
| **Currently Available Supplies** | | | | | | |
| *TRWD* | 3,575 | 5,124 | 6,694 | 7,320 | 7,233 | 6,999 |
| *TRWD (limited by Treatment Plant Capacity - 1.6 peaking factor)* | *3,575* | *4,204* | *4,204* | *4,204* | *4,204* | *4,204* |
| ***Total Currently Available Supplies*** | ***3,575*** | ***4,204*** | ***4,204*** | ***4,204*** | ***4,204*** | ***4,204*** |
| | | | | | | |
| **Need (Demand - Supply)** | **88** | **1,380** | **4,384** | **6,645** | **8,040** | **9,384** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail and wholesale customers) | 88 | 304 | 548 | 737 | 886 | 1,040 |
| Conservation (retail) | 58 | 186 | 350 | 458 | 509 | 555 |
| Conservation (wholesale) | 30 | 118 | 198 | 279 | 377 | 485 |
| 2 mgd WTP Expansion (2.0 peaking) and additional TRWD | | 1,076 | 1,121 | 1,121 | 1,121 | 1,121 |
| Parallel Pipeline to Rhome (5 3-mile pipelines) | | 0 | 0 | 0 | 0 | 0 |
| 2 mgd WTP Expansion and Additional TRWD | | 0 | 1,121 | 1,121 | 1,121 | 1,121 |
| 2 mgd WTP Expansion and Additional TRWD | | | 1,121 | 1,121 | 1,121 | 1,121 |
| New Eagle Mountain WTP (2 mgd) | | | 473 | 1,121 | 1,121 | 1,121 |
| 2 mgd WTP Expansion and Additional TRWD | | | | 1,121 | 1,121 | 1,121 |
| 2 mgd WTP Expansion and Additional TRWD | | | | 303 | 1,121 | 1,121 |
| 2 mgd WTP Expansion and Additional TRWD | | | | | 428 | 1,121 |
| 2 mgd WTP Expansion and Additional TRWD | | | | | 0 | 497 |
| **Total Supplies from Strategies** | **88** | **1,380** | **4,384** | **6,645** | **8,040** | **9,384** |
| **Total Supplies** | **3,663** | **5,584** | **8,588** | **10,849** | **12,244** | **13,588** |
| **Surplus or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.76**
**Summary of Costs for Walnut Creek SUD Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Walnut Creek SUD (Ac-Ft/Yr) | Walnut Ck. SUD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010-2060 | 555 | $5,000 | $0.10 | $0.10 | Q-10 & Q-11 |
| Conservation (wholesale) | 2010-2060 | 485 | Included under County Summaries in Section 4F. | | | |
| 2 mgd WTP Expansion (2.0 peaking) and additional TRWD | 2012 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| Parallel Pipeline to Rhome (5 3-mile pipelines) | 2015 | 1,996 | $10,093,000 | $1.24 | $0.12 | Q-107 |
| 2 mgd WTP Expansion and Additional TRWD | 2017 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| 2 mgd WTP Expansion and Additional TRWD | 2022 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| New Eagle Mountain WTP (2 mgd) | 2027 | 1,121 | $11,576,000 | $3.01 | $0.70 | Q-15 |
| 2 mgd WTP Expansion and Additional TRWD | 2032 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| 2 mgd WTP Expansion and Additional TRWD | 2037 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| 2 mgd WTP Expansion and Additional TRWD | 2042 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| 2 mgd WTP Expansion and Additional TRWD | 2049 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| **Total Walnut Creek SUD Capital Costs** | | | **$72,564,000** | | | |

**Table 4E.77**
**Summary of Costs for Walnut Creek SUD Alternative Strategies**

| Strategy | Quantity for Walnut Creek SUD (Ac-Ft/Yr) | Walnut Creek SUD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|
| | | | With Debt Service | After Debt Service | |
| 12 mgd Water Treatment Plant on Lake Bridgeport and Transmission | 6,726 | $48,972,000 | $3.70 | $2.07 | Q-108 |
| Purchase of Treated water from Azle and Transmission | 6,726 | $20,133,000 | $3.33 | $2.66 | Q-109 |

## Waxahachie

The City of Waxahachie provides water to Buena Vista-Bethel SUD, Ellis County Other (small water supply corporations), and Ellis County Manufacturing. Potential future customers include Italy, Maypearl, Files Valley WSC, and Ellis County Steam Electric Power. Waxahachie obtains its current water supply from the following sources:

- Lake Waxahachie
- Bardwell Lake (by contract with TRA)
- Indirect reuse from Bardwell Lake (by contract with TRA)
- Supplies from Rockett SUD to retail connections in Waxahachie
- Water from TRWD through TRA from the Sokoll Water Treatment Plant, a joint project of Rockett SUD and Waxahachie.

Waxahachie's recommended strategies to meet its needs include:

- Conservation
- Additional water from TRWD through TRA for the Sokoll water treatment plant.
- Expansions of the Sokoll Water Treatment Plant and additional supplies from TRWD through TRA (part of the Ellis County Water Project)
- Raw water transmission for Ellis County Steam Electric Power.

These strategies are discussed individually below.

**Conservation.** Conservation is the projected conservation savings for Waxahachie and its customers, based on the recommended Region C water conservation program. Not including savings from low-flow plumbing fixtures (which amount to about 5 percent of demand and are built into demand projections) and not including reuse, conservation by Waxahachie and its customers is projected to reach 3,332 acre-feet per year by 2060.

**Additional TRWD (current Sokoll Plant) – Ellis County Water Supply Project.** As part of the Ellis County Water Supply Project, Waxahachie will obtain raw water from TRWD through TRA for treatment at the Sokoll Water Treatment Plant.

**Sokoll Plant Expansions – Ellis County Water Supply Project.** As part of the Ellis County Water Supply Project, Waxahachie will expand the Sokoll Water Treatment Plant and obtain additional raw water from TRWD through TRA for treatment.

**Raw Water Transmission for Ellis County Steam Electric Power.** Waxahachie is expected to supply water for steam electric power generation in Ellis County.

Table 4E.78 shows the recommended water management strategies for the City of Waxahachie. Table 4E.79 gives information on the capital and unit costs for the recommended water management strategies.

**Table 4E.78**
**Summary of Recommended Water Management Strategies for Waxahachie**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Projected Demands** | **9,110** | **11,681** | **13,851** | **19,365** | **25,648** | **31,320** |
| **Currently Available Supplies** | | | | | | |
| *Rockett SUD Supplies (for Rockett Retail Connections)* | *613* | *613* | *613* | *613* | *613* | *613* |
| *Lake Bardwell* | *4,320* | *4,320* | *4,183* | *3,988* | *3,794* | *3,600* |
| *Lake Waxahachie* | *2,905* | *2,800* | *2,695* | *2,590* | *2,485* | *2,380* |
| *Reuse* | *4,998* | *5,129* | *5,129* | *5,129* | *5,129* | *5,129* |
| *TRWD through TRA for Sokol* | *2,325* | *2,440* | *3,765* | *6,978* | *9,822* | *11,487* |
| *Sokoll Plant (Waxahachie share 10 mgd)* | *2,325* | *2,440* | *3,765* | *5,605* | *5,605* | *5,605* |

**Table 4E.78, Continued**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| ***Current Supply*** | ***15,161*** | ***15,302*** | ***16,385*** | ***17,925*** | ***17,626*** | ***17,327*** |
| ***Current Supply Limited by Plant Capacity (15 mgd South Plant)*** | ***11,346*** | ***11,461*** | ***12,786*** | ***14,626*** | ***14,626*** | ***14,626*** |
| | | | | | | |
| **Need (Demand - Supply)** | **0** | **220** | **1,065** | **4,739** | **11,022** | **16,694** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 56 | 452 | 815 | 1,162 | 1,620 | 2,251 |
| Conservation (wholesale customers) | 119 | 405 | 550 | 704 | 879 | 1,081 |
| Sokoll Plant Expansion (10 MGD to Waxahachie - from TRWD though TRA) | | 0 | 0 | 757 | 4,394 | 5,605 |
| Ellis County Steam Electric Supply Project (usable) | | | | 2,116 | 4,129 | 4,454 |
| Sokoll Plant Expansion (10 MGD to Waxahachie - from TRWD though TRA) | | | | | 0 | 3,303 |
| **Total Supplies from Strategies** | **175** | **857** | **1,365** | **4,739** | **11,022** | **16,694** |
| **Total Supplies** | **11,521** | **12,318** | **14,151** | **19,365** | **25,648** | **31,320** |
| **Reserve or (Shortage)** | **2,411** | **637** | **300** | **0** | **0** | **0** |

**Table 4E.79**
**Summary of Costs for Waxahachie Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Waxahachie (Ac-Ft/Yr) | Waxahachie Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 2,251 | $0 | $0.56 | $0.56 | Q-10 & Q-11 |
| Conservation (wholesale customers) | 2010 | 1,081 | Included under County Summaries in Section 4F. | | | |
| Sokoll Plant Expansion (10 MGD to Waxahachie - from TRWD though TRA) | 2015 | 5,605 | $19,226,000 | $1.46 | $0.70 | Q-74 |

**Table 4E.79, Continued**

| Strategy | Date to be Developed | Quantity for Waxahachie (Ac-Ft/Yr) | Waxahachie Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Ellis County Steam Electric Supply Project | 2040 | 4,454 | Included under Ellis County WSP in TRA, Table 4E.14. | | | |
| Sokoll Plant Expansion (10 MGD to Waxahachie - from TRWD though TRA) | 2045 | 5,605 | $19,226,000 | $1.46 | $0.70 | Q-74 |
| **Total Waxahachie Capital Costs** | | | **$38,452,000** | | | |

*Waxahachie has already made an initial capital investment to implement its conservation programs. In addition, Waxahachie is a customer of Tarrant Regional Water District (through TRA) and thus is included in TRWD's conservation efforts. In the future, all costs will be annual operating costs.

## City of Weatherford

The City of Weatherford provides municipal and manufacturing water to users in Parker County. Weatherford also provides a small amount of water from Lake Weatherford for steam electric power. Weatherford's water supply consists of water the city has rights to use out of Lake Weatherford and Benbrook Lake and raw water the city purchases from Tarrant Regional Water District. The currently available supplies for Weatherford are limited to 7,840 acre-feet per year because of treatment plant capacity. To fully utilize its existing water rights and contracts, Weatherford will need to expand its water treatment plant capacity and expand the pumping capacity of the pipeline from Benbrook Lake. The recommended water management strategies for Weatherford include implementing water conservation measures, increasing treatment capacity, increasing transmission pump capacity from Benbrook Lake, and purchasing additional water from the TRWD. Table 4E.80 shows the recommended water management strategies for Weatherford. Table 4E.81 shows the costs of the strategies.

**Table 4E.80**
**Summary of Recommended Water Management Strategies for Weatherford**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Projected Demands** | **6,269** | **7,883** | **9,291** | **10,607** | **11,915** | **13,399** |
| **Currently Available Supplies** | | | | | | |
| *Lake Weatherford* | *2,967* | *2,923* | *2,880* | *2,837* | *2,793* | *2,750* |
| *TRWD* | *3,076* | *4,550* | *4,998* | *5,243* | *5,389* | *5,486* |
| ***Current Supply*** | ***6,043*** | ***7,473*** | ***7,878*** | ***8,080*** | ***8,182*** | ***8,236*** |
| ***Current Supply Limited by Plant Capacity (14 mgd)*** | ***6,043*** | ***7,473*** | ***7,840*** | ***7,840*** | ***7,840*** | ***7,840*** |
| | | | | | | |
| **Need (Demand - Supply)** | **226** | **410** | **1,451** | **2,767** | **4,075** | **5,559** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 223 | 445 | 627 | 793 | 970 | 1,181 |
| Conservation (wholesale customers) | 4 | 65 | 87 | 112 | 150 | 177 |
| 7 mgd Water Treatment Plant Expansion and Water from TRWD | | | 737 | 1,862 | 2,955 | 3,920 |
| Expand Lake Benbrook PS | | | 0 | 0 | 0 | 0 |
| 7 mgd Water Treatment Plant Expansion and Water from TRWD | | | | | | 281 |
| **Total Supplies from Strategies** | **227** | **510** | **1,451** | **2,767** | **4,075** | **5,559** |
| **Total Supplies** | **6,270** | **7,983** | **9,291** | **10,607** | **11,915** | **13,399** |
| **Reserve or (Shortage)** | **1** | **100** | **0** | **0** | **0** | **0** |

**Table 4E.81**
**Summary of Costs for Weatherford Recommended Strategies**

| **Strategy** | **Date to be Developed** | **Quantity for Weatherford (Ac-Ft/Yr)** | **Weatherford Share of Capital Costs** | **Unit Cost ($/1000 gal)** | | **Table for Details** |
|---|---|---|---|---|---|---|
| | | | | **With Debt Service** | **After Debt Service** | |
| Conservation (retail) | 2010 | 1,181 | $10,000 | $0.47 | $0.47 | Q-10 & Q-11 |

**Table 4E.81, Continued**

| Strategy | Date to be Developed | Quantity for Weatherford (Ac-Ft/Yr) | Weatherford Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (wholesale customers) | 2010 | 177 | Included under County Summaries in Section 4F. | | | |
| 7 mgd Water Treatment Plant Expansion and Water from TRWD | 2030 | 3,920 | $18,211,000 | $1.56 | $0.70 | Q-15 |
| Expand Lake Benbrook Pump Station (7 mgd) | 2030 | 0 | $545,000 | $0.74 | $0.72 | Q-114 |
| 7 mgd Water Treatment Plant Expansion and Water from TRWD | 2060 | 3,920 | $18,211,000 | $1.56 | $0.70 | Q-15 |
| **Total Weatherford Capital Costs** | | | **$36,977,000** | | | |

## West Cedar Creek Municipal Utility District

West Cedar Creek Municipal Utility District purchases raw water from the Tarrant Regional Water District (TRWD). West Cedar Creek MUD currently provides water to Seven Points and Tool and plans to continue selling water to these entities in the future. The current supplies to West Cedar Creek MUD are limited by contract. The recommended water management strategies include implementing water conservation measures, purchasing additional water from the TRWD, and expanding water treatment capacity. Table 4E.82 shows the recommended water management strategies for the West Cedar Creek MUD. Table 4E.83 shows the costs of the strategies.

**Table 4E.82**
**Summary of Recommended Water Management Strategies for West Cedar Creek MUD**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **2,317** | **3,278** | **4,089** | **4,838** | **5,800** | **7,013** |
| **Currently Available Supplies** | | | | | | |
| *TRWD (limited by contract)* | *1,714* | *1,714* | *1,714* | *1,714* | *1,714* | *1,714* |
| ***Current Supply*** | ***1,714*** | ***1,714*** | ***1,714*** | ***1,714*** | ***1,714*** | ***1,714*** |

**Table 4E.82, Continued**

| Planned Supplies (Ac-Ft/Yr) | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Need (Demand - Supply)** | **603** | **1,564** | **2,375** | **3,124** | **4,086** | **5,299** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (retail) | 38 | 133 | 205 | 263 | 335 | 429 |
| Conservation (wholesale customers) | 6 | 23 | 33 | 41 | 49 | 61 |
| Additional TRWD (Limited by plant capacity) | 559 | 1,408 | 1,425 | 1,425 | 1,425 | 1,425 |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | | | 712 | 1,395 | 2,277 | 2,802 |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | | | | | | 582 |
| **Total Supplies from Strategies** | **603** | **1,564** | **2,375** | **3,124** | **4,086** | **5,299** |
| **Total Supplies** | **2,317** | **3,278** | **4,089** | **4,838** | **5,800** | **7,013** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.83**
**Summary of Costs for West Cedar Creek Municipal Utility District Recommended Strategies**

| Strategy | Date to be Developed | Quantity for WCCMUD (Ac-Ft/Yr) | WCCMUD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (retail) | 2010 | 429 | $5,000 | $0.09 | $0.09 | Q-10 & Q-11 |
| Conservation (wholesale customers) | 2010 | 61 | Included under County Summaries in Section 4F. | | | |
| Additional TRWD (current Plant) | 2010 | 1,425 | $0 | $0.72 | $0.72 | None |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | 2040 | 2,802 | $14,328,000 | $1.64 | $0.70 | Q-15 |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | 2060 | 2,802 | $14,328,000 | $1.64 | $0.70 | Q-15 |
| **Total WCCMUD Capital Costs** | | | **$28,661,000** | | | |

## Wise County Water Supply District

The current water supply for Wise County Water Supply District is water purchased from the Tarrant Regional Water District (TRWD). Wise County WSD supplies water to Decatur and Wise County Manufacturing and is expected to continue doing so. The recommended strategies for Wise County WSD include implementing water conservation measures, purchasing additional water from TRWD, and expanding water treatment capacity. Table 4E.84 shows the recommended water management strategies for the Wise County WSD. Table 4E.85 shows the costs of the strategies.

**Table 4E.84**
**Summary of Recommended Water Management Strategies for Wise County WSD**

| **Planned Supplies (Ac-Ft/Yr)** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Projected Demands** | **1,755** | **2,144** | **2,897** | **3,701** | **4,757** | **5,578** |
| **Currently Available Supplies** | | | | | | |
| *TRWD* | *1,730* | *1,966* | *2,258* | *2,496* | *2,810* | *2,873* |
| *TRWD Limited by Treatment Capacity (3.13 mgd)* | *1,730* | *1,754* | *1,754* | *1,754* | *1,754* | *1,754* |
| ***Current Supply*** | ***1,730*** | ***1,754*** | ***1,754*** | ***1,754*** | ***1,754*** | ***1,754*** |
| | | | | | | |
| **Need (Demand - Supply)** | **25** | **390** | **1,143** | **1,947** | **3,003** | **3,824** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Conservation (wholesale customers) | 25 | 108 | 189 | 278 | 398 | 514 |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | | 282 | 954 | 1,669 | 2,605 | 2,802 |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | | | | | | 508 |
| **Total Supplies from Strategies** | **25** | **390** | **1,143** | **1,947** | **3,003** | **3,824** |
| **Total Supplies** | **1,755** | **2,144** | **2,897** | **3,701** | **4,757** | **5,578** |
| **Reserve or (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

**Table 4E.85**
**Summary of Costs for Wise County Water Supply District Recommended Strategies**

| Strategy | Date to be Developed | Quantity for Wise Co. WSD (Ac-Ft/Yr) | Wise Co. WSD Share of Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|
| | | | | With Debt Service | After Debt Service | |
| Conservation (wholesale customers) | 2010-2060 | 514* | Included under County Summaries in Section 4F. | | | |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | 2012 | 2,802 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| 5 mgd Water Treatment Plant Expansion and Water from TRWD | 2045 | 2,802 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| **Total Wise Co. WSD Capital Costs** | | | **$14,540,000** | | | |

* Wise County WSD has no retail sales, so conservation savings are reflected in their customers' conservation savings.

# SECTION 4E
# LIST OF REFERENCES


(1) Chiang, Patel and Yerby, Inc.: *2005 Update - Long Range Water Supply Plan*, Dallas, December 31, 2005.

(2) City of Dallas: Letter from Acting City Manager Mary Suhm to Region C Chair Jim Parks, Dallas, March 17, 2005.

(3) Alan Plummer Associates, Inc.: *City of Dallas 5-Year Strategic Plan for Water Conservation*, Dallas, April 2005.

(4) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2001 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2001.

(5) Alan Plummer Associates, Inc.: *Draft Recycled Water Implementation Plan*, Dallas, August 2004.

(6) Espey Consultants, Inc., Brown and Root, Inc., Freese and Nichols, Inc. GSG, Inc., Crespo Consulting Services, Inc., *Final – Water Availability Models for the Trinity, Trinity-San Jacinto, and Neches Trinity Basins*, prepared for the Texas Water Development Board, Austin, March 2002.

(7) U.S. Army Corps of Engineers, Tulsa District, *Draft Environmental Assessment, Lake Texoma Storage Reallocation Study, Lake Texoma, Oklahoma and Texas*, Tulsa, January 2005.

(8) Schaumburg & Polk, Inc., *East Texas Region Plan*, prepared for the East Texas Regional Water Planning Group, May 2005.

(9) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

(10) Texas Water Development Board: *Water for Texas 2007*. [Online] Available URL: http://www.twdb.state.tx.us/wrpi/swp/swp.htm, April 2006.

# 4F. Recommended Water Management Strategies for Water User Groups by County

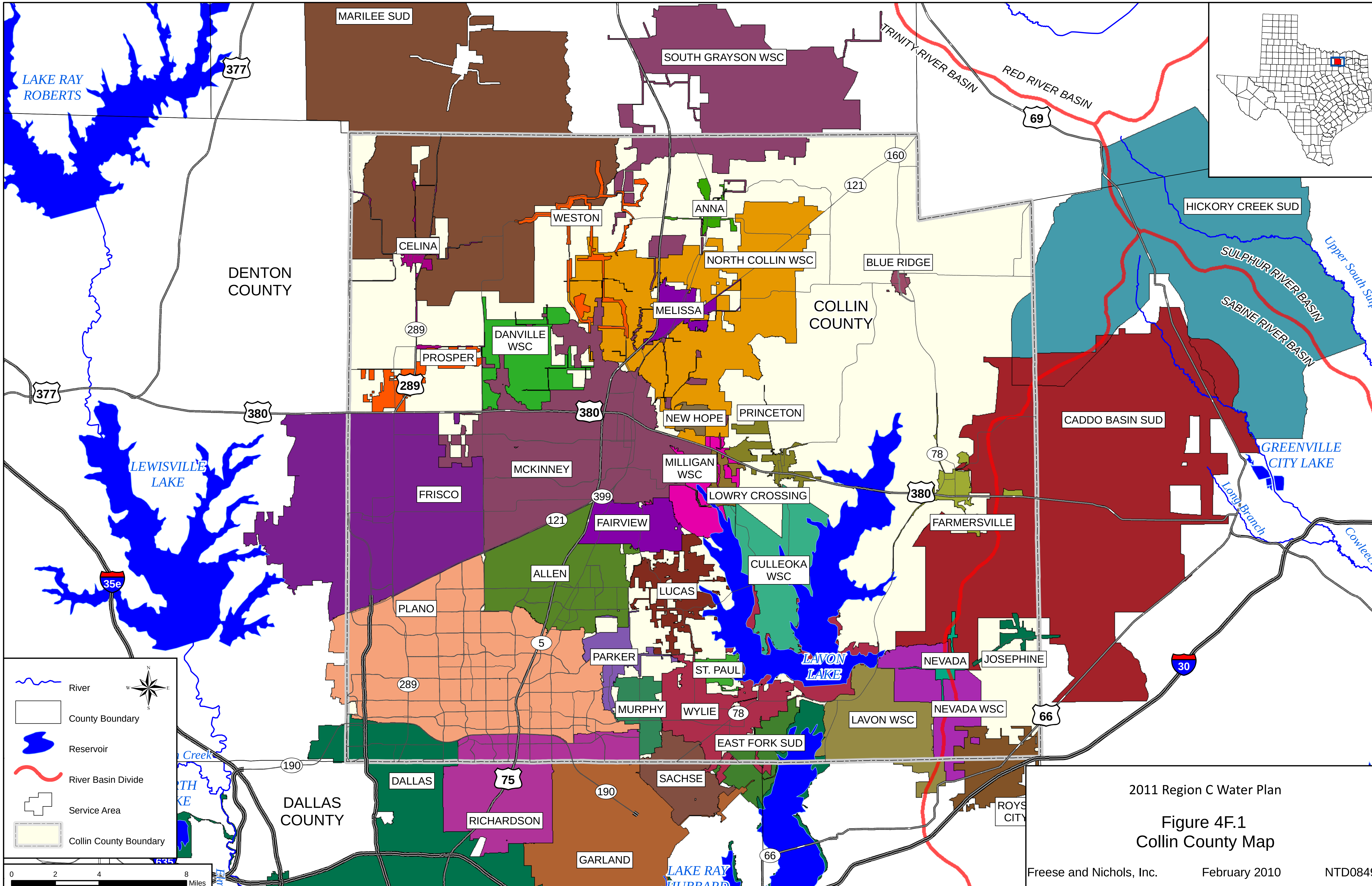
Appendix C includes a summary by water user group of the projected demands, current water supplies, and recommended water management strategies to provide additional supplies. Water management strategies and costs for wholesale water providers are discussed in Section 4E. The recommended strategies for the remaining water user groups in Region C (that are not also wholesale water providers) are discussed by county below. For water user groups that are located in multiple counties, the discussion is in the county with the largest share of their population.

## *4F.1 Collin County*

Figure 4F.1 is a map of Collin County. Most Collin County water user groups receive their water supplies from the North Texas Municipal Water District (NTMWD). Other sources of supply in Collin County include groundwater, Upper Trinity Regional Water District, Dallas, and local supplies. According to available data from the Texas Water Development Board, groundwater pumping from both the Trinity and Woodbine aquifers in Collin County exceeded managed available groundwater supplies in 2006. NTMWD will continue to supply most of the water used in the county. Water user groups that currently get water from NTMWD will purchase additional water from NTMWD to meet future demands, and some Collin County suppliers that do not currently get water from NTMWD are expected to do so in the future. Section 4E includes a discussion of the current and future sources of supply for NTMWD as a wholesale water provider.

The Greater Texoma Utility Authority (GTUA) is the sponsor of the Collin-Grayson Municipal Alliance Pipeline project, which supplies NTMWD water to Anna and Melissa in Collin County and to water user groups in Grayson County. Future expansions of this project will increase the capacity of the system. The cost for future expansions of the Collin-Grayson Municipal Alliance Pipeline Project is included under GTUA in Section 4E.

Water management strategies for Collin County water user groups are discussed below. The costs for Collin County water user groups are summarized in Tables 4F.34 on page 4F.35 and Table 4F.35 on page 4F.40. A summary for Collin County begins on page 4F.41.




2011 Region C Water Plan

Figure 4F.1
Collin County Map

Freese and Nichols, Inc. February 2010 NTD08492

## Allen

Allen is a city of slightly over 80,000 people located in south central Collin County. The city is nearly fully developed. Allen receives its water supply from NTMWD and will continue to be supplied by NTMWD. Table 4F.1 shows the projected population and demand, the current supplies, and the water management strategies for Allen.

**Table 4F.1**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Allen**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **82,000** | **90,000** | **98,000** | **98,500** | **98,500** | **98,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 20,207 | 24,699 | 27,663 | 27,694 | 27,694 | 27,694 |
| ***Total Projected Water Demand*** | ***20,207*** | ***24,699*** | ***27,663*** | ***27,694*** | ***27,694*** | ***27,694*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 19,809 | 20,103 | 19,555 | 17,589 | 15,905 | 14,783 |
| ***Total Current Supplies*** | ***19,809*** | ***20,103*** | ***19,555*** | ***17,589*** | ***15,905*** | ***14,783*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***398*** | ***4,596*** | ***8,108*** | ***10,105*** | ***11,789*** | ***12,911*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 398 | 1,459 | 2,090 | 2,347 | 2,579 | 2,810 |
| Additional Water from NTMWD | 0 | 3,137 | 6,018 | 7,758 | 9,210 | 10,101 |
| ***Total Water Management Strategies*** | ***398*** | ***4,596*** | ***8,108*** | ***10,105*** | ***11,789*** | ***12,911*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Anna

Anna has a population of about 9,000 and is expected to experience rapid growth in the coming decades. Anna is in north Collin County and currently receives its water supply from groundwater (Trinity and Woodbine Aquifers) and from NTMWD (through the Collin-Grayson Municipal Alliance). Water management strategies for Anna are conservation, expansion of the supply from NTMWD through the Collin-Grayson Municipal Alliance, and supplemental wells to replace existing water wells. Table 4F.2 shows the projected population and demand, the current supplies, and the water management strategies for Anna.

**Table 4F.2**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Anna**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **9,000** | **14,000** | **21,000** | **28,000** | **36,000** | **60,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,653 | 2,948 | 4,399 | 5,865 | 7,541 | 12,568 |
| ***Total Projected Water Demand*** | ***1,653*** | ***2,948*** | ***4,399*** | ***5,865*** | ***7,541*** | ***12,568*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 88 | 88 | 88 | 88 | 88 | 88 |
| Woodbine Aquifer | 124 | 124 | 124 | 124 | 124 | 124 |
| North Texas Municipal Water District (Collin-Grayson Municipal Alliance) | 1,408 | 1,668 | 1,668 | 1,668 | 1,668 | 1,668 |
| ***Total Current Supplies*** | ***1,620*** | ***1,880*** | ***1,880*** | ***1,880*** | ***1,880*** | ***1,880*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***33*** | ***1,068*** | ***2,519*** | ***3,985*** | ***5,661*** | ***10,688*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 33 | 165 | 298 | 448 | 640 | 1,169 |
| Expand Collin-Grayson Municipal Alliance, Additional Water from NTMWD | 0 | 903 | 2,221 | 3,537 | 5,021 | 9,519 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***33*** | ***1,068*** | ***2,519*** | ***3,985*** | ***5,661*** | ***10,688*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Blue Ridge

Blue Ridge is a city of about 2,000 people in northeast Collin County. The city's current water supply is groundwater (Woodbine Aquifer). Water management strategies for Blue Ridge are conservation, establishing a direct connection to NTMWD and purchasing water from NTMWD, and supplemental wells to replace existing water wells. Table 4F.3 shows the projected population and demand, the current supplies, and the water management strategies for Blue Ridge.

**Table 4F.3**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Blue Ridge**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,000** | **4,000** | **7,000** | **11,000** | **16,000** | **18,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 305 | 627 | 1,090 | 1,700 | 2,473 | 2,782 |
| ***Total Projected Water Demand*** | ***305*** | ***627*** | ***1,090*** | ***1,700*** | ***2,473*** | ***2,782*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 328 | 328 | 328 | 328 | 328 | 328 |
| ***Total Current Supplies*** | ***328*** | ***328*** | ***328*** | ***328*** | ***328*** | ***328*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***299*** | ***762*** | ***1,372*** | ***2,145*** | ***2,454*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 28 | 56 | 93 | 144 | 171 |
| Direct Connection and Water from NTMWD | 0 | 337 | 837 | 1,476 | 2,198 | 2,480 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***7*** | ***365*** | ***893*** | ***1,569*** | ***2,342*** | ***2,651*** |
| **Reserve (Shortage)** | **30** | **66** | **131** | **197** | **197** | **197** |

## Caddo Basin Special Utility District

Caddo Basin SUD has a current population of about 9,400, split almost evenly between Collin County in Region C and Hunt County in Region D. The SUD is expected to experience substantial growth, growing more rapidly in Hunt County than in Collin County. Caddo Basin SUD currently receives its water supply from NTMWD and is expected to continue to use NTMWD supplies. Water management strategies for Caddo Basin SUD are conservation and additional water from NTMWD. Table 4F.4 shows the projected population and demand, the current supplies, and the water management strategies for Caddo Basin SUD.

**Table 4F.4**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Caddo Basin Special Utility District (Regions C and D)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **9,386** | **11,653** | **14,690** | **18,807** | **26,258** | **37,161** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,210 | 1,501 | 1,893 | 2,423 | 3,382 | 4,787 |
| ***Total Projected Water Demand*** | ***1,210*** | ***1,501*** | ***1,893*** | ***2,423*** | ***3,382*** | ***4,787*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,199 | 1,222 | 1,338 | 1,539 | 1,942 | 2,555 |
| ***Total Current Supplies*** | ***1,199*** | ***1,222*** | ***1,338*** | ***1,539*** | ***1,942*** | ***2,555*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***11*** | ***279*** | ***555*** | ***884*** | ***1,440*** | ***2,232*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 11 | 39 | 55 | 70 | 87 | 106 |
| Additional Water from NTMWD | 0 | 240 | 500 | 814 | 1,353 | 2,126 |
| ***Total Water Management Strategies*** | ***11*** | ***279*** | ***555*** | ***884*** | ***1,440*** | ***2,232*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Celina

The City of Celina has a population of about 5,000 people and is located in northwest Collin County. Celina is projected to grow rapidly in the coming decades and to expand into Denton County. The city currently receives its water supply from groundwater (Trinity and Woodbine Aquifers) and from Upper Trinity Regional Water District (UTRWD). Water management strategies for Celina are conservation, additional water from UTRWD, establishing a direct connection to NTMWD and purchasing water from NTMWD, and supplemental wells to replace existing water wells. Table 4F.5 shows the projected population and demand, the current supplies, and the water management strategies for Celina.

**Table 4F.5**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Celina**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,000** | **25,414** | **53,798** | **95,267** | **145,702** | **168,118** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,238 | 6,234 | 13,076 | 23,050 | 35,253 | 40,677 |
| ***Total Projected Water Demand*** | ***1,238*** | ***6,234*** | ***13,076*** | ***23,050*** | ***35,253*** | ***40,677*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 317 | 317 | 317 | 317 | 317 | 317 |
| Woodbine Aquifer | 236 | 236 | 236 | 236 | 236 | 236 |
| Upper Trinity Regional Water District | 723 | 1,517 | 2,338 | 2,800 | 2,800 | 2,800 |
| ***Total Current Supplies*** | ***1,276*** | ***2,070*** | ***2,891*** | ***3,353*** | ***3,353*** | ***3,353*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***4,164*** | ***10,185*** | ***19,697*** | ***31,900*** | ***37,324*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 37 | 317 | 791 | 1,593 | 2,732 | 3,497 |
| Additional Water from UTRWD | 0 | 2,403 | 6,500 | 13,259 | 24,373 | 29,082 |
| Connection to NTMWD and Supply | 0 | 1,500 | 3,000 | 5,000 | 5,000 | 5,000 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***37*** | ***4,220*** | ***10,291*** | ***19,852*** | ***32,105*** | ***37,579*** |
| **Reserve (Shortage)** | **75** | **56** | **106** | **155** | **205** | **255** |

## Collin County Irrigation

Table 4F.6 shows the projected demand, the current supplies, and the water management strategies for Collin County Irrigation. Most irrigation in Collin County is for golf course irrigation. (The Texas Water Development classifies the use of potable water for golf course irrigation as a part of municipal use. The use of raw water or reuse of treated wastewater effluent for golf course irrigation is classified as irrigation use.) As shown in Table 4F.6, groundwater, direct reuse, local sources, and Dallas Water Utilities all provide water for irrigation in Collin County.

**Table 4F.6**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Collin County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **2,995** | **2,995** | **2,995** | **2,995** | **2,995** | **2,995** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Direct Reuse (The Colony) | 380 | 380 | 380 | 380 | 380 | 380 |
| Direct Reuse (NTMWD) | 1,847 | 1,847 | 1,847 | 1,847 | 1,847 | 1,847 |
| Other Aquifer | 21 | 21 | 21 | 21 | 21 | 21 |
| Trinity Aquifer | 545 | 545 | 545 | 545 | 545 | 545 |
| DWU Sources | 2,713 | 2,216 | 2,116 | 1,986 | 1,833 | 1,611 |
| Local Supplies | 408 | 408 | 408 | 408 | 408 | 408 |
| ***Total Current Supplies*** | ***5,914*** | ***5,417*** | ***5,317*** | ***5,187*** | ***5,034*** | ***4,812*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 99 | 190 | 238 | 283 | 328 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***6*** | ***99*** | ***190*** | ***238*** | ***283*** | ***328*** |
| **Reserve (Shortage)** | **2,925** | **2,521** | **2,512** | **2,430** | **2,322** | **2,145** |

## Collin County Livestock

Table 4F.7 shows the projected demand and the current supplies for Collin County Livestock. The current supplies for Collin County Livestock are local surface water supplies and unclassified aquifer supplies. The sources are sufficient to meet future demands.

**Table 4F.7**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Collin County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **884** | **884** | **884** | **884** | **884** | **884** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Livestock Local Supply | 1,002 | 1,002 | 1,002 | 1,002 | 1,002 | 1,002 |

**(Table 4F.7 continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Other Aquifer | 118 | 118 | 118 | 118 | 118 | 118 |
| ***Total Current Supplies*** | ***1,120*** | ***1,120*** | ***1,120*** | ***1,120*** | ***1,120*** | ***1,120*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **236** | **236** | **236** | **236** | **236** | **236** |

### Collin County Manufacturing

Table 4F.8 shows the projected demand, the current supplies, and the water management strategies for Collin County Manufacturing. Most manufacturing in Collin County is supplied by cities that obtain their water from NTMWD, and there is some supply from the Woodbine Aquifer. Conservation, additional supplies from NTMWD, and supplemental wells are the water management strategies to meet demands.

**Table 4F.8**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Collin County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **3,607** | **4,137** | **4,654** | **5,170** | **5,633** | **6,115** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 327 | 327 | 327 | 327 | 327 | 327 |
| North Texas Municipal Water District (through multiple suppliers) | 3,280 | 3,101 | 3,059 | 3,076 | 3,047 | 3,090 |
| ***Total Current Supplies*** | ***3,607*** | ***3,428*** | ***3,386*** | ***3,403*** | ***3,374*** | ***3,417*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***709*** | ***1,268*** | ***1,767*** | ***2,259*** | ***2,698*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 6 | 72 | 108 | 119 | 130 |

**(Table 4F.8 continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Additional Water from NTMWD | 0 | 703 | 1,196 | 1,659 | 2,140 | 2,568 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***709*** | ***1,268*** | ***1,767*** | ***2,259*** | ***2,698*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Collin County Mining

Table 4F.9 shows the projected demand, the current supplies, and the water management strategies for Collin County Mining. Collin County Mining is supplied from local supplies and from NTMWD. The water management strategy for this water user group is additional supplies from NTMWD.

**Table 4F.9**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Collin County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **341** | **341** | **341** | **341** | **341** | **341** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 195 | 195 | 195 | 195 | 195 | 195 |
| North Texas Municipal Water District | 146 | 119 | 103 | 93 | 84 | 78 |
| ***Total Current Supplies*** | ***341*** | ***314*** | ***298*** | ***288*** | ***279*** | ***273*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***27*** | ***43*** | ***53*** | ***62*** | ***68*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from NTMWD | 0 | 27 | 43 | 53 | 62 | 68 |
| ***Total Water Management Strategies*** | ***0*** | ***27*** | ***43*** | ***53*** | ***62*** | ***68*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Collin County Other

Collin County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included in Collin County

Other currently receive their water supply from either groundwater (Trinity and/or Woodbine aquifers) or from NTMWD. Water management strategies for these entities include conservation, additional water from NTMWD, and/or supplemental wells to replace existing water wells. Table 4F.10 shows the projected population and demand, the current supplies, and the water management strategies for Collin County Other.

**Table 4F.10**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Collin County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **6,408** | **5,981** | **5,600** | **5,208** | **4,801** | **4,369** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 818 | 743 | 677 | 613 | 554 | 504 |
| ***Total Projected Water Demand*** | ***818*** | ***743*** | ***677*** | ***613*** | ***554*** | ***504*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 655 | 655 | 655 | 655 | 655 | 655 |
| Woodbine Aquifer | 505 | 505 | 505 | 505 | 505 | 505 |
| North Texas Municipal Water District | 403 | 302 | 239 | 194 | 159 | 135 |
| ***Total Current Supplies*** | ***1,563*** | ***1,462*** | ***1,399*** | ***1,354*** | ***1,319*** | ***1,295*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 11 | 36 | 42 | 41 | 39 | 37 |
| Additional Water from NTMWD | 0 | 33 | 57 | 71 | 79 | 80 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***11*** | ***69*** | ***99*** | ***112*** | ***118*** | ***117*** |
| **Reserve (Shortage)** | **756** | **788** | **821** | **853** | **883** | **908** |

## Collin County Steam Electric Power

Table 4F.11 shows the projected demand, the current supplies, and the water management strategies for Collin County Steam Electric Power. Collin County Steam Electric Power is currently supplied by raw water purchased from NTMWD. The water management strategy for this water user group is additional supplies from NTMWD.

**Table 4F.11**
**Projected Demand, Current Supplies,**
**Water Management Strategies for Collin County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **771** | **715** | **1,000** | **1,200** | **1,600** | **2,000** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 771 | 0 | 0 | 0 | 0 | 0 |
| ***Total Current Supplies*** | ***771*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***715*** | ***1,000*** | ***1,200*** | ***1,600*** | ***2,000*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from NTMWD | 0 | 715 | 1,000 | 1,200 | 1,600 | 2,000 |
| ***Total Water Management Strategies*** | ***0*** | ***715*** | ***1,000*** | ***1,200*** | ***1,600*** | ***2,000*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Culleoka Water Supply Corporation

The service area for Culleoka WSC is located between the two arms of Lake Lavon in central Collin County. The WSC supplies about 8,500 people and receives its water supply from NTMWD through Princeton. Water management strategies for Culleoka WSC are conservation and additional water from NTMWD through Princeton. Table 4F.12 shows the projected population and demand, the current supplies, and the water management strategies for Culleoka WSC.

**Table 4F.12**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Culleoka Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **8,534** | **11,264** | **13,682** | **16,161** | **18,754** | **21,515** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 908 | 1,350 | 1,625 | 1,883 | 2,185 | 2,506 |
| ***Total Projected Water Demand*** | ***908*** | ***1,350*** | ***1,625*** | ***1,883*** | ***2,185*** | ***2,506*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Princeton (NTMWD) | 890 | 1,099 | 1,149 | 1,196 | 1,255 | 1,338 |
| ***Total Current Supplies*** | ***890*** | ***1,099*** | ***1,149*** | ***1,196*** | ***1,255*** | ***1,338*** |

(Table 4F.12, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***18*** | ***251*** | ***476*** | ***687*** | ***930*** | ***1,168*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 18 | 74 | 102 | 126 | 154 | 185 |
| Additional Water from Princeton | 0 | 177 | 374 | 561 | 776 | 983 |
| ***Total Water Management Strategies*** | ***18*** | ***251*** | ***476*** | ***687*** | ***930*** | ***1,168*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Dallas

Dallas Water Utilities (DWU) is the water utility of the City of Dallas, which has a population of about 1,300,000. DWU is a wholesale water provider. The City of Dallas is primarily in Dallas County but extends into Collin County and other counties. There is a detailed discussion of water supply plans for DWU beginning on page 4E.4 in Section 4E.

## Danville Water Supply Corporation

Danville WSC is located north of McKinney in northwest Collin County. The WSC currently receives its water supply from NTMWD through McKinney. Water Management Strategies for Danville WSC are conservation and additional water from NTMWD through McKinney. It should be noted that Danville WSC's service area has been decreasing in the past few years. The service area is being taken over by the cities of McKinney, Prosper, and Celina. After the population and demand projections for this project were finalized, it was determined that the current population is significantly less than the projections shown in this report. This information was provided after the TWDB approval of population and water demands and will be considered in the next round of planning. Table 4F.13 shows the projected population and demand, the current supplies, and the water management strategies for Danville WSC.

**Table 4F.13**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Danville Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **4,570** | **6,315** | **7,860** | **9,444** | **11,101** | **12,865** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 845 | 1,153 | 1,417 | 1,693 | 1,990 | 2,306 |
| ***Total Projected Water Demand*** | ***845*** | ***1,153*** | ***1,417*** | ***1,693*** | ***1,990*** | ***2,306*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| McKinney (NTMWD) | 834 | 938 | 1,002 | 1,075 | 1,143 | 1,231 |
| ***Total Current Supplies*** | ***834*** | ***938*** | ***1,002*** | ***1,075*** | ***1,143*** | ***1,231*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***11*** | ***215*** | ***415*** | ***618*** | ***847*** | ***1,075*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 11 | 72 | 108 | 143 | 184 | 232 |
| Additional Water from McKinney | 0 | 143 | 307 | 475 | 663 | 843 |
| ***Total Water Management Strategies*** | ***11*** | ***215*** | ***415*** | ***618*** | ***847*** | ***1,075*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## East Fork Special Utility District

East Fork SUD is located in southern Collin County and extends into Dallas and Rockwall Counties. The SUD receives its water supply from NTMWD. Water management strategies for East Fork SUD are conservation and additional water from NTMWD. Table 4F.14 shows the projected population and demand, the current supplies, and the water management strategies for East Fork SUD.

**Table 4F.14**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the East Fork Special Utility District**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **8,778** | **10,003** | **11,075** | **12,173** | **13,329** | **14,568** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,239 | 1,378 | 1,501 | 1,637 | 1,777 | 1,942 |
| ***Total Projected Demand*** | ***1,239*** | ***1,378*** | ***1,501*** | ***1,637*** | ***1,777*** | ***1,942*** |

(Table 4F.14, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,215 | 1,122 | 1,061 | 1,040 | 1,021 | 1,037 |
| ***Total Current Supplies*** | ***1,215*** | ***1,122*** | ***1,061*** | ***1,040*** | ***1,021*** | ***1,037*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***24*** | ***256*** | ***440*** | ***597*** | ***756*** | ***905*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 24 | 66 | 84 | 98 | 113 | 130 |
| Additional Water from NTMWD | 0 | 190 | 356 | 499 | 643 | 775 |
| ***Total Water Management Strategies*** | ***24*** | ***256*** | ***440*** | ***597*** | ***756*** | ***905*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Fairview

The City of Fairview is located in central Collin County and has a population of about 9,000. The city receives its water supply from NTMWD. Water management strategies for Fairview are conservation and additional water from NTMWD. Table 4F.15 shows the projected population and demand, the current supplies, and the water management strategies for Fairview.

**Table 4F.15**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Fairview**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **9,300** | **10,800** | **13,600** | **18,000** | **18,000** | **18,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 3,469 | 3,992 | 5,012 | 6,593 | 6,593 | 6,593 |
| ***Total Projected Demand*** | ***3,469*** | ***3,992*** | ***5,012*** | ***6,593*** | ***6,593*** | ***6,593*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 3,392 | 3,249 | 3,543 | 4,187 | 3,787 | 3,519 |
| ***Total Current Supplies*** | ***3,392*** | ***3,249*** | ***3,543*** | ***4,187*** | ***3,787*** | ***3,519*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***77*** | ***743*** | ***1,469*** | ***2,406*** | ***2,806*** | ***3,074*** |

**(4F.15, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| **Water Management Strategies** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Water Conservation | 77 | 252 | 410 | 597 | 653 | 708 |
| Additional Water from NTMWD | 0 | 491 | 1,059 | 1,809 | 2,153 | 2,366 |
| ***Total Water Management Strategies*** | ***77*** | ***743*** | ***1,469*** | ***2,406*** | ***2,806*** | ***3,074*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Farmersville

The City of Farmersville is located in western Collin County and receives its water supply from NTMWD. The city has a current population of about 3,700, and it is expected to grow rapidly in the coming decades. Water management strategies for Farmersville are conservation and additional water from NTMWD. Table 4F.16 shows the projected population and demand, the current supplies, and the water management strategies for Farmersville.

**Table 4F.16**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Farmersville**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,683** | **7,000** | **10,000** | **15,000** | **22,000** | **30,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 627 | 1,176 | 1,680 | 2,520 | 3,696 | 5,041 |
| ***Total Projected Demand*** | ***627*** | ***1,176*** | ***1,680*** | ***2,520*** | ***3,696*** | ***5,041*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 621 | 957 | 1,188 | 1,601 | 2,123 | 2,691 |
| ***Total Current Supplies*** | ***621*** | ***957*** | ***1,188*** | ***1,601*** | ***2,123*** | ***2,691*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***6*** | ***219*** | ***492*** | ***919*** | ***1,573*** | ***2,350*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 59 | 103 | 176 | 290 | 437 |
| Additional Water from NTMWD | 0 | 160 | 389 | 743 | 1,283 | 1,913 |
| ***Total Water Management Strategies*** | ***6*** | ***219*** | ***492*** | ***919*** | ***1,573*** | ***2,350*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Frisco

The City of Frisco is a rapidly growing community in west Collin County and east Denton County. The city has a population of about 109,000 and is expected to continue to grow rapidly. Frisco receives its water supply from NTMWD. Water management strategies for Frisco are conservation, additional water from NTMWD, and development of a direct reuse project for irrigation of parks and schools. Table 4F.17 shows the projected population and demand, the current supplies, and the water management strategies for Frisco.

**Table 4F.17**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Frisco**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **108,671** | **148,000** | **197,000** | **246,000** | **280,000** | **280,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 36,153 | 47,910 | 62,450 | 77,983 | 88,760 | 88,760 |
| ***Total Projected Demand*** | ***36,153*** | ***47,910*** | ***62,450*** | ***77,983*** | ***88,760*** | ***88,760*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 35,415 | 37,171 | 41,771 | 45,941 | 47,733 | 44,363 |
| ***Total Current Supplies*** | ***35,415*** | ***37,171*** | ***41,771*** | ***45,941*** | ***47,733*** | ***44,363*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***738*** | ***10,739*** | ***20,679*** | ***32,042*** | ***41,027*** | ***44,397*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 738 | 4,062 | 8,744 | 11,587 | 13,938 | 14,693 |
| Additional Water from NTMWD | 0 | 4,437 | 8,575 | 14,805 | 21,439 | 24,054 |
| Direct Reuse | 0 | 2,240 | 3,360 | 5,650 | 5,650 | 5,650 |
| ***Total Water Management Strategies*** | ***738*** | ***10,739*** | ***20,679*** | ***32,042*** | ***41,027*** | ***44,397*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Hickory Creek Special Utility District

Hickory Creek SUD is primarily located in Hunt County in the Northeast Texas Region (Region D), with some service area in northeast Collin County and south Fannin County in

Region C. Water management strategies for Region C are described under Fannin County on page 4F.195.

### Josephine

Josephine is located in southeastern Collin County, with a small part of the city in Hunt County in the Northeast Texas Region (Region D). Josephine has a population of about 900 and receives its water supply from NTMWD. Water management strategies for Josephine are conservation and additional water from NTMWD. Table 4F.18 shows the projected population and demand, the current supplies, and the water management strategies for Josephine.

**Table 4F.18**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Josephine (Region C and D)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **941** | **1,262** | **1,514** | **1,820** | **2,119** | **2,449** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 259 | 346 | 415 | 499 | 580 | 668 |
| ***Total Projected Demand*** | ***259*** | ***346*** | ***415*** | ***499*** | ***580*** | ***668*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 257 | 282 | 293 | 317 | 333 | 357 |
| ***Total Current Supplies*** | ***257*** | ***282*** | ***293*** | ***317*** | ***333*** | ***357*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***64*** | ***122*** | ***182*** | ***247*** | ***311*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 15 | 22 | 31 | 41 | 52 |
| Additional Water from NTMWD | 0 | 49 | 100 | 151 | 206 | 259 |
| ***Total Water Management Strategies*** | ***2*** | ***64*** | ***122*** | ***182*** | ***247*** | ***311*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Lavon Water Supply Corporation

Lavon WSC has a population of about 5,200, split between Collin and Rockwall Counties in Region C. The WSC receives its water supply from NTMWD and is projected to grow rapidly in the coming decades. Water management strategies for Lavon WSC are conservation and additional water from NTMWD. Table 4F.19 shows the projected population and demand, the current supplies, and the water management strategies for Lavon WSC.

**Table 4F.19**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Lavon Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,201** | **14,306** | **19,954** | **25,000** | **31,668** | **41,841** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 559 | 1,746 | 2,414 | 2,997 | 3,796 | 5,015 |
| ***Total Projected Demand*** | ***559*** | ***1,746*** | ***2,414*** | ***2,997*** | ***3,796*** | ***5,015*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 549 | 1,421 | 1,706 | 1,903 | 2,180 | 2,677 |
| ***Total Current Supplies*** | ***549*** | ***1,421*** | ***1,706*** | ***1,903*** | ***2,180*** | ***2,677*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***10*** | ***325*** | ***708*** | ***1,094*** | ***1,616*** | ***2,338*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 10 | 96 | 149 | 197 | 262 | 363 |
| Additional Water from NTMWD | 0 | 229 | 559 | 897 | 1,354 | 1,975 |
| ***Total Water Management Strategies*** | ***10*** | ***325*** | ***708*** | ***1,094*** | ***1,616*** | ***2,338*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Lowry Crossing

The City of Lowry Crossing has a population of about 1,900 and is located in central Collin County. Lowry Crossing receives its water supply from NTMWD through Milligan WSC. Water management strategies for Lowry Crossing are conservation and additional water from NTMWD through Milligan WSC. Table 4F.20 shows the projected population and demand, the current supplies, and the water management strategies for Lowry Crossing.

**Table 4F.20**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Lowry Crossing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,898** | **2,434** | **2,910** | **3,000** | **3,000** | **3,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 366 | 458 | 541 | 554 | 551 | 551 |
| ***Total Projected Demand*** | ***366*** | ***458*** | ***541*** | ***554*** | ***551*** | ***551*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Milligan WSC (NTMWD) | 362 | 373 | 382 | 352 | 316 | 294 |
| ***Total Current Supplies*** | ***362*** | ***373*** | ***382*** | ***352*** | ***316*** | ***294*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***4*** | ***85*** | ***159*** | ***202*** | ***235*** | ***257*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 22 | 33 | 39 | 43 | 48 |
| Additional Water from Milligan WSC | 0 | 63 | 126 | 163 | 192 | 209 |
| ***Total Water Management Strategies*** | ***4*** | ***85*** | ***159*** | ***202*** | ***235*** | ***257*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Lucas

The City of Lucas has a population of about 6,400 and is located in south central Collin County. Lucas receives its water supply from NTMWD. Water management strategies for Lucas are conservation and additional water from NTMWD. Table 4F.21 shows the projected population and demand, the current supplies, and the water management strategies for Lucas.

**Table 4F.21**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Lucas**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **6,400** | **9,849** | **12,000** | **15,500** | **22,000** | **30,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,032 | 1,533 | 1,828 | 2,344 | 3,327 | 4,537 |
| ***Total Projected Demand*** | ***1,032*** | ***1,533*** | ***1,828*** | ***2,344*** | ***3,327*** | ***4,537*** |

**(Table 4F.21, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,018 | 1,248 | 1,292 | 1,489 | 1,911 | 2,422 |
| ***Total Current Supplies*** | ***1,018*** | ***1,248*** | ***1,292*** | ***1,489*** | ***1,911*** | ***2,422*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***14*** | ***285*** | ***536*** | ***855*** | ***1,416*** | ***2,115*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 56 | 83 | 116 | 175 | 254 |
| Additional Water from NTMWD | 0 | 229 | 453 | 739 | 1,241 | 1,861 |
| ***Total Water Management Strategies*** | ***14*** | ***285*** | ***536*** | ***855*** | ***1,416*** | ***2,115*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Marilee Special Utility District (Formerly called Gunter Rural WSC)

Marilee SUD serves about 4,300 people and is located in northeastern Collin County and southeastern Grayson County. The water supply plans for Marilee SUD are discussed on page 4F.238 under Grayson County.

## McKinney

The City of McKinney is the county seat of Collin County. It has a population of about 130,000 and is located in central Collin County. McKinney gets all of its water supply from NTMWD and will continue to do so in the future. Water management strategies for McKinney include conservation and additional water from NTMWD. Table 4F.22 shows the projected population and demand, the current supplies, and the water management strategies for McKinney.

**Table 4F.22**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of McKinney**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **130,000** | **200,000** | **275,000** | **350,000** | **380,000** | **380,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 34,366 | 53,767 | 73,929 | 94,092 | 102,157 | 102,157 |
| Customer Demand* | 1,581 | 1,937 | 2,242 | 2,559 | 2,902 | 3,268 |
| ***Total Projected Demand*** | ***35,947*** | ***55,704*** | ***76,171*** | ***96,651*** | ***105,059*** | ***105,425*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 35,329 | 45,504 | 54,100 | 61,711 | 60,740 | 56,872 |
| ***Total Current Supplies*** | ***35,329*** | ***45,504*** | ***54,100*** | ***61,711*** | ***60,740*** | ***56,872*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***618*** | ***10,200*** | ***22,071*** | ***34,940*** | ***44,319*** | ***48,553*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 672 | 4,199 | 8,876 | 12,114 | 14,063 | 15,011 |
| Additional Water from NTMWD | 0 | 6,078 | 13,321 | 23,015 | 30,539 | 34,171 |
| ***Total Water Management Strategies*** | ***672*** | ***10,277*** | ***22,197*** | ***35,129*** | ***44,602*** | ***49,182*** |
| **Reserve (Shortage)** | **54** | **77** | **126** | **189** | **283** | **629** |

* Customer demand includes: all of Danville WSC, 20% of North Collin WSC, and 561 ac-ft/yr for Melissa.

## Melissa

Melissa is a city of about 5,000 people located in northern Collin County. The city receives its water supply from groundwater (Woodbine aquifer) and from NTMWD (through McKinney and through the GTUA Collin-Grayson Municipal Alliance pipeline) and is expected to grow rapidly in coming decades. Water management strategies for Melissa are conservation, additional water from NTMWD (through the GTUA Collin-Grayson Municipal Alliance pipeline), treated water supply line from NTMWD, and supplemental wells to replace existing water wells. Table 4F.23 shows the projected population and demand, the current supplies, and the water management strategies for Melissa.

**Table 4F.23**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Melissa**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,000** | **23,000** | **35,000** | **50,000** | **70,000** | **77,044** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 807 | 4,972 | 7,527 | 10,753 | 15,055 | 16,570 |
| ***Total Projected Demand*** | ***807*** | ***4,972*** | ***7,527*** | ***10,753*** | ***15,055*** | ***16,570*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 108 | 108 | 108 | 108 | 108 | 108 |
| North Texas Municipal Water District (through McKinney) | 561 | 561 | 561 | 561 | 561 | 561 |
| North Texas Municipal Water District (GTUA Collin-Grayson Municipal Alliance Pipeline) | 126 | 3,398 | 4,684 | 6,200 | 8,024 | 8,226 |
| ***Total Current Supplies*** | ***795*** | ***4,067*** | ***5,353*** | ***6,869*** | ***8,693*** | ***8,895*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***12*** | ***905*** | ***2,174*** | ***3,884*** | ***6,362*** | ***7,675*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 12 | 146 | 255 | 401 | 967 | 1,218 |
| Additional Water from NTMWD (GTUA CGMA Pipeline) | 0 | 759 | 1,919 | 3,483 | 5,395 | 6,457 |
| Treated Water Supply Line from NTMWD | 0 | 0 | 0 | 0 | 0 | 0 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***12*** | ***905*** | ***2,174*** | ***3,884*** | ***6,362*** | ***7,675*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Milligan Water Supply Corporation

Milligan WSC provides retail water service to the City of Lowry Crossing and to customers outside of Lowry Crossing, a total of about 3,500 people. (The supply to Lowry Crossing is small enough that Milligan WSC does not qualify as a wholesale water provider under TWDB rules.) Milligan WSC receives its water supply from NTMWD. Water management strategies for Milligan WSC are conservation and additional water from

NTMWD. Table 4F.24 shows the projected population and demand, the current supplies, and the water management strategies for Milligan WSC.

**Table 4F.24**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Milligan WSC**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | | | | | | |
| Outside Lowry Crossing | 1,621 | 1,621 | 1,621 | 1,621 | 1,621 | 1,621 |
| Lowry Crossing | 1,898 | 2,434 | 2,910 | 3,000 | 3,000 | 3,000 |
| **Total Population Served** | **3,519** | **4,055** | **4,531** | **4,621** | **4,621** | **4,621** |
| **Projected Water Demand** | | | | | | |
| Outside Lowry Crossing | 202 | 196 | 191 | 185 | 183 | 183 |
| Lowry Crossing | 366 | 458 | 541 | 554 | 551 | 551 |
| ***Total Projected Demand*** | ***568*** | ***654*** | ***732*** | ***739*** | ***734*** | ***734*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 561 | 532 | 517 | 469 | 422 | 392 |
| ***Total Current Supplies*** | ***561*** | ***532*** | ***517*** | ***469*** | ***422*** | ***392*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***7*** | ***122*** | ***215*** | ***270*** | ***312*** | ***342*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 32 | 45 | 52 | 56 | 62 |
| Additional Water from NTMWD | 0 | 90 | 170 | 218 | 256 | 280 |
| ***Total Water Management Strategies*** | ***7*** | ***122*** | ***215*** | ***270*** | ***312*** | ***342*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Murphy

The City of Murphy is located in southern Collin County and has a population of about 14,000. The city receives its water supply from NTMWD. Water management strategies for Murphy are conservation and additional water from NTMWD. Table 4F.25 shows the projected population and demand, the current supplies, and the water management strategies for Murphy.

**Table 4F.25**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Murphy**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **14,000** | **28,500** | **28,500** | **28,500** | **28,500** | **28,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 4,234 | 8,556 | 8,556 | 8,556 | 8,556 | 8,556 |
| ***Total Projected Demand*** | ***4,234*** | ***8,556*** | ***8,556*** | ***8,556*** | ***8,556*** | ***8,556*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 4,192 | 6,964 | 6,048 | 5,434 | 4,914 | 4,567 |
| ***Total Current Supplies*** | ***4,192*** | ***6,964*** | ***6,048*** | ***5,434*** | ***4,914*** | ***4,567*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***42*** | ***1,592*** | ***2,508*** | ***3,122*** | ***3,642*** | ***3,989*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 42 | 411 | 507 | 580 | 651 | 722 |
| Additional Water from NTMWD | 0 | 1,181 | 2,001 | 2,542 | 2,991 | 3,267 |
| ***Total Water Management Strategies*** | ***42*** | ***1,592*** | ***2,508*** | ***3,122*** | ***3,642*** | ***3,989*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Nevada

The City of Nevada is located in southeast Collin County and has a population of about 700. The city receives its water supply from NTMWD (through Nevada WSC, which provides retail service in the city). Water management strategies for Nevada are conservation and additional water from NTMWD (through Nevada WSC). Table 4F.26 shows the projected population and demand, the current supplies, and the water management strategies for Nevada.

**Table 4F.26**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Nevada**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **690** | **1,500** | **1,800** | **3,600** | **6,000** | **15,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 247 | 528 | 631 | 1,254 | 2,090 | 5,226 |
| ***Total Projected Demand*** | ***247*** | ***528*** | ***631*** | ***1,254*** | ***2,090*** | ***5,226*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Nevada WSC (NTMWD) | 245 | 429 | 446 | 796 | 1,200 | 2,790 |
| ***Total Current Supplies*** | ***245*** | ***429*** | ***446*** | ***796*** | ***1,200*** | ***2,790*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***99*** | ***185*** | ***458*** | ***890*** | ***2,436*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 22 | 33 | 76 | 145 | 405 |
| Additional Water from Nevada WSC | 0 | 77 | 152 | 382 | 745 | 2,031 |
| ***Total Water Management Strategies*** | ***2*** | ***99*** | ***185*** | ***458*** | ***890*** | ***2,436*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## New Hope

The City of New Hope is located in central Collin County and has a population of about 800. New Hope receives its water supply from NTMWD through North Collin WSC. Water management strategies for New Hope are conservation and additional water from NTMWD through North Collin WSC. Table 4F.27 shows the projected population and demand, the current supplies, and the water management strategies for New Hope.

**Table 4F.27**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of New Hope**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **826** | **1,200** | **2,000** | **3,000** | **4,500** | **10,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 267 | 383 | 632 | 944 | 1,416 | 3,148 |
| ***Total Projected Demand*** | ***267*** | ***383*** | ***632*** | ***944*** | ***1,416*** | ***3,148*** |

**(Table 4F.27, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| North Texas MWD (thru N. Collin WSC) | 265 | 312 | 447 | 600 | 813 | 1,680 |
| ***Total Current Supplies*** | ***265*** | ***312*** | ***447*** | ***600*** | ***813*** | ***1,680*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***71*** | ***185*** | ***344*** | ***603*** | ***1,468*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 17 | 35 | 61 | 103 | 255 |
| Additional Water from NTMWD | 0 | 54 | 150 | 283 | 500 | 1,213 |
| ***Total Water Management Strategies*** | ***2*** | ***71*** | ***185*** | ***344*** | ***603*** | ***1,468*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## North Collin Water Supply Corporation

North Collin WSC is located in north Collin County and serves the City of New Hope and customers outside of New Hope. North Collin WSC currently receives its water supply from NTMWD with a portion of the water delivered through McKinney. Water management strategies for North Collin WSC are conservation and additional water from NTMWD. Table 4F.28 shows the projected population and demand, the current supplies, and the water management strategies for North Collin WSC.

**Table 4F.28**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the North Collin Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,044** | **6,510** | **7,808** | **9,138** | **10,530** | **12,012** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 876 | 1,116 | 1,321 | 1,525 | 1,757 | 2,005 |
| Customer Demand | 267 | 383 | 632 | 944 | 1,416 | 3,148 |
| ***Total Projected Demand*** | ***1,143*** | ***1,499*** | ***1,953*** | ***2,469*** | ***3,173*** | ***5,153*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas MWD (part thru McKinney) | 1,129 | 1,220 | 1,381 | 1,569 | 1,822 | 2,750 |

(Table 4F.28, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Current Supplies*** | ***1,129*** | ***1,220*** | ***1,381*** | ***1,569*** | ***1,822*** | ***2,750*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***14*** | ***279*** | ***572*** | ***900*** | ***1,351*** | ***2,403*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 88 | 137 | 193 | 269 | 461 |
| Additional Water from NTMWD | 0 | 191 | 435 | 707 | 1,082 | 1,942 |
| ***Total Water Management Strategies*** | ***14*** | ***279*** | ***572*** | ***900*** | ***1,351*** | ***2,403*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Parker

The City of Parker is located in south Collin County and has a population of about 4,000. The city receives its water supply from NTMWD. Water management strategies for Parker are conservation and additional water from NTMWD. Table 4F.29 shows the projected population and demand, the current supplies, and the water management strategies for Parker.

**Table 4F.29**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Parker**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,900** | **10,900** | **16,000** | **26,000** | **38,000** | **52,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,494 | 4,078 | 5,950 | 9,669 | 14,132 | 19,338 |
| ***Total Projected Demand*** | ***1,494*** | ***4,078*** | ***5,950*** | ***9,669*** | ***14,132*** | ***19,338*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,482 | 3,319 | 4,206 | 6,141 | 8,116 | 10,322 |
| ***Total Current Supplies*** | ***1,482*** | ***3,319*** | ***4,206*** | ***6,141*** | ***8,116*** | ***10,322*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***12*** | ***759*** | ***1,744*** | ***3,528*** | ***6,016*** | ***9,016*** |
| | | | | | | |

(Table 4F.29, Continued)

| (Values in Ac-Ft/Yr) Water Management Strategies | Projected Population and Demand 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Water Conservation | 12 | 184 | 331 | 616 | 1,020 | 1,559 |
| Additional Water from NTMWD | 0 | 575 | 1,413 | 2,912 | 4,996 | 7,457 |
| ***Total Water Management Strategies*** | ***12*** | ***759*** | ***1,744*** | ***3,528*** | ***6,016*** | ***9,016*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Plano

Plano is a city of about 260,000 located in southwest Collin County and southeast Denton County. The city receives all of its water supply from NTMWD. Water management strategies for Plano are conservation and additional water from NTMWD. Table 4F.30 shows the projected population and demand, the current supplies, and the water management strategies for Plano.

**Table 4F.30**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Plano**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **263,300** | **271,100** | **275,000** | **277,000** | **279,000** | **280,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 75,208 | 76,828 | 77,318 | 77,570 | 77,818 | 78,097 |
| ***Total Projected Demand*** | ***75,208*** | ***76,828*** | ***77,318*** | ***77,570*** | ***77,818*** | ***78,097*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 74,702 | 62,531 | 54,657 | 49,267 | 44,693 | 41,687 |
| ***Total Current Supplies*** | ***74,702*** | ***62,531*** | ***54,657*** | ***49,267*** | ***44,693*** | ***41,687*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***506*** | ***14,297*** | ***22,661*** | ***28,303*** | ***33,125*** | ***36,410*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 506 | 3,307 | 4,365 | 5,053 | 5,724 | 6,395 |
| Additional Water from NTMWD | 0 | 10,990 | 18,296 | 23,250 | 27,401 | 30,015 |
| ***Total Water Management Strategies*** | ***506*** | ***14,297*** | ***22,661*** | ***28,303*** | ***33,125*** | ***36,410*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Princeton

The City of Princeton is located in central Collin County and has a population of about 6,000. Princeton is a wholesale water provider, and there is a detailed discussion of water supply plans for Princeton beginning on page 4E.94 in Section 4E.

## Prosper

The City of Prosper is located in western Collin County and eastern Denton County and has a population of about 8,000. The city currently receives its water supply from groundwater (Woodbine aquifer), NTMWD, and UTRWD. Water management strategies for Prosper are conservation, additional water from NTMWD, additional water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.31 shows the projected population and demand, the current supplies, and the water management strategies for Prosper.

**Table 4F.31**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Prosper**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **8,000** | **20,000** | **35,000** | **50,000** | **70,000** | **75,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,998 | 5,399 | 9,448 | 13,498 | 18,897 | 20,247 |
| ***Total Projected Demand*** | ***1,998*** | ***5,399*** | ***9,448*** | ***13,498*** | ***18,897*** | ***20,247*** |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 605 | 605 | 605 | 605 | 605 | 605 |
| North Texas Municipal Water District | 1,948 | 2,636 | 4,007 | 4,972 | 7,287 | 7,205 |
| Upper Trinity Regional Water District | 98 | 773 | 917 | 1,069 | 940 | 897 |
| ***Total Current Supplies*** | ***2,651*** | ***4,014*** | ***5,529*** | ***6,646*** | ***8,832*** | ***8,707*** |
| ***Need (Demand - Current Supply)*** | ***0*** | ***1,385*** | ***3,919*** | ***6,852*** | ***10,065*** | ***11,540*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 50 | 344 | 701 | 1,119 | 1,723 | 2,021 |
| Additional Water from NTMWD | 0 | 259 | 961 | 1,738 | 3,678 | 4,272 |
| Additional Water from UTRWD | 0 | 1,387 | 2,862 | 4,600 | 5,269 | 5,852 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***50*** | ***1,990*** | ***4,524*** | ***7,457*** | ***10,670*** | ***12,145*** |
| **Reserve (Shortage)** | **703** | **605** | **605** | **605** | **605** | **605** |

## Richardson

Richardson is a city of about 103,000 people located in north Dallas County and southwest Collin County. Since most of the population is in Dallas County, its water supply plans are discussed on page 4F.84 under Dallas County.

## Royse City

Royse City is a city of about 12,000 people located in northeast Rockwall County and southeast Collin County. Since most of the population is in Rockwall County, its water supply plans are discussed on page 4F.379 under Rockwall County.

## Sachse

Sachse is a city of about 20,000 people located in north Dallas County and south Collin County. Since most of the population is in Dallas County, its water supply plans are discussed on page 4F.85 under Dallas County.

## Saint Paul

The City of Saint Paul is located in south Collin County and has a population of about 1,000. The city receives its water supply from NTMWD. Water management strategies for Saint Paul are conservation and additional water from NTMWD. Table 4F.32 shows the projected population and demand, the current supplies, and the water management strategies for Saint Paul.

**Table 4F.32**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Saint Paul**

| **(Values in Ac-Ft/Yr)** | **Projected Population and Demand** | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,000** | **2,500** | **5,000** | **8,000** | **9,500** | **10,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 192 | 468 | 930 | 1,479 | 1,756 | 1,848 |
| ***Total Projected Demand*** | ***192*** | ***468*** | ***930*** | ***1,479*** | ***1,756*** | ***1,848*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 190 | 381 | 657 | 939 | 1,009 | 986 |
| ***Total Current Supplies*** | ***190*** | ***381*** | ***657*** | ***939*** | ***1,009*** | ***986*** |
| | | | | | | |

**(Table 4F.32, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***2*** | ***87*** | ***273*** | ***540*** | ***747*** | ***862*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 24 | 58 | 106 | 140 | 163 |
| Additional Water from NTMWD | 0 | 63 | 215 | 434 | 607 | 699 |
| ***Total Water Management Strategies*** | ***2*** | ***87*** | ***273*** | ***540*** | ***747*** | ***862*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### South Grayson Water Supply Corporation

South Grayson Water Supply Corporation is located in south Grayson County and north Collin County and has an estimated service area population of 2,700. The water supply plans for South Grayson WSC are discussed on page 4F.240 under Grayson County.

### Weston

Weston is a city of about 2,000 people located in northwest Collin County. Weston gets its current water supply from groundwater (Woodbine aquifer). Water management strategies for Weston are conservation, establishing a connection to NTMWD and purchasing water from NTMWD, and supplemental wells to replace existing water wells. Table 4F.33 shows the projected population and demand, the current supplies, and the water management strategies for Weston.

**Table 4F.33**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Weston**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,000** | **4,000** | **7,000** | **20,000** | **35,000** | **60,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 251 | 672 | 1,482 | 4,234 | 7,410 | 12,702 |
| ***Total Projected Demand*** | ***251*** | ***672*** | ***1,482*** | ***4,234*** | ***7,410*** | ***12,702*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 276 | 276 | 276 | 276 | 276 | 276 |
| ***Total Current Supplies*** | ***276*** | ***276*** | ***276*** | ***276*** | ***276*** | ***276*** |

**(Table 4F.33, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***396*** | ***1,206*** | ***3,958*** | ***7,134*** | ***12,426*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 8 | 50 | 117 | 370 | 712 | 1,327 |
| North Texas Municipal Water District | 0 | 401 | 1,199 | 3,754 | 6,588 | 11,265 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***8*** | ***451*** | ***1,316*** | ***4,124*** | ***7,300*** | ***12,592*** |
| **Reserve (Shortage)** | **33** | **55** | **110** | **166** | **166** | **166** |

## Wylie

Wylie has a population of about 40,000 and is located in southern Collin County, with some area in Dallas and Rockwall Counties. The City of Wylie currently receives its water supply from NTMWD. Water management strategies for Wylie are conservation and additional water from NTMWD. Table 4F.34 shows the projected population and demand, the current supplies, and the water management strategies for Wylie.

**Table 4F.34**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Wylie**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **40,000** | **52,000** | **63,000** | **75,000** | **75,000** | **75,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 6,810 | 8,737 | 10,586 | 12,601 | 12,601 | 12,601 |
| ***Total Projected Demand*** | ***6,810*** | ***8,737*** | ***10,586*** | ***12,601*** | ***12,601*** | ***12,601*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 6,663 | 7,111 | 7,483 | 8,003 | 7,237 | 6,726 |
| ***Total Current Supplies*** | ***6,663*** | ***7,111*** | ***7,483*** | ***8,003*** | ***7,237*** | ***6,726*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***147*** | ***1,626*** | ***3,103*** | ***4,598*** | ***5,364*** | ***5,875*** |
| | | | | | | |

**(Table 4F.34, Continued)**

| (Values in Ac-Ft/Yr)<br><br>Water Management Strategies | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Water Conservation | 147 | 673 | 1,213 | 1,556 | 1,662 | 1,767 |
| Additional Water from NTMWD | 0 | 953 | 1,890 | 3,042 | 3,702 | 4,108 |
| ***Total Water Management Strategies*** | ***147*** | ***1,626*** | ***3,103*** | ***4,598*** | ***5,364*** | ***5,875*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Costs for Collin County Water User Groups

Table 4F.35 shows the estimated capital costs for Collin County water management strategies not covered under the wholesale water providers, and Table 4F.36 summarizes the costs by category. Table 4F.36 is followed by a summary for Collin County.

**Table 4F.35**
**Costs for Recommended Water Management Strategies for Collin County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Allen | Conservation | 2010 | 2,810 | $17,000 | $0.30 | $0.30 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 10,101 | $0 | $1.25 | $1.25 | None |
| Anna | Conservation | 2010 | 1,169 | $5,000 | $0.41 | $0.41 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,381,000 | N/A | N/A | Q-13 |
| | Additional NTMWD supplies (CGMA) | See GTUA in Section 4E. | | | | | |
| Blue Ridge | Conservation | 2010 | 171 | $5,000 | $0.09 | $0.09 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,528,000 | N/A | N/A | Q-13 |
| | Connect to NTMWD and supplies | 2020 | 2,480 | $2,294,000 | $1.52 | $1.34 | Q-116 |
| Caddo Basin SUD* | Conservation | 2010 | 106 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 2,126 | $0 | $1.30 | $1.30 | None |
| Celina* | Conservation | 2010 | 3,497 | $5,000 | $0.24 | $0.24 | Q-10 & Q-11 |
| | Supplemental wells (Collin County only) | 2010 | 0 | $2,838,000 | N/A | N/A | Q-13 |
| | Connect to NTMWD and supplies | 2020 | 5,000 | $15,669,250 | $2.15 | $0.15 | Q-115 |
| | Additional UTRWD supplies | 2020 | 29,082 | $0 | $2.64 | $2.64 | None |
| Collin County Other | Conservation | 2010 | 42 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $595,000 | N/A | N/A | Q-13 |
| | Additional NTMWD supplies | 2020 | 80 | $0 | $1.30 | $1.30 | None |

(Table 4F.35, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Culleoka WSC | Conservation | 2010 | 185 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD supplies (through Princeton) | 2020 | 983 | $0 | $2.50 | $2.50 | None |
| Dallas* | Conservation | 2010 | 52,987 | See DWU in Section 4E. | | | |
| | See DWU Information in Section 4E. | See DWU in Section 4E. | | | | | |
| Danville WSC | Conservation | 2010 | 232 | $0 | $0.57 | $0.57 | Q-10 & Q-11 |
| | Additional NTMWD supplies (through McKinney) | 2020 | 843 | $0 | $2.50 | $2.50 | None |
| East Fork SUD* | Conservation | 2010 | 130 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 775 | $0 | $1.30 | $1.30 | None |
| Fairview | Conservation | 2010 | 708 | $10,000 | $0.27 | $0.27 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 2,366 | $0 | $1.30 | $1.30 | None |
| Farmersville | Conservation | 2010 | 437 | $0 | $0.49 | $0.49 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 1,913 | $0 | $1.25 | $1.25 | None |
| Frisco* | Conservation | 2010 | 14,693 | $46,000 | $0.23 | $0.23 | Q-10 & Q-11 |
| | Direct reuse | 2020 | 5,650 | $31,448,606 | $1.65 | $0.41 | Q-117 |
| | Additional NTMWD supplies | 2020 | 24,054 | $0 | $1.25 | $1.25 | None |
| Garland* | Conservation | 2010 | 5,075 | See Garland in Section 4E. | | | |
| | Additional NTMWD supplies | 2020 | 14,594 | See Garland in Section 4E. | | | |
| Hickory Creek SUD* | Additional Woodbine Aquifer (Region D) | Supplies are from Region D. See the Region D plan for costs. | | | | | |

(Table 4F.35, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Josephine* | Conservation | 2010 | 52 | $0 | $0.40 | $0.40 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 259 | $0 | $1.30 | $1.30 | None |
| Lavon WSC* | Conservation | 2010 | 363 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 1,975 | $0 | $1.30 | $1.30 | None |
| Lowry Crossing | Conservation | 2010 | 48 | $0 | $0.54 | $0.54 | Q-10 & Q-11 |
| | Additional NTMWD supplies (though Milligan WSC) | 2020 | 209 | $0 | $2.50 | $2.50 | None |
| Lucas | Conservation | 2010 | 254 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 1,861 | $0 | $1.30 | $1.30 | None |
| Marilee SUD* | Conservation | 2010 | 162 | See Grayson County. | | | |
| | Supplemental wells (Collin Co.) | See Grayson County. | | | | | |
| | Grayson County Project supplies | See Grayson County. | | | | | |
| McKinney | Conservation | 2010 | 14,687 | $64,000 | $0.30 | $0.30 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2010 | 32,940 | $0 | $1.25 | $1.25 | None |
| Melissa | Conservation | 2010 | 1,218 | $5,000 | $0.51 | $0.51 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,330,000 | N/A | N/A | Q-13 |
| | Supply line from NTMWD | 2012 | 0 | $1,916,000 | N/A | N/A | Q-254 |
| | Additional NTMWD supplies (CGMA) | 2020 | 6,457 | See GTUA in Section 4E. | | | |
| Milligan WSC | Conservation | 2010 | 14 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 71 | $0 | $1.30 | $1.30 | None |

(Table 4F.35, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Murphy | Conservation | 2010 | 722 | $0 | $0.35 | $0.35 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 3,267 | $0 | $1.30 | $1.30 | None |
| Nevada | Conservation | 2010 | 405 | $0 | $0.34 | $0.34 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 2,031 | $0 | $1.30 | $1.30 | None |
| New Hope | Conservation | 2010 | 255 | $0 | $0.38 | $0.38 | Q-10 & Q-11 |
| | Additional NTMWD supplies (through North Collin WSC) | 2020 | 1,213 | $0 | $2.50 | $2.50 | None |
| North Collin WSC | Conservation | 2010 | 206 | $0 | $0.61 | $0.61 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 730 | $0 | $1.30 | $1.30 | None |
| Parker | Conservation | 2010 | 1,559 | $0 | $0.24 | $0.24 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 7,457 | $0 | $1.30 | $1.30 | None |
| Plano* | Conservation | 2010 | 6,395 | $0 | $0.22 | $0.22 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 30,015 | $0 | $1.25 | $1.25 | None |
| Princeton | Conservation | 2010 | 1,300 | See Princeton in Section 4E. | | | |
| | Additional NTMWD supplies | 2020 | 6,221 | See Princeton in Section 4E. | | | |
| Prosper* | Conservation | 2010 | 2,021 | $5,000 | $0.27 | $0.27 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 4,272 | $0 | $1.30 | $1.30 | Q-118 |
| | Additional UTRWD supplies | 2020 | 5,852 | See Denton County. | | | |
| | Supplemental wells | 2010 | 0 | $4,583,166 | N/A | N/A | Q-13 |

**(Table 4F.35, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Richardson* | Conservation | See Dallas County. | | | | | |
| | Additional NTMWD supplies | See Dallas County. | | | | | |
| Royse City* | Conservation | See Rockwall County. | | | | | |
| | Additional NTMWD supplies | See Rockwall County. | | | | | |
| Sachse* | Conservation | See Dallas County. | | | | | |
| | Additional NTMWD supplies | See Dallas County. | | | | | |
| Saint Paul | Conservation | 2010 | 163 | $0 | $0.52 | $0.52 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 699 | $0 | $1.30 | $1.30 | None |
| South Grayson WSC* | Conservation | See Grayson County. | | | | | |
| | Supplemental wells (Grayson County) | See Grayson County. | | | | | |
| | NTMWD supplies (CGMA) | See Grayson County. | | | | | |
| | Grayson County Project supplies | See Grayson County. | | | | | |
| Weston | Conservation | 2010 | 1,327 | $5,000 | $0.36 | $0.36 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,168,000 | N/A | N/A | Q-13 |
| | Connect to NTMWD and supplies | 2020 | 11,265 | $27,722,000 | $3.95 | $0.28 | Q-119 |
| Wylie* | Conservation | 2010 | 1,767 | $10,000 | $0.63 | $0.63 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 4,108 | $0 | $1.25 | $1.25 | None |
| Collin County Irrigation | Conservation | 2010 | 328 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2020 | 0 | $608,000 | N/A | N/A | Q-13 |
| Collin County Livestock | Supplemental wells | 2020 | 0 | $304,000 | N/A | N/A | Q-13 |

(Table 4F.35, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| Collin County Manufacturing | Conservation | 2020 | 130 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $506,000 | N/A | N/A | Q-13 |
| | Additional NTMWD supplies | 2020 | 2,568 | $0 | $1.25 | $1.25 | None |
| Collin County Mining | NTMWD supplies | 2020 | 68 | N/A | $0.69 | $0.69 | None |
| Collin County Steam Electric | Additional NTMWD supplies | 2020 | 2,000 | $0 | $0.69 | $0.69 | None |

Note: Water User Groups marked with an * extend into more than one county.

**Table 4F.36**

**Summary of Recommended Water Management Strategies for Collin County Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 53,814 | $177,000 |
| Purchase from WWP | 201,193 | $0 |
| Supplemental Wells | 0 | $14,841,166 |
| Direct Reuse | 5,650 | $31,448,606 |
| Connect to Supplies | 18,745 | $47,601,250 |
| **Total** | | **$94,070,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.


COLLIN COUNTY COURTHOUSE

***2000 Population:*** 491,774

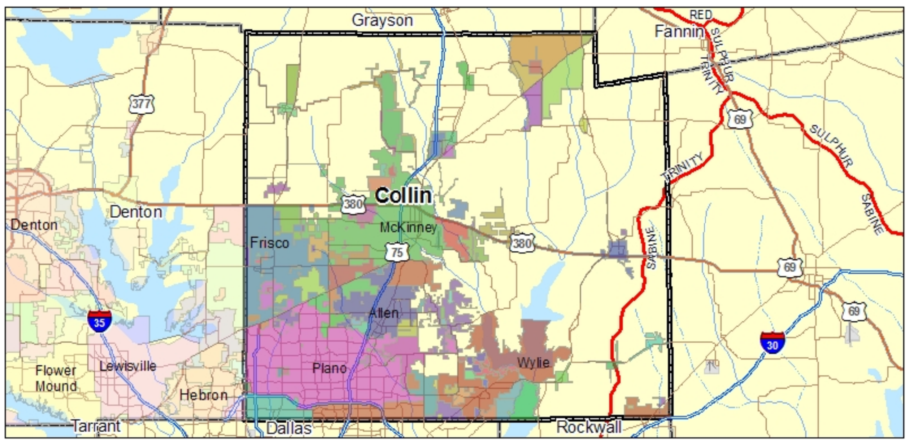
***Projected 2060 Population:*** 1,938,067

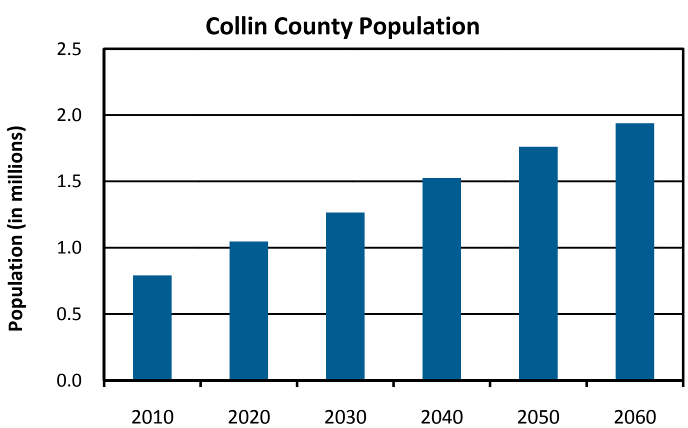
***County Seat:*** McKinney

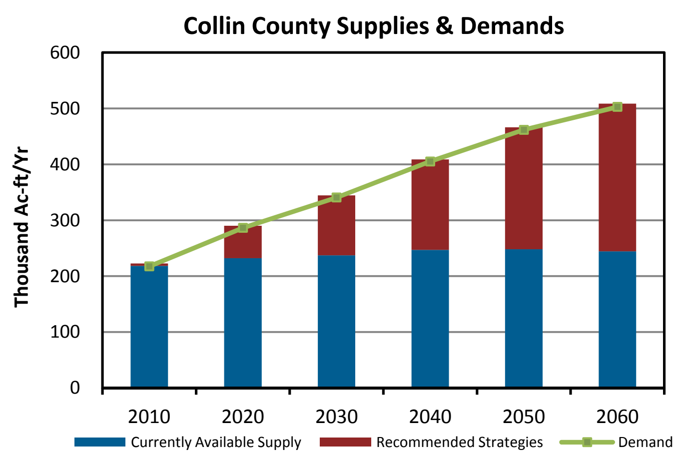
***Economy:*** Government/services; manufacturing; retail and wholesale

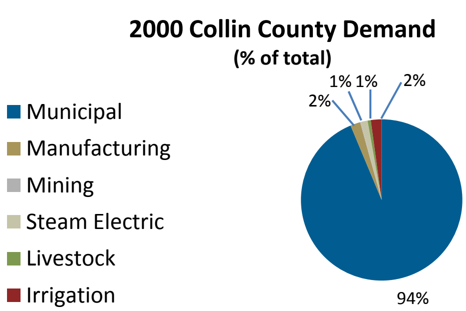
***River Basin(s):***

- Trinity (94%), Sabine (6%)

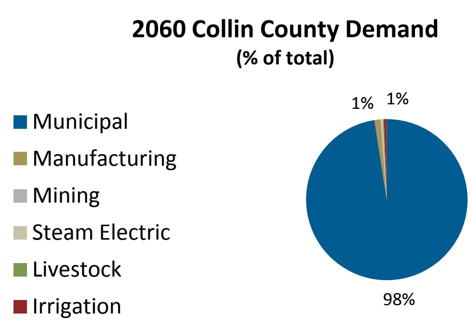



Total=138,306 acre-feet




Total= 502,770 acre-feet

| WATER USER GROUP | 2060 COLLIN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Allen | 27,694 | NTMWD | Additional NTMWD supplies |
| Anna | 12,568 | Trinity and Woodbine Aquifers, NTMWD (Collin-Grayson Municipal Alliance) | Supplemental wells, Additional NTMWD supplies (CGMA) |
| Blue Ridge | 2,782 | Woodbine Aquifer | Supplemental wells, NTMWD supplies |
| Caddo Basin SUD [a] | 1,541 | NTMWD | Additional NTMWD supplies |
| Celina [a] | 36,293 | Trinity and Woodbine Aquifers, UTRWD | Supplemental wells, Additional UTRWD supplies, NTMWD Supplies |
| Culleoka WSC | 2,506 | NTMWD (through Princeton) | Additional NTMWD supplies (through Princeton) |
| Dallas [a] | 20,005 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| Danville WSC | 2,306 | NTMWD (through McKinney) | Additional NTMWD supplies (through McKinney) |
| East Fork SUD [a] | 1,802 | NTMWD | Additional NTMWD supplies |
| Fairview | 6,593 | NTMWD | Additional NTMWD supplies |
| Farmersville | 5,041 | NTMWD | Additional NTMWD supplies |
| Frisco [a] | 54,480 | NTMWD | Additional NTMWD supplies, Direct reuse |
| Garland [a] | 0 | NTMWD | Additional NTMWD supplies |
| Hickory Creek SUD [a] | 29 | Woodbine Aquifer (Region D) | None |
| Josephine [a] | 660 | NTMWD | Additional NTMWD supplies |
| Lavon WSC [a] | 3,596 | NTMWD | Additional NTMWD supplies |
| Lowry Crossing | 551 | NTMWD (through Milligan WSC) | Additional NTMWD supplies (through Milligan WSC) |
| Lucas | 4,537 | NTMWD | Additional NTMWD supplies |
| Marilee SUD [a] | 1,360 | Trinity Aquifer, Grayson County Water Supply Project | Supplemental wells, Additional Grayson County WSP |
| McKinney | 102,157 | NTMWD | Additional NTMWD supplies |
| Melissa | 16,570 | Woodbine Aquifer, NTMWD (Collin-Grayson Municipal Alliance), NTMWD (through McKinney) | Supplemental wells, Additional NTMWD supplies (CGMA), Treated water supply line from NTMWD |
| Milligan WSC | 183 | NTMWD | Additional NTMWD supplies |
| Murphy | 8,556 | NTMWD | Additional NTMWD supplies |
| Nevada | 5,226 | NTMWD (through Nevada WSC) | Additional NTMWD supplies (through Nevada WSC) |
| New Hope | 3,148 | NTMWD (through North Collin WSC) | Additional NTMWD supplies (through North Collin WSC) |
| North Collin WSC | 2,005 | NTMWD | Additional NTMWD supplies |
| Parker | 19,338 | NTMWD | Additional NTMWD supplies |
| Plano [a] | 75,921 | NTMWD | Additional NTMWD supplies |

| WATER USER GROUP | 2060 COLLIN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [B] |
|---|---|---|---|
| Princeton | 16,130 | NTMWD | Additional NTMWD supplies |
| Prosper [a] | 13,498 | Woodbine Aquifer, NTMWD, UTRWD | Supplemental wells, Additional NTMWD supplies, Additional UTRWD supplies |
| Richardson [a] | 10,359 | NTMWD | Additional NTMWD supplies |
| Royse City [a] | 4,307 | NTMWD | Additional NTMWD supplies |
| Sachse [a] | 1,362 | NTMWD | Additional NTMWD supplies |
| Saint Paul | 1,848 | NTMWD | Additional NTMWD supplies |
| South Grayson WSC [a] | 225 | Trinity and Woodbine Aquifers | Supplemental wells, NTMWD and GTUA supplies (CGMA), Grayson County Water Supply Project |
| Weston | 12,702 | Woodbine Aquifer | Supplemental wells, NTMWD supplies |
| Wylie [a] | 12,052 | NTMWD | Additional NTMWD supplies |
| County-Other | 504 | Trinity and Woodbine Aquifers, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Irrigation | 2,995 | Direct reuse, Other and Trinity Aquifers, Local supplies, DWU | Supplemental wells |
| Livestock | 884 | Other Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 6,115 | Woodbine Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Mining | 341 | Local supplies, NTMWD | Additional NTMWD supplies |
| Steam Electric Power | 2,000 | NTMWD | Additional NTMWD supplies |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

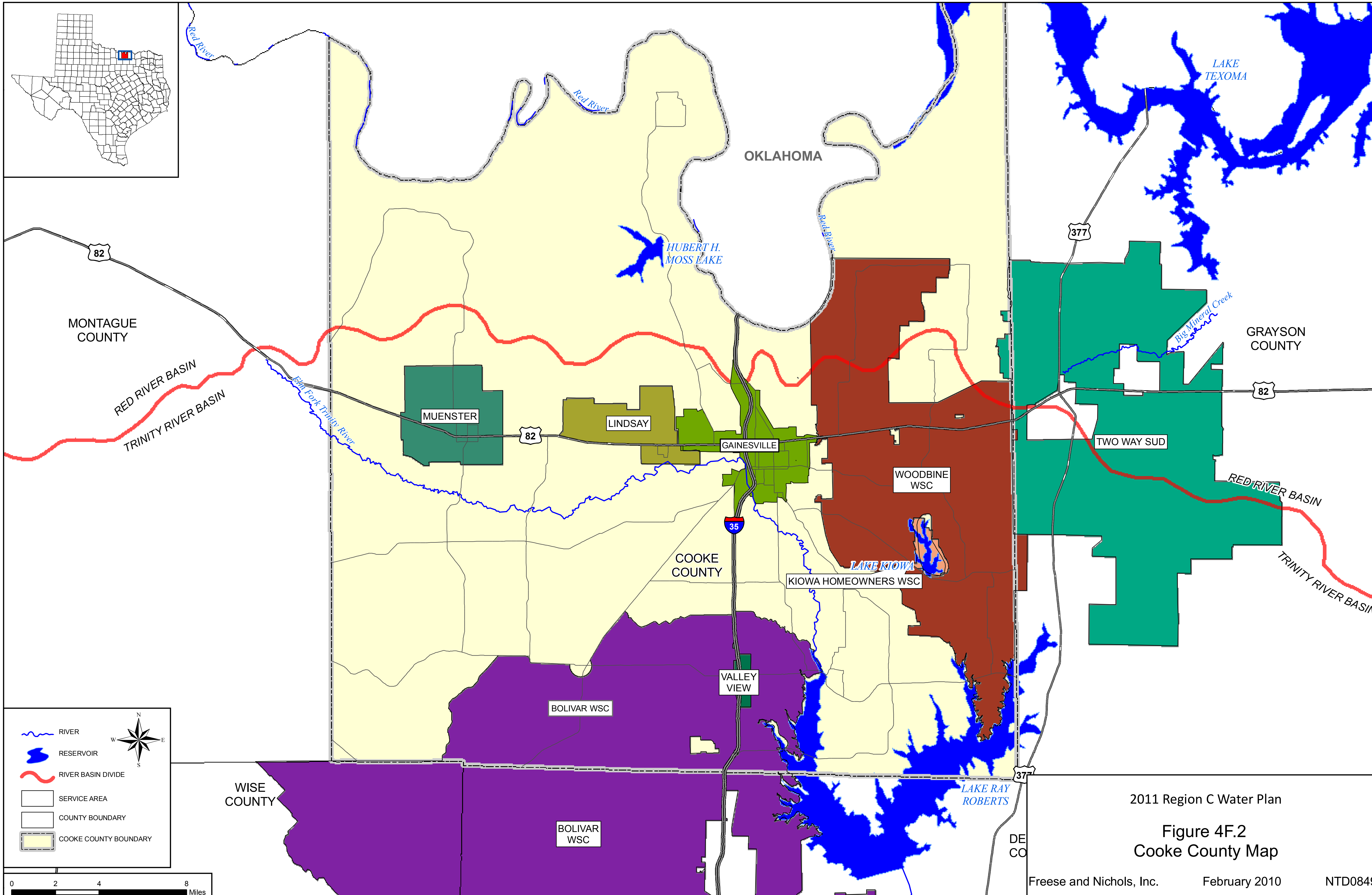
### 4F.2 Cooke County

Figure 4F.2 is a map of Cooke County. The Trinity aquifer provides most of the water currently used in the county. The other significant source of supply currently in use in Cooke County is Gainesville's surface water supply from Moss Lake. The projected demands in the county are greater than the estimated long-term reliable groundwater supply (managed available groundwater). Recommended water management strategies to meet demands in Cooke County include the following:

- Construction of transmission and treatment facilities to use water from Lake Muenster by the City of Muenster
- Development of the Cooke County Water Supply Project consisting of additional raw water transmission facilities from Moss Lake, treatment plant expansions for Gainesville, and treated water pipelines to deliver water to users throughout the county
- Supplies purchased from Gainesville
- Supplies purchased from the Upper Trinity Regional Water District.

As part of the Cooke County Water Supply Project, Gainesville is assumed to develop additional supplies from Moss Lake before 2020 by building new raw water delivery facilities and expanding its water treatment plant. Further treatment plant and raw water delivery expansions will be needed over time. The Cooke County Water Supply Project will also provide treated surface water from Moss Lake to water suppliers in Cooke County (Table 4F.37). It is discussed in Section 4E of this report under the City of Gainesville. The Cooke County Water Supply Project will be developed by a combination of Gainesville, Greater Texoma Utility Authority, and other suppliers in the county. For this plan, the capital costs ($50,280,000) are included under Gainesville in Section 4E.

Water management strategies for Cooke County water user groups are discussed below. The costs for Cooke County water user groups are summarized in Tables 4F.48 on page 4F.56 and Table 4F.49 on page 4F.59. A summary for Cooke County begins on page 4F.60.



OKLAHOMA
Red River
LAKE TEXOMA
HUBERT H. MOSS LAKE
MONTAGUE COUNTY
GRAYSON COUNTY
RED RIVER BASIN
TRINITY RIVER BASIN
Elm Fork Trinity River
Big Mineral Creek
82
377
35
MUENSTER
LINDSAY
GAINESVILLE
WOODBINE WSC
TWO WAY SUD
LAKE KIOWA
KIOWA HOMEOWNERS WSC
COOKE COUNTY
VALLEY VIEW
BOLIVAR WSC
WISE COUNTY
LAKE RAY ROBERTS
DE
CO
RIVER
RESERVOIR
RIVER BASIN DIVIDE
SERVICE AREA
COUNTY BOUNDARY
COOKE COUNTY BOUNDARY
N
S
E
W
0 2 4 8 Miles
2011 Region C Water Plan
Figure 4F.2
Cooke County Map
Freese and Nichols, Inc.
February 2010
NTD08492

**Table 4F.37**
**Supplies from the Cooke County Water Supply Project (from Gainesville)**

| Water User Group | Supplies from the Cooke Co. WSP (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Bolivar WSC | 0 | 18 | 83 | 104 | 127 | 149 |
| Cooke County Other | 0 | 125 | 125 | 125 | 125 | 125 |
| Gainesville | 0 | 1,518 | 1,161 | 1,945 | 2,420 | 1,912 |
| Kiowa Homeowners WSC | 0 | 100 | 100 | 100 | 100 | 100 |
| Lindsay | 0 | 40 | 50 | 50 | 50 | 50 |
| Valley View | 0 | 150 | 400 | 650 | 1,200 | 1,600 |
| Woodbine WSC | 0 | 40 | 80 | 120 | 170 | 230 |
| Cooke County Irrigation | 0 | 70 | 70 | 70 | 70 | 70 |
| Cooke County Manufacturing | 0 | 155 | 143 | 165 | 183 | 206 |
| Cooke County Mining | 0 | 24 | 28 | 31 | 35 | 38 |
| **Total** | **0** | **2,240** | **2,240** | **3,360** | **4,480** | **4,480** |
| Alternate Strategy: | | | | | | |
| Muenster | | 200 | 200 | 200 | 200 | 200 |

## Bolivar Water Supply Corporation

Bolivar WSC serves wholesale and retail customers in southern Cooke County and in Denton and Wise Counties. Bolivar WSC is a wholesale water provider, and there is a detailed discussion of water supply plans for the WSC beginning on page 4E.68 in Section 4E.

## Cooke County Irrigation

Cooke County Irrigation is supplied from groundwater (Trinity aquifer and other aquifer), direct reuse and local supplies. Water management strategies to develop additional supplies for irrigation include a temporary overdraft of the Trinity aquifer (in 2010 only), water conservation, direct reuse, supplies from the Cooke County Water Supply Project, and supplemental wells. Table 4F.38 shows the projected demand, the current supplies, and the water management strategies for Cooke County Irrigation.

**Table 4F.38**
**Projected Demand, Current Supplies and**
**Water Management Strategies for Cooke County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **444** | **444** | **444** | **444** | **444** | **444** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 172 | 172 | 172 | 172 | 172 | 172 |
| Other Aquifer | 100 | 100 | 100 | 100 | 100 | 100 |
| Direct Reuse | 9 | 9 | 9 | 9 | 9 | 9 |
| Local Supplies | 23 | 23 | 23 | 23 | 23 | 23 |
| ***Total Current Supplies*** | ***304*** | ***304*** | ***304*** | ***304*** | ***304*** | ***304*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***140*** | ***140*** | ***140*** | ***140*** | ***140*** | ***140*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 6 | 11 | 15 | 18 | 22 |
| Overdraft Trinity Aquifer | 140 | 0 | 0 | 0 | 0 | 0 |
| Direct Reuse | 0 | 70 | 70 | 70 | 70 | 70 |
| Cooke County Water Supply Project | 0 | 70 | 70 | 70 | 70 | 70 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***140*** | ***146*** | ***151*** | ***155*** | ***158*** | ***162*** |
| **Reserve (Shortage)** | **0** | **6** | **11** | **15** | **18** | **22** |

## Cooke County Livestock

Table 4F.39 shows the projected demand, the current supplies, and the water management strategies for Cooke County Livestock. As the table shows, current supplies are from the Trinity aquifer and local supplies and are sufficient to meet the projected demand. Supplemental wells to maintain current water supplies are the only water management strategy.

**Table 4F.39**
**Projected Demand, Current Supplies and**
**Water Management Strategies for Cooke County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,898** | **1,898** | **1,898** | **1,898** | **1,898** | **1,898** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 711 | 711 | 711 | 711 | 711 | 711 |
| Local Supplies | 1,187 | 1,187 | 1,187 | 1,187 | 1,187 | 1,187 |
| ***Total Current Supplies*** | ***1,898*** | ***1,898*** | ***1,898*** | ***1,898*** | ***1,898*** | ***1,898*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Cooke County Manufacturing

Cooke County manufacturing is currently supplied from the Trinity aquifer and surface water provided through Gainesville. Water management strategies include conservation, the Cooke County Water Supply Project, Lake Muenster, and supplemental wells. Table 4F.40 shows the projected demand, the current supplies, and the water management strategies for Cooke County Manufacturing.

**Table 4F.40**
**Projected Demand, Current Supplies and**
**Water Management Strategies for Cooke County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **273** | **306** | **335** | **364** | **389** | **421** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 50 | 50 | 50 | 50 | 50 | 50 |
| Gainesville | 215 | 194 | 158 | 152 | 137 | 130 |
| ***Total Current Supplies*** | ***265*** | ***244*** | ***208*** | ***202*** | ***187*** | ***180*** |
| | | | | | | |

**(Table 4F.40, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***8*** | ***62*** | ***127*** | ***162*** | ***202*** | ***241*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 1 | 7 | 10 | 11 | 12 |
| Cooke County Water Supply Project | 8 | 61 | 60 | 91 | 128 | 164 |
| Lake Muenster | 0 | 0 | 60 | 61 | 63 | 65 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***8*** | ***62*** | ***127*** | ***162*** | ***202*** | ***241*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Cooke County Mining

Cooke County Mining is currently supplied from the Trinity aquifer and local supplies. Water management strategies to develop additional supplies for Cooke County Mining include a temporary overdraft of the Trinity aquifer (in 2010 only), direct reuse, supplies from the Cooke County Water Supply Project, and supplemental wells. Table 4F.41 shows the projected demand, the current supplies, and the water management strategies for Cooke County Mining.

**Table 4F.41**
**Projected Demand, Current Supplies and**
**and Water Management Strategies for Cooke County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **361** | **484** | **421** | **428** | **435** | **441** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 49 | 49 | 49 | 49 | 49 | 49 |
| Local Supplies | 237 | 237 | 237 | 237 | 237 | 237 |
| ***Total Current Supplies*** | ***286*** | ***286*** | ***286*** | ***286*** | ***286*** | ***286*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***75*** | ***198*** | ***135*** | ***142*** | ***149*** | ***155*** |
| | | | | | | |

(Table 4F.41, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Overdraft Trinity Aquifer (existing wells) | 75 | 0 | 0 | 0 | 0 | 0 |
| Direct Reuse | 0 | 99 | 67 | 71 | 74 | 77 |
| Cooke County Water Supply Project | 0 | 99 | 68 | 71 | 75 | 78 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***75*** | ***198*** | ***135*** | ***142*** | ***149*** | ***155*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Cooke County Other

The entities included under Cooke County Other currently receive their water supply from groundwater (Trinity, Woodbine and/or other aquifers). Water management strategies for these entities include conservation, participation in the Cooke County Water Supply Project, and supplemental wells to replace existing water wells. Table 4F.42 shows the projected population and demand, the current supplies, and the water management strategies for Cooke County Other.

**Table 4F.42**
**Projected Population and Demand, Current Supplies and**
**and Water Management Strategies for Cooke County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **9,487** | **10,181** | **10,533** | **10,590** | **10,586** | **10,586** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,074 | 1,232 | 1,251 | 1,234 | 1,221 | 1,222 |
| ***Total Projected Water Demand*** | ***1,074*** | ***1,232*** | ***1,251*** | ***1,234*** | ***1,221*** | ***1,222*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 883 | 883 | 883 | 883 | 883 | 883 |
| Woodbine Aquifer | 154 | 154 | 154 | 154 | 154 | 154 |
| Other Aquifer | 137 | 137 | 137 | 137 | 137 | 137 |
| ***Total Current Supplies*** | ***1,174*** | ***1,174*** | ***1,174*** | ***1,174*** | ***1,174*** | ***1,174*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***58*** | ***77*** | ***60*** | ***47*** | ***48*** |
| | | | | | | |

(Table 4F.42, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 13 | 47 | 65 | 70 | 74 | 78 |
| Cooke County Water Supply Project | 0 | 125 | 125 | 125 | 125 | 125 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***13*** | ***172*** | ***190*** | ***195*** | ***199*** | ***203*** |
| **Reserve (Shortage)** | **113** | **114** | **113** | **135** | **152** | **155** |

## Gainesville

Gainesville is the county seat of Cooke County and has a population of about 17,000. Gainesville is a wholesale water provider, and there is a detailed discussion of water supply plans for the city beginning on page 4E.78 in Section 4E.

## Kiowa Homeowners Water Supply Corporation

Kiowa Homeowners WSC serves about 3,300 people around Lake Kiowa in eastern Cooke County. The WSC currently gets its water supply from groundwater (Trinity aquifer). Water management strategies for Kiowa Homeowners WSC are conservation, participation in the Cooke County Water Supply Project, and supplemental wells to replace existing water wells. Table 4F.43 shows the projected population and demand, the current supplies, and the water management strategies for Kiowa Homeowners WSC.

**Table 4F.43**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the Kiowa Homeowners Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,324** | **3,567** | **3,691** | **3,711** | **3,710** | **3,709** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 875 | 931 | 955 | 952 | 948 | 947 |
| ***Total Projected Demand*** | ***875*** | ***931*** | ***955*** | ***952*** | ***948*** | ***947*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 887 | 887 | 887 | 887 | 887 | 887 |
| ***Total Current Supplies*** | ***887*** | ***887*** | ***887*** | ***887*** | ***887*** | ***887*** |

**(Table 4F.43, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***44*** | ***68*** | ***65*** | ***61*** | ***60*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 20 | 28 | 31 | 34 | 38 |
| Cooke County Water Supply Project | 0 | 100 | 100 | 100 | 100 | 100 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***6*** | ***120*** | ***128*** | ***131*** | ***134*** | ***138*** |
| **Reserve (Shortage)** | **18** | **76** | **60** | **66** | **73** | **78** |

## Lindsay

Lindsay is a city of about 900 people in central Cooke County. The city currently receives its water supply from the Trinity aquifer. Water management strategies for Lindsay are conservation, participation in the Cooke County Water Supply Project, and supplemental wells to replace existing water wells. Table 4F.44 shows the projected population and demand, the current supplies, and the water management strategies for Lindsay. The City of Lindsay has purchased a portion of GTUA's water supply from Lake Texoma and plans to utilize it in the future.

**Table 4F.44**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Lindsay**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **879** | **943** | **976** | **981** | **981** | **981** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 154 | 161 | 164 | 162 | 160 | 160 |
| ***Total Projected Demand*** | ***154*** | ***161*** | ***164*** | ***162*** | ***160*** | ***160*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 165 | 165 | 165 | 165 | 165 | 165 |
| ***Total Current Supplies*** | ***165*** | ***165*** | ***165*** | ***165*** | ***165*** | ***165*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 5 | 7 | 8 | 8 | 9 |
| Cooke County Water Supply Project | 0 | 40 | 50 | 50 | 50 | 50 |

(Table 4F.44, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***45*** | ***57*** | ***58*** | ***58*** | ***59*** |

## Muenster

The City of Muenster currently receives its water supply from the Trinity aquifer. Water management strategies for Muenster are conservation, construction of a water treatment plant at Muenster Lake to begin utilizing Muenster Lake supply, and supplemental wells to replace existing water wells. Participation in the Cooke County Water Supply Project is an alternative water management strategy for Muenster. Table 4F.45 shows the projected population and demand, the current supplies, and the recommended water management strategies for Muenster.

**Table 4F.45**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Muenster**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,700** | **1,800** | **1,900** | **2,000** | **2,100** | **2,200** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 339 | 351 | 366 | 379 | 395 | 414 |
| Cooke County Manufacturing | 0 | 0 | 60 | 61 | 63 | 65 |
| ***Total Projected Demand*** | ***339*** | ***351*** | ***426*** | ***440*** | ***458*** | ***479*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 339 | 339 | 339 | 339 | 339 | 339 |
| ***Total Current Supplies*** | ***339*** | ***339*** | ***339*** | ***339*** | ***339*** | ***339*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***12*** | ***87*** | ***101*** | ***119*** | ***140*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 9 | 13 | 25 | 29 | 34 |
| New WTP at Muenster Lake | 0 | 280 | 280 | 280 | 280 | 280 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***289*** | ***293*** | ***305*** | ***309*** | ***314*** |
| **Reserve (Shortage)** | **3** | **277** | **206** | **204** | **190** | **174** |

## Two Way Special Utility District

Two Way SUD serves about 5,000 people in eastern Cooke County and western Grayson County. Since most of the service area is in Grayson County, Two Way SUD is discussed under Grayson County on page 4F.244.

## Valley View

Valley View has a population of about 1,500 and is located in southern Cooke County. The city currently receives its water supply from the Trinity aquifer. Water management strategies for Valley View are conservation, participation in the Cooke County Water Supply Project, and supplemental wells to replace existing water wells. Table 4F.46 shows the projected population and demand, the current supplies, and the recommended water management strategies for Valley View.

**Table 4F.46**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Valley View**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,500** | **3,000** | **5,000** | **7,000** | **12,000** | **15,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 187 | 363 | 594 | 808 | 1,371 | 1,714 |
| ***Total Projected Demand*** | ***187*** | ***363*** | ***594*** | ***808*** | ***1,371*** | ***1,714*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 363 | 363 | 363 | 363 | 363 | 363 |
| ***Total Current Supplies*** | ***363*** | ***363*** | ***363*** | ***363*** | ***363*** | ***363*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***231*** | ***445*** | ***1,008*** | ***1,351*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 16 | 31 | 46 | 83 | 110 |
| Cooke County Water Supply Project | 0 | 150 | 400 | 650 | 1,200 | 1,600 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***166*** | ***431*** | ***696*** | ***1,283*** | ***1,710*** |
| **Reserve (Shortage)** | **179** | **166** | **200** | **251** | **275** | **359** |

## Woodbine Water Supply Corporation

Woodbine WSC serves about 5,000 people in eastern Cooke County and western Grayson County. The WSC currently receives its water supply from the Trinity aquifer. Water management strategies for Woodbine WSC are conservation, participation in the Cooke County Water Supply Project, and supplemental wells to replace existing water wells. Table 4F.47 shows the projected population and demand, the current supplies, and the recommended water management strategies for Woodbine WSC.

**Table 4F.47**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the Woodbine Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,336** | **5,773** | **6,307** | **6,839** | **7,370** | **7,901** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 669 | 712 | 762 | 802 | 855 | 915 |
| ***Total Projected Demand*** | ***669*** | ***712*** | ***762*** | ***802*** | ***855*** | ***915*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 661 | 661 | 661 | 661 | 661 | 661 |
| ***Total Current Supplies*** | ***661*** | ***661*** | ***661*** | ***661*** | ***661*** | ***661*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***8*** | ***51*** | ***101*** | ***141*** | ***194*** | ***254*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 8 | 28 | 39 | 46 | 52 | 59 |
| Cooke County Water Supply Project | 0 | 40 | 80 | 120 | 170 | 230 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***8*** | ***68*** | ***119*** | ***166*** | ***222*** | ***289*** |
| **Reserve (Shortage)** | **0** | **17** | **18** | **25** | **28** | **35** |

## Costs for Cooke County Water User Groups

Table 4F.48 shows the estimated capital costs for Cooke County water management strategies not covered under the wholesale water providers, and Table 4F.49 summarizes the costs by category. Table 4F.50 shows the cost of the alternative strategy not covered under the wholesale water providers, and it is followed by a summary for Cooke County.

**Table 4F.48**
**Costs for Recommended Water Management Strategies for Cooke County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Bolivar WSC* | Conservation | See Denton County. | | | | | |
| | Supplemental wells | See Denton County. | | | | | |
| | UTRWD supplies | See Denton County. | | | | | |
| | Cooke County Water Supply Project | 2020 | 149 | See Gainesville in Section 4E. | | | |
| Cooke County Other | Conservation | 2010 | 78 | 0 | 0 | 0 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $6,354,000 | N/A | N/A | Q-13 |
| | Cooke County Water Supply Project | 2020 | 125 | See Gainesville in Section 4E. | | | |
| Gainesville | Conservation | 2010 | 462 | See Gainesville in Section 4E. | | | |
| | Overdraft Trinity Aquifer (2010) | 2010 | 103 | See Gainesville in Section 4E. | | | |
| | Supplemental wells | 2010 | 0 | See Gainesville in Section 4E. | | | |
| | Additional Direct Reuse | 2020 | 107 | See Gainesville in Section 4E. | | | |
| | Cooke County Water Supply Project | 2020 | 1,762 | See Gainesville in Section 4E. | | | |
| Kiowa Homeowners WSC | Conservation | 2010 | 38 | $0.00 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,948,000 | N/A | N/A | Q-13 |
| | Cooke County Water Supply Project | 2020 | 100 | See Gainesville in Section 4E. | | | |

**(Table 4F.48, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Lindsay | Conservation | 2010 | 9 | $0.00 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,380,000 | N/A | N/A | Q-13 |
| | Cooke County Water Supply Project | 2020 | 50 | See Gainesville in Section 4E. | | | |
| Muenster | Conservation | 2010 | 34 | $0.00 | $0.72 | $0.72 | Q-10 & Q-11 |
| | Supplemental Wells | 2010 | 0 | $2,150,000 | N/A | N/A | Q-13 |
| | Develop Muenster Lake supply | 2020 | 280 | $8,217,000 | $7.86 | $1.32 | Q-124 |
| Two Way SUD* | Conservation | See Grayson County. | | | | | |
| | Supplemental wells | See Grayson County. | | | | | |
| | Grayson County Water Supply Project | 2020 | 800 | See GTUA in Section 4E. | | | |
| Valley View | Conservation | 2010 | 110 | $0.00 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2020 | 0 | $456,000 | N/A | N/A | Q-13 |
| | Cooke County Water Supply Project | 2020 | 1,600 | See Gainesville in Section 4E. | | | |
| Woodbine WSC* | Conservation | 2010 | 59 | $0.00 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,852,000 | N/A | N/A | Q-13 |
| | Cooke County Water Supply Project | 2020 | 230 | See Gainesville in Section 4E. | | | |
| Cooke County Irrigation | Conservation | 2020 | 22 | $0.00 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $1,678,000 | N/A | N/A | Q-13 |
| | Overdraft Trinity Aquifer (2010) | 2010 | 140 | $0.00 | $0.47 | $0.47 | Q-125 |
| | Direct Reuse | 2020 | 70 | See Gainesville in Section 4E. | | | |

(Table 4F.48, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Cooke County Irrigation, Continued | Cooke County Water Supply Project | 2020 | 70 | See Gainesville in Section 4E. | | | |
| Cooke County Livestock | Supplemental wells | 2010 | 0 | $4,614,000 | N/A | N/A | Q-13 |
| Cooke County Manufacturing | Conservation | 2020 | 12 | $0.00 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $1,584,000 | N/A | N/A | Q-13 |
| | Cooke County Water Supply Project | 2020 | 164 | See Gainesville in Section 4E. | | | |
| | From Muenster (Muenster Lake supply) | 2030 | 65 | See Muenster Lake under Muenster above | | | |
| Cooke County Mining | Supplemental wells | 2010 | 0 | $420,000 | N/A | N/A | Q-13 |
| | Overdraft Trinity Aquifer (2010) | 2010 | 75 | $269,000 | $1.15 | $0.70 | Q-126 |
| | Direct Reuse | 2020 | 77 | See Gainesville in Section 4E. | | | |
| | Cooke County Water Supply Project | 2020 | 78 | See Gainesville in Section 4E. | | | |
| **Total** | | | | **$32,922,000** | | | |

Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.49**
**Summary of Recommended Water Management Strategies for Cooke County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 842 | $0 |
| Purchase from WWP | 0 | $0 |
| Supplemental wells | 0 | $24,436,000 |
| Overdraft Groundwater | 318 | $269,000 |
| Connect to Supplies | 5,473 | $8,217,000 |
| Treatment Plant expansions | 0 | $0 |
| Reuse | 254 | $0 |
| **Total** | | **$32,920,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.

**Table 4F.50**
**Summary of Alternative Water Management Strategies for Cooke County**
**Not Covered Under Wholesale Water Providers**

| Strategy and Supplier | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Cooke County Water Supply Project - Muenster | 200 | $3,254,000 |
| **Total for Alternative Strategies** | | **$3,254,000** |

COOKE COUNTY COURTHOUSE

***2000 Population:*** 36,363

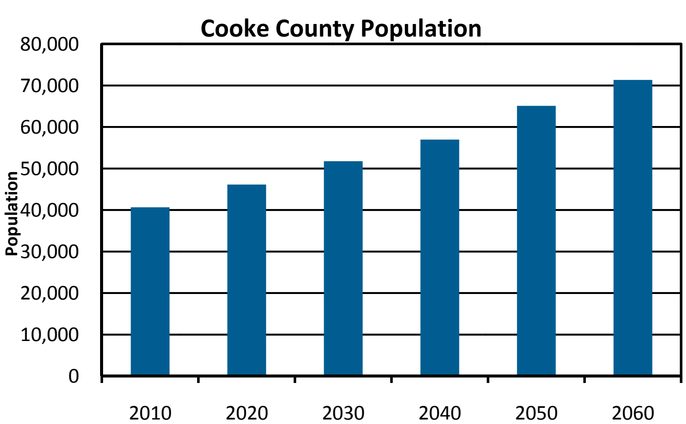
***Projected 2060 Population:*** *71,328*

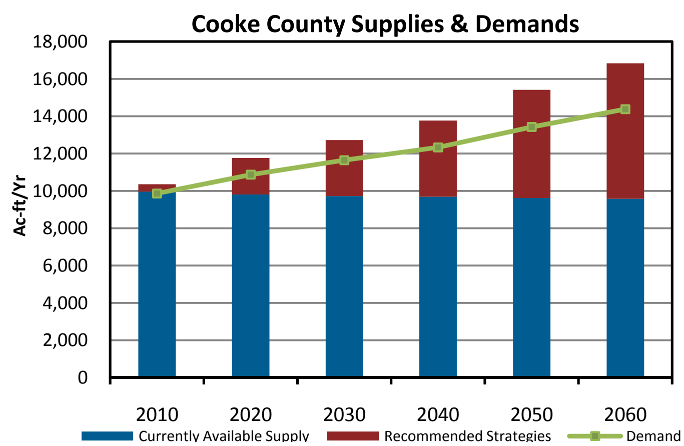
***County Seat:*** Gainesville

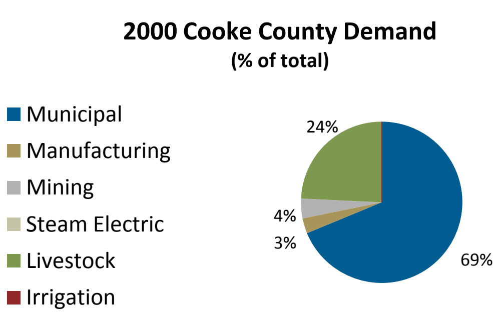
***Economy:*** *Oil, agribusiness, tourism, manufacturing*

***River Basin(s):***

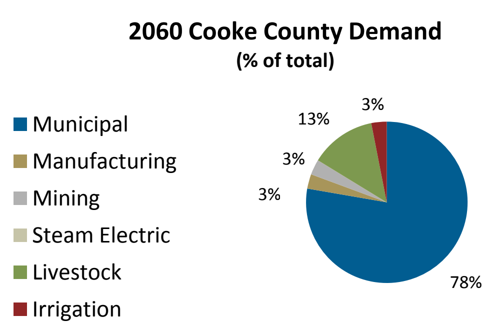
- *Trinity (67%), Red (32%)*


**Total=7,270 acre-feet**




**Total= 14,381 acre-feet**

| WATER USER GROUP | 2060 COOKE CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bolivar WSC [a] | 285 | Trinity Aquifer | Supplemental wells, UTRWD supplies, Cooke County Water Supply Project |
| Gainesville | 5,522 | Trinity Aquifer, Moss Lake | Supplemental wells, Overdraft Trinity Aquifer (2010), Cooke County Water Supply Project (raw water delivery and water treatment) |
| Kiowa Homeowners WSC | 947 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| Lindsay | 160 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| Muenster | 414 | Trinity Aquifer | Supplemental wells, Develop Muenster Lake supply |
| Two Way SUD [a] | 11 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Valley View | 1,714 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| Woodbine WSC [a] | 902 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| County-Other | 1,222 | Trinity, Woodbine, and Other Aquifers | Supplemental wells, Cooke County Water Supply Project |
| Irrigation | 444 | Trinity and Other Aquifers, Direct reuse (Gainesville), Local supplies | Supplemental wells, Overdraft of Trinity Aquifer (2010), Cooke County Water Supply Project, Additional reuse |
| Livestock | 1,898 | Trinity Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 421 | Trinity Aquifer, Gainesville | Supplemental wells, Muenster Lake, Cooke County Water Supply Project |
| Mining | 441 | Trinity Aquifer, Local supplies | Supplemental wells, Overdraft Trinity Aquifer (2010), Reuse, Cooke County Water Supply Project |
| Steam Electric Power | 0 | None | None |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

## 4F.3 Dallas County

Figure 4F.3 is a map of Dallas County. Most of Dallas County's current demands are met by Dallas Water Utilities (DWU), with North Texas Municipal Water District (NTMWD) and Irving also providing major supplies. DWU, NTMWD, and Irving will continue to be the largest water providers in the county in the future. Along with additional supplies from DWU and NTMWD, other management strategies for Dallas County include the following:

- Conservation
- Supplemental wells
- Supplies from Mansfield, Midlothian, and Arlington for Grand Prairie (all using raw water from Tarrant Regional Water District [TRWD])
- Water from Oklahoma for Irving
- Reuse projects (Dallas, Irving, TRA)
- Supplies from the Waxahachie's Sokoll Water Treatment Plant in Ellis County (for suppliers primarily located in Ellis County). The raw water for these supplies comes from TRWD.

Water management strategies for Dallas County water user groups are discussed below. Table 4F.77 on page 4F.90 shows the estimated capital costs for the Dallas County water management strategies not associated with the wholesale water providers, and Table 4F.78 on page 4F.96 is a summary of the costs by category. Table 4F. 79 gives the costs of alternative strategies for Dallas County suppliers and is followed by a Dallas County summary.

### Addison

The City of Addison has a population of about 16,000 and is located in northern Dallas County. The city receives its water supply from DWU. Water management strategies for Addison are conservation and additional water from DWU. Table 4F.51 shows the projected population and demand, the current supplies, and the recommended water management strategies for Addison.

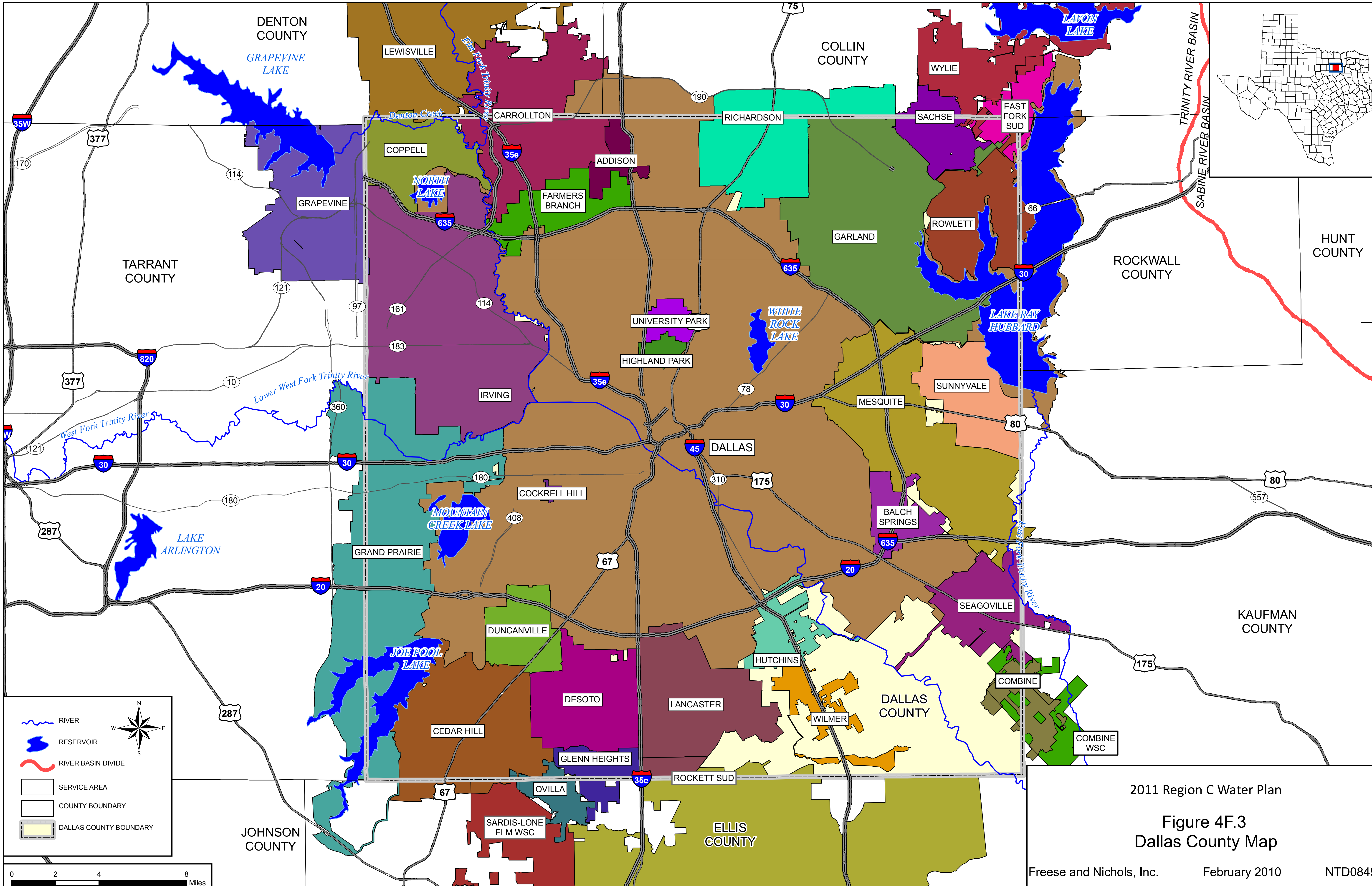

DENTON COUNTY
GRAPEVINE LAKE
LEWISVILLE
Elm Fork Trinity River
Denton Creek
CARROLLTON
COLLIN COUNTY
WYLIE
LAVON LAKE
TRINITY RIVER BASIN
SABINE RIVER BASIN
RICHARDSON
SACHSE
EAST FORK SUD
COPPELL
ADDISON
NORTH LAKE
FARMERS BRANCH
GRAPEVINE
ROWLETT
GARLAND
TARRANT COUNTY
ROCKWALL COUNTY
HUNT COUNTY
UNIVERSITY PARK
WHITE ROCK LAKE
LAKE RAY HUBBARD
HIGHLAND PARK
Lower West Fork Trinity River
SUNNYVALE
MESQUITE
IRVING
West Fork Trinity River
DALLAS
COCKRELL HILL
MOUNTAIN CREEK LAKE
BALCH SPRINGS
LAKE ARLINGTON
GRAND PRAIRIE
East Fork Trinity River
SEAGOVILLE
KAUFMAN COUNTY
DUNCANVILLE
JOE POOL LAKE
HUTCHINS
COMBINE
DALLAS COUNTY
DESOTO
LANCASTER
WILMER
CEDAR HILL
COMBINE WSC
GLENN HEIGHTS
ROCKETT SUD
OVILLA
SARDIS-LONE ELM WSC
ELLIS COUNTY
JOHNSON COUNTY
RIVER
RESERVOIR
RIVER BASIN DIVIDE
SERVICE AREA
COUNTY BOUNDARY
DALLAS COUNTY BOUNDARY
N
S
E
W
0
2
4
8
Miles
2011 Region C Water Plan
Figure 4F.3
Dallas County Map
Freese and Nichols, Inc.
February 2010
NTD08492

**Table 4F.51**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Addison**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **16,000** | **20,534** | **22,358** | **23,629** | **24,515** | **25,133** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 7,904 | 10,074 | 10,919 | 11,514 | 11,918 | 12,218 |
| ***Total Projected Water Demand*** | ***7,904*** | ***10,074*** | ***10,919*** | ***11,514*** | ***11,918*** | ***12,218*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 7,268 | 7,565 | 7,832 | 7,753 | 7,404 | 6,674 |
| ***Total Current Supplies*** | ***7,268*** | ***7,565*** | ***7,832*** | ***7,753*** | ***7,404*** | ***6,674*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***636*** | ***2,509*** | ***3,087*** | ***3,761*** | ***4,514*** | ***5,544*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 189 | 351 | 478 | 600 | 721 | 841 |
| Additional Water from DWU | 447 | 2,158 | 2,609 | 3,161 | 3,793 | 4,703 |
| ***Total Water Management Strategies*** | ***636*** | ***2,509*** | ***3,087*** | ***3,761*** | ***4,514*** | ***5,544*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Balch Springs

The City of Balch Springs has a population of about 21,000. The city currently receives its water supply from DWU (through retail service provided by Dallas County WCID #6). Water management strategies for Balch Springs are conservation and additional water from DWU (through Dallas County WCID #6). Table 4F.52 shows the projected population and demand, the current supplies, and the recommended water management strategies for Balch Springs.

**Table 4F.52**
**Projected Population and Demand, Current Supplies**
**and Water Management Strategies for the City of Balch Springs**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **21,083** | **22,564** | **23,849** | **24,963** | **25,930** | **26,768** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,621 | 2,730 | 2,805 | 2,852 | 2,934 | 3,028 |
| ***Total Projected Demand*** | ***2,621*** | ***2,730*** | ***2,805*** | ***2,852*** | ***2,934*** | ***3,028*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas County WCID #6 (DWU) | 2,410 | 2,050 | 2,012 | 1,920 | 1,823 | 1,654 |
| ***Total Current Supplies*** | ***2,410*** | ***2,050*** | ***2,012*** | ***1,920*** | ***1,823*** | ***1,654*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***211*** | ***680*** | ***793*** | ***932*** | ***1,111*** | ***1,374*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 28 | 95 | 132 | 149 | 164 | 180 |
| Additional Dallas County WCID #6 (DWU) | 183 | 585 | 661 | 783 | 947 | 1,194 |
| ***Total Water Management Strategies*** | ***211*** | ***680*** | ***793*** | ***932*** | ***1,111*** | ***1,374*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Carrollton

Carrollton is a city of about 121,000 people located in northwest Dallas County and southern Denton County. The water supply for Carrollton is discussed under Denton County on page 4F.105.

## Cedar Hill

The City of Cedar Hill has a population of about 46,000. It is located in southwest Dallas County, with a small part in Ellis County. Cedar Hill currently receives its water supply from the Trinity aquifer and DWU. Water management strategies for Cedar Hill are conservation, additional water from DWU, and supplemental wells to replace existing water wells. Table 4F.53 shows the projected population and demand, the current supplies, and the recommended water management strategies for Cedar Hill.

**Table 4F.53**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Cedar Hill**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **46,255** | **66,728** | **78,085** | **81,622** | **81,622** | **81,622** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 10,104 | 14,351 | 16,706 | 17,280 | 17,280 | 17,280 |
| ***Total Projected Demand*** | ***10,104*** | ***14,351*** | ***16,706*** | ***17,280*** | ***17,280*** | ***17,280*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 275 | 275 | 275 | 275 | 275 | 275 |
| Dallas Water Utilities | 9,027 | 10,561 | 11,776 | 11,441 | 10,554 | 9,279 |
| ***Total Current Supplies*** | ***9,302*** | ***10,836*** | ***12,051*** | ***11,716*** | ***10,829*** | ***9,554*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***802*** | ***3,515*** | ***4,655*** | ***5,564*** | ***6,451*** | ***7,726*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 380 | 997 | 1,362 | 1,562 | 1,706 | 1,850 |
| Additional Water from DWU | 422 | 2,518 | 3,293 | 4,002 | 4,745 | 5,876 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***802*** | ***3,515*** | ***4,655*** | ***5,564*** | ***6,451*** | ***7,726*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Cockrell Hill

The City of Cockrell Hill has a population of about 4,800 people in western Dallas County. The city receives its water supply from DWU. Water management strategies for Cockrell Hill are conservation and additional water from DWU. Table 4F.54 shows the projected population and demand, the current supplies, and the recommended water management strategies for Cockrell Hill.

**Table 4F.54**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Cockrell Hill**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **4,782** | **4,947** | **5,028** | **5,067** | **5,086** | **5,095** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 653 | 687 | 681 | 670 | 667 | 668 |
| ***Total Projected Demand*** | ***653*** | ***687*** | ***681*** | ***670*** | ***667*** | ***668*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 600 | 516 | 488 | 451 | 414 | 365 |
| ***Total Current Supplies*** | ***600*** | ***516*** | ***488*** | ***451*** | ***414*** | ***365*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***53*** | ***171*** | ***193*** | ***219*** | ***253*** | ***303*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 21 | 28 | 31 | 33 | 36 |
| Additional Water from DWU | 47 | 150 | 165 | 188 | 220 | 267 |
| ***Total Water Management Strategies*** | ***53*** | ***171*** | ***193*** | ***219*** | ***253*** | ***303*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Combine

Combine has a population of about 2,400 people and is located in southeast Dallas County and western Kaufman County. The water supply for Combine is discussed under Kaufman County on page 4F.296.

## Combine Water Supply Corporation

Combine WSC serves about 6,500 retail customers in and around Combine in southeast Dallas County and western Kaufman County. The water supply for Combine WSC is discussed under Kaufman County on page 4F.297.

## Coppell

The City of Coppell has a population of about 40,000 and is located in northwest Dallas County with a small area in Denton County. Coppell currently receives its water supply from DWU. Water management strategies for Coppell are conservation and additional water from DWU. Table 4F.55 shows the projected population and demand, the current supplies, and the recommended water management strategies for Coppell.

**Table 4F.55**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Coppell**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **40,415** | **40,577** | **40,715** | **40,832** | **40,932** | **41,016** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 11,544 | 11,500 | 11,447 | 11,434 | 11,417 | 11,440 |
| ***Total Projected Demand*** | ***11,544*** | ***11,500*** | ***11,447*** | ***11,434*** | ***11,417*** | ***11,440*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 10,615 | 8,637 | 8,211 | 7,699 | 7,093 | 6,249 |
| ***Total Current Supplies*** | ***10,615*** | ***8,637*** | ***8,211*** | ***7,699*** | ***7,093*** | ***6,249*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***929*** | ***2,863*** | ***3,236*** | ***3,735*** | ***4,324*** | ***5,191*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 515 | 809 | 956 | 1,063 | 1,157 | 1,255 |
| Additional Water from DWU | 414 | 2,054 | 2,280 | 2,672 | 3,167 | 3,936 |
| ***Total Water Management Strategies*** | ***929*** | ***2,863*** | ***3,236*** | ***3,735*** | ***4,324*** | ***5,191*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Dallas

Dallas Water Utilities (DWU) is the water utility of the City of Dallas, which has a population of about 1,300,000. DWU is a wholesale water provider. The City of Dallas is primarily in Dallas County but extends into Collin, Denton, Kaufman, and Rockwall Counties. There is a detailed discussion of water supply plans for DWU beginning on page 4E.4 in Section 4E.

## Dallas County Irrigation

Table 4F.56 shows the projected demand, the current supplies, and the water management strategies for Dallas County Irrigation. Golf course irrigation is the largest part of the irrigation water use in Dallas County. (The Texas Water Development classifies the use of potable water for golf course irrigation as a part of municipal use. The use of raw water or reuse of treated wastewater effluent for golf course irrigation is classified as irrigation use.) As shown in Table 4F.56, DWU, local supplies, indirect reuse, direct reuse, Joe Pool Lake, and groundwater all provide water for irrigation in Dallas County. Water management strategies include conservation, additional water from DWU, additional TRA direct reuse for Los Colinas, and supplemental wells.

**Table 4F.56**
**Projected Demand, Current Supplies**
**and Water Management Strategies for the Dallas County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **13,087** | **13,087** | **13,087** | **13,087** | **13,087** | **13,087** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| DWU Sources | 8,063 | 6,585 | 6,290 | 5,904 | 5,447 | 4,790 |
| Local Supplies | 791 | 791 | 791 | 791 | 791 | 791 |
| Indirect Reuse | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Direct Reuse | 561 | 561 | 561 | 561 | 561 | 561 |
| TRA Direct Reuse | 125 | 125 | 125 | 125 | 125 | 125 |
| Joe Pool Lake (Grand Prairie) | 300 | 300 | 300 | 300 | 300 | 300 |
| Other Aquifer | 80 | 80 | 80 | 80 | 80 | 80 |
| ***Total Current Supplies*** | ***17,920*** | ***16,442*** | ***16,147*** | ***15,761*** | ***15,304*** | ***14,647*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 26 | 429 | 825 | 1,032 | 1,227 | 1,422 |
| Additional Water from DWU | 705 | 2,183 | 2,478 | 2,864 | 3,321 | 3,978 |
| Additional TRA Las Colinas | 0 | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***731*** | ***9,612*** | ***10,303*** | ***10,896*** | ***11,548*** | ***12,400*** |
| **Reserve (Shortage)** | **5,564** | **12,967** | **13,363** | **13,570** | **13,765** | **13,960** |

## Dallas County Livestock

Table 4F.57 shows the projected demand and the current supplies for Dallas County Livestock. The current supplies for Dallas County Livestock are local surface water supplies and Woodbine aquifer supplies. The sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.57**
**Projected Demand, Current Supplies**
**and Water Management Strategies for Dallas County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **482** | **482** | **482** | **482** | **482** | **482** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local supplies | 712 | 712 | 712 | 712 | 712 | 712 |
| Woodbine Aquifer | 703 | 703 | 703 | 703 | 703 | 703 |
| ***Total Current Supplies*** | ***1,415*** | ***1,415*** | ***1,415*** | ***1,415*** | ***1,415*** | ***1,415*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **933** | **933** | **933** | **933** | **933** | **933** |

## Dallas County Manufacturing

Table 4F.58 shows the projected demand, the current supplies, and the water management strategies for Dallas County Manufacturing. Most manufacturing in Dallas County is supplied by DWU and NTMWD, with additional supplies from Irving, direct reuse, and groundwater (Trinity and Woodbine aquifers). Conservation and additional supplies from DWU and NTMWD are the water management strategies to meet demands.

**Table 4F.58**
**Projected Demand, Current Supplies**
**and Water Management Strategies for the Dallas County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **34,115** | **37,791** | **41,148** | **44,214** | **46,703** | **46,983** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 22,901 | 20,719 | 21,546 | 21,734 | 21,180 | 18,736 |
| North Texas Municipal Water District | 6,482 | 5,844 | 5,527 | 5,336 | 5,097 | 4,765 |
| Irving (Lake Chapman) | 2,047 | 2,267 | 2,469 | 2,653 | 2,802 | 2,819 |
| Direct Reuse | 20 | 20 | 20 | 20 | 20 | 20 |
| Trinity Aquifer | 890 | 890 | 890 | 890 | 890 | 890 |
| Woodbine Aquifer | 1,228 | 1,228 | 1,228 | 1,228 | 1,228 | 1,228 |
| ***Total Current Supplies*** | ***33,568*** | ***30,968*** | ***31,680*** | ***31,861*** | ***31,217*** | ***28,458*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***547*** | ***6,823*** | ***9,468*** | ***12,353*** | ***15,486*** | ***18,525*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 68 | 781 | 1,135 | 1,212 | 1,258 |
| Additional Water from DWU | 2,003 | 6,868 | 8,492 | 10,542 | 12,913 | 15,562 |
| Additional Water from NTMWD | 0 | 1,336 | 2,291 | 3,065 | 3,777 | 4,162 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2,003*** | ***8,272*** | ***11,564*** | ***14,742*** | ***17,902*** | ***20,982*** |
| **Reserve (Shortage)** | **1,456** | **1,449** | **2,096** | **2,389** | **2,416** | **2,457** |

### Dallas County Mining

Table 4F.59 shows the projected demand, the current supplies, and the water management strategies for Dallas County Mining. Dallas County Mining is supplied from DWU, local supplies, and groundwater (Trinity, Woodbine and other aquifers). The water management strategies for this water user group are additional supplies from DWU and supplemental wells.

**Table 4F.59**
**Projected Demand, Current Supplies**
**and Water Management Strategies for the Dallas County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **2,980** | **3,040** | **3,030** | **3,030** | **3,030** | **3,030** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| DWU Sources | 274 | 228 | 217 | 204 | 188 | 166 |
| Local Supplies | 1,525 | 1,525 | 1,525 | 1,525 | 1,525 | 1,525 |
| Trinity Aquifer | 382 | 382 | 382 | 382 | 382 | 382 |
| Woodbine Aquifer | 323 | 323 | 323 | 323 | 323 | 323 |
| Other Aquifer | 513 | 513 | 513 | 513 | 513 | 513 |
| ***Total Current Supplies*** | ***3,017*** | ***2,971*** | ***2,960*** | ***2,947*** | ***2,931*** | ***2,909*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***69*** | ***70*** | ***83*** | ***99*** | ***121*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from DWU | 0 | 69 | 70 | 83 | 99 | 121 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***69*** | ***70*** | ***83*** | ***99*** | ***121*** |
| **Reserve (Shortage)** | **37** | **0** | **0** | **0** | **0** | **0** |

## Dallas County Other

Dallas County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Dallas County Other currently receive their water supply from either groundwater (Trinity and Woodbine aquifers) or from DWU. Water management strategies for these entities include conservation and supplemental wells to replace existing water wells. Table 4F.60 shows the projected population and demand, the current supplies, and the water management strategies for Dallas County Other.

**Table 4F.60**
**Projected Population and Demand, Current Supplies and Water Management Strategies for Dallas County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,474** | **1,143** | **887** | **687** | **533** | **412** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 190 | 146 | 110 | 81 | 60 | 47 |
| ***Total Projected Water Demand*** | ***190*** | ***146*** | ***110*** | ***81*** | ***60*** | ***47*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 150 | 150 | 150 | 150 | 150 | 150 |
| Woodbine Aquifer | 59 | 59 | 59 | 59 | 59 | 59 |
| Dallas Water Utilities | 87 | 55 | 39 | 27 | 19 | 13 |
| ***Total Current Supplies*** | ***296*** | ***264*** | ***248*** | ***236*** | ***228*** | ***222*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 5 | 5 | 5 | 4 | 3 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1*** | ***5*** | ***5*** | ***5*** | ***4*** | ***3*** |
| **Reserve (Shortage)** | **107** | **123** | **143** | **160** | **172** | **178** |

### Dallas County Steam Electric Power

Table 4F.61 shows the projected demand, the current supplies, and the water management strategies for Dallas County Steam Electric Power. Dallas County Steam Electric Power is currently supplied by DWU, NTMWD, Mountain Creek Lake, and run-of-the-river supplies. The water management strategies for this water user group are additional supplies from DWU and NTMWD and direct reuse.

**Table 4F.61**
**Projected Demand, Current Supplies**
**and Water Management Strategies for Dallas County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **3,367** | **4,290** | **11,918** | **12,000** | **12,000** | **12,000** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 3,096 | 3,222 | 3,587 | 3,367 | 3,106 | 2,731 |
| North Texas Municipal Water District | 67 | 70 | 168 | 152 | 138 | 128 |
| Mountain Creek Lake | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |
| Run-of-River | 368 | 368 | 368 | 368 | 368 | 368 |
| ***Total Current Supplies*** | ***9,931*** | ***10,060*** | ***10,523*** | ***10,287*** | ***10,012*** | ***9,627*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***1,395*** | ***1,713*** | ***1,988*** | ***2,373*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from DWU | 271 | 1,068 | 1,413 | 1,633 | 1,894 | 2,269 |
| Additional Water from NTMWD | 0 | 16 | 70 | 88 | 102 | 112 |
| Direct Reuse (TRA) | 0 | 0 | 6,760 | 6,760 | 6,760 | 6,760 |
| ***Total Water Management Strategies*** | ***271*** | ***1,084*** | ***8,243*** | ***8,481*** | ***8,756*** | ***8,756*** |
| **Reserve (Shortage)** | **6,835** | **6,854** | **6,848** | **6,768** | **6,768** | **6,383** |

## Dallas County Water Control and Improvement District #6

Dallas County WCID #6 provides retail service in Balch Springs and is classified as a wholesale water provider. There is a detailed discussion of water supply plans for Dallas County WCID #6 beginning on page 4E.70 in Section 4E.

## DeSoto

Desoto is a city of about 48,000 people in southwestern Dallas County and receives its water supply from DWU. Water management strategies for DeSoto are conservation and additional water from DWU. Table 4F.62 shows the projected population and demand, the current supplies, and the water management strategies for DeSoto.

**Table 4F.62**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of DeSoto**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **47,649** | **57,243** | **65,849** | **73,881** | **82,923** | **85,400** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 10,355 | 12,375 | 14,162 | 15,807 | 17,741 | 18,271 |
| ***Total Projected Demand*** | ***10,355*** | ***12,375*** | ***14,162*** | ***15,807*** | ***17,741*** | ***18,271*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 9,522 | 9,294 | 10,158 | 10,644 | 11,022 | 9,981 |
| ***Total Current Supplies*** | ***9,522*** | ***9,294*** | ***10,158*** | ***10,644*** | ***11,022*** | ***9,981*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***833*** | ***3,081*** | ***4,004*** | ***5,163*** | ***6,719*** | ***8,290*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 322 | 721 | 1,009 | 1,269 | 1,571 | 1,773 |
| Additional Water from DWU | 511 | 2,360 | 2,995 | 3,894 | 5,148 | 6,517 |
| ***Total Water Management Strategies*** | ***833*** | ***3,081*** | ***4,004*** | ***5,163*** | ***6,719*** | ***8,290*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Duncanville

Duncanville has a population of about 37,000 people and is located in southwestern Dallas County. The city receives its water supply from DWU. Water management strategies for Duncanville are conservation and additional water from DWU. Table 4F.63 shows the projected population and demand, the current supplies, and the water management strategies for Duncanville.

**Table 4F.63**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Duncanville**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **37,100** | **37,100** | **37,100** | **37,100** | **37,100** | **37,100** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 7,605 | 7,563 | 7,522 | 7,439 | 7,356 | 7,356 |
| ***Total Projected Demand*** | ***7,605*** | ***7,563*** | ***7,522*** | ***7,439*** | ***7,356*** | ***7,356*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 6,993 | 5,680 | 5,396 | 5,009 | 4,570 | 4,018 |
| ***Total Current Supplies*** | ***6,993*** | ***5,680*** | ***5,396*** | ***5,009*** | ***4,570*** | ***4,018*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***612*** | ***1,883*** | ***2,126*** | ***2,430*** | ***2,786*** | ***3,338*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 367 | 841 | 943 | 1,000 | 1,052 | 1,113 |
| Additional Water from DWU | 245 | 1,042 | 1,183 | 1,430 | 1,734 | 2,225 |
| ***Total Water Management Strategies*** | ***612*** | ***1,883*** | ***2,126*** | ***2,430*** | ***2,786*** | ***3,338*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## East Fork Special Utility District

East Fork SUD is located in southern Collin County and extends into Dallas and Rockwall Counties. The water management strategies for East Fork SUD are described under Collin County on page 4F.14.

## Farmers Branch

Farmers Branch has a population of about 30,000 people in northwestern Dallas County. The city receives its water supply from DWU. As shown on Table 4F.64, water management strategies for Farmers Branch are conservation and additional water from DWU.

**Table 4F.64**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Farmers Branch**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **30,470** | **33,161** | **35,608** | **37,833** | **39,855** | **41,693** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 11,229 | 12,109 | 12,883 | 13,603 | 14,286 | 14,945 |
| ***Total Projected Demand*** | ***11,229*** | ***12,109*** | ***12,883*** | ***13,603*** | ***14,286*** | ***14,945*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 10,326 | 9,094 | 9,241 | 9,160 | 8,875 | 8,164 |
| ***Total Current Supplies*** | ***10,326*** | ***9,094*** | ***9,241*** | ***9,160*** | ***8,875*** | ***8,164*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***903*** | ***3,015*** | ***3,642*** | ***4,443*** | ***5,411*** | ***6,781*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 496 | 910 | 1,144 | 1,353 | 1,546 | 1,745 |
| Additional Water from DWU | 407 | 2,105 | 2,498 | 3,090 | 3,865 | 5,036 |
| ***Total Water Management Strategies*** | ***903*** | ***3,015*** | ***3,642*** | ***4,443*** | ***5,411*** | ***6,781*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Garland

Garland is a city of about 230,000 in northeastern Dallas County. Garland is a wholesale water provider, and there is a discussion of Garland's water supply plans on page 4E.82 in Section 4E.

## Glenn Heights

Glenn Heights is a city of about 11,000 people located in southern Dallas and northern Ellis Counties. Glenn Heights provides water for in-city municipal demand and provides wholesale water to the City of Oak Leaf. Glenn Heights gets its water supply from DWU and the Trinity aquifer. Water management strategies for Glenn Heights are conservation, additional water from DWU, and supplemental wells. Table 4F.65 shows the projected population and demand, the current supplies, and the water management strategies for Glenn Heights.

**Table 4F.65**
**Projected Population and Demand, Current Supplies**
**and Water Management Strategies for the City of Glenn Heights**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population (In City Only)** | **11,423** | **13,833** | **16,516** | **19,102** | **21,705** | **24,332** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,407 | 1,674 | 1,961 | 2,247 | 2,528 | 2,834 |
| Customer Demand (Oak Leaf) | 260 | 254 | 282 | 302 | 318 | 320 |
| ***Total Projected Demand*** | ***1,667*** | ***1,928*** | ***2,243*** | ***2,549*** | ***2,846*** | ***3,154*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 229 | 229 | 229 | 229 | 229 | 229 |
| Dallas Water Utilities | 1,222 | 1,305 | 1,453 | 1,571 | 1,633 | 1,632 |
| ***Total Current Supplies*** | ***1,451*** | ***1,534*** | ***1,682*** | ***1,800*** | ***1,862*** | ***1,861*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***216*** | ***394*** | ***561*** | ***749*** | ***984*** | ***1,293*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 21 | 71 | 107 | 132 | 158 | 186 |
| Additional Water from DWU | 195 | 323 | 454 | 617 | 826 | 1,107 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***216*** | ***394*** | ***561*** | ***749*** | ***984*** | ***1,293*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Grand Prairie

Grand Prairie is a city of about 170,000 in western Dallas County, eastern Tarrant County, and northwestern Ellis County. The city is a wholesale water provider, and there is a discussion of Grand Prairie's water supply plans on page 4E.84 in Section 4E.

## Highland Park

Highland Park is a city of about 9,000 people in central Dallas County and receives its water supply from the Dallas County Park Cities MUD. The only water management strategy for Highland Park is conservation. Table 4F.66 shows the projected population and demand, the current supplies, and the water management strategies for Highland Park.

**Table 4F.66**
**Projected Population and Demand, Current Supplies**
**and Water Management Strategies for the City of Highland Park**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **8,937** | **9,025** | **9,106** | **9,181** | **9,249** | **9,313** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 4,255 | 4,266 | 4,274 | 4,278 | 4,289 | 4,319 |
| ***Total Projected Demand*** | ***4,255*** | ***4,266*** | ***4,274*** | ***4,278*** | ***4,289*** | ***4,319*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas County Park Cities Municipal Utility District (Lake Grapevine) | 4,233 | 4,205 | 4,188 | 4,176 | 4,172 | 4,187 |
| ***Total Current Supplies*** | ***4,233*** | ***4,205*** | ***4,188*** | ***4,176*** | ***4,172*** | ***4,187*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***22*** | ***61*** | ***86*** | ***102*** | ***117*** | ***132*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 22 | 61 | 86 | 102 | 117 | 132 |
| ***Total Water Management Strategies*** | ***22*** | ***61*** | ***86*** | ***102*** | ***117*** | ***132*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Hutchins

Hutchins is located in southern Dallas County and has a population of about 3,200. The city receives its water supply from DWU. Water management strategies for Hutchins are conservation and additional water from DWU. Table 4F.67 shows the projected population and demand, the current supplies, and the water management strategies for Hutchins.

**Table 4F.67**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Hutchins**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,200** | **4,000** | **5,000** | **6,500** | **8,500** | **14,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 821 | 1,008 | 1,255 | 1,624 | 2,123 | 3,497 |
| ***Total Projected Demand*** | ***821*** | ***1,008*** | ***1,255*** | ***1,624*** | ***2,123*** | ***3,497*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 755 | 757 | 900 | 1,094 | 1,319 | 1,910 |
| ***Total Current Supplies*** | ***755*** | ***757*** | ***900*** | ***1,094*** | ***1,319*** | ***1,910*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***66*** | ***251*** | ***355*** | ***530*** | ***804*** | ***1,587*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 23 | 56 | 78 | 116 | 170 | 309 |
| Additional Water from DWU | 43 | 195 | 277 | 414 | 634 | 1,278 |
| ***Total Water Management Strategies*** | ***66*** | ***251*** | ***355*** | ***530*** | ***804*** | ***1,587*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Irving

Irving is a city of about 220,000 people located in northwestern Dallas County. The city provides water for in-city municipal demand and for Dallas County Manufacturing use in the city. Irving gets its water supply from Lake Chapman and DWU. Recommended water management strategies for Irving are conservation, Lake Chapman Booster Pump Station expansion (to be done jointly with NTMWD), expansions to the Princeton Booster Pump Station, additional water from DWU, Oklahoma water, and direct reuse project. Alternative water management strategies for Irving include Marvin Nichols Reservoir, George Parkhouse North, George Parkhouse South, Ralph Hall, Lake Wright Patman, and indirect reuse. Table 4F.68 shows the projected population and demand, the current supplies, and the water management strategies for Irving.

**Table 4F.68**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Irving**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **219,238** | **240,099** | **255,853** | **267,751** | **276,736** | **283,521** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 58,202 | 66,967 | 70,502 | 73,780 | 76,256 | 78,126 |
| Manufacturing Demand | 2,047 | 2,267 | 2,469 | 2,653 | 2,802 | 2,819 |
| ***Total Projected Demand*** | ***60,249*** | ***69,234*** | ***72,971*** | ***76,433*** | ***79,058*** | ***80,945*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Chapman | 44,484 | 44,484 | 44,484 | 44,484 | 44,484 | 44,484 |
| Dallas Water Utilities | 14,497 | 14,082 | 2,869 | 2,694 | 2,485 | 2,185 |
| ***Total Current Supplies*** | ***58,981*** | ***58,566*** | ***47,353*** | ***47,178*** | ***46,969*** | ***46,669*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***1,268*** | ***10,668*** | ***25,618*** | ***29,255*** | ***32,089*** | ***34,276*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2,178 | 3,779 | 4,882 | 5,836 | 6,679 | 7,502 |
| Chapman Booster Pump Station (with NTMWD) | | 0 | 0 | 0 | 0 | 0 |
| Princeton Pump Station Expansion | | 0 | 0 | 0 | 0 | 0 |
| Additional Water from DWU | | 889 | 1,131 | 1,306 | 1,515 | 1,815 |
| Oklahoma | | | 25,000 | 25,000 | 25,000 | 25,000 |
| Direct Reuse | | 6,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| ***Total Water Management Strategies*** | ***2,178*** | ***10,668*** | ***39,013*** | ***40,142*** | ***41,194*** | ***42,317*** |
| **Reserve (Shortage)** | **910** | **0** | **13,395** | **10,887** | **9,105** | **8,041** |

## Lancaster

Lancaster is in southern Dallas County and has a population of about 38,000. The city receives most of its water supply from DWU, with a small number of connections in the city being served by Rockett SUD (with water from TRWD). Water management strategies for Lancaster are conservation, additional water from DWU with a new delivery point, and a small amount of additional water from Rockett SUD. Water management strategies for Lancaster are conservation and additional water from DWU. Table 4F.69 shows the projected population and demand, the current supplies, and the water management strategies for Lancaster.

**Table 4F.69**
**Projected Population and Demand, Current Supplies**
**and Water Management Strategies for the City of Lancaster**

| **(Values in Ac-Ft/Yr)** | **Projected Population and Demand** | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **38,000** | **59,664** | **65,301** | **65,301** | **65,301** | **65,301** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 5,704 | 8,755 | 9,436 | 9,363 | 9,363 | 9,363 |
| ***Total Projected Demand*** | ***5,704*** | ***8,755*** | ***9,436*** | ***9,363*** | ***9,363*** | ***9,363*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 5,162 | 5,601 | 5,601 | 5,601 | 5,601 | 5,066 |
| Rockett Special Utility District (TRWD) | 66 | 63 | 57 | 50 | 45 | 39 |
| ***Total Current Supplies*** | ***5,228*** | ***5,664*** | ***5,658*** | ***5,651*** | ***5,646*** | ***5,105*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***476*** | ***3,091*** | ***3,778*** | ***3,712*** | ***3,717*** | ***4,258*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 62 | 281 | 378 | 411 | 442 | 474 |
| Additional Water from DWU and New Delivery Point | 390 | 2,783 | 3,367 | 3,261 | 3,230 | 3,733 |
| Additional Water from Rockett SUD | 24 | 27 | 33 | 40 | 45 | 51 |
| ***Total Water Management Strategies*** | ***476*** | ***3,091*** | ***3,778*** | ***3,712*** | ***3,717*** | ***4,258*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Lewisville

Lewisville is a city of about 98,000 is located in southeastern Denton County with a small area in Dallas County. The water management strategies for Lewisville are described under Denton County on page 4F.125.

## Mesquite

Mesquite is a city of about 140,000 people located in eastern Dallas County extending into western Kaufman County. The city receives its water supply from NTMWD, and water management strategies for Mesquite are conservation and additional water from NTMWD. Table 4F.70 shows the projected population and demand, the current supplies, and the water management strategies for Mesquite.

**Table 4F.70**
**Projected Population and Demand, Current Supplies**
**and Water Management Strategies for the City of Mesquite**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **142,002** | **165,003** | **180,004** | **183,168** | **183,445** | **183,501** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 26,245 | 30,312 | 33,874 | 34,469 | 34,521 | 34,532 |
| ***Total Projected Demand*** | ***26,245*** | ***30,312*** | ***33,874*** | ***34,469*** | ***34,521*** | ***34,532*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 26,024 | 24,671 | 23,946 | 21,893 | 19,826 | 18,433 |
| ***Total Current Supplies*** | ***26,024*** | ***24,671*** | ***23,946*** | ***21,893*** | ***19,826*** | ***18,433*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***221*** | ***5,641*** | ***9,928*** | ***12,576*** | ***14,695*** | ***16,099*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 221 | 1,685 | 2,651 | 3,049 | 3,347 | 3,636 |
| Additional Water from NTMWD | 0 | 3,956 | 7,277 | 9,527 | 11,348 | 12,463 |
| ***Total Water Management Strategies*** | ***221*** | ***5,641*** | ***9,928*** | ***12,576*** | ***14,695*** | ***16,099*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Ovilla

Ovilla is a city of about 4,000 located in northern Ellis County and southern Dallas County. The water management strategies for Ovilla are described under Ellis County on page 4F.170.

## Richardson

Richardson is a city of about 103,000 people located in northern Dallas County and southern Collin County. The city receives its water supply from NTMWD, and water management strategies for Richardson are conservation and additional water from NTMWD. Table 4F.71 shows the projected population and demand, the current supplies, and the water management strategies for Richardson.

**Table 4F.71**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Richardson**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **102,880** | **116,000** | **116,000** | **116,000** | **116,000** | **116,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 32,383 | 36,123 | 35,993 | 35,602 | 35,343 | 35,343 |
| ***Total Projected Demand*** | ***32,383*** | ***36,123*** | ***35,993*** | ***35,602*** | ***35,343*** | ***35,343*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 31,797 | 29,401 | 25,444 | 22,612 | 20,299 | 18,866 |
| ***Total Current Supplies*** | ***31,797*** | ***29,401*** | ***25,444*** | ***22,612*** | ***20,299*** | ***18,866*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***586*** | ***6,722*** | ***10,549*** | ***12,990*** | ***15,044*** | ***16,477*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 586 | 2,010 | 2,531 | 2,814 | 3,091 | 3,386 |
| Additional Water from NTMWD | 0 | 4,712 | 8,018 | 10,176 | 11,953 | 13,091 |
| ***Total Water Management Strategies*** | ***586*** | ***6,722*** | ***10,549*** | ***12,990*** | ***15,044*** | ***16,477*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Rockett Special Utility District

Rockett SUD has a large service area in northern Ellis County extending into Dallas County. Rockett SUD is a wholesale water provider, and there is a discussion of the SUD's water supply plans on page 4E.95 in Section 4E.

## Rowlett

Rowlett is a city of about 59,000 located in northeastern Dallas County and Rockwall County. The city currently receives its water supply from NTMWD, and water management strategies for Rowlett are conservation and additional water from NTMWD. Table 4F.72 shows the projected population and demand, the current supplies, and the water management strategies for Rowlett.

**Table 4F.72**
**Projected Population and Demand, Current Supplies**
**and Water Management Strategies for the City of Rowlett**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **59,271** | **70,856** | **80,178** | **87,714** | **93,811** | **98,747** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 11,619 | 13,731 | 15,447 | 16,801 | 17,759 | 18,694 |
| ***Total Projected Demand*** | ***11,619*** | ***13,731*** | ***15,447*** | ***16,801*** | ***17,759*** | ***18,694*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 11,504 | 11,176 | 10,920 | 10,671 | 10,200 | 9,979 |
| ***Total Current Supplies*** | ***11,504*** | ***11,176*** | ***10,920*** | ***10,671*** | ***10,200*** | ***9,979*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***115*** | ***2,555*** | ***4,527*** | ***6,130*** | ***7,559*** | ***8,715*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 115 | 721 | 1,033 | 1,273 | 1,499 | 1,733 |
| Additional Water from NTMWD | 0 | 1,834 | 3,494 | 4,857 | 6,060 | 6,982 |
| ***Total Water Management Strategies*** | ***115*** | ***2,555*** | ***4,527*** | ***6,130*** | ***7,559*** | ***8,715*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Sachse

Sachse is a city of about 20,000 located in northeastern Dallas County and southern Collin County. Sachse receives its water supply from NTMWD, and water management strategies are conservation and additional water from NTMWD. Table 4F.73 shows the projected population and demand, the current supplies, and the water management strategies for Sachse.

**Table 4F.73**
**Projected Population and Demand, Current Supplies**
**and Water Management Strategies for the City of Sachse**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **20,560** | **23,700** | **27,000** | **27,000** | **27,000** | **27,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 4,399 | 5,124 | 5,806 | 5,746 | 5,746 | 5,746 |
| ***Total Projected Demand*** | ***4,399*** | ***5,124*** | ***5,806*** | ***5,746*** | ***5,746*** | ***5,746*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 4,351 | 4,170 | 4,104 | 3,649 | 3,300 | 3,067 |
| ***Total Current Supplies*** | ***4,351*** | ***4,170*** | ***4,104*** | ***3,649*** | ***3,300*** | ***3,067*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***48*** | ***954*** | ***1,702*** | ***2,097*** | ***2,446*** | ***2,679*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 48 | 298 | 461 | 510 | 558 | 606 |
| Additional Water from NTMWD | 0 | 656 | 1,241 | 1,587 | 1,888 | 2,073 |
| ***Total Water Management Strategies*** | ***48*** | ***954*** | ***1,702*** | ***2,097*** | ***2,446*** | ***2,679*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Sardis-Lone Elm Water Supply Corporation

Sardis-Lone Elm WSC serves northwestern Ellis County with a small area in Dallas County. Sardis-Lone Elm WSC's water supply plans are discussed under Ellis County on page 4F.174.

## Seagoville

Seagoville is a city of about 5,000 people located in southeastern Dallas County with some area in Kaufman County. Seagoville is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.98 in Section 4E.

## Sunnyvale

Sunnyvale located in eastern Dallas County and has a population of about 5,000. The city receives its water supply from NTMWD, and water management strategies are conservation and additional water from NTMWD. Table 4F.74 shows the projected population and demand, the current supplies, and the water management strategies for Sunnyvale.

**Table 4F.74**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Sunnyvale**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,000** | **7,000** | **9,000** | **11,000** | **13,000** | **13,300** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,770 | 2,454 | 3,135 | 3,820 | 4,514 | 4,618 |
| ***Total Projected Demand*** | ***1,770*** | ***2,454*** | ***3,135*** | ***3,820*** | ***4,514*** | ***4,618*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,756 | 1,997 | 2,216 | 2,426 | 2,593 | 2,465 |
| ***Total Current Supplies*** | ***1,756*** | ***1,997*** | ***2,216*** | ***2,426*** | ***2,593*** | ***2,465*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***14*** | ***457*** | ***919*** | ***1,394*** | ***1,921*** | ***2,153*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 108 | 174 | 246 | 328 | 375 |
| Additional Water from NTMWD | 0 | 349 | 745 | 1,148 | 1,593 | 1,778 |
| ***Total Water Management Strategies*** | ***14*** | ***457*** | ***919*** | ***1,394*** | ***1,921*** | ***2,153*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## University Park

University Park is a city of about 24,000 people in central Dallas County and receives its water supply from the Dallas County Park Cities MUD. The only water management strategy for the city is conservation. Table 4F.75 shows the projected population and demand, the current supplies, and the water management strategy for University Park.

**Table 4F.75**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of University Park**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **24,092** | **24,647** | **25,046** | **25,335** | **25,543** | **25,693** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 7,799 | 7,896 | 7,940 | 7,946 | 7,983 | 8,030 |
| ***Total Projected Demand*** | ***7,799*** | ***7,896*** | ***7,940*** | ***7,946*** | ***7,983*** | ***8,030*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas County Park Cities MUD | 7,754 | 7,765 | 7,756 | 7,733 | 7,742 | 7,760 |
| ***Total Current Supplies*** | ***7,754*** | ***7,765*** | ***7,756*** | ***7,733*** | ***7,742*** | ***7,760*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***45*** | ***131*** | ***184*** | ***213*** | ***241*** | ***270*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 45 | 131 | 184 | 213 | 241 | 270 |
| ***Total Water Management Strategies*** | ***45*** | ***131*** | ***184*** | ***213*** | ***241*** | ***270*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Wilmer

Wilmer is a city of about 3,800 people located in southeastern Dallas County. The city receives its water supply from groundwater (Trinity aquifer) and DWU (through Hutchins). Water management strategies for Wilmer are conservation, additional water from DWU (through Hutchins), and supplemental wells to replace existing water wells. 4F.76 shows the projected population and demand, the current supplies, and the water management strategies for Wilmer.

**Table 4F.76**
**Projected Population and Demand, Current Supplies and Water Management Strategies for the City of Wilmer**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,800** | **4,400** | **5,200** | **7,500** | **14,000** | **22,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 443 | 527 | 612 | 874 | 1,631 | 2,563 |
| ***Total Projected Demand*** | ***443*** | ***527*** | ***612*** | ***874*** | ***1,631*** | ***2,563*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 322 | 322 | 322 | 322 | 322 | 322 |
| Hutchins (DWU) | 111 | 154 | 208 | 372 | 813 | 1,224 |
| ***Total Current Supplies*** | ***433*** | ***476*** | ***530*** | ***694*** | ***1,135*** | ***1,546*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***10*** | ***51*** | ***82*** | ***180*** | ***496*** | ***1,017*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 21 | 32 | 49 | 97 | 160 |
| Additional Water from Hutchins | 3 | 30 | 50 | 131 | 399 | 857 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***10*** | ***51*** | ***82*** | ***180*** | ***496*** | ***1,017*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Wylie

Wylie is city of about 40,000 located in southern Collin County with small areas in Dallas and Rockwall Counties. Wylie's water supply plans are discussed under Collin County on page 4F.33.

## Costs for Dallas County Water User Groups

Table 4F.77 shows the estimated capital costs for Dallas County water management strategies not covered under the wholesale water providers, and Table 4F.78 summarizes the costs by category. Table 4F.79 shows the cost of the alternative strategy not covered under the wholesale water providers, and it is followed by a summary for Dallas County.

**Table 4F.77**
**Costs for Recommended Water Management Strategies for Dallas County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Addison | Conservation | 2010 | 841 | $0 | $0.24 | $0.24 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 4,703 | $0 | $1.37 | $1.37 | None |
| Balch Springs | Conservation | 2010 | 180 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Dallas County WCID #6 (from DWU) | 2010 | 1,194 | See Dallas County WCID #6 in Section 4E. | | | |
| Carrollton* | Conservation | See Denton County. | | | | | |
| | Supplemental wells | See Denton County. | | | | | |
| | Additional DWU supplies | See Denton County. | | | | | |
| Cedar Hill* | Conservation | 2010 | 1,850 | $31,000 | $0.28 | $0.28 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,808,000 | N/A | N/A | Q-13 |
| | Additional DWU supplies | 1558 | 5,876 | $0 | $1.37 | $1.37 | None |
| Cockrell Hill | Conservation | 2010 | 36 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 267 | $0 | $1.37 | $1.37 | None |
| Combine* | Conservation | See Kaufman County. | | | | | |
| | Additional DWU supplies | See Kaufman County. | | | | | |
| Combine WSC* | Conservation | See Kaufman County. | | | | | |
| | Direct connection with DWU | See Kaufman County. | | | | | |
| | Additional DWU supplies | See Kaufman County. | | | | | |

(Table 4F.77, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Coppell* | Conservation | 2010 | 1,255 | $14,000 | $0.31 | $0.31 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 3,936 | $0 | $1.37 | $1.37 | None |
| Dallas* | Conservation | 2010 | 52,987*** | See DWU in Section 4E. | | | |
| | See DWU Information in Section 4E. | See DWU in Section 4E. | | | | | |
| Dallas County Other | Conservation | 2010 | 5 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $794,000 | N/A | N/A | Q-13 |
| Dallas County WCID #6 | Conservation | N/A | 0 | See Dallas County WCID #6 in Section 4E. | | | |
| | Additional DWU supplies | N/A | 0 | See Dallas County WCID #6 in Section 4E. | | | |
| DeSoto | Conservation | 2010 | 1,773 | $0 | $0.64 | $0.64 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 6,517 | $0 | $1.37 | $1.37 | None |
| Duncanville | Conservation | 2010 | 1,113 | $0 | $0.52 | $0.52 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 2,225 | $0 | $1.37 | $1.37 | None |
| East Fork SUD* | Conservation | See Collin County. | | | | | |
| | Additional NTMWD supplies | See Collin County. | | | | | |
| Farmers Branch | Conservation | 2010 | 1,745 | $11,000 | $0.43 | $0.43 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 5,036 | $0 | $1.37 | $1.37 | None |
| Garland* | Conservation | 2010 | 5,075 | See Garland in Section 4E. | | | |
| | Additional NTMWD supplies | 2010 | 14,594 | See Garland in Section 4E. | | | |

**(Table 4F.77, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Glenn Heights* | Conservation | 2010 | 186 | $0 | $0 | $0 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,659,000 | N/A | N/A | Q-13 |
| | Additional DWU supplies | 2010 | 1,099 | $0 | $1.37 | $1.37 | None |
| Grand Prairie* | Conservation | 2010 | 6,366 | See Grand Prairie in Section 4E. | | | |
| | Additional DWU supplies | 2010 | 7,804 | See Grand Prairie in Section 4E. | | | |
| | Supplemental wells | 2010 | 0 | See Grand Prairie in Section 4E. | | | |
| | Additional Fort Worth (TRWD | 2010 | 544 | See Grand Prairie in Section 4E. | | | |
| | Midlothian (from TRWD and Joe Pool) | 2020 | 7,287 | See Grand Prairie in Section 4E. | | | |
| | Mansfield (from TRWD) | 2020 | 6,726 | See Grand Prairie in Section 4E. | | | |
| | Arlington (from TRWD) | 2020 | 4,484 | See Grand Prairie in Section 4E. | | | |
| Grapevine* | Conservation | See Tarrant County. | | | | | |
| | Additional Reuse | See Tarrant County. | | | | | |
| | Additional TRA | See Tarrant County. | | | | | |
| Highland Park | Conservation | 2010 | 132 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Hutchins | Conservation | 2010 | 309 | $0 | $0.46 | $0.46 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 1,278 | $0 | $1.37 | $1.37 | None |
| Irving | Conservation | 2010 | 7,502 | $20,000 | $0.29 | $0.29 | Q-10 & Q-11 |
| | Chapman Booster PS (w/ NTMWD) | 2020 | 0 | $9,092,000 | N/A | N/A | Q-68 |
| | Direct reuse | 2020 | 8,000 | $58,628,000 | $1.86 | $0.77 | Q-136 |
| | Princeton PS Expansion | 2020 | 0 | $12,879,000 | N/A | N/A | Q-134 |

(Table 4F.77, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Irving, Continued | Oklahoma (Lake Hugo) | 2030 | 25,000 | $302,717,000 | $4.52 | $1.81 | Q-137 & Q-139 |
| | Additional DWU supplies | 2020 | 1,815 | $0 | $1.37 | $1.37 | None |
| Lancaster | Conservation | 2010 | 474 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | New Delivery Point for DWU and DWU supplies | 2010 | 3,733 | $2,373,000 | $1.00 | $0.86 | Q-142 |
| | Additional Rockett SUD supplies | 2010 | 51 | $0 | $2.50 | $2.50 | None |
| Lewisville* | Conservation | See Denton County. | | | | | |
| | New water treatment plant and expansions | See Denton County. | | | | | |
| | Additional DWU supplies | See Denton County. | | | | | |
| Mesquite* | Conservation | 2010 | 3,636 | $62,000 | $0.29 | $0.29 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 12,463 | $0 | $1.37 | $1.37 | None |
| Ovilla* | Conservation | See Ellis County. | | | | | |
| | Supplemental wells | See Ellis County. | | | | | |
| | Additional DWU supplies | See Ellis County. | | | | | |
| Richardson* | Conservation | 2010 | 3,386 | $20,000 | $0.25 | $0.25 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 13,091 | $0 | $1.37 | $1.37 | None |

(Table 4F.77, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Rockett SUD* | Conservation | See Rockett SUD in Section 4E. | | | | | |
| | Additional TRA from TRWD (Sokoll Plant) | See Rockett SUD in Section 4E. | | | | | |
| Rowlett* | Conservation | 2010 | 1,733 | $0 | $0.33 | $0.33 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 6,982 | $0 | $1.25 | $1.25 | None |
| Sachse* | Conservation | 2010 | 606 | $20,000 | $0.40 | $0.40 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 2,073 | $0 | $1.30 | $1.30 | None |
| Sardis-Lone Elm WSC* | Conservation | See Ellis County. | | | | | |
| | Supplemental wells | See Ellis County. | | | | | |
| | Rockett SUD (from TRA from TRWD) | See Ellis County. | | | | | |
| Seagoville* | Conservation | 2010 | 201 | $0 | $0.53 | $0.53 | Q-10 & Q-11 |
| | Additional DWU supplies | 2020 | 1,778 | $0 | $1.37 | $1.37 | None |
| Sunnyvale | Conservation | 2010 | 375 | $0 | $0.33 | $0.33 | Q-10 & Q-11 |
| | Additional NTMWD supplies | 2020 | 1,778 | $0 | $1.37 | $1.37 | None |
| University Park | Conservation | 2010 | 270 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Wilmer | Conservation | 2010 | 160 | $5,000 | $0.11 | $0.11 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,977,000 | N/A | N/A | Q-13 |
| | Additional Hutchins (from DWU) | 2010 | 857 | $0 | $2.50 | $2.50 | None |

**(Table 4F.77, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Wylie* | Conservation | See Collin County. | | | | | |
| | Additional NTMWD supplies | See Collin County. | | | | | |
| Dallas County Irrigation | Conservation | 2010 | 1,422 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $316,000 | N/A | N/A | Q-13 |
| | Los Colinas Expansion | 2015 | 7,000 | $14,530,000 | $0.87 | $0.41 | Q-75 |
| | Additional DWU supplies | 2010 | 3,978 | $0 | $0.49 | $0.49 | None |
| Dallas County Livestock | Supplemental wells | 2010 | 0 | $186,000 | N/A | N/A | Q-13 |
| Dallas County Manufacturing | Conservation | 2020 | 1,258 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $1,410,000 | N/A | N/A | Q-13 |
| | Additional DWU supplies | 2010 | 15,562 | $0 | $1.37 | $1.37 | None |
| | Additional NTMWD supplies | 2020 | 4,162 | $0 | $1.25 | $1.25 | None |
| Dallas County Mining | Supplemental wells | 2010 | 0 | $316,000 | N/A | N/A | Q-13 |
| | Additional DWU supplies | 2020 | 121 | $0 | $0.49 | $0.49 | None |
| Dallas County Steam Electric | Additional DWU supplies | 2010 | 2,269 | $0 | $0.49 | $0.49 | None |
| | Additional NTMWD supplies | 2020 | 112 | $0 | $0.69 | $0.69 | None |
| | Reuse (TRA) | 2030 | 4,500 | $14,895,000 | $1.19 | $0.46 | Q-76 |

Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.78**
**Summary of Recommended Water Management Strategies for Dallas County Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 90,890 | $183,000 |
| Purchase from WWP | 144,318 | $11,465,000 |
| Supplemental Wells | 0 | $10,466,000 |
| Connect to Supplies | 44,500 | $403,649,000 |
| **Total** | | **$425,763,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.

**Table 4F.79**
**Summary of Alternative Water Management Strategies for Dallas County Not Covered Under Wholesale Water Providers**

| Strategy and Supplier | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Marvin Nichols Reservoir | 50,000 | $322,326,000 |
| George Parkhouse North | 50,000 | $360,612,000 |
| George Parkhouse South | 50,000 | $428,329,000 |
| Lake Ralph Hall | 29,219 | $143,201,000 |
| Indirect Reuse | 26,000 | $194,183,000 |
| Wright Patman – System | 50,000 | $403,387,000 |
| Wright Patman – Raise Flood Pool | 50,000 | $527,595,000 |
| Wright Patman – Texarkana | 50,000 | $507,523,000 |
| **Total** | | **$2,887,156,000** |


***2000 Population:*** *2,218,774*

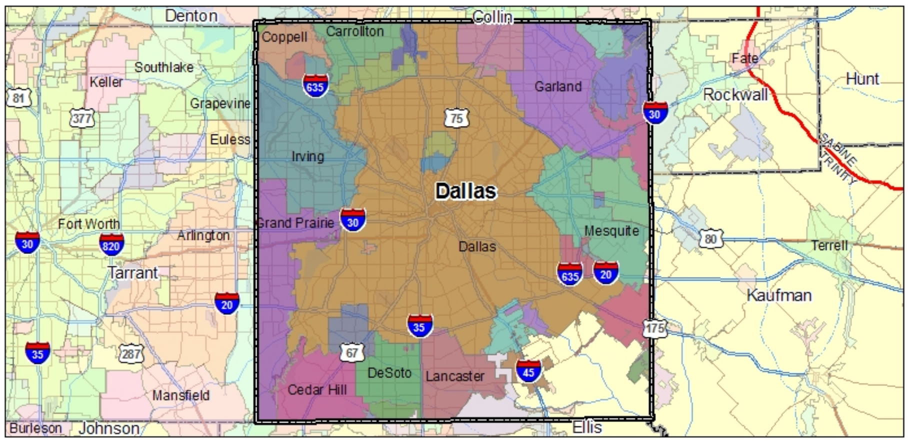
***Projected 2060 Population:*** *3,695,125*

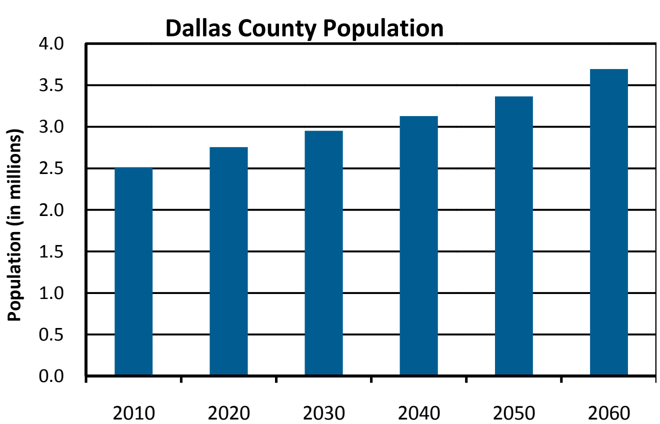
***County Seat:*** *Dallas*

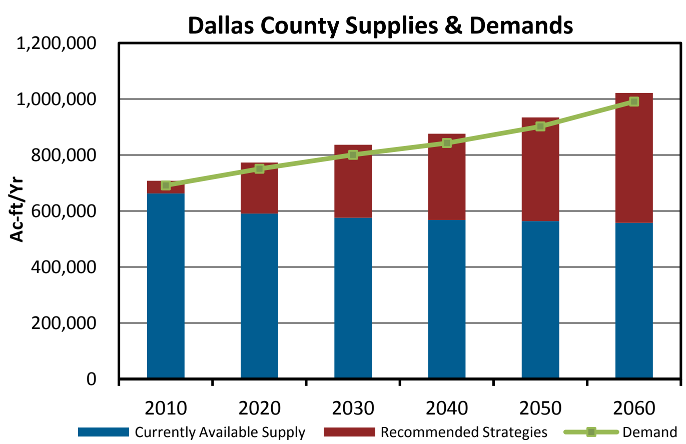
***Economy:*** *Telecommunications, transportation, manufacturing, government/services.*

***River Basin(s):***

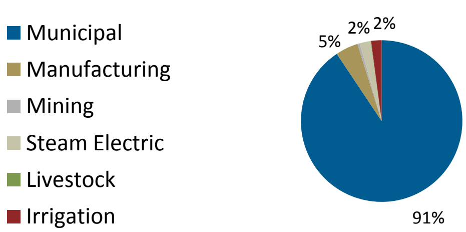
- Trinity (100%)



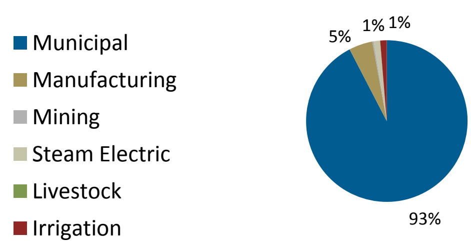




**2000 Dallas County Demand**
**(% of total)**




**Total=623,535 acre-feet**

**2060 Dallas County Demand**
**(% of total)**




**Total= 991,021 acre-feet**

| WATER USER GROUP | 2060 DALLAS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Addison | 12,218 | DWU | Additional DWU supplies |
| Balch Springs | 3,028 | Dallas County WCID #6 (from DWU) | Additional DCWCID #6 (from DWU) |
| Carrollton [a] | 10,946 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Cedar Hill [a] | 17,270 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Cockrell Hill | 668 | DWU | Additional DWU supplies |
| Combine [a] | 188 | Combine WSC (from DWU) | Additional Combine WSC (from DWU) |
| Combine WSC [a] | 373 | DWU | Additional DWU supplies |
| Coppell [a] | 11,157 | DWU | Additional DWU supplies |
| Dallas [a] | 539,023 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| Dallas Co. WCID #6 | Balch Springs | DWU | Additional DWU supplies |
| Desoto | 18,271 | DWU | Additional DWU supplies |
| Duncanville | 7,356 | DWU | Additional DWU supplies |
| East Fork SUD [a] | 132 | NTMWD | Additional NTMWD supplies |
| Farmers Branch | 14,945 | DWU | Additional DWU supplies |
| Garland [a] | 42,190 | NTMWD | Additional NTMWD supplies |
| Glenn Heights [a] | 1,820 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU |
| Grand Prairie [a] | 38,514 | Trinity Aquifer, DWU, Fort Worth (TRWD), Joe Pool Lake (for Irrigation) | Supplemental wells, Additional DWU supplies, Additional Fort Worth supplies, Midlothian (TRWD), Mansfield (TRWD), Arlington (TRWD) |
| Highland Park | 4,319 | Dallas County Park Cities MUD | None |
| Hutchins | 3,497 | DWU | Additional DWU supplies |
| Irving | 78,126 | DWU, Lake Chapman | Additional DWU supplies, Direct reuse, Oklahoma (Lake Hugo), Chapman booster pump station (w/ NTMWD), Princeton pump station expansion |
| Lancaster | 9,363 | DWU, Rockett SUD | Additional DWU supplies and new delivery point, Additional Rockett SUD |
| Lewisville [a] | 1 | DWU | Additional DWU supplies, WTP expansions, New WTP |
| Mesquite [a] | 34,530 | NTMWD | Additional NTMWD supplies |
| Ovilla [a] | 630 | DWU | Additional DWU supplies |
| Richardson [a] | 24,984 | NTMWD | Additional NTMWD |
| Rockett SUD [a] | 616 | Midlothian (TRA), TRA from TRWD | Additional TRA from TRWD, WTP expansions |
| Rowlett [a] | 17,236 | NTMWD | Additional NTMWD supplies |
| Sachse [a] | 4,384 | NTMWD | Additional NTMWD supplies |

| WATER USER GROUP | 2060 DALLAS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [B] |
|---|---|---|---|
| Sardis-Lone Elm WSC [a] | 7 | Trinity Aquifer | Supplemental wells, Rockett SUD (TRA from TRWD), Overdraft Trinity Aquifer (2010) |
| Seagoville [a] | 4,180 | DWU | Additional DWU supplies |
| Sunnyvale | 4,618 | NTMWD | Additional NTMWD supplies |
| University Park | 8,030 | Dallas County Park Cities MUD | None |
| Wilmer | 2,563 | Trinity Aquifer, Hutchins (DWU) | Supplemental wells, Additional Hutchins (DWU) |
| Wylie [a] | 209 | NTMWD | Additional NTMWD supplies |
| County-Other | 47 | Trinity and Woodbine Aquifers, DWU | Supplemental wells |
| Irrigation | 13,087 | Other Aquifer, DWU, Indirect Reuse (TRA), Direct Reuse (DWU), Local supplies, Joe Pool Lake (Grand Prairie) | Supplemental wells, Additional DWU supplies, Additional TRA reuse (Las Colinas) |
| Livestock | 482 | Woodbine Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 46,983 | DWU, NTMWD, Irving (Lake Chapman), Reuse, Trinity and Woodbine Aquifers | Additional NTMWD supplies, Additional DWU supplies, Supplemental wells |
| Mining | 3,030 | Trinity, Woodbine, and Other Aquifers, DWU, Local supplies | Supplemental wells, Additional DWU supplies |
| Steam Electric Power | 12,000 | NTMWD, DWU, Mountain Creek Lake, Run of River | Additional NTMWD supplies, Additional DWU supplies, Reuse (TRA) |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

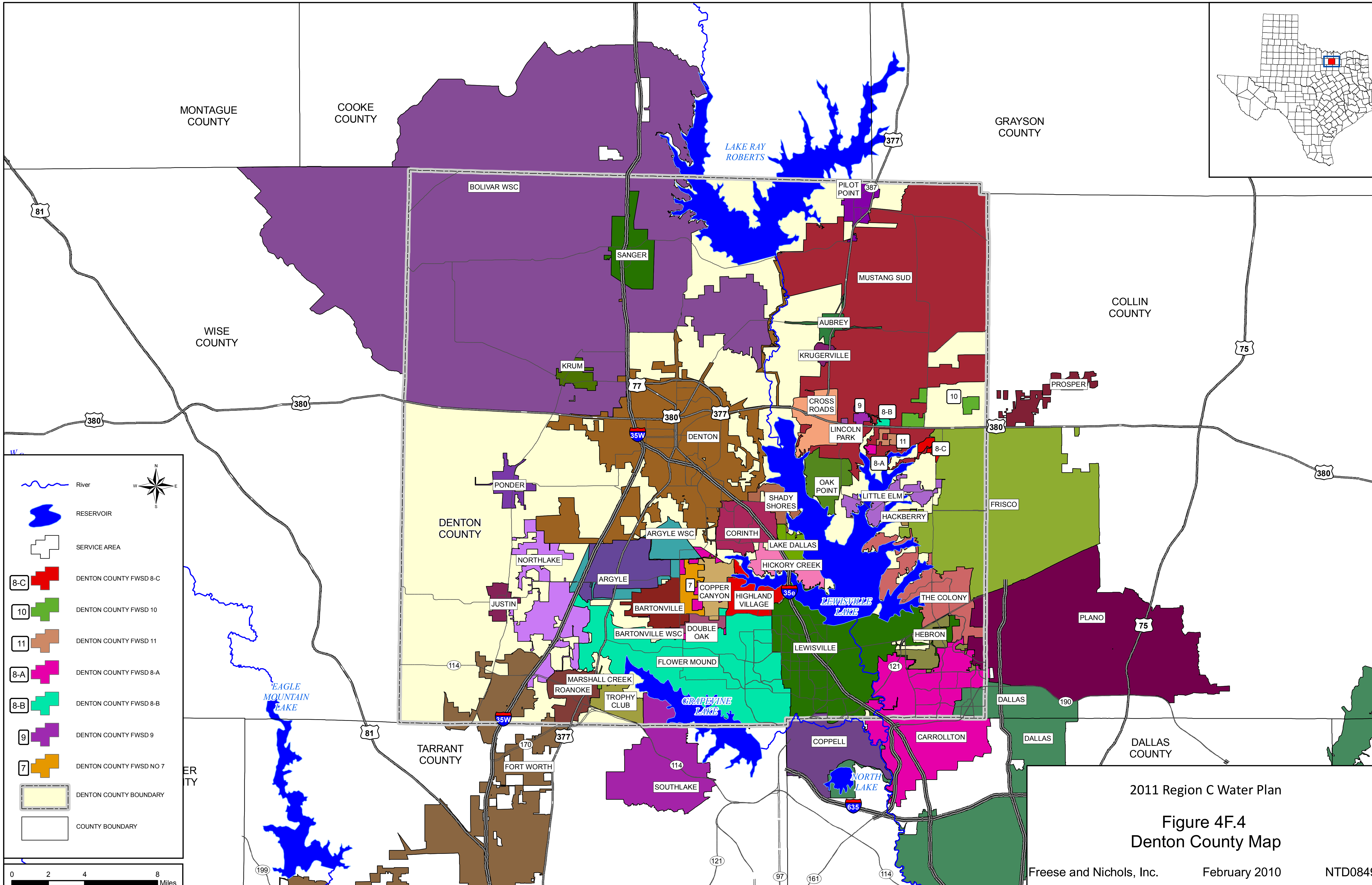
### *4F.4 Denton County*

Figure 4F.4 is a map of Denton County, which has many sources of water supply. The Upper Trinity Regional Water District (UTRWD), a wholesale water provider in Region C, supplies water to many water user groups in Denton County and is expected supply an increasing amount of water in the county. The City of Denton has its own supplies and plans to obtain raw water from Dallas Water Utilities (DWU) in the future. Other wholesale water providers also supply treated water to Denton County:

- Dallas Water Utilities (DWU) supplies cities in the southeast part of the county (Carrollton, Coppell, Dallas, Lewisville, and The Colony).
- North Texas Municipal Water District (NTMWD) provides water to cities in the east part of the county (Frisco, Hackberry, Little Elm, and Prosper).
- Fort Worth supplies cities in the south and southwest part of the county (Northlake, Roanoke, Southlake, and Trophy Club).

Many water suppliers in Denton County have traditionally used groundwater, but the growing demand for water has cause suppliers to increase their use of surface water supplies in recent years. Surface water use is expected to continue to grow in the future.

Water management strategies for Denton County water user groups are discussed below. Table 4F.116 on page 4F.138 shows the estimated capital costs for the Denton County water management strategies not associated with the wholesale water providers, and Table 4F.117 on page 4F.145 is a summary of the costs by category. Table 4F.117 is followed by a summary for Denton County.


MONTAGUE COUNTY
COOKE COUNTY
GRAYSON COUNTY
WISE COUNTY
COLLIN COUNTY
DENTON COUNTY
TARRANT COUNTY
DALLAS COUNTY
LAKE RAY ROBERTS
LEWISVILLE LAKE
GRAPEVINE LAKE
EAGLE MOUNTAIN LAKE
NORTH LAKE
BOLIVAR WSC
SANGER
KRUM
PILOT POINT
MUSTANG SUD
AUBREY
KRUGERVILLE
CROSS ROADS
PROSPER
LINCOLN PARK
DENTON
PONDER
OAK POINT
LITTLE ELM
SHADY SHORES
HACKBERRY
FRISCO
ARGYLE WSC
CORINTH
LAKE DALLAS
NORTHLAKE
HICKORY CREEK
ARGYLE
COPPER CANYON
HIGHLAND VILLAGE
THE COLONY
JUSTIN
BARTONVILLE
PLANO
DOUBLE OAK
BARTONVILLE WSC
HEBRON
LEWISVILLE
FLOWER MOUND
MARSHALL CREEK
ROANOKE
TROPHY CLUB
DALLAS
COPPELL
CARROLLTON
FORT WORTH
SOUTHLAKE
River
RESERVOIR
SERVICE AREA
8-C DENTON COUNTY FWSD 8-C
10 DENTON COUNTY FWSD 10
11 DENTON COUNTY FWSD 11
8-A DENTON COUNTY FWSD 8-A
8-B DENTON COUNTY FWSD 8-B
9 DENTON COUNTY FWSD 9
7 DENTON COUNTY FWSD NO 7
DENTON COUNTY BOUNDARY
COUNTY BOUNDARY
0 2 4 8 Miles
2011 Region C Water Plan
Figure 4F.4
Denton County Map
Freese and Nichols, Inc.
February 2010
NTD08492

## Argyle

Argyle is a city of about 3,800 people located in southern Denton County. Argyle WSC provides retail service within the city, and Argyle WSC's water supply is from groundwater and UTRWD. Water management strategies for Argyle are conservation and additional water from Argyle WSC. Table 4F.80 shows the projected population and demand, the current supplies, and the water management strategies for Argyle.

**Table 4F.80**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Argyle**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,750** | **8,935** | **12,983** | **14,550** | **16,282** | **18,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,227 | 2,902 | 4,217 | 4,710 | 5,271 | 5,827 |
| ***Total Projected Water Demand*** | ***1,227*** | ***2,902*** | ***4,217*** | ***4,710*** | ***5,271*** | ***5,827*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Argyle WSC (UTRWD and groundwater) | 1,209 | 1,343 | 1,394 | 1,291 | 1,222 | 1,210 |
| ***Total Current Supplies*** | ***1,209*** | ***1,343*** | ***1,394*** | ***1,291*** | ***1,222*** | ***1,210*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***18*** | ***1,559*** | ***2,823*** | ***3,419*** | ***4,049*** | ***4,617*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 34 | 135 | 239 | 307 | 387 | 477 |
| Additional Water from Argyle WSC | | 1,424 | 2,631 | 3,207 | 3,804 | 4,330 |
| ***Total Water Management Strategies*** | ***34*** | ***1,559*** | ***2,870*** | ***3,514*** | ***4,191*** | ***4,807*** |
| **Reserve (Shortage)** | **16** | **0** | **47** | **95** | **142** | **190** |

## Argyle Water Supply Corporation

Argyle WSC serves about 10,000 people in and around the City of Argyle in Denton County. Argyle WSC is a wholesale water provider, and there is a discussion of the WSC's water supply plans on page 4E.60 of Section 4E.

## Aubrey

Aubrey is a city of about 2,800 people in northeast Denton County. The city receives its water supply from groundwater (Trinity aquifer) and UTRWD. Water management strategies for Aubrey are conservation, additional water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.81 shows the projected population and demand, the current supplies, and the water management strategies for Aubrey.

**Table 4F.81**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Aubrey**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,830** | **5,375** | **8,755** | **11,767** | **15,814** | **21,252** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 396 | 855 | 1,373 | 1,819 | 2,445 | 3,285 |
| ***Total Projected Demand*** | ***396*** | ***855*** | ***1,373*** | ***1,819*** | ***2,445*** | ***3,285*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 436 | 436 | 436 | 436 | 436 | 436 |
| Upper Trinity Regional Water District | 102 | 202 | 270 | 299 | 339 | 413 |
| ***Total Current Supplies*** | ***538*** | ***638*** | ***706*** | ***735*** | ***775*** | ***849*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***217*** | ***667*** | ***1,084*** | ***1,670*** | ***2,436*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 8 | 55 | 68 | 97 | 139 | 198 |
| Additional Water from UTRWD | 0 | 307 | 773 | 1,190 | 1,763 | 2,499 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***8*** | ***362*** | ***841*** | ***1,287*** | ***1,902*** | ***2,697*** |
| **Reserve (Shortage)** | **150** | **145** | **174** | **203** | **232** | **261** |

## Bartonville

Bartonville is a city of about 1,500 people in southern Denton County. Bartonville WSC provides retail water service to the residents of Bartonville, and the water supply comes from groundwater (Trinity aquifer) and UTRWD. Water management strategies for

Bartonville are conservation and additional water from Bartonville WSC. Table 4F.82 shows the projected population and demand, the current supplies, and the water management strategies for Bartonville.

**Table 4F.82**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Bartonville**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | 1,500 | 4,500 | 5,000 | 5,000 | 5,000 | 5,000 |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 282 | 943 | 1,042 | 1,042 | 1,042 | 1,042 |
| ***Total Projected Water Demand*** | ***282*** | ***943*** | ***1,042*** | ***1,042*** | ***1,042*** | ***1,042*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Bartonville WSC (UTRWD and groundwater) | 277 | 377 | 301 | 249 | 213 | 196 |
| ***Total Current Supplies*** | ***277*** | ***377*** | ***301*** | ***249*** | ***213*** | ***196*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***5*** | ***566*** | ***741*** | ***793*** | ***829*** | ***846*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 9 | 54 | 71 | 80 | 88 | 97 |
| Additional Water from Bartonville WSC | 0 | 512 | 676 | 725 | 760 | 774 |
| ***Total Water Management Strategies*** | ***9*** | ***566*** | ***747*** | ***805*** | ***848*** | ***871*** |
| **Reserve (Shortage)** | **4** | **0** | **6** | **12** | **19** | **25** |

## Bartonville Water Supply Corporation

Bartonville WSC serves about 7,200 people in and around the cities of Bartonville, Copper Canyon, and Double Oak in southern Denton County. Bartonville WSC is a wholesale water provider, and there is a discussion of the WSC's water supply plans on page 4E.67 of Section 4E.

## Bolivar Water Supply Corporation

Bolivar WSC serves wholesale and retail customers in Cooke, Denton, and Wise Counties. Bolivar WSC is a wholesale water provider, and there is a discussion of water supply plans for the WSC beginning on page 4E.68 in Section 4E.

## Carrollton

Carrollton is a city of about 121,000 people located in southern Denton County and northwest Dallas County. The City of Carrollton receives its water supply from groundwater (very small amount from the Trinity aquifer) and DWU. Water management strategies for Carrollton are conservation, additional water from DWU and supplemental wells to replace existing wells. Table 4F.83 shows the projected population and demand, the current supplies, and the water management strategies for Carrollton.

**Table 4F.83**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Carrollton**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **121,000** | **124,000** | **128,500** | **131,320** | **133,450** | **134,800** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 25,887 | 26,113 | 26,772 | 27,065 | 27,356 | 27,632 |
| ***Total Projected Demand*** | ***25,887*** | ***26,113*** | ***26,772*** | ***27,065*** | ***27,356*** | ***27,632*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 10 | 10 | 10 | 10 | 10 | 10 |
| Dallas Water Utilities | 23,806 | 19,612 | 19,203 | 18,225 | 16,995 | 15,094 |
| ***Total Current Supplies*** | ***23,816*** | ***19,622*** | ***19,213*** | ***18,235*** | ***17,005*** | ***15,104*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2,071*** | ***6,491*** | ***7,559*** | ***8,830*** | ***10,351*** | ***12,528*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1,048 | 1,732 | 2,127 | 2,394 | 2,652 | 2,911 |
| Additional Water from DWU | 1,033 | 4,769 | 5,442 | 6,446 | 7,709 | 9,627 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2,081*** | ***6,501*** | ***7,569*** | ***8,840*** | ***10,361*** | ***12,538*** |
| **Reserve (Shortage)** | **10** | **10** | **10** | **10** | **10** | **10** |

## Celina

The City of Celina has a population of about 5,000 people and is located in northwest Collin County. Celina is projected to grow rapidly in the coming decades and to expand into Denton County. Water supply plans for Celina are discussed on page 4F.6 under Collin County.

## Coppell

Coppell has a population of about 40,000 people and is located in northwest Dallas County with a small population in Denton County. Water supply plans for Coppell are discussed on page 4F.67 under Dallas County.

## Copper Canyon

Copper Canyon is a city of about 1,300 people in southern Denton County. Bartonville WSC provides retail water service to the residents of Copper Canyon, and the water supply comes from groundwater (Trinity aquifer) and UTRWD. Water management strategies for Copper Canyon are conservation and additional water from Bartonville WSC. Table 4F.84 shows the projected population and demand, the current supplies, and the water management strategies for Copper Canyon.

**Table 4F.84**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Copper Canyon**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,300** | **1,600** | **1,900** | **2,200** | **2,500** | **2,800** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 357 | 432 | 507 | 582 | 661 | 740 |
| ***Total Projected Water Demand*** | ***357*** | ***432*** | ***507*** | ***582*** | ***661*** | ***740*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Bartonville WSC (UTRWD and groundwater) | 351 | 223 | 207 | 201 | 196 | 197 |
| ***Total Current Supplies*** | ***351*** | ***223*** | ***207*** | ***201*** | ***196*** | ***197*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***6*** | ***209*** | ***300*** | ***381*** | ***465*** | ***543*** |
| | | | | | | |

**(Table 4F.84 continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 10 | 20 | 30 | 40 | 51 | 63 |
| Additional Water from Bartonville WSC | 0 | 189 | 281 | 362 | 435 | 512 |
| ***Total Water Management Strategies*** | ***10*** | ***209*** | ***311*** | ***402*** | ***486*** | ***575*** |
| **Reserve (Shortage)** | **4** | **0** | **11** | **21** | **21** | **32** |

## Corinth

Corinth is a city of about 21,000 people located in central Denton County. The city gets its water supply from groundwater (Trinity aquifer) and UTRWD. Water management strategies for Corinth are conservation, additional water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.85 shows the projected population and demand, the current supplies, and the water management strategies for Corinth.

**Table 4F.85**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Corinth**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **21,032** | **24,000** | **26,000** | **28,000** | **30,000** | **31,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 4,665 | 5,269 | 5,679 | 6,085 | 6,519 | 6,845 |
| ***Total Projected Demand*** | ***4,665*** | ***5,269*** | ***5,679*** | ***6,085*** | ***6,519*** | ***6,845*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 280 | 280 | 280 | 280 | 280 | 280 |
| Upper Trinity Regional Water District | 4,204 | 1,886 | 1,379 | 1,147 | 987 | 909 |
| ***Total Current Supplies*** | ***4,484*** | ***2,166*** | ***1,659*** | ***1,427*** | ***1,267*** | ***1,189*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***181*** | ***3,103*** | ***4,020*** | ***4,658*** | ***5,252*** | ***5,656*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 211 | 368 | 474 | 565 | 659 | 750 |
| Additional Water from UTRWD | 0 | 3,015 | 3,826 | 4,373 | 4,873 | 5,186 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***211*** | ***3,383*** | ***4,300*** | ***4,938*** | ***5,532*** | ***5,936*** |
| **Reserve (Shortage)** | **30** | **280** | **280** | **280** | **280** | **280** |

## Cross Roads

Cross Roads is a city of about 1,500 in central Denton County. The residents of Cross Roads are provided retail services by Mustang SUD, and the water supply comes from groundwater and UTRWD. Water management strategies for Cross Roads are conservation and additional water from Mustang SUD. Table 4F.86 shows the projected population and demand, the current supplies, and the water management strategies for Cross Roads.

**Table 4F.86**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Cross Roads**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,500** | **3,800** | **3,800** | **3,800** | **3,800** | **3,800** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 575 | 1,234 | 1,230 | 1,230 | 1,230 | 1,230 |
| ***Total Projected Demand*** | ***575*** | ***1,234*** | ***1,230*** | ***1,230*** | ***1,230*** | ***1,230*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Mustang SUD (UTRWD & Groundwater) | 532 | 579 | 498 | 459 | 426 | 410 |
| ***Total Current Supplies*** | ***532*** | ***579*** | ***498*** | ***459*** | ***426*** | ***410*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***43*** | ***655*** | ***732*** | ***771*** | ***804*** | ***820*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 19 | 64 | 76 | 86 | 97 | 107 |
| Additional Water from Mustang SUD | 24 | 591 | 682 | 736 | 784 | 815 |
| ***Total Water Management Strategies*** | ***43*** | ***655*** | ***758*** | ***822*** | ***881*** | ***922*** |
| **Reserve (Shortage)** | **0** | **0** | **26** | **51** | **77** | **102** |

## Dallas

Dallas Water Utilities (DWU) is the water utility of the City of Dallas, which has a population of about 1,300,000. DWU is a wholesale water provider. The City of Dallas is primarily in Dallas County but extends into Denton County (and other counties). There is a detailed discussion of water supply plans for DWU beginning on page 4E.4 in Section 4E.

## Denton

Denton is a city of about 121,000 in central Denton County and is a wholesale water provider. Denton's water supply plans are discussed beginning on page 4E.71 in Section 4E.

## Denton County Fresh Water Supply District No. 1A

Denton County FWSD No. 1A serves about 3,100 people in southeastern Denton County. The District currently receives most of its water supply from UTRWD and a small portion from Lewisville (which in turn gets water from DWU). Water management strategies for Denton County FWSD No. 1A are conservation, additional water from UTRWD, and additional water from Lewisville. Table 4F.87 shows the projected population and demand, the current supplies, and the water management strategies for Denton County FWSD No. 1A.

**Table 4F.87**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Denton County FWSD No. 1A**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,092** | **4,952** | **6,701** | **8,501** | **10,328** | **12,240** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 991 | 1,581 | 2,132 | 2,704 | 3,286 | 3,894 |
| ***Total Projected Demand*** | ***991*** | ***1,581*** | ***2,132*** | ***2,704*** | ***3,286*** | ***3,894*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Upper Trinity Regional Water District | 871 | 379 | 347 | 342 | 333 | 347 |
| Lewisville (DWU) | 91 | 392 | 505 | 601 | 673 | 702 |
| ***Total Current Supplies*** | ***962*** | ***771*** | ***852*** | ***943*** | ***1,006*** | ***1,049*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***29*** | ***810*** | ***1,280*** | ***1,761*** | ***2,280*** | ***2,845*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 47 | 133 | 175 | 245 | 327 | 420 |
| Additional Water from UTRWD | 0 | 591 | 964 | 1,306 | 1,650 | 1,981 |
| Additional Water from Lewisville (DWU) | 0 | 86 | 141 | 210 | 303 | 444 |
| ***Total Water Management Strategies*** | ***47*** | ***810*** | ***1,280*** | ***1,761*** | ***2,280*** | ***2,845*** |
| **Reserve (Shortage)** | **18** | **0** | **0** | **0** | **0** | **0** |

## Denton County Irrigation

Table 4F.88 shows the projected demand, the current supplies, and the water management strategies for Denton County Irrigation. Golf course irrigation is the largest part of the irrigation water use in Denton County. (The Texas Water Development classifies the use of potable water for golf course irrigation as a part of municipal use. The use of raw water or reuse of treated wastewater effluent for golf course irrigation is classified as irrigation use.) As shown in Table 4F.88, direct reuse from several sources, DWU, local supplies, groundwater (Woodbine aquifer) all provide water for irrigation in Denton County. Water management strategies include additional groundwater, additional direct reuse water from TRA and UTRWD, and supplemental wells.

**Table 4F.88**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Denton County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **2,108** | **2,108** | **2,108** | **2,108** | **2,108** | **2,108** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Direct Reuse (UTRWD) | 897 | 897 | 897 | 897 | 897 | 897 |
| Direct Reuse (Denton) | 401 | 401 | 401 | 401 | 401 | 401 |
| Direct Reuse (Trophy Club MUD #1) | 800 | 800 | 800 | 800 | 800 | 800 |
| Dallas Water Utilities | 2,207 | 1,802 | 1,722 | 1,616 | 1,491 | 1,311 |
| Woodbine Aquifer | 1,337 | 1,337 | 1,337 | 1,337 | 1,337 | 1,337 |
| ***Total Current Supplies*** | ***5,642*** | ***5,237*** | ***5,157*** | ***5,051*** | ***4,926*** | ***4,746*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Groundwater | 200 | 200 | 200 | 200 | 200 | 200 |
| TRA Direct Reuse | 0 | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 |
| Additional UTRWD Direct Reuse | | | 560 | 1,121 | 2,240 | 2,240 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***200*** | ***3,950*** | ***4,510*** | ***5,071*** | ***6,190*** | ***6,190*** |
| **Reserve (Shortage)** | **3,734** | **7,079** | **7,559** | **8,014** | **9,008** | **8,828** |

## Denton County Livestock

Table 4F.89 shows the projected demand, current supplies, and water management strategies for Denton County Livestock. The current supplies for Denton County Livestock are local surface water supplies and groundwater (Trinity and Woodbine aquifers). The sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.89**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Denton County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,235** | **1,235** | **1,235** | **1,235** | **1,235** | **1,235** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 935 | 935 | 935 | 935 | 935 | 935 |
| Trinity Aquifer | 246 | 246 | 246 | 246 | 246 | 246 |
| Woodbine Aquifer | 531 | 531 | 531 | 531 | 531 | 531 |
| ***Total Current Supplies*** | ***1,712*** | ***1,712*** | ***1,712*** | ***1,712*** | ***1,712*** | ***1,712*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **477** | **477** | **477** | **477** | **477** | **477** |

## Denton County Manufacturing

Table 4F.90 shows the projected demand, the current supplies, and the water management strategies for Denton County Manufacturing. Current supplies include UTRWD, Denton, DWU, NTMWD, and groundwater (Trinity aquifer). Conservation, additional supplies from all the current sources, and supplemental wells are the water management strategies to meet demands.

**Table 4F.90**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Denton County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **1,068** | **1,239** | **1,408** | **1,579** | **1,731** | **1,880** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Upper Trinity Regional Water District | 175 | 108 | 70 | 52 | 45 | 44 |
| Denton (Lake Ray Roberts) | 335 | 368 | 326 | 293 | 267 | 217 |
| Denton (Lake Lewisville) | 140 | 153 | 136 | 123 | 112 | 91 |
| Dallas Water Utilities | 393 | 373 | 404 | 426 | 430 | 411 |
| Trinity Aquifer | 59 | 59 | 59 | 59 | 59 | 59 |
| North Texas Municipal Water District | 53 | 50 | 49 | 50 | 50 | 50 |
| ***Total Current Supplies*** | ***1,155*** | ***1,111*** | ***1,044*** | ***1,003*** | ***963*** | ***872*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***128*** | ***364*** | ***576*** | ***768*** | ***1,008*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 2 | 29 | 44 | 49 | 53 |
| Additional Water from UTRWD | 4 | 193 | 218 | 226 | 249 | 285 |
| Additional Water from DWU | 34 | 123 | 159 | 206 | 262 | 341 |
| Additional Water from NTMWD | 0 | 12 | 21 | 29 | 37 | 44 |
| Additional Water from Denton | 6 | 37 | 171 | 295 | 401 | 538 |
| Additional Groundwater | 200 | 200 | 200 | 200 | 200 | 200 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***244*** | ***567*** | ***798*** | ***1,000*** | ***1,198*** | ***1,461*** |
| **Reserve (Shortage)** | **331** | **439** | **434** | **424** | **430** | **453** |

## Denton County Mining

Table 4F.91 shows the projected demand, the current supplies, and the water management strategies for Denton County Mining. Denton County Mining is supplied from local supplies, UTRWD, and groundwater (Trinity aquifer). The water management strategies for this water user group are additional supplies from UTRWD, additional groundwater, and supplemental wells.

**Table 4F.91**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Denton County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,571** | **751** | **751** | **751** | **751** | **751** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 2,019 | 2,019 | 2,019 | 2,019 | 2,019 | 2,019 |
| Upper Trinity Regional Water District (through multiple suppliers) | 537 | 94 | 64 | 50 | 40 | 35 |
| Trinity Aquifer | 1,571 | 1,571 | 1,571 | 1,571 | 1,571 | 1,571 |
| ***Total Current Supplies*** | ***4,127*** | ***3,684*** | ***3,654*** | ***3,640*** | ***3,630*** | ***3,625*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from UTRWD | 13 | 169 | 199 | 213 | 223 | 228 |
| Additional Groundwater | 200 | 200 | 200 | 200 | 200 | 200 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***213*** | ***369*** | ***399*** | ***413*** | ***423*** | ***428*** |
| **Reserve (Shortage)** | **2,769** | **3,302** | **3,302** | **3,302** | **3,302** | **3,302** |

## Denton County Other

Denton County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Denton County Other currently receive their water supply from Fort Worth, UTRWD, and groundwater (Trinity, Woodbine, and other aquifers). Water management strategies for these entities include conservation, additional supplies from Fort Worth, UTRWD, and groundwater, and supplemental wells to replace existing water wells. Table 4F.92 shows the projected population and demand, the current supplies, and the water management strategies for Denton County Other.

**Table 4F.92**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Denton County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **42,742** | **56,446** | **65,410** | **73,718** | **81,794** | **90,112** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 8,905 | 11,571 | 13,262 | 14,863 | 16,492 | 18,169 |
| ***Total Projected Water Demand*** | ***8,905*** | ***11,571*** | ***13,262*** | ***14,863*** | ***16,492*** | ***18,169*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 439 | 531 | 517 | 501 | 487 | 468 |
| Upper Trinity Regional Water District | 5,963 | 3,094 | 2,545 | 2,308 | 2,122 | 2,106 |
| Other Aquifer | 5 | 5 | 5 | 5 | 5 | 5 |
| Trinity Aquifer | 2,550 | 2,550 | 2,550 | 2,550 | 2,550 | 2,550 |
| Woodbine Aquifer | 825 | 825 | 825 | 825 | 825 | 825 |
| ***Total Current Supplies*** | ***9,782*** | ***7,005*** | ***6,442*** | ***6,189*** | ***5,989*** | ***5,954*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***4,566*** | ***6,820*** | ***8,674*** | ***10,503*** | ***12,215*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 113 | 378 | 543 | 661 | 788 | 929 |
| Additional Water from Fort Worth | 6 | 48 | 146 | 242 | 338 | 440 |
| Additional Water from UTRWD | 34 | 5,171 | 7,396 | 9,272 | 11,112 | 12,816 |
| Additional Groundwater | 200 | 200 | 200 | 200 | 200 | 200 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***353*** | ***5,797*** | ***8,285*** | ***10,375*** | ***12,438*** | ***14,385*** |
| **Reserve (Shortage)** | **1,230** | **1,231** | **1,465** | **1,701** | **1,935** | **2,170** |

## Denton County Steam Electric Power

Table 4F.93 shows the projected demand, the current supplies, and the water management strategies for Denton County Steam Electric Power. Denton County Steam Electric Power is currently supplied by direct reuse from Denton. The water management strategy for this water user group is groundwater.

**Table 4F.93**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Denton County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **644** | **744** | **844** | **944** | **1,044** | **1,144** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Direct Reuse (Denton) | 1,233 | 2,242 | 2,690 | 3,251 | 3,924 | 4,708 |
| ***Total Current Supplies*** | ***1,233*** | ***2,242*** | ***2,690*** | ***3,251*** | ***3,924*** | ***4,708*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Groundwater | 200 | 200 | 200 | 200 | 200 | 200 |
| ***Total Water Management Strategies*** | ***200*** | ***200*** | ***200*** | ***200*** | ***200*** | ***200*** |
| **Reserve (Shortage)** | **789** | **1,698** | **2,046** | **2,507** | **3,080** | **3,764** |

### Double Oak

Double Oak is a city of about 3,000 people in southern Denton County. Bartonville WSC provides retail water service to the residents of Double Oak, and the water supply comes from groundwater (Trinity aquifer) and UTRWD. Water management strategies for Double Oak are conservation and additional water from Bartonville WSC. Table 4F.94 shows the projected population and demand, the current supplies, and the water management strategies for Double Oak.

**Table 4F.94**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Double Oak**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,000** | **3,000** | **3,000** | **3,000** | **3,000** | **3,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 716 | 706 | 699 | 696 | 692 | 692 |
| ***Total Projected Water Demand*** | ***716*** | ***706*** | ***699*** | ***696*** | ***692*** | ***692*** |
| | | | | | | |

**(Table 4F.94 Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Bartonville WSC (UTRWD and groundwater) | 703 | 363 | 303 | 276 | 258 | 249 |
| ***Total Current Supplies*** | ***703*** | ***363*** | ***303*** | ***276*** | ***258*** | ***249*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***13*** | ***343*** | ***396*** | ***420*** | ***434*** | ***443*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 21 | 34 | 43 | 49 | 55 | 61 |
| Additional Water from Bartonville WSC | 0 | 309 | 370 | 405 | 430 | 485 |
| ***Total Water Management Strategies*** | ***21*** | ***343*** | ***413*** | ***454*** | ***485*** | ***546*** |
| **Reserve (Shortage)** | **8** | **0** | **17** | **34** | **51** | **103** |

## Flower Mound

Flower Mound is a city of about 67,000 people in southern Denton County. The city obtains its water supply from DWU and UTRWD. Water management strategies for Flower Mound are conservation, additional water from DWU, and additional water from UTRWD. Table 4F.95 shows the projected population and demand, the current supplies, and the water management strategies for Flower Mound.

**Table 4F.95**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Flower Mound**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **66,667** | **75,555** | **93,000** | **93,000** | **93,000** | **93,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 17,325 | 23,189 | 32,085 | 32,085 | 32,085 | 32,085 |
| ***Total Projected Demand*** | ***17,325*** | ***23,189*** | ***32,085*** | ***32,085*** | ***32,085*** | ***32,085*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Upper Trinity Regional Water District | 8,454 | 4,565 | 4,798 | 3,727 | 2,992 | 2,626 |
| Dallas Water Utilities | 7,965 | 7,837 | 8,837 | 8,296 | 7,654 | 6,730 |
| ***Total Current Supplies*** | ***16,419*** | ***12,402*** | ***13,635*** | ***12,023*** | ***10,646*** | ***9,356*** |

**(Table 4F.95, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***906*** | ***10,787*** | ***18,450*** | ***20,062*** | ***21,439*** | ***22,729*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 859 | 1,798 | 2,822 | 3,123 | 3,393 | 3,660 |
| Additional Water from UTRWD | 0 | 7,200 | 13,228 | 14,114 | 14,683 | 14,884 |
| Additional Water from DWU | 267 | 1,789 | 2,400 | 2,825 | 3,363 | 4,185 |
| ***Total Water Management Strategies*** | ***1,126*** | ***10,787*** | ***18,450*** | ***20,062*** | ***21,439*** | ***22,729*** |
| **Reserve (Shortage)** | **220** | **0** | **0** | **0** | **0** | **0** |

## Fort Worth

Fort Worth is a city of about 743,000 located primarily in Tarrant County, with some population in Denton, Parker, and Wise Counties. Fort Worth is a wholesale water provider, and the city's water supply plans are discussed beginning on page 4E.30 in Section 4E.

## Frisco

The City of Frisco is a rapidly growing community in west Collin County and east Denton County. The city has a population of about 109,000 and is expected to continue to grow rapidly. Water supply strategies are discussed on page 4F.17 under Collin County.

## Hackberry

Hackberry is a city of about 1,100 in eastern Denton County. The city receives its water supply from groundwater (Trinity aquifer) and NTMWD. Water management strategies for Hackberry are conservation, additional water from NTMWD, and supplemental wells to replace existing water wells. Table 4F.96 shows the projected population and demand, the current supplies, and the water management strategies for Hackberry.

**Table 4F.96**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Hackberry**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population (In City Only)** | **1,086** | **1,619** | **2,120** | **2,361** | **2,477** | **2,533** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 142 | 210 | 275 | 304 | 319 | 326 |
| ***Total Projected Demand*** | ***142*** | ***210*** | ***275*** | ***304*** | ***319*** | ***326*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 67 | 112 | 143 | 147 | 141 | 135 |
| Trinity Aquifer | 73 | 73 | 73 | 73 | 73 | 73 |
| ***Total Current Supplies*** | ***140*** | ***185*** | ***216*** | ***220*** | ***214*** | ***208*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***25*** | ***59*** | ***84*** | ***105*** | ***118*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 9 | 14 | 17 | 19 | 20 |
| Additional Water from NTMWD | 0 | 16 | 45 | 67 | 86 | 98 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***25*** | ***59*** | ***84*** | ***105*** | ***118*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Hebron

Hebron has a population of about 500 and is located in southeast Denton County. The city gets water from Carrollton (which gets its water from DWU). Water management strategies for Hebron are conservation and additional water from Carrollton. Table 4F.97 shows the projected population and demand, the current supplies, and the water management strategies for Hebron.

**Table 4F.97**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Hebron**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population (In City Only)** | **500** | **500** | **500** | **500** | **500** | **500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 114 | 111 | 110 | 109 | 109 | 109 |
| ***Total Projected Demand*** | ***114*** | ***111*** | ***110*** | ***109*** | ***109*** | ***109*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrollton (DWU) | 105 | 83 | 79 | 73 | 68 | 60 |
| ***Total Current Supplies*** | ***105*** | ***83*** | ***79*** | ***73*** | ***68*** | ***60*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***9*** | ***28*** | ***31*** | ***36*** | ***41*** | ***49*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 5 | 6 | 7 | 8 | 9 |
| Additional Water from Carrollton | 9 | 23 | 25 | 29 | 33 | 40 |
| ***Total Water Management Strategies*** | ***9*** | ***28*** | ***31*** | ***36*** | ***41*** | ***49*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Hickory Creek

Hickory Creek is a city of about 4,200 people in central Denton County. The city gets its water supply from Lake Cities MUA, which uses groundwater and UTRWD. Water management strategies for Hickory Creek are conservation and additional water from Lake Cities MUA. Table 4F.98 shows the projected population and demand, the current supplies, and the water management strategies for Hickory Creek.

**Table 4F.98**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Hickory Creek**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,150** | **5,600** | **6,500** | **7,941** | **7,941** | **7,941** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 753 | 1,004 | 1,158 | 1,405 | 1,405 | 1,405 |
| ***Total Projected Demand*** | ***753*** | ***1,004*** | ***1,158*** | ***1,405*** | ***1,405*** | ***1,405*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Cities Municipal Utility Authority (UTRWD and Groundwater) | 786 | 477 | 397 | 370 | 308 | 269 |
| ***Total Current Supplies*** | ***786*** | ***477*** | ***397*** | ***370*** | ***308*** | ***269*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***527*** | ***761*** | ***1,035*** | ***1,097*** | ***1,136*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 24 | 57 | 80 | 110 | 122 | 133 |
| Additional Water from Lake Cities MUA | 0 | 470 | 681 | 925 | 975 | 1,003 |
| ***Total Water Management Strategies*** | ***24*** | ***527*** | ***761*** | ***1,035*** | ***1,097*** | ***1,136*** |
| **Reserve (Shortage)** | **57** | **0** | **0** | **0** | **0** | **0** |

## Highland Village

The City of Highland Village is located in southern Denton County and has a population of about 15,000. The city receives its water supply from groundwater and UTRWD supplies. Water management strategies for Highland Village are conservation, additional water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.99 shows the projected population and demand, the current supplies, and the water management strategies for Highland Village.

**Table 4F.99**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Highland Village**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **15,148** | **16,868** | **17,862** | **18,000** | **18,000** | **18,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 3,733 | 4,100 | 4,302 | 4,295 | 4,274 | 4,274 |
| ***Total Projected Demand*** | ***3,733*** | ***4,100*** | ***4,302*** | ***4,295*** | ***4,274*** | ***4,274*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,411 | 1,411 | 1,411 | 1,411 | 1,411 | 1,411 |
| Upper Trinity Regional Water District | 2,568 | 1,073 | 804 | 644 | 530 | 480 |
| ***Total Current Supplies*** | ***3,979*** | ***2,484*** | ***2,215*** | ***2,055*** | ***1,941*** | ***1,891*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***1,616*** | ***2,087*** | ***2,240*** | ***2,333*** | ***2,383*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 78 | 150 | 329 | 402 | 436 | 472 |
| Additional Water from UTRWD | 0 | 1,775 | 2,177 | 2,367 | 2,537 | 2,661 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***78*** | ***1,925*** | ***2,506*** | ***2,769*** | ***2,973*** | ***3,133*** |
| **Reserve (Shortage)** | **324** | **309** | **419** | **529** | **640** | **750** |

## Justin

Justin has a population of about 3,200 and is located in southwest Denton County. The city receives its water supply from groundwater (Trinity aquifer) and UTRWD. Water management strategies for Justin are conservation, additional water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.100 shows the projected population and demand, the current supplies, and the water management strategies for Justin.

**Table 4F.100**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Justin**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,177** | **5,252** | **8,474** | **13,926** | **17,000** | **18,759** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 587 | 1,012 | 1,614 | 2,636 | 3,218 | 3,551 |
| ***Total Projected Demand*** | ***587*** | ***1,012*** | ***1,614*** | ***2,636*** | ***3,218*** | ***3,551*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Upper Trinity Regional Water District | 427 | 309 | 359 | 474 | 471 | 460 |
| Trinity Aquifer | 150 | 150 | 150 | 150 | 150 | 150 |
| ***Total Current Supplies*** | ***577*** | ***459*** | ***509*** | ***624*** | ***621*** | ***610*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***10*** | ***553*** | ***1,105*** | ***2,012*** | ***2,597*** | ***2,941*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 28 | 82 | 150 | 269 | 357 | 424 |
| Additional Water from UTRWD | 0 | 471 | 970 | 1,773 | 2,285 | 2,577 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***28*** | ***553*** | ***1,120*** | ***2,042*** | ***2,642*** | ***3,001*** |
| **Reserve (Shortage)** | **18** | **0** | **15** | **30** | **45** | **60** |

## Krugerville

Krugerville has a population of about 1,700 in central Denton County. The city gets is water from Mustang SUD, which uses groundwater and UTRWD. Water management strategies for Krugerville are conservation and additional water from Mustang SUD. Table 4F.101 shows the projected population and demand, the current supplies, and the water management strategies for Krugerville.

**Table 4F.101**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Krugerville**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,672** | **1,918** | **2,228** | **2,900** | **3,783** | **5,422** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 204 | 228 | 257 | 331 | 428 | 613 |
| ***Total Projected Demand*** | ***204*** | ***228*** | ***257*** | ***331*** | ***428*** | ***613*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Mustang Special Utility District (UTRWD and Groundwater) | 214 | 176 | 167 | 171 | 175 | 193 |
| ***Total Current Supplies*** | ***214*** | ***176*** | ***167*** | ***171*** | ***175*** | ***193*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***52*** | ***90*** | ***160*** | ***253*** | ***420*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 10 | 14 | 20 | 28 | 42 |
| Additional Water from Mustang SUD | 0 | 42 | 88 | 163 | 260 | 424 |
| ***Total Water Management Strategies*** | ***3*** | ***52*** | ***102*** | ***183*** | ***288*** | ***466*** |
| **Reserve (Shortage)** | **13** | **0** | **12** | **23** | **35** | **46** |

## Krum

The City of Krum is located in central Denton County and has a population of about 4,200. The city receives its water supply from groundwater (Trinity aquifer) and UTRWD. Water management strategies for Krum are conservation, additional water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.102 shows the projected population and demand, the current supplies, and the water management strategies for Krum.

**Table 4F.102**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Krum**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,200** | **4,600** | **5,000** | **5,500** | **6,200** | **7,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 640 | 721 | 773 | 838 | 945 | 1,066 |
| ***Total Projected Demand*** | ***640*** | ***721*** | ***773*** | ***838*** | ***945*** | ***1,066*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Upper Trinity Regional Water District | 208 | 105 | 94 | 94 | 98 | 108 |
| Trinity Aquifer | 427 | 427 | 427 | 427 | 427 | 427 |
| ***Total Current Supplies*** | ***635*** | ***532*** | ***521*** | ***521*** | ***525*** | ***535*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***5*** | ***189*** | ***252*** | ***317*** | ***420*** | ***531*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 15 | 31 | 41 | 48 | 57 | 68 |
| Additional Water from UTRWD | 0 | 158 | 254 | 354 | 491 | 634 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***15*** | ***189*** | ***295*** | ***402*** | ***548*** | ***702*** |
| **Reserve (Shortage)** | **10** | **0** | **43** | **85** | **128** | **171** |

## Lake Dallas

Lake Dallas is a city of about 7,900 people in central Denton County. The city gets its water supply from Lake Cities MUA, which uses groundwater and water from UTRWD. Water management strategies for Lake Dallas are conservation and additional water from Lake Cities MUA. Table 4F.103 shows the projected population and demand, the current supplies, and the water management strategies for Lake Dallas.

**Table 4F.103**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Lake Dallas**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **7,902** | **9,102** | **9,933** | **9,933** | **9,933** | **9,933** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,354 | 1,580 | 1,702 | 1,691 | 1,680 | 1,680 |
| ***Total Projected Demand*** | ***1,354*** | ***1,580*** | ***1,702*** | ***1,691*** | ***1,680*** | ***1,680*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Cities Municipal Utility Authority (UTRWD and Groundwater) | 1,414 | 750 | 597 | 491 | 409 | 357 |
| ***Total Current Supplies*** | ***1,414*** | ***750*** | ***597*** | ***491*** | ***409*** | ***357*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***830*** | ***1,105*** | ***1,200*** | ***1,271*** | ***1,323*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 40 | 84 | 114 | 128 | 142 | 156 |
| Additional Water from Lake Cities MUA | 0 | 828 | 1,070 | 1,152 | 1,199 | 1,227 |
| ***Total Water Management Strategies*** | ***40*** | ***912*** | ***1,184*** | ***1,280*** | ***1,341*** | ***1,383*** |
| **Reserve (Shortage)** | **100** | **82** | **79** | **80** | **70** | **60** |

## Lewisville

Lewisville is a city of about 98,000 people in southern Denton County, with a small area in Dallas County. Lewisville receives its water supply from DWU. Its water management strategies are conservation and additional water from DWU with a new water treatment plant and future treatment plant expansions. Table 4F.104 shows the projected population and demand, the current supplies, and the water management strategies for Lewisville.

**Table 4F.104**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Lewisville**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **97,709** | **110,002** | **122,002** | **136,002** | **155,002** | **176,515** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 19,263 | 21,317 | 23,506 | 26,051 | 29,517 | 33,613 |
| Customer Demand (Denton Co FWSD) | 99 | 522 | 704 | 892 | 1,084 | 1,285 |
| ***Total Projected Demand*** | ***19,362*** | ***21,839*** | ***24,210*** | ***26,943*** | ***30,601*** | ***34,898*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 17,804 | 16,402 | 17,366 | 18,143 | 19,011 | 19,064 |
| ***Total Current Supplies*** | ***17,804*** | ***16,402*** | ***17,366*** | ***18,143*** | ***19,011*** | ***19,064*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***1,558*** | ***5,437*** | ***6,844*** | ***8,800*** | ***11,590*** | ***15,834*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 918 | 1,742 | 2,277 | 2,808 | 3,458 | 4,245 |
| Additional Water from DWU with New WTP and Expansions | 640 | 3,695 | 4,567 | 5,992 | 8,132 | 11,589 |
| ***Total Water Management Strategies*** | ***1,558*** | ***5,437*** | ***6,844*** | ***8,800*** | ***11,590*** | ***15,834*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Lincoln Park

Lincoln Park is located in eastern Denton County and has a population of about 700 people. The city receives its water supply from groundwater (Trinity aquifer) and UTRWD. Water management strategies for Lincoln Park are conservation, additional water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.105 shows the projected population and demand, the current supplies, and the water management strategies for Lincoln Park.

**Table 4F.105**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Lincoln Park**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **680** | **835** | **990** | **1,145** | **1,300** | **1,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 102 | 132 | 155 | 178 | 202 | 234 |
| ***Total Projected Demand*** | ***102*** | ***132*** | ***155*** | ***178*** | ***202*** | ***234*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 49 | 49 | 49 | 49 | 49 | 49 |
| Upper Trinity Regional Water District | 67 | 35 | 30 | 29 | 27 | 28 |
| ***Total Current Supplies*** | ***116*** | ***84*** | ***79*** | ***78*** | ***76*** | ***77*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***48*** | ***76*** | ***100*** | ***126*** | ***157*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 5 | 7 | 9 | 10 | 13 |
| Additional Water from UTRWD | 1 | 59 | 88 | 114 | 142 | 173 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***64*** | ***95*** | ***123*** | ***152*** | ***186*** |
| **Reserve (Shortage)** | **16** | **16** | **19** | **23** | **26** | **29** |

## Little Elm

Little Elm has a population of about 24,000 in eastern Denton County. The town receives its water supply from groundwater (Woodbine aquifer) and NTMWD. Water management strategies for Little Elm are conservation, additional water from NTMWD, new wells in the Woodbine aquifer, and supplemental wells to replace existing water wells. Table 4F.106 shows the projected population and demand, the current supplies, and the water management strategies for Little Elm.

**Table 4F.106**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Little Elm**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **24,000** | **29,250** | **35,650** | **40,371** | **40,371** | **40,371** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 4,731 | 6,061 | 7,348 | 8,321 | 8,321 | 8,321 |
| ***Total Projected Demand*** | ***4,731*** | ***6,061*** | ***7,348*** | ***8,321*** | ***8,321*** | ***8,321*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 286 | 286 | 286 | 286 | 286 | 286 |
| North Texas Municipal Water District | 3,812 | 4,367 | 4,702 | 4,843 | 4,379 | 4,070 |
| ***Total Current Supplies*** | ***4,098*** | ***4,653*** | ***4,988*** | ***5,129*** | ***4,665*** | ***4,356*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***633*** | ***1,408*** | ***2,360*** | ***3,192*** | ***3,656*** | ***3,965*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 223 | 445 | 632 | 789 | 859 | 929 |
| Additional Water from NTMWD | 0 | 553 | 1,318 | 1,993 | 2,387 | 2,626 |
| New Wells-Woodbine Aquifer | 410 | 410 | 410 | 410 | 410 | 410 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***633*** | ***1,408*** | ***2,360*** | ***3,192*** | ***3,656*** | ***3,965*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Mustang Special Utility District

Mustang SUD serves about 14,000 people in northeastern Denton County. The SUD is a wholesale water provider, and the discussion of its water supply plans is on page 4E.91 in Section 4E.

## Northlake

Northlake is a city of about 1,700 people in southwestern Denton County and is supplied from groundwater (Woodbine aquifer) and Fort Worth. Water management strategies for Northlake are conservation, additional water from Fort Worth, water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.107 shows the projected population and demand, the current supplies, and the water management strategies for Northlake.

**Table 4F.107**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Northlake**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,700** | **4,974** | **5,753** | **11,059** | **16,364** | **19,684** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 268 | 808 | 934 | 1,796 | 2,658 | 3,197 |
| ***Total Projected Demand*** | ***268*** | ***808*** | ***934*** | ***1,796*** | ***2,658*** | ***3,197*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 218 | 218 | 218 | 218 | 218 | 218 |
| Fort Worth (TRWD) | 265 | 371 | 364 | 606 | 785 | 824 |
| Upper Trinity Regional Water District | 0 | 145 | 113 | 169 | 201 | 212 |
| ***Total Current Supplies*** | ***483*** | ***734*** | ***695*** | ***993*** | ***1,204*** | ***1,254*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***74*** | ***239*** | ***803*** | ***1,454*** | ***1,943*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 29 | 57 | 125 | 207 | 276 |
| Additional Water from Fort Worth | 0 | 18 | 74 | 229 | 440 | 637 |
| Upper Trinity Regional Water District | 0 | 245 | 326 | 667 | 1,025 | 1,248 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***292*** | ***457*** | ***1,021*** | ***1,672*** | ***2,161*** |
| **Reserve (Shortage)** | **218** | **218** | **218** | **218** | **218** | **218** |

## Oak Point

Oak Point is a city of about 4,000 in central Denton County. The residents of Oak Point are provided retail water service by Mustang SUD, and the water supply comes from groundwater and UTRWD. Water management strategies for Oak Point are conservation and additional water from Mustang SUD. Table 4F.108 shows the projected population and demand, the current supplies, and the water management strategies for Oak Point.

**Table 4F.108**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Oak Point**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,988** | **8,534** | **12,812** | **14,471** | **16,141** | **17,905** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 585 | 1,377 | 2,067 | 2,318 | 2,585 | 2,868 |
| ***Total Projected Demand*** | ***585*** | ***1,377*** | ***2,067*** | ***2,318*** | ***2,585*** | ***2,868*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Mustang SUD (UTRWD and Groundwater) | 350 | 429 | 475 | 452 | 427 | 427 |
| ***Total Current Supplies*** | ***350*** | ***429*** | ***475*** | ***452*** | ***427*** | ***427*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***235*** | ***948*** | ***1,592*** | ***1,866*** | ***2,158*** | ***2,441*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 9 | 77 | 141 | 178 | 220 | 268 |
| Additional Water from Mustang SUD | 226 | 871 | 1,451 | 1,688 | 1,938 | 2,173 |
| ***Total Water Management Strategies*** | ***235*** | ***948*** | ***1,592*** | ***1,866*** | ***2,158*** | ***2,441*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Pilot Point

Pilot Point has a population of about 5,000 and is located in northern Denton County. The city receives its water supply from groundwater (Trinity aquifer). Water management strategies for Pilot Point are conservation, establishing a direct connection to UTRWD and purchasing water from UTRWD, additional water from Trinity aquifer (new wells), and supplemental wells to replace existing water wells. Table 4F.109 shows the projected population and demand, the current supplies, and the water management strategies for Pilot Point.

**Table 4F.109**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Pilot Point**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,047** | **7,067** | **12,000** | **13,290** | **14,100** | **15,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 763 | 1,124 | 1,895 | 2,069 | 2,195 | 2,335 |
| ***Total Projected Demand*** | ***763*** | ***1,124*** | ***1,895*** | ***2,069*** | ***2,195*** | ***2,335*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 673 | 673 | 673 | 673 | 673 | 673 |
| ***Total Current Supplies*** | ***673*** | ***673*** | ***673*** | ***673*** | ***673*** | ***673*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***90*** | ***451*** | ***1,222*** | ***1,396*** | ***1,522*** | ***1,662*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 9 | 58 | 122 | 90 | 103 | 117 |
| Upper Trinity Regional Water District | 0 | 226 | 1,017 | 1,307 | 1,504 | 1,714 |
| Additional Trinity Aquifer (new wells) | 167 | 167 | 167 | 167 | 167 | 167 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***176*** | ***451*** | ***1,306*** | ***1,564*** | ***1,774*** | ***1,998*** |
| **Reserve (Shortage)** | **86** | **0** | **84** | **168** | **252** | **336** |

## Plano

Plano is a city of about 260,000 located in southwest Collin County and southeast Denton County. The water supply plans for Plano are discussed on page 4F.29 under Collin County.

## Ponder

Ponder is a city of about 1,350 located in western Denton County. The city receives its water supply from groundwater (Trinity aquifer). Water management strategies for Ponder are conservation, establishing a direct connection to UTRWD and purchasing water from UTRWD, and supplemental wells to replace existing water wells. Table 4F.110 shows the projected population and demand, the current supplies, and the water management strategies for Ponder.

**Table 4F.110**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Ponder**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,350** | **5,000** | **10,000** | **16,000** | **18,500** | **19,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 250 | 913 | 1,815 | 2,903 | 3,357 | 3,448 |
| ***Total Projected Demand*** | ***250*** | ***913*** | ***1,815*** | ***2,903*** | ***3,357*** | ***3,448*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 359 | 359 | 359 | 359 | 359 | 359 |
| ***Total Current Supplies*** | ***359*** | ***359*** | ***359*** | ***359*** | ***359*** | ***359*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***554*** | ***1,456*** | ***2,544*** | ***2,998*** | ***3,089*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 58 | 135 | 240 | 307 | 344 |
| Upper Trinity Regional Water District | 0 | 559 | 1,414 | 2,426 | 2,843 | 2,926 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***5*** | ***617*** | ***1,549*** | ***2,666*** | ***3,150*** | ***3,270*** |
| **Reserve (Shortage)** | **114** | **63** | **93** | **122** | **152** | **181** |

## Prosper

The City of Prosper is located in western Collin County and eastern Denton County and has a population of about 8,000. Water management strategies for Prosper are described on page 4F.30 under Collin County.

## Roanoke

Roanoke has a population of about 7,000 in southwestern Denton County. The city receives its water supply from groundwater (Trinity aquifer) and Fort Worth. Water management strategies for Roanoke are conservation, additional water from Fort Worth, and supplemental wells to replace existing water wells. Table 4F.111 shows the projected population and demand, the current supplies, and the water management strategies for Roanoke.

**Table 4F.111**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Roanoke**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **7,000** | **10,080** | **13,160** | **16,240** | **21,615** | **26,197** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,756 | 2,732 | 3,538 | 4,348 | 5,787 | 7,013 |
| ***Total Projected Demand*** | ***1,756*** | ***2,732*** | ***3,538*** | ***4,348*** | ***5,787*** | ***7,013*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 258 | 258 | 258 | 258 | 258 | 258 |
| Fort Worth (TRWD) | 1,482 | 2,271 | 2,558 | 2,760 | 3,267 | 3,481 |
| ***Total Current Supplies*** | ***1,740*** | ***2,529*** | ***2,816*** | ***3,018*** | ***3,525*** | ***3,739*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***16*** | ***203*** | ***722*** | ***1,330*** | ***2,262*** | ***3,274*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 16 | 124 | 208 | 296 | 441 | 594 |
| Additional Water from Fort Worth | 0 | 79 | 514 | 1,034 | 1,821 | 2,680 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***16*** | ***203*** | ***722*** | ***1,330*** | ***2,262*** | ***3,274*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Sanger

Sanger is a city of about 7,800 located in northern Denton County. The city gets its water supply from groundwater (Trinity aquifer) and through Bolivar WSC. Water management strategies for Sanger are conservation, additional water from Bolivar WSC, and supplemental wells to replace existing water wells. Table 4F.112 shows the projected population and demand, the current supplies, and the water management strategies for Sanger.

**Table 4F.112**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Sanger**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **7,750** | **12,750** | **17,947** | **21,400** | **23,998** | **25,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,302 | 2,114 | 2,935 | 3,476 | 3,871 | 4,033 |
| ***Total Projected Demand*** | ***1,302*** | ***2,114*** | ***2,935*** | ***3,476*** | ***3,871*** | ***4,033*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 543 | 543 | 543 | 543 | 543 | 543 |
| Bolivar Water Supply Corporation (UTRWD) | 561 | 561 | 561 | 561 | 534 | 497 |
| ***Total Current Supplies*** | ***1,104*** | ***1,104*** | ***1,104*** | ***1,104*** | ***1,077*** | ***1,040*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***198*** | ***1,010*** | ***1,831*** | ***2,372*** | ***2,794*** | ***2,993*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 41 | 123 | 207 | 276 | 342 | 390 |
| Additional Water from Bolivar WSC | 212 | 942 | 1,728 | 2,249 | 2,653 | 2,853 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***253*** | ***1,065*** | ***1,935*** | ***2,525*** | ***2,995*** | ***3,243*** |
| **Reserve (Shortage)** | **55** | **55** | **104** | **153** | **201** | **250** |

## Shady Shores

Shady Shores is a city of about 2,500 people in central Denton County. The city gets its water supply from Lake Cities MUA, which uses groundwater and water from UTRWD. Water management strategies for Shady Shores are conservation and additional water from Lake Cities MUA. Table 4F.113 shows the projected population and demand, the current supplies, and the water management strategies for Shady Shores.

**Table 4F.113**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Shady Shores**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **2,474** | **3,228** | **3,936** | **3,936** | **3,936** | **3,936** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 357 | 510 | 613 | 608 | 604 | 604 |
| ***Total Projected Demand*** | ***357*** | ***510*** | ***613*** | ***608*** | ***604*** | ***604*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Cities Municipal Utility Authority (UTRWD and Groundwater) | 373 | 242 | 207 | 169 | 141 | 123 |
| ***Total Current Supplies*** | ***373*** | ***242*** | ***207*** | ***169*** | ***141*** | ***123*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***268*** | ***406*** | ***439*** | ***463*** | ***481*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 28 | 27 | 29 | 31 | 33 |
| Additional Water from Lake Cities MUA | 0 | 240 | 379 | 410 | 432 | 448 |
| ***Total Water Management Strategies*** | ***5*** | ***268*** | ***406*** | ***439*** | ***463*** | ***481*** |
| **Reserve (Shortage)** | **21** | **0** | **0** | **0** | **0** | **0** |

## Southlake

Southlake is a city of about 28,000 in northwestern Tarrant County, with some area in southern Denton County. Water management strategies for Southlake are described on page 4F.414 under Tarrant County.

## The Colony

The Colony is a city of about 40,000 in southeastern Denton County. The city receives its water supply from groundwater (Trinity aquifer), DWU, and Plano. Water management strategies for The Colony are conservation, additional water from DWU, additional water from Plano, and supplemental wells to replace existing water wells. Table 4F.114 shows the projected population and demand, the current supplies, and the water management strategies for The Colony.

**Table 4F.114**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of The Colony**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **40,500** | **56,000** | **63,000** | **65,000** | **67,000** | **67,600** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 5,761 | 7,778 | 8,609 | 8,810 | 9,006 | 9,087 |
| ***Total Projected Demand*** | ***5,761*** | ***7,778*** | ***8,609*** | ***8,810*** | ***9,006*** | ***9,087*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 934 | 934 | 934 | 934 | 934 | 934 |
| Dallas Water Utilities | 4,768 | 5,257 | 5,558 | 5,339 | 5,035 | 4,467 |
| Plano (NTMWD) | 568 | 633 | 609 | 560 | 517 | 485 |
| ***Total Current Supplies*** | ***6,270*** | ***6,824*** | ***7,101*** | ***6,833*** | ***6,486*** | ***5,886*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***954*** | ***1,508*** | ***1,977*** | ***2,520*** | ***3,201*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 77 | 299 | 416 | 462 | 505 | 540 |
| Additional Water from DWU | 348 | 1,474 | 1,816 | 2,174 | 2,616 | 3,225 |
| Additional Water from Plano | 0 | 115 | 210 | 275 | 333 | 370 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***425*** | ***1,888*** | ***2,442*** | ***2,911*** | ***3,454*** | ***4,135*** |
| **Reserve (Shortage)** | **934** | **934** | **934** | **934** | **934** | **934** |

## Trophy Club

Trophy Club has a population of about 8,300 in southern Denton County. The city receives its water supply from groundwater (Trinity aquifer) and Fort Worth. Water management strategies for Trophy Club are conservation, additional water from Fort Worth, and supplemental wells to replace existing water wells. Table 4F.115 shows the projected population and demand, the current supplies, and the water management strategies for Trophy Club.

**Table 4F.115**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of the Trophy Club**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **8,253** | **9,307** | **10,211** | **10,995** | **11,841** | **12,687** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,847 | 3,190 | 3,477 | 3,732 | 4,019 | 4,306 |
| ***Total Projected Demand*** | ***2,847*** | ***3,190*** | ***3,477*** | ***3,732*** | ***4,019*** | ***4,306*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 770 | 770 | 770 | 770 | 770 | 770 |
| Fort Worth (TRWD) | 2,057 | 2,221 | 2,111 | 1,999 | 1,920 | 1,822 |
| ***Total Current Supplies*** | ***2,827*** | ***2,991*** | ***2,881*** | ***2,769*** | ***2,690*** | ***2,592*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***20*** | ***199*** | ***596*** | ***963*** | ***1,329*** | ***1,714*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 20 | 133 | 191 | 243 | 296 | 353 |
| Additional Water from Fort Worth | 0 | 66 | 405 | 720 | 1,033 | 1,361 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***20*** | ***199*** | ***596*** | ***963*** | ***1,329*** | ***1,714*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Costs for Denton County Water User Groups

Table 4F.116 shows the estimated capital costs for Denton County water management strategies not covered under the wholesale water providers, and Table 4F.117 summarizes the costs by category. Table 4F.117 is followed by a summary for Denton County.

**Table 4F.116**
**Costs for Recommended Water Management Strategies for Denton County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Argyle | Conservation | 2010 | 477 | $0 | $0.30 | $0.30 | Q-10 & Q-11 |
| | Additional Argyle WSC (UTRWD) | 2020 | 4,330 | $0 | $2.64 | $2.64 | None |
| Argyle WSC | Conservation | 2010 | 105 | See Argyle WSC in Section 4E. | | | |
| | Supplemental wells | 2010 | 0 | See Argyle WSC in Section 4E. | | | |
| | Additional UTRWD supplies | 2010 | 845 | See Argyle WSC in Section 4E. | | | |
| Aubrey | Conservation | 2010 | 198 | $5,000 | $0.30 | $0.30 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,794,000 | N/A | N/A | Q-13 |
| | Additional UTRWD supplies | 2020 | 2,499 | $0 | $2.64 | $2.64 | None |
| Bartonville | Conservation | 2010 | 97 | $0 | $0.44 | $0.44 | Q-10 & Q-11 |
| | Additional Bartonville WSC (UTRWD) | 2020 | 774 | $0 | $2.64 | $2.64 | None |
| Bartonville WSC | Conservation | 2010 | 35 | See Bartonville WSC in Section 4E. | | | |
| | Supplemental wells | 2010 | 0 | See Bartonville WSC in Section 4E. | | | |
| | Additional UTRWD supplies | 2020 | 290 | See Bartonville WSC in Section 4E. | | | |
| Bolivar WSC* | Conservation | 2010 | 981 | See Bolivar WSC in Section 4E. | | | |
| | Supplemental wells | 2010 | 0 | See Bolivar WSC in Section 4E. | | | |
| | UTRWD supplies | 2020 | 10,985 | See Bolivar WSC in Section 4E. | | | |
| | Cooke County WSP | 2020 | 149 | See Gainesville in Section 4E. | | | |

**(Table 4F.116, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Carrollton* | Conservation | 2010 | 2,911 | $20,000 | $0.34 | $0.34 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,173,000 | N/A | N/A | Q-13 |
| | Additional DWU supplies | 2010 | 9,627 | $0 | $1.37 | $1.37 | None |
| Celina* | Conservation | See Collin County | | | | | |
| | Supplemental wells | See Collin County | | | | | |
| | Connect to NTMWD and supplies | See Collin County | | | | | |
| | Additional UTRWD supplies | See Collin County | | | | | |
| Coppell* | Conservation | See Dallas County. | | | | | |
| | Additional DWU supplies | See Dallas County. | | | | | |
| Copper Canyon | Conservation | 2010 | 63 | $0 | $0.38 | $0.38 | Q-10 & Q-11 |
| | Additional Bartonville WSC (UTRWD) | 2020 | 512 | $0 | $2.64 | $2.64 | None |
| Corinth | Conservation | 2010 | 750 | $5,000 | $0.41 | $0.41 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $542,000 | N/A | N/A | Q-13 |
| | Additional UTRWD supplies | 2020 | 5,186 | $0 | $2.64 | $2.64 | None |
| Cross Roads | Conservation | 2010 | 107 | $5,000 | $0.40 | $0.40 | Q-10 & Q-11 |
| | Additional Mustang SUD (UTRWD) | 2010 | 815 | $0 | $2.64 | $2.64 | None |
| Dallas* | Conservation | 2010 | 52,987 *** | See DWU in Section 4E. | | | |
| | Other measures | See DWU in Section 4E. | | | | | |
| Denton | Conservation | 2010 | 9,776 | See Denton in Section 4E. | | | |
| | Other measures | See Denton in Section 4E. | | | | | |

(Table 4F.116, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Denton County FWSD #1A | Conservation | 2010 | 420 | $5,000 | $0.32 | $0.32 | Q-10 & Q-11 |
| | Additional UTRWD supplies | 2020 | 1,981 | $0 | $2.64 | $2.64 | None |
| | Additional Lewisville supplies (DWU) | 2020 | 105 | $0 | $2.50 | $2.50 | None |
| Denton County Other | Conservation | 2010 | 929 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,170,000 | N/A | N/A | Q-13 |
| | Additional groundwater | 2010 | 200 | $1,957,000 | $6.54 | $2.18 | Q-162 & Q-163 |
| | Additional UTRWD supplies | 2010 | 12,816 | $0 | $2.64 | $2.64 | None |
| | Additional Fort Worth (TRWD) | 2010 | 440 | $0 | $2.50 | $2.50 | None |
| Double Oak | Conservation | 2010 | 61 | $0 | $0.42 | $0.42 | Q-10 & Q-11 |
| | Additional Bartonville WSC (UTRWD) | 2020 | 485 | $0 | $2.64 | $2.64 | None |
| Flower Mound | Conservation | 2010 | 3,660 | $42,000 | $0.15 | $0.15 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 4,185 | $0 | $1.37 | $1.37 | None |
| | Additional UTRWD supplies | 2020 | 14,884 | $0 | $2.64 | $2.64 | None |
| Fort Worth* | Conservation | See Fort Worth in Section 4E. | | | | | |
| | Other measures | See Fort Worth in Section 4E. | | | | | |
| Frisco* | Conservation | See Collin County | | | | | |
| | Direct reuse | See Collin County | | | | | |
| | Additional NTMWD supplies | See Collin County | | | | | |
| Hackberry | Conservation | 2010 | 20 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $959,000 | N/A | N/A | Q-13 |
| | Additional NTMWD supplies | 2020 | 98 | $0 | $1.30 | $1.30 | None |
| Hebron | Conservation | 2020 | 9 | $0 | $0.51 | $0.51 | Q-10 & Q-11 |
| | Additional Carrollton (DWU) | 2010 | 40 | $0 | $2.50 | $2.50 | None |

**(Table 4F.116, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Hickory Creek | Conservation | 2010 | 133 | $0 | $0.50 | $0.50 | Q-10 & Q-11 |
| | Additional Lake Cities MUA (UTRWD) | 2020 | 1,023 | $0 | $2.64 | $2.64 | None |
| Highland Village | Conservation | 2010 | 472 | $10,000 | $0.42 | $0.42 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $4,992,000 | N/A | N/A | Q-13 |
| | Additional UTRWD supplies | 2020 | 2,661 | $0 | $2.64 | $2.64 | None |
| Justin | Conservation | 2010 | 424 | $24,000 | $0.48 | $0.48 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,188,000 | N/A | N/A | Q-13 |
| | Additional UTRWD supplies | 2020 | 2,577 | $0 | $2.64 | $2.64 | None |
| Krugerville | Conservation | 2010 | 42 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Mustang SUD (UTRWD) | 2020 | 424 | $0 | $2.64 | $2.64 | None |
| Krum | Conservation | 2010 | 68 | $5,000 | $0.10 | $0.10 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,266,000 | N/A | N/A | Q-13 |
| | Additional UTRWD supplies | 2020 | 634 | $0 | $2.64 | $2.64 | None |
| Lake Dallas | Conservation | 2010 | 156 | $0 | $0.54 | $0.54 | Q-10 & Q-11 |
| | Additional Lake Cities MUA (UTRWD) | 2020 | 1,227 | $0 | $2.64 | $2.64 | None |
| Lewisville* | Conservation | 2010 | 4,106 | $72,000 | $0.34 | $0.34 | Q-10 & Q-11 |
| | Additional DWU supplies | 2020 | 11,484 | $0 | $1.37 | $1.37 | None |
| | New WTP and Expansions | 2040 | 5,605 | $31,621,000 | $1.96 | $0.70 | Q-15 |
| Lincoln Park | Conservation | 2010 | 13 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $500,000 | N/A | N/A | Q-13 |
| | Additional UTRWD supplies | 2010 | 173 | $0 | $2.64 | $2.64 | None |

**(Table 4F.116, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Little Elm | Conservation | 2010 | 929 | $10,000 | $0.42 | $0.42 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,004,000 | N/A | N/A | Q-13 |
| | New wells | 2010 | 410 | $421,000 | $0.70 | $0.46 | Q-258 |
| | Additional NTMWD supplies | 2020 | 2,626 | $0 | $1.30 | $1.30 | None |
| Mustang SUD | Conservation | 2010 | 485 | $5,000 | $0.08 | $0.08 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | See Mustang SUD in Section 4E. | | | |
| | Additional UTRWD supplies | 2020 | 8,604 | See Mustang SUD in Section 4E. | | | |
| Northlake | Conservation | 2010 | 276 | $0 | $0.56 | $0.56 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 637 | $0 | $2.50 | $2.50 | None |
| | Supplemental wells | 2010 | 0 | $500,000 | N/A | N/A | Q-13 |
| | UTRWD supplies | 2020 | 1,248 | $0 | $2.64 | $2.64 | None |
| Oak Point | Conservation | 2010 | 268 | $5,000 | $0.58 | $0.58 | Q-10 & Q-11 |
| | Additional Mustang SUD (UTRWD) | 2010 | 2,173 | $0 | $2.64 | $2.64 | None |
| Pilot Point | Conservation | 2010 | 122 | $0 | $0.81 | $0.81 | Q-10 & Q-11 |
| | Additional groundwater | 2010 | 167 | $443,000 | $1.21 | $0.62 | Q-149 |
| | Supplemental wells | 2010 | 0 | $4,002,000 | N/A | N/A | Q-13 |
| | UTRWD supplies | 2020 | 1,714 | $0 | $2.64 | $2.64 | None |
| Plano* | Conservation | See Collin County | | | | | |
| | Additional NTMWD supplies | See Collin County | | | | | |
| Ponder | Conservation | 2010 | 344 | $5,000 | $0.58 | $0.58 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,902,000 | N/A | N/A | Q-13 |
| | UTRWD supplies | 2020 | 2,926 | $0 | $2.64 | $2.64 | None |
| Prosper* | Conservation | See Collin County | | | | | |
| | Additional NTMWD supplies | See Collin County | | | | | |
| | Additional UTRWD supplies | See Collin County | | | | | |

**(Table 4F.116, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Roanoke | Conservation | 2010 | 594 | $0 | $0.48 | $0.48 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,164,000 | N/A | N/A | Q-13 |
| | Additional Fort Worth (TRWD) | 2020 | 2,680 | $0 | $2.50 | $2.50 | None |
| Sanger | Conservation | 2010 | 390 | $0 | $0.50 | $0.50 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,360,000 | N/A | N/A | Q-13 |
| | Additional Bolivar WSC (UTRWD) | 2010 | 2,853 | $0 | $2.64 | $2.64 | None |
| Shady Shores | Conservation | 2010 | 33 | $0 | $0.85 | $0.85 | Q-10 & Q-11 |
| | Additional Lake Cities MUA (UTRWD) | 2020 | 448 | $0 | $2.64 | $2.64 | None |
| Southlake* | Conservation | See Tarrant County | | | | | |
| | Additional Fort Worth (TRWD) | See Tarrant County | | | | | |
| The Colony | Conservation | 2010 | 540 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $4,218,000 | N/A | N/A | Q-13 |
| | Additional DWU supplies | 727 | 787 | $0 | $1.37 | $1.37 | None |
| | Additional Plano (NTMWD) | 2020 | 370 | $0 | $2.50 | $2.50 | None |
| Trophy Club | Conservation | 2010 | 353 | $0 | $0.36 | $0.36 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,179,000 | N/A | N/A | Q-13 |
| | Additional Fort Worth (TRWD) | 2020 | 1,361 | $0 | $2.50 | $2.50 | None |
| Denton County Irrigation | Supplemental wells | 2010 | 0 | $116,000 | N/A | N/A | Q-13 |
| | Additional groundwater | 2010 | 200 | $717,000 | $1.50 | $0.70 | Q-156 |
| | Additional direct reuse (UTRWD) | 2030 | 2,240 | See UTRWD in Section 4E. | | | |
| | Direct reuse (TRA) | 2020 | 3,750 | See TRA in Section 4E. | | | |

**(Table 4F.116, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Denton County Livestock | Supplemental wells | 2010 | 0 | $116,000 | N/A | N/A | Q-13 |
| Denton County Manu-facturing | Conservation | 2020 | 53 | $0 | $0.85 | $0.85 | Q-12 |
| | Additional Denton (treated water and direct reuse) | 2010 | 538 | See Denton in Section 4E. | | | |
| | Additional DWU supplies | 2010 | 341 | $0 | $1.37 | $1.37 | None |
| | Additional NTMWD supplies | 2020 | 44 | $0 | $1.30 | $1.30 | None |
| | Additional UTRWD supplies | 2010 | 285 | $0 | $2.64 | $2.64 | None |
| | Supplemental wells | 2010 | 0 | $504,000 | N/A | N/A | Q-13 |
| | Additional groundwater | 2010 | 200 | $717,000 | $1.50 | $0.70 | Q-154 |
| Denton County Mining | Additional UTRWD supplies | 2010 | 228 | $0 | $2.64 | $2.64 | None |
| | Supplemental wells | 2010 | 0 | $267,000 | N/A | N/A | Q-13 |
| | Additional groundwater | 2010 | 200 | $1,064,000 | $1.00 | $0.51 | Q-153 |
| Denton County Steam Electric | Additional groundwater | 2010 | 200 | $717,000 | $1.50 | $0.70 | Q-155 |

Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

***Retail conservation

**Table 4F.117**
**Summary of Recommended Water Management Strategies for Denton County Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 39,917 | $218,000 |
| Purchase from WWP | 116,700 | $0 |
| Supplemental Wells | 0 | $36,916,000 |
| Additional groundwater | 1,577 | $6,036,000 |
| Reuse | 6,528 | $0 |
| Treatment Plant Expansions | 0 | $31,621,000 |
| **Total** | | **$74,791,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.

***2000 Population:*** *432,976*

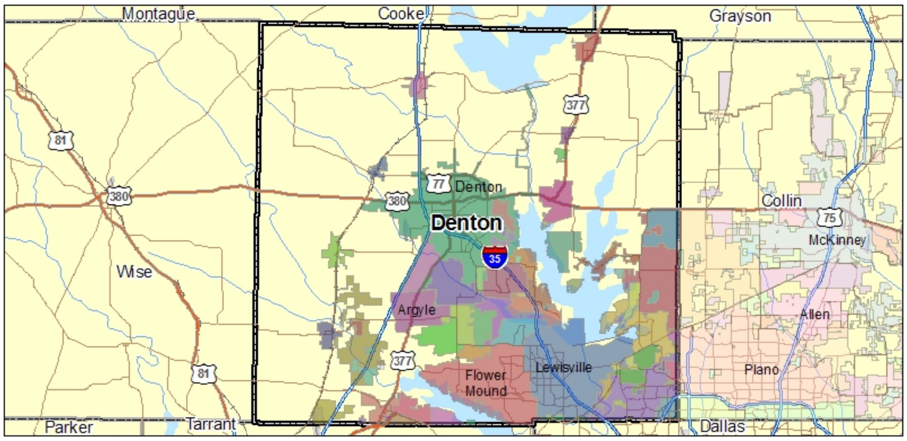
***Projected 2060 Population:*** *1,839,507*

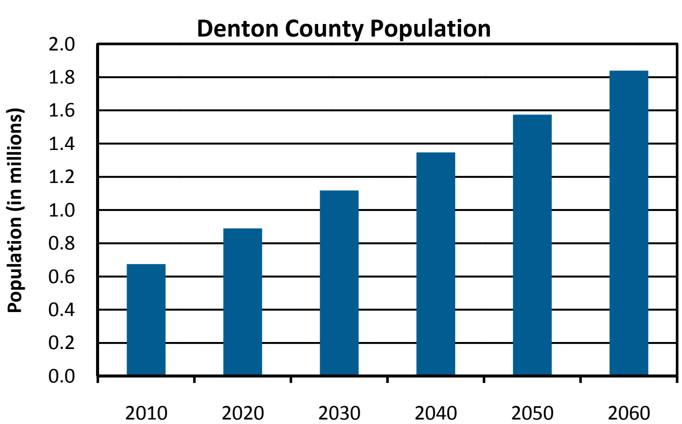
***County Seat:*** *Denton*

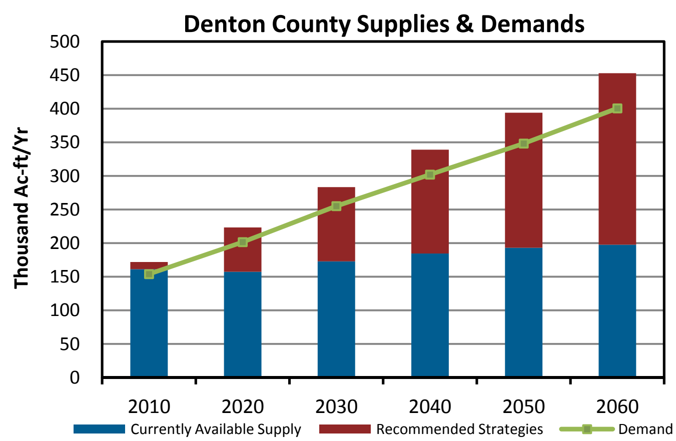
***Economy:*** *Industry; tourism; government/services*

***River Basin(s):***

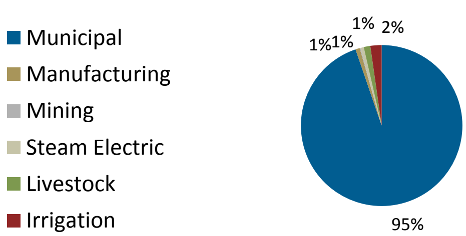
– Trinity (100%)



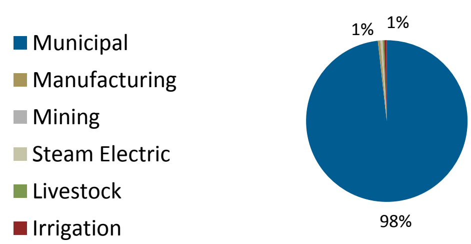




**2000 Denton County Demand**
**(% of total)**




**Total=93,982 acre-feet**

**2060 Denton County Demand**
**(% of total)**




**Total= 400,618 acre-feet**

| WATER USER GROUP | 2060 DENTON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Argyle | 5,827 | Argyle WSC | Additional Argyle WSC |
| Argyle WSC | 1,212 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Aubrey | 3,285 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Bartonville | 1,042 | Bartonville WSC | Additional Bartonville WSC |
| Bartonville WSC | 466 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Bolivar WSC [a] | 13,504 | Trinity Aquifer | Supplemental wells, UTRWD supplies, Cooke County Water Supply Project |
| Carrollton [a] | 16,686 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Celina [a] | 4,384 | Trinity and Woodbine Aquifers, UTRWD | Supplemental wells, Additional UTRWD supplies, NTMWD supplies |
| Coppell [a] | 283 | DWU | Additional DWU supplies |
| Copper Canyon | 740 | Bartonville WSC | Additional Bartonville WSC |
| Corinth | 6,845 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Cross Roads | 1,230 | Mustang SUD | Additional Mustang SUD |
| Dallas [a] | 8,270 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| Denton | 98,275 | Lake Ray Roberts, Lake Lewisville, Direct reuse, Indirect reuse, DWU | Additional DWU supplies, Additional WTP capacity |
| Denton County FWSD #1 | 3,894 | UTRWD, Lewisville (DWU) | Additional UTRWD supplies, Additional Lewisville supplies (DWU) |
| Double Oak | 692 | Bartonville WSC | Additional Bartonville WSC |
| Flower Mound | 32,085 | DWU, UTRWD | Additional DWU and UTRWD supplies |
| Fort Worth [a] | 33,069 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| Frisco [a] | 34,280 | NTMWD | Additional NTMWD supplies, Direct reuse |
| Hackberry | 326 | Trinity Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Hebron | 109 | Carrollton (DWU) | Additional Carrollton (DWU) |
| Hickory Creek | 1,405 | Lake Cities MUA | Additional Lake Cities MUA |
| Highland Village | 4,274 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Justin | 3,551 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Krugerville | 613 | Mustang SUD | Additional Mustang SUD |
| Krum | 1,066 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Lake Dallas | 1,680 | Lake Cities MUA | Additional Lake Cities MUA |

| WATER USER GROUP | 2060 DENTON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES (B) |
|---|---|---|---|
| Lewisville [a] | 33,612 | DWU | Additional DWU supplies, New WTP and WTP expansions |
| Lincoln Park | 234 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Little Elm | 8,321 | Woodbine Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies, Additional groundwater |
| Mustang SUD | 6,949 | Trinity Aquifer, UTRWD | Supplemental wells, Additional UTRWD supplies |
| Northlake | 3,197 | Woodbine Aquifer, Fort Worth (TRWD), UTRWD | Supplemental wells, Additional Fort Worth (TRWD), Additional UTRWD supplies |
| Oak Point | 2,868 | Mustang SUD | Additional Mustang SUD |
| Pilot Point | 2,335 | Trinity Aquifer | Supplemental wells, Additional Trinity Aquifer, UTRWD supplies |
| Plano [a] | 2,176 | NTMWD | Additional NTMWD supplies |
| Ponder | 3,448 | Trinity Aquifer | Supplemental wells, UTRWD supplies |
| Prosper [a] | 6,749 | Woodbine Aquifer, NTMWD, UTRWD | Supplemental wells, Additional NTMWD supplies, Additional UTRWD supplies |
| Roanoke | 7,013 | Trinity Aquifer, Fort Worth (TRWD) | Supplemental wells, Additional Fort Worth (TRWD) |
| Sanger | 4,033 | Trinity Aquifer, Bolivar WSC | Supplemental wells, Additional Bolivar WSC |
| Shady Shores | 604 | Lake Cities MUA | Additional Lake Cities MUA |
| Southlake [a] | 1,306 | Fort Worth (TRWD) | Additional Fort Worth (TRWD) |
| The Colony | 9,087 | Trinity Aquifer, DWU, Plano (NTMWD) | Supplemental wells, Additional DWU supplies, Additional Plano (NTMWD) |
| Trophy Club | 4,306 | Trinity Aquifer, Fort Worth (TRWD) | Supplemental wells, Additional Fort Worth (TRWD) |
| County-Other | 18,169 | Other, Trinity, and Woodbine Aquifers, UTRWD, Fort Worth (TRWD) | Supplemental wells, Additional groundwater, Additional UTRWD supplies, Additional Fort Worth supplies |
| Irrigation | 2,108 | Woodbine Aquifer, DWU, Direct reuse | Supplemental wells, Additional direct reuse (TRA), Additional Groundwater |
| Manufacturing | 1,880 | Trinity Aquifer, Denton (treated water and direct reuse), DWU, NTMWD, UTRWD | Supplemental wells, Additional groundwater, Additional Denton supplies, Additional DWU supplies, Additional NTMWD supplies, Additional UTRWD supplies |
| Livestock | 1,235 | Trinity and Woodbine Aquifers, Local supplies | Supplemental wells |
| Mining | 751 | Trinity Aquifer, Local supplies, UTRWD | Supplemental wells, Additional Groundwater supplies, Additional UTRWD supplies |
| Steam Electric Power | 1,144 | Denton (direct reuse) | Additional Groundwater supplies |

[a] WUG is in multiple counties

[b] Water conservation is a strategy for every municipal user group.

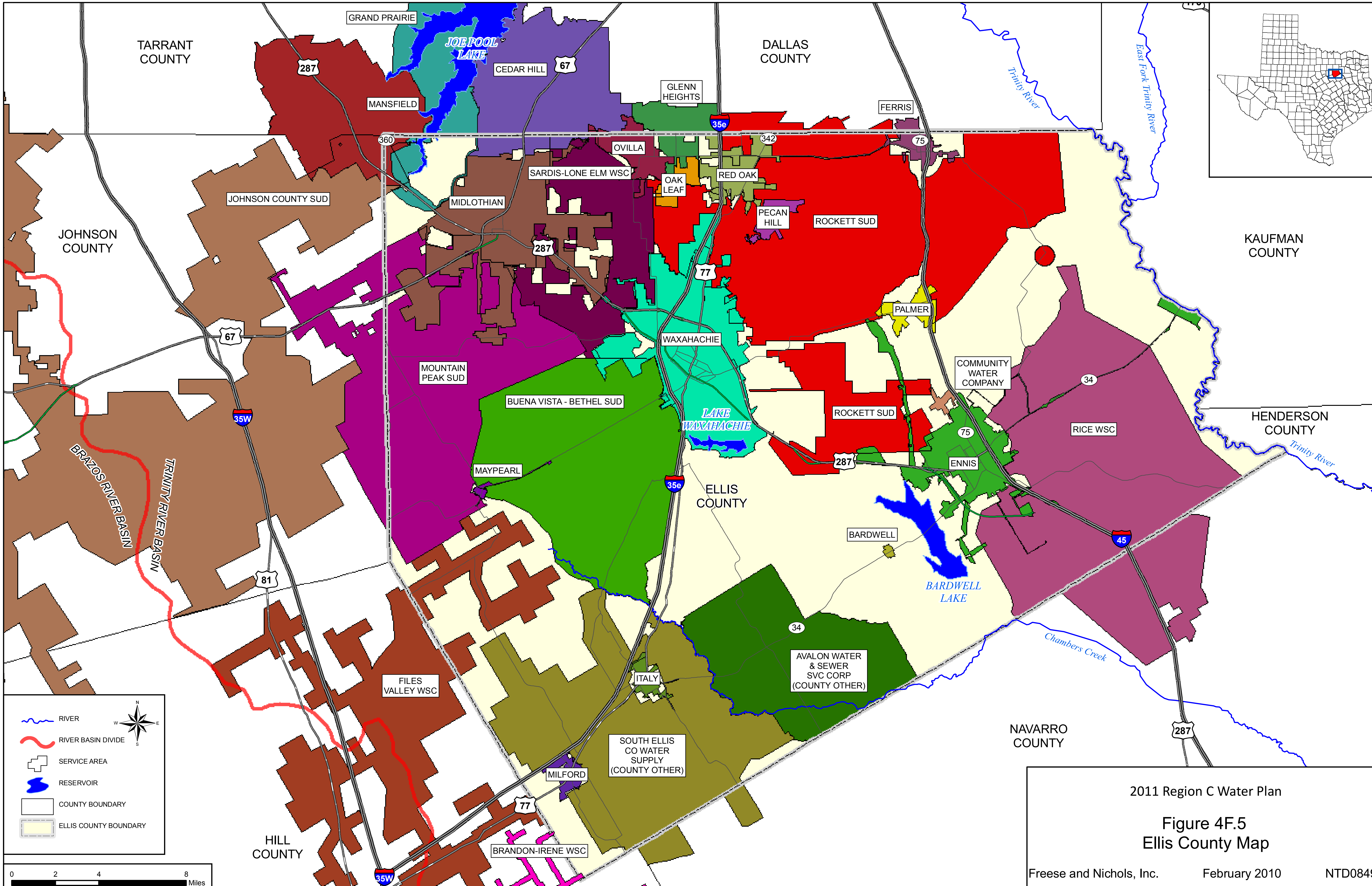
### *4F.5 Ellis County*

Figure 4F.5 is a map of Ellis County. Current sources of water supply in Ellis County include:

- Joe Pool Lake (Trinity River Authority [TRA]) for Midlothian
- Bardwell Lake (TRA) for Ennis and Waxahachie
- Lake Waxahachie for Waxahachie
- Tarrant Regional Water District (TRWD) through TRA for Ennis, Rockett SUD, and Waxahachie
- Reuse for Waxahachie and Steam Electric Power
- Dallas Water Utilities (DWU) for suppliers in the northern part of the county.
- Lake Aquilla and the BRA SWATS system (both in Region G) for suppliers in the western part of the county
- Groundwater.

Current groundwater pumping from the Trinity aquifer in Ellis County greatly exceeds the managed available groundwater as determined by the Texas Water Development Board (TWBD). The managed available groundwater from the Trinity aquifer in Ellis County is 3,959 acre-feet per year. According to TWDB records, the pumping from the Trinity aquifer in Ellis County in 2006 was 7,186 acre-feet, almost twice as much as the managed available groundwater. This plan calls for overdrafting of the Trinity aquifer in 2010, but includes the development of other sources of supply to eliminate the need for overdrafting the aquifer by 2020. The 2006 pumping from the Woodbine aquifer in Ellis County was 2,129 acre-feet, less than the managed available groundwater supply of 5,441 acre-feet per year. Thus, there is room for additional groundwater development from the Woodbine.

The TRA and local suppliers in Ellis County have begun to develop the Ellis County Water Supply Project which will supply increasing amounts of surface water (from TRWD) to customers in Ellis County (Table 4F.118). Water for the Ellis County Surface Water Supply Project will be delivered by the TRWD pipelines that run through Ellis County and will be treated at water treatment facilities operated by Ennis, Waxahachie/Rockett SUD, and Midlothian. This strategy will require water treatment plants and treatment plant




2011 Region C Water Plan

Figure 4F.5
Ellis County Map

Freese and Nichols, Inc. February 2010 NTD08492

**Table 4F.118**
**Supplies from the Ellis County Water Supply Project**

| Water User Group | Demands and Supplies (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Ennis Municipal | 3,497 | 4,358 | 5,504 | 6,949 | 8,834 | 11,308 |
| Community WC (Ellis Co.) | 116 | 171 | 201 | 230 | 264 | 304 |
| Rice WSC (part) | 50 | 50 | 50 | 50 | 50 | 50 |
| Ellis Co. Other (East Garrett WSC) | 56 | 56 | 56 | 56 | 56 | 56 |
| Bardwell | 0 | 17 | 42 | 69 | 100 | 135 |
| Ellis Co. Manufacturing (10%) | 347 | 367 | 384 | 399 | 409 | 391 |
| Ellis Co. Steam Electric | 1,401 | 1,401 | 1,401 | 1,401 | 1,401 | 1,401 |
| **Total Demands** | **5,467** | **6,420** | **7,638** | **9,154** | **11,114** | **13,645** |
| Other Supplies | 5,512 | 5,284 | 5,057 | 5,163 | 7,123 | 8,071 |
| Conservation | 188 | 441 | 649 | 894 | 1,215 | 1,653 |
| **Ennis Supply from ECWSP** | **0** | **695** | **1,932** | **3,097** | **2,776** | **3,921** |
| Midlothian Municipal | 3,438 | 6,765 | 9,174 | 11,151 | 13,178 | 15,206 |
| Alvarado (Region G, net of Groundwater) | 0 | 444 | 484 | 521 | 580 | 658 |
| Grand Prairie (part) | 0 | 7,287 | 7,287 | 7,287 | 7,287 | 7,287 |
| Mountain Peak SUD (net of Groundwater) | 155 | 586 | 658 | 856 | 1,224 | 1,701 |
| Rockett SUD | 1,544 | 1,682 | 1,682 | 1,682 | 1,682 | 1,682 |
| Venus (Region G)] | 363 | 358 | 349 | 344 | 342 | 342 |
| Ellis Co. Manufacturing (40%) | 1,386 | 1,468 | 1,536 | 1,595 | 1,636 | 1,565 |
| Ellis Co. Steam Electric | 224 | 224 | 224 | 224 | 224 | 224 |
| **Total Demands** | **7,110** | **18,814** | **21,394** | **23,660** | **26,153** | **28,665** |
| Other Supplies | 7,258 | 7,105 | 6,951 | 6,798 | 6,644 | 6,490 |
| Conservation | 226 | 1,407 | 1,895 | 2,311 | 2,744 | 3,207 |
| **Midlothian Supply from ECWSP** | **0** | **10,302** | **12,548** | **14,551** | **16,765** | **18,968** |
| Rockett SUD Municipal | 4,713 | 5,985 | 7,436 | 8,636 | 9,240 | 9,320 |
| Ellis County Other (Boyce WSC and Bristol WSC) | 70 | 70 | 70 | 70 | 70 | 70 |
| Ferris (net of Groundwater) | 174 | 220 | 268 | 328 | 403 | 473 |
| Lancaster (part) | 90 | 90 | 90 | 90 | 90 | 90 |
| Oak Leaf (part) | 55 | 55 | 55 | 55 | 55 | 55 |
| Palmer (net of Groundwater) | 0 | 2 | 13 | 24 | 40 | 42 |
| Pecan Hill | 160 | 183 | 205 | 228 | 265 | 285 |
| Red Oak (part) | 118 | 201 | 246 | 263 | 281 | 299 |
| Sardis-Lone Elm WSC (net of Groundwater) | 0 | 2,155 | 2,934 | 2,890 | 2,867 | 2,867 |
| **Total Demands** | **5,380** | **8,961** | **11,317** | **12,584** | **13,311** | **13,501** |

**(Table 4F.118, Continued)**

| Water User Group | Demands and Supplies (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Other Supplies (Midlothian) | 1,544 | 1,682 | 1,682 | 1,682 | 1,682 | 1,682 |
| Conservation | 105 | 506 | 761 | 904 | 1,013 | 1,088 |
| **Rockett SUD Supply from ECWSP** | **3,731** | **6,773** | **8,874** | **9,998** | **10,616** | **10,731** |
| Waxahachie Municipal | 6,855 | 8,781 | 10,330 | 13,090 | 16,672 | 21,341 |
| Buena Vista-Bethel SUD (net of Groundwater) | 1,043 | 1,466 | 1,967 | 2,536 | 3,158 | 3,836 |
| Ellis County Other | 242 | 240 | 237 | 236 | 235 | 235 |
| Files Valley WSC (part) | 0 | 100 | 100 | 100 | 100 | 100 |
| Italy (part) | 0 | 43 | 75 | 110 | 152 | 202 |
| Maypearl (part) | 0 | 23 | 67 | 61 | 57 | 57 |
| Waxahachie (part) | 613 | 613 | 613 | 613 | 613 | 613 |
| Ellis Co. Manufacturing (28%) | 970 | 1,028 | 1,075 | 1,116 | 1,145 | 1,095 |
| Ellis Co. Steam Electric | 0 | 0 | 0 | 2,116 | 4,129 | 4,454 |
| **Total Demands** | **9,723** | **12,294** | **14,464** | **19,978** | **26,261** | **31,933** |
| Other Supplies (Limited by South Plant Capacity) | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 |
| Conservation | 175 | 851 | 1,356 | 1,856 | 2,487 | 3,318 |
| **Waxahachie Supply from ECWSP (minimum 2,500 ac-ft per year)** | **2,500** | **2,500** | **4,095** | **9,109** | **14,761** | **19,602** |
| **Total** | **6,231** | **20,270** | **27,449** | **36,755** | **44,918** | **53,222** |

expansions and treated water pipelines. The Ellis County Water Supply Project will be developed by a combination of TRA, Ennis, Midlothian, Waxahachie and other suppliers in the county. For this plan, the capital costs ($258,517,000) are included under TRA, Ennis, Midlothian, Rockett SUD, and Waxahachie in Section 4E. (See Table Q-74 in Appendix Q.)

Other water management strategies to provide additional water for Ellis County include:

- Water user groups getting water from DWU will get additional DWU supplies.
- Water user groups getting water from Brazos Basin supplies will get additional supplies.
- Water user groups will overdraft the Trinity aquifer in 2010.
- Some water user groups will develop additional supplies from the Woodbine aquifer.
- Grand Prairie will purchase water from Arlington, Midlothian and Mansfield as well as DWU.

- Johnson County SUD will purchase additional water from Mansfield and water from Grand Prairie.
- Additional raw water and direct reuse supplies will be developed for steam electric power.

Water management strategies for each Ellis County water user group are discussed below. Table 4F.141 on page 4F.176 shows the estimated capital costs for the Ellis County water management strategies not associated with the wholesale water providers, and Table 4F.142 on page 4F.182 is a summary of the costs by category. Table 4F.142 is followed by a summary for Ellis County.

## Bardwell

Bardwell is a city of about 800 people in southern Ellis County. The city's water supply is groundwater that requires desalination (Woodbine aquifer). Water management strategies for Bardwell are conservation, establishing a direct connection to Ennis and contracting for and purchasing water from Ennis, and supplemental wells to replace existing water wells. Table 4F.119 shows the projected population and demand, the current supplies, and the water management strategies for Bardwell.

**Table 4F.119**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Bardwell**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **838** | **1,075** | **1,308** | **1,546** | **1,813** | **2,107** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 103 | 130 | 155 | 182 | 213 | 248 |
| ***Total Projected Demand*** | ***103*** | ***130*** | ***155*** | ***182*** | ***213*** | ***248*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer and Desalination | 113 | 113 | 113 | 113 | 113 | 113 |
| ***Total Current Supplies*** | ***113*** | ***113*** | ***113*** | ***113*** | ***113*** | ***113*** |
| | | | | | | |

(Table 4F.119, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***17*** | ***42*** | ***69*** | ***100*** | ***135*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 6 | 10 | 12 | 15 | 18 |
| Ennis (TRWD through TRA) | 0 | 11 | 32 | 57 | 85 | 117 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***17*** | ***42*** | ***69*** | ***100*** | ***135*** |
| **Reserve (Shortage)** | **12** | **0** | **0** | **0** | **0** | **0** |

## Brandon-Irene Water Supply Corporation

Brandon-Irene Water Supply Corporation serves about 2,400 people in Ellis, Hill and Navarro Counties. The majority of the WSC's service area is in Hill County in the Brazos G region, so the water supply plans would be covered in more detail in the Brazos G Regional Water Plan. Plans for Region C are covered on page 4F.__ under Navarro County.

## Buena Vista-Bethel Special Utility District

Buena Vista-Bethel SUD provides water to about 3,900 people in central and western Ellis County. The SUD gets its water supply from groundwater (Trinity aquifer) and TRWD (through Waxahachie). Water management strategies for Buena Vista-Bethel SUD are conservation, overdrafting of the Trinity aquifer (2010 only), constructing an additional pipeline from Waxahachie and purchasing additional water from Waxahachie, and supplemental wells to replace existing water wells. Table 4F.120 shows the projected population and demand, the current supplies, and the water management strategies for Buena Vista-Bethel SUD.

**Table 4F.120**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Buena Vista-Bethel Special Utility District**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,858** | **5,049** | **6,447** | **8,035** | **9,771** | **11,661** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,387 | 1,810 | 2,311 | 2,880 | 3,502 | 4,180 |
| ***Total Projected Demand*** | ***1,387*** | ***1,810*** | ***2,311*** | ***2,880*** | ***3,502*** | ***4,180*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 344 | 344 | 344 | 344 | 344 | 344 |
| Waxahachie (TRWD) | 560 | 560 | 560 | 560 | 560 | 560 |
| ***Total Current Supplies*** | ***904*** | ***904*** | ***904*** | ***904*** | ***904*** | ***904*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***483*** | ***906*** | ***1,407*** | ***1,976*** | ***2,598*** | ***3,276*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 117 | 367 | 494 | 640 | 807 | 998 |
| Overdraft Trinity Aquifer | 366 | 0 | 0 | 0 | 0 | 0 |
| Additional Water from Waxahachie and Additional Pipeline | | 539 | 913 | 1,336 | 1,791 | 2,278 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***483*** | ***906*** | ***1,407*** | ***1,976*** | ***2,598*** | ***3,276*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Cedar Hill

The City of Cedar Hill has a population of about 46,000. It is located in southwest Dallas County, with a small part in Ellis County. The city's water supply plans are discussed on page 4F.65 under Dallas County.

## Community Water Company

Community Water Company is located in Regions C, D and I. In Region C, Community Water Company serves about 1,100 people in Ellis County and 1,000 people in Navarro County. The Ellis County supply is treated water purchased from Ennis. Water management strategies for Community Water Company in Ellis County include conservation and purchasing additional water from Ennis. Strategies for Navarro County are discussed on page 4F.326. Table 4F.121 shows the projected population and demand, the current supplies, and the water management strategies for Community Water Company in Region C.

**Table 4F.121**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Community Water Company (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | | | | | | |
| Ellis County | 1,134 | 1,414 | 1,690 | 1,972 | 2,288 | 2,636 |
| Navarro County | 1,041 | 1,301 | 1,626 | 2,032 | 2,541 | 3,176 |
| **Total Region C Population Served** | **2,175** | **2,715** | **3,316** | **4,004** | **4,829** | **5,812** |
| **Projected Water Demand** | | | | | | |
| Ellis County | 116 | 171 | 201 | 230 | 264 | 304 |
| Navarro County | 106 | 157 | 193 | 237 | 293 | 366 |
| ***Total Region C Projected Demand*** | ***222*** | ***328*** | ***394*** | ***467*** | ***557*** | ***670*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Ennis (TRA - Lake Bardwell) | 100 | 119 | 112 | 101 | 90 | 80 |
| Corsicana (TRA - Navarro Mills Lake) | 106 | 157 | 181 | 215 | 255 | 303 |
| ***Total Current Supplies*** | ***206*** | ***276*** | ***293*** | ***316*** | ***345*** | ***383*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***16*** | ***52*** | ***101*** | ***151*** | ***212*** | ***287*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 13 | 21 | 27 | 34 | 43 |
| Additional Water from Ennis (Ellis County Water Supply Project) | 13 | 39 | 78 | 116 | 158 | 204 |
| Additional Water from Corsicana | 0 | 0 | 2 | 8 | 20 | 40 |
| ***Total Water Management Strategies*** | ***16*** | ***52*** | ***101*** | ***151*** | ***212*** | ***287*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Ellis County Irrigation

Table 4F.122 shows the projected demand, the current supplies, and the water management strategies for Ellis County Irrigation. As shown in Table 4F.122, local supplies, groundwater (Trinity aquifer), and reuse provide water for irrigation in Ellis County. Water management strategies include conservation, additional groundwater from the Woodbine aquifer, and supplemental wells.

**Table 4F.122**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Ellis County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **583** | **583** | **583** | **583** | **583** | **583** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 3 | 3 | 3 | 3 | 3 | 3 |
| Trinity Aquifer | 129 | 129 | 129 | 129 | 129 | 129 |
| Reuse | 125 | 125 | 125 | 125 | 125 | 125 |
| ***Total Current Supplies*** | ***257*** | ***257*** | ***257*** | ***257*** | ***257*** | ***257*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***326*** | ***326*** | ***326*** | ***326*** | ***326*** | ***326*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 15 | 29 | 37 | 44 | 51 |
| New wells in the Woodbine Aquifer | 563 | 563 | 563 | 563 | 563 | 563 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***564*** | ***578*** | ***592*** | ***600*** | ***607*** | ***614*** |
| **Reserve (Shortage)** | **238** | **252** | **266** | **274** | **281** | **288** |

### Ellis County Livestock

Table 4F.123 shows the projected demand, current supplies, and water management strategies for Ellis County Livestock. The current supplies for Ellis County Livestock are local surface water supplies and groundwater (Woodbine aquifer). These sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.123**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Ellis County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,183** | **1,183** | **1,183** | **1,183** | **1,183** | **1,183** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 1,688 | 1,688 | 1,688 | 1,688 | 1,688 | 1,688 |
| Woodbine Aquifer | 154 | 154 | 154 | 154 | 154 | 154 |
| ***Total Current Supplies*** | ***1,842*** | ***1,842*** | ***1,842*** | ***1,842*** | ***1,842*** | ***1,842*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **659** | **659** | **659** | **659** | **659** | **659** |

## Ellis County Manufacturing

Table 4F.124 shows the projected demand, the current supplies, and the water management strategies for Ellis County Manufacturing. Current supplies include Ennis, Midlothian, Waxahachie, and groundwater (Trinity and Woodbine aquifers). Additional supplies from the three cities and supplemental wells are the water management strategies for this water user group.

**Table 4F.124**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Ellis County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **3,466** | **3,670** | **3,841** | **3,987** | **4,089** | **3,912** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,035 | 1,035 | 1,035 | 1,035 | 1,035 | 1,035 |
| Woodbine Aquifer | 419 | 419 | 419 | 419 | 419 | 419 |
| Midlothian | 1,295 | 940 | 1,032 | 1,035 | 998 | 880 |
| Ennis | 351 | 343 | 325 | 293 | 220 | 176 |
| Waxahachie | 1,136 | 890 | 889 | 863 | 804 | 692 |

**(Table 4F.124, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Current Supplies*** | ***4,236*** | ***3,627*** | ***3,700*** | ***3,645*** | ***3,476*** | ***3,202*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***43*** | ***141*** | ***342*** | ***613*** | ***710*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from Midlothian | 0 | 533 | 504 | 560 | 638 | 685 |
| Additional Water from Ennis | 0 | 4 | 28 | 56 | 59 | 76 |
| Additional Water from Waxahachie | 0 | 8 | 53 | 165 | 278 | 354 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***545*** | ***585*** | ***781*** | ***975*** | ***1,115*** |
| **Reserve (Shortage)** | **770** | **502** | **444** | **439** | **362** | **405** |

## Ellis County Mining

Table 4F.125 shows the projected demand, the current supplies, and the water management strategies for Ellis County Mining. Ellis County Mining is supplied from groundwater (Woodbine aquifer). The only water management strategy for this water user group is supplemental wells.

**Table 4F.125**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Ellis County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **210** | **140** | **140** | **140** | **140** | **140** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 231 | 231 | 231 | 231 | 231 | 231 |
| ***Total Current Supplies*** | ***231*** | ***231*** | ***231*** | ***231*** | ***231*** | ***231*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **21** | **91** | **91** | **91** | **91** | **91** |

## Ellis County Other

Ellis County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Ellis County Other supply about 11,000 people and receive their water supply from Waxahachie, Ennis, TRWD (through various suppliers) and groundwater (Trinity, Woodbine, and other aquifers). Water management strategies for these entities include conservation, additional supplies from TRWD through various entities, additional groundwater (Woodbine aquifer), and supplemental wells to replace existing water wells. Table 4F.126 shows the projected population and demand, the current supplies, and the water management strategies for Ellis County Other.

**Table 4F.126**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Ellis County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **10,707** | **10,707** | **10,707** | **10,707** | **10,707** | **10,707** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,015 | 2,003 | 1,979 | 1,967 | 1,955 | 1,955 |
| ***Total Projected Water Demand*** | ***2,015*** | ***2,003*** | ***1,979*** | ***1,967*** | ***1,955*** | ***1,955*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District (through various suppliers) | 92 | 72 | 86 | 112 | 117 | 111 |
| Waxahachie (Lake Waxahachie) | 198 | 163 | 113 | 37 | 0 | 0 |
| Ennis (Lake Bardwell) | 48 | 39 | 31 | 25 | 19 | 15 |
| Other Aquifer | 113 | 113 | 113 | 113 | 113 | 113 |
| Trinity Aquifer | 287 | 287 | 287 | 287 | 287 | 287 |
| Woodbine Aquifer | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 |
| ***Total Current Supplies*** | ***2,138*** | ***2,074*** | ***2,030*** | ***1,974*** | ***1,936*** | ***1,926*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***19*** | ***29*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 17 | 54 | 73 | 81 | 87 | 94 |

(Table 4F.126, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Additional Groundwater (Woodbine) | 0 | 865 | 865 | 865 | 865 | 865 |
| Additional Water from TRWD (through Waxahachie, Rockett SUD, and Ennis) | 0 | 0 | 0 | 0 | 4 | 24 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***17*** | ***919*** | ***938*** | ***946*** | ***956*** | ***983*** |
| **Reserve (Shortage)** | **140** | **990** | **989** | **953** | **937** | **954** |

## Ellis County Steam Electric Power

Table 4F.127 shows the projected demand, the current supplies, and the water management strategies for Ellis County Steam Electric Power. Ellis County Steam Electric Power is currently supplied by direct reuse from Ennis and treated water from Ennis and Midlothian. Water management strategies for this water user group are additional water from Midlothian, treated water from Waxahachie, and a TRA direct reuse project.

**Table 4F.127**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Ellis County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **981** | **698** | **1,450** | **3,741** | **5,754** | **7,878** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Ennis Direct Reuse | 800 | 800 | 800 | 800 | 800 | 800 |
| Ennis Treated Water | 601 | 601 | 601 | 601 | 601 | 601 |
| Midlothian | 209 | 144 | 151 | 145 | 137 | 126 |
| ***Total Current Supplies*** | ***1,610*** | ***1,545*** | ***1,552*** | ***1,546*** | ***1,538*** | ***1,527*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***2,195*** | ***4,216*** | ***6,351*** |
| | | | | | | |

**(Table 4F.127, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Additional water from Midlothian | 15 | 80 | 73 | 79 | 107 | 118 |
| Waxahachie Steam Electric Power Supply (TRWD) | 0 | 0 | 0 | 2,116 | 4,128 | 4,454 |
| Trinity River Authority Ellis Co. Reuse | 0 | 0 | 0 | 0 | 0 | 2,200 |
| ***Total Water Management Strategies*** | ***15*** | ***80*** | ***73*** | ***2,195*** | ***4,235*** | ***6,772*** |
| **Reserve (Shortage)** | **644** | **927** | **175** | **0** | **19** | **421** |

## Ennis

Ennis is a city of about 20,500 people located in southeastern Ellis County. The city is a wholesale water provider, and its water management strategies are discussed on page 4E.75 of Section 4E.

## Ferris

Ferris is a city of about 2,600 people located in northern Ellis and southern Dallas Counties. Ferris gets it water supply from groundwater (Woodbine aquifer) and Rockett SUD. Water management strategies for Ferris include conservation, additional water from Rockett SUD, and supplemental wells to replace existing wells. Table 4F.128 shows the projected population and demand, the current supplies, and the water management strategies for Ferris.

**Table 4F.128**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Ferris**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,631** | **3,000** | **3,400** | **3,900** | **4,500** | **5,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 401 | 447 | 495 | 555 | 630 | 700 |
| ***Total Projected Demand*** | ***401*** | ***447*** | ***495*** | ***555*** | ***630*** | ***700*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 227 | 227 | 227 | 227 | 227 | 227 |
| Rockett Special Utility District (TRWD) | 167 | 202 | 209 | 221 | 238 | 244 |

(Table 4F.128, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Current Supplies*** | ***394*** | ***429*** | ***436*** | ***448*** | ***465*** | ***471*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***7*** | ***18*** | ***59*** | ***107*** | ***165*** | ***229*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 16 | 23 | 29 | 35 | 41 |
| Additional Water from Rockett SUD | 0 | 2 | 36 | 78 | 130 | 188 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***7*** | ***18*** | ***59*** | ***107*** | ***165*** | ***229*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Files Valley Water Supply Corporation

Files Valley WSC serves about 3,000 people in western Ellis and eastern Hill Counties. The WSC purchases treated water from the Aquilla Water Supply District, which is located in Hill County in the Brazos G region. Water management strategies for the WSC in Region C include water conservation and participation in the Ellis County Water Supply Project purchasing water from Waxahachie. Table 4F.129 shows the projected population and demand, the current supplies, and the water management strategies for Files Valley WSC in Region C. Information on Brazos G supplies can be found in the Brazos G Regional Water Plan.

**Table 4F.129**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Files Valley Water Supply Corporation (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Region C Population** | **1,000** | **1,115** | **1,230** | **1,345** | **1,460** | **1,575** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand in Region C | 208 | 227 | 247 | 265 | 286 | 309 |
| ***Total Projected Region C Demand*** | ***208*** | ***227*** | ***247*** | ***265*** | ***286*** | ***309*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Aquilla Water Supply District (BRA - Region G) | 208 | 227 | 247 | 265 | 286 | 309 |
| ***Total Current Supplies*** | ***208*** | ***227*** | ***247*** | ***265*** | ***286*** | ***309*** |

(Table 4F.129, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 6 | 9 | 10 | 12 | 14 |
| Ellis County Water Supply Project (Buena Vista-Bethel WSC from Waxahachie from TRA from TRWD) | 0 | 100 | 100 | 100 | 100 | 100 |
| ***Total Water Management Strategies*** | ***2*** | ***106*** | ***109*** | ***110*** | ***112*** | ***114*** |
| **Region C Reserve (Shortage)** | **2** | **106** | **109** | **110** | **112** | **114** |

## Glenn Heights

Glenn Heights is a city of about 11,000 people located in southern Dallas and northern Ellis Counties. The city's water supply plans are discussed on page 4F.77 under Dallas County.

## Grand Prairie

Grand Prairie is a city of about 170,000 in western Dallas County, eastern Tarrant County, and northwestern Ellis County. The city is a wholesale water provider, and there is a discussion of Grand Prairie's water supply plans on page 4E.84 in Section 4E.

## Italy

Italy is located in southwest Ellis County and has a population of about 2,400. The city gets its water supply from groundwater (Trinity and Woodbine aquifers). Table 4F.130 shows the projected population and demand, the current supplies, and the water management strategies for Italy. Strategies include conservation, water from Waxahachie as part of the Ellis County Water Supply Project, and supplemental wells.

**Table 4F.130**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Italy**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,376** | **2,731** | **3,081** | **3,438** | **3,838** | **4,279** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 282 | 330 | 362 | 397 | 439 | 489 |
| ***Total Projected Demand*** | ***282*** | ***330*** | ***362*** | ***397*** | ***439*** | ***489*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 208 | 208 | 208 | 208 | 208 | 208 |
| Woodbine Aquifer | 79 | 79 | 79 | 79 | 79 | 79 |
| ***Total Current Supplies*** | ***287*** | ***287*** | ***287*** | ***287*** | ***287*** | ***287*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***43*** | ***75*** | ***110*** | ***152*** | ***202*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 13 | 19 | 23 | 27 | 32 |
| Waxahachie (TRWD through TRA) | 0 | 30 | 56 | 87 | 125 | 170 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***43*** | ***75*** | ***110*** | ***152*** | ***202*** |
| **Reserve (Shortage)** | **9** | **0** | **0** | **0** | **0** | **0** |

## Johnson County Special Utility District

The Johnson County Special Utility District has a large service area in Johnson and Hill Counties in the Brazos G region and Tarrant and Ellis Counties in Region C. The majority of the population served by the SUD is in Johnson County, and the Brazos G Regional Water Plan deals with the SUD's overall water supply strategies. Johnson County SUD currently gets water from Mansfield, and plans to purchase additional supplies from Mansfield in the future and to purchase water from Grand Prairie. These supplies originating in Region C will more than meet the demand for the SUD in Region C and leave considerable excess supplies for use in the Brazos G region. Table 4F.131 shows the projected population and demand, the current supplies, and the water management strategies for Johnson County SUD in Region C. Information on Brazos G supplies can be found in the Brazos G Regional Water Plan.

**Table 4F.131**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Johnson County Special Utility District (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population in Region C** | **2,406** | **3,015** | **3,638** | **4,294** | **5,076** | **5,994** |
| **Projected Water Demand in Region C** | | | | | | |
| *Municipal Demand* | *461* | *587* | *725* | *885* | *1,080* | *1,276* |
| ***Total Projected Region C Demand*** | ***461*** | ***587*** | ***725*** | ***885*** | ***1,080*** | ***1,276*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Mansfield (TRWD) | 1,675 | 3,087 | 5,246 | 4,539 | 3,974 | 3,466 |
| ***Total Current Supplies*** | ***1,675*** | ***3,087*** | ***5,246*** | ***4,539*** | ***3,974*** | ***3,466*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 23 | 30 | 39 | 50 | 63 |
| Additional Supply from Mansfield | 0 | 3,639 | 1,480 | 2,187 | 2,752 | 3,260 |
| Grand Prairie (multiple sources) | 0 | 6,726 | 6,726 | 6,726 | 6,726 | 6,726 |
| ***Total Water Management Strategies*** | ***7*** | ***10,388*** | ***8,236*** | ***8,952*** | ***9,528*** | ***10,049*** |
| ***Available for Brazos G Region*** | ***1,221*** | ***12,888*** | ***12,757*** | ***12,606*** | ***12,422*** | ***12,239*** |

## Mansfield

The City of Mansfield has a population of about 57,000 people in Ellis, Johnson and Tarrant Counties. Mansfield is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.87 in Section 4E.

## Maypearl

Maypearl is a city of about 1,000 located in western Ellis County. The city gets its water supply from groundwater (Trinity and Woodbine aquifers). Water management strategies for Maypearl are conservation, participation in the Ellis County Water Supply Project by purchasing treated water from Waxahachie, and supplemental wells to replace existing water wells. Table 4F.132 shows the projected population and demand, the current supplies, and the water management strategies for Maypearl.

**Table 4F.132**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Maypearl**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,000** | **1,250** | **1,500** | **1,500** | **1,500** | **1,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 195 | 238 | 282 | 276 | 272 | 272 |
| ***Total Projected Demand*** | ***195*** | ***238*** | ***282*** | ***276*** | ***272*** | ***272*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 55 | 55 | 55 | 55 | 55 | 55 |
| Woodbine Aquifer | 160 | 160 | 160 | 160 | 160 | 160 |
| ***Total Current Supplies*** | ***215*** | ***215*** | ***215*** | ***215*** | ***215*** | ***215*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***23*** | ***67*** | ***61*** | ***57*** | ***57*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 13 | 19 | 21 | 23 | 26 |
| Ellis County Water Supply Project (Waxahachie from TRA from TRWD) | 0 | 10 | 48 | 40 | 34 | 31 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***23*** | ***67*** | ***61*** | ***57*** | ***57*** |
| **Reserve (Shortage)** | **22** | **0** | **0** | **0** | **0** | **0** |

## Midlothian

The City of Midlothian has a population of about 16,500 people in northwestern Ellis County. Midlothian is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.89 in Section 4E.

## Milford

Milford is a city of about 700 in southwest Ellis County. The city gets its water supply from groundwater (Woodbine aquifer) and Files Valley WSC. Water management strategies for Milford include water conservation and supplemental wells. Table 4F.133 shows the projected population and demand, the current supplies, and the water management strategies for Milford.

**Table 4F.133**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Milford**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **737** | **737** | **737** | **737** | **737** | **737** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 132 | 130 | 127 | 125 | 122 | 122 |
| ***Total Projected Demand*** | ***132*** | ***130*** | ***127*** | ***125*** | ***122*** | ***122*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 145 | 145 | 145 | 145 | 145 | 145 |
| Files Valley Water Supply Corporation (BRA in Region G) | 84 | 84 | 84 | 84 | 84 | 84 |
| ***Total Current Supplies*** | ***229*** | ***229*** | ***229*** | ***229*** | ***229*** | ***229*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 4 | 5 | 5 | 6 | 6 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1*** | ***4*** | ***5*** | ***5*** | ***6*** | ***6*** |
| **Reserve (Shortage)** | **98** | **103** | **107** | **109** | **113** | **113** |

### Mountain Peak Special Utility District

Mountain Peak SUD serves customers in western Ellis County and eastern Johnson County. In Region C, Mountain Peak SUD gets water from groundwater (Trinity aquifer) and a small amount from Midlothian. Water management strategies in Region C include conservation, overdrafting the Trinity aquifer (2010 only), new groundwater from the Woodbine aquifer, additional water from Midlothian, and supplemental wells to replace existing wells. Table 4F.134 shows the projected population and demand, the current supplies, and the water management strategies for Mountain Peak SUD in Region C. Information on plans in the Brazos G Region can be found in the Brazos G Regional Water Plan.

**Table 4F.134**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Mountain Peak Special Utility District (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population in Region C** | **6,691** | **7,509** | **7,964** | **9,194** | **11,305** | **14,031** |
| **Projected Water Demand in Region C** | | | | | | |
| Municipal Demand | 1,207 | 1,337 | 1,409 | 1,607 | 1,975 | 2,452 |
| ***Total Projected Demand in Region C*** | ***1,207*** | ***1,337*** | ***1,409*** | ***1,607*** | ***1,975*** | ***2,452*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 751 | 751 | 751 | 751 | 751 | 751 |
| Midlothian | 63 | 538 | 513 | 578 | 723 | 876 |
| ***Total Current Supplies*** | ***814*** | ***1,289*** | ***1,264*** | ***1,329*** | ***1,474*** | ***1,627*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***393*** | ***48*** | ***145*** | ***278*** | ***501*** | ***825*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 46 | 85 | 110 | 141 | 189 | 257 |
| Overdraft Trinity Aquifer in 2010 | 301 | 0 | 0 | 0 | 0 | 0 |
| Woodbine Aquifer (new wells) | 0 | 200 | 200 | 200 | 200 | 200 |
| Additional Water from Midlothian | 46 | 0 | 0 | 0 | 112 | 368 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***393*** | ***285*** | ***310*** | ***341*** | ***501*** | ***825*** |
| **Reserve (Shortage)** | **0** | **237** | **165** | **63** | **0** | **0** |

## Oak Leaf

Oak Leaf is a city of about 1,500 located in northern Ellis County. The city gets water from Glenn Heights, and some residents are provided retail service by Rockett SUD. Water management strategies for Oak Leaf include conservation, additional water from Glenn Heights and additional water from Rockett SUD. Table 4F.135 shows the projected population and demand, the current supplies, and the water management strategies for Oak Leaf.

**Table 4F.135**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Oak Leaf**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,502** | **1,774** | **2,042** | **2,316** | **2,622** | **2,960** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 338 | 393 | 448 | 503 | 567 | 640 |
| ***Total Projected Demand*** | ***338*** | ***393*** | ***448*** | ***503*** | ***567*** | ***640*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Glenn Heights (DWU and Groundwater) | 260 | 254 | 282 | 302 | 318 | 320 |
| Rockett Special Utility District (TRWD) | 40 | 39 | 35 | 31 | 27 | 24 |
| ***Total Current Supplies*** | ***300*** | ***293*** | ***317*** | ***333*** | ***345*** | ***344*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***38*** | ***100*** | ***131*** | ***170*** | ***222*** | ***296*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 10 | 20 | 29 | 37 | 47 | 58 |
| Additional Water from Glenn Heights | 13 | 64 | 82 | 109 | 147 | 207 |
| Additional Water from Rockett SUD | 15 | 16 | 20 | 24 | 28 | 31 |
| ***Total Water Management Strategies*** | ***38*** | ***100*** | ***131*** | ***170*** | ***222*** | ***296*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Ovilla

Ovilla is a city of about 4,000 located in northern Ellis County and southern Dallas County. Ovilla gets its water supplies from DWU, and water management strategies are conservation and additional water from DWU. Table 4F.136 shows the projected population and demand, the current supplies, and the water management strategies for Ovilla.

**Table 4F.136**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Ovilla**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,850** | **6,070** | **8,290** | **10,508** | **11,050** | **11,846** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 992 | 1,550 | 2,099 | 2,648 | 2,784 | 2,985 |
| ***Total Projected Demand*** | ***992*** | ***1,550*** | ***2,099*** | ***2,648*** | ***2,784*** | ***2,985*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 861 | 1,122 | 1,465 | 1,745 | 1,695 | 1,600 |
| ***Total Current Supplies*** | ***861*** | ***1,122*** | ***1,465*** | ***1,745*** | ***1,695*** | ***1,600*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***131*** | ***428*** | ***634*** | ***903*** | ***1,089*** | ***1,385*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 28 | 83 | 138 | 197 | 232 | 274 |
| Additional Water from DWU | 103 | 345 | 496 | 706 | 857 | 1,111 |
| ***Total Water Management Strategies*** | ***131*** | ***428*** | ***634*** | ***903*** | ***1,089*** | ***1,385*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Palmer

Palmer has a population of about 2,200 and is located in northeastern Ellis County. Palmer gets its water supplies from groundwater (Woodbine aquifer). Its water management strategies are conservation, water from Rockett SUD, and supplemental wells to replace existing wells. Table 4F.137 shows the projected population and demand, the current supplies, and the water management strategies for Palmer.

**Table 4F.137**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Palmer**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,178** | **2,335** | **2,490** | **2,648** | **2,826** | **3,022** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 271 | 282 | 293 | 303 | 320 | 342 |
| ***Total Projected Demand*** | ***271*** | ***282*** | ***293*** | ***303*** | ***320*** | ***342*** |

(Table 4F.137, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 280 | 280 | 280 | 280 | 280 | 280 |
| ***Total Current Supplies*** | ***280*** | ***280*** | ***280*** | ***280*** | ***280*** | ***280*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***2*** | ***13*** | ***23*** | ***40*** | ***62*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 11 | 16 | 18 | 20 | 23 |
| Rockett Special Utility District (TRWD) | 0 | 0 | 0 | 5 | 20 | 39 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***11*** | ***16*** | ***23*** | ***40*** | ***62*** |
| **Reserve (Shortage)** | **13** | **9** | **3** | **0** | **0** | **0** |

## Pecan Hill

Pecan Hill has a population of about 800 and is located in northern Ellis County. The city's residents get retail water service from Rockett SUD, and that supply is expected to continue. Table 4F.138 shows the projected population and demand, the current supplies, and the water management strategies for Pecan Hill.

**Table 4F.138**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Pecan Hill**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **813** | **943** | **1,072** | **1,203** | **1,350** | **1,512** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 160 | 183 | 205 | 228 | 254 | 285 |
| ***Total Projected Demand*** | ***160*** | ***183*** | ***205*** | ***228*** | ***254*** | ***285*** |
| **Currently Available Water Supplies** | | | | | | |
| Rockett SUD (TRWD and Midlothian) | 160 | 183 | 205 | 228 | 254 | 285 |
| ***Total Current Supplies*** | ***160*** | ***183*** | ***205*** | ***228*** | ***254*** | ***285*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 5 | 7 | 9 | 11 | 13 |
| ***Total Water Management Strategies*** | ***1*** | ***5*** | ***7*** | ***9*** | ***11*** | ***13*** |
| **Reserve (Shortage)** | **1** | **5** | **7** | **9** | **11** | **13** |

## Red Oak

Red Oak is a city of about 12,500 people located in northern Ellis County. The city's current water supplies are groundwater (Woodbine aquifer), DWU, and retail service for some residents from Rockett SUD. Water management strategies for Red Oak include conservation, additional water from DWU, additional water from Rockett SUD, and supplemental wells to replace existing wells. Table 4F.139 shows the projected population and demand, the current supplies, and the water management strategies for Red Oak.

**Table 4F.139**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Red Oak**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **12,500** | **21,000** | **26,000** | **28,000** | **30,000** | **32,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,366 | 4,022 | 4,922 | 5,269 | 5,612 | 5,986 |
| ***Total Projected Demand*** | ***2,366*** | ***4,022*** | ***4,922*** | ***5,269*** | ***5,612*** | ***5,986*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 605 | 605 | 605 | 605 | 605 | 605 |
| Dallas Water Utilities | 1,741 | 2,568 | 3,178 | 3,371 | 3,313 | 3,107 |
| Rockett Special Utility District | 118 | 188 | 202 | 192 | 184 | 177 |
| ***Total Current Supplies*** | ***2,464*** | ***3,361*** | ***3,985*** | ***4,168*** | ***4,102*** | ***3,889*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***661*** | ***937*** | ***1,101*** | ***1,510*** | ***2,097*** |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 27 | 205 | 314 | 382 | 454 | 534 |
| Additional Water from Rockett SUD | 0 | 13 | 44 | 71 | 97 | 122 |
| Additional Water from DWU | 0 | 443 | 579 | 648 | 959 | 1,441 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***27*** | ***661*** | ***937*** | ***1,101*** | ***1,510*** | ***2,097*** |
| **Reserve (Shortage)** | **125** | **0** | **0** | **0** | **0** | **0** |

## Rice Water Supply Corporation

Rice WSC provides retail service to about 8,600 people in northern Navarro County and southeastern Ellis County in and around the City of Rice. The WSC's water supply plans are discussed on page 4F.337 under Navarro County.

## Rockett Special Utility District

Rockett SUD serves retail and wholesale customers in northern Ellis County and southern Dallas County. The SUD serves about 35,000 people outside of incorporated areas and has many more customers in cities. Rockett SUD is a wholesale water provider, and its water supply plans are discussed on page 4E.97 in Section 4E.

## Sardis-Lone Elm Water Supply Corporation

Sardis-Lone Elm WSC is located in northern Ellis County with a small area in southern Dallas County. The WSC serves about 12,000 people outside of incorporated areas and also has some retail customers in Midlothian. The WSC currently gets all of its water supply from the Trinity aquifer. Water management strategies include conservation, overdrafting the Trinity aquifer (2010 only), participation in the Ellis County Water Supply Project by obtaining water from Rockett SUD, and supplemental wells to replace existing wells. Table 4F.140 shows the projected population and demand, the current supplies, and the water management strategies for Sardis-Lone Elm WSC.

**Table 4F.140**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Sardis-Lone Elm Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **12,036** | **16,036** | **20,036** | **20,036** | **20,036** | **20,036** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,508 | 3,305 | 4,084 | 4,040 | 4,017 | 4,017 |
| ***Total Projected Demand*** | ***2,508*** | ***3,305*** | ***4,084*** | ***4,040*** | ***4,017*** | ***4,017*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,150 | 1,150 | 1,150 | 1,150 | 1,150 | 1,150 |
| ***Total Current Supplies*** | ***1,150*** | ***1,150*** | ***1,150*** | ***1,150*** | ***1,150*** | ***1,150*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***1,358*** | ***2,155*** | ***2,934*** | ***2,890*** | ***2,867*** | ***2,867*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 100 | 212 | 313 | 346 | 378 | 411 |
| Rockett Special Utility District (TRWD) | 0 | 1,943 | 2,621 | 2,544 | 2,489 | 2,456 |

(Table 4F.140, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Overdraft Trinity Aquifer (existing wells) | 1,258 | 0 | 0 | 0 | 0 | 0 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1,358*** | ***2,155*** | ***2,934*** | ***2,890*** | ***2,867*** | ***2,867*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Waxahachie

Waxahachie is a city of about 30,000 people located in central Ellis County. The city is a wholesale water provider, and its water management strategies are discussed on page 4E.106 of Section 4E.

### Costs for Ellis County Water User Groups

Table 4F.141 shows the estimated capital costs for Ellis County water management strategies not covered under the wholesale water providers, and Table 4F.142 summarizes the costs by category. Table 4F.142 is followed by a summary for Ellis County.

**Table 4F.141**
**Costs for Recommended Water Management Strategies for Ellis County**
**Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Bardwell | Conservation | 2010 | 18 | $5,000 | $0.16 | $0.16 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $581,000 | N/A | N/A | Q-13 |
| | Ennis supplies | 2020 | 117 | $0 | $2.50 | $2.50 | None |
| Brandon-Irene WSC* (Region C only) | Conservation | See Navarro County. | | | | | |
| | Additional Aquilla WSC | See Navarro County. | | | | | |
| Buena Vista-Bethel WSC | Conservation | 2010 | 998 | $5,000 | $0.24 | $0.24 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,732,000 | N/A | N/A | Q-13 |
| | Overdraft groundwater (Trinity Aquifer) | 2010 | 366 | $0 | $0.47 | $0.47 | Q-157 |
| | Additional Pipeline to Waxahachie | 2020 | Included Below | $8,798,000 | $1.73 | $0.87 | Q-159 |
| | Additional Waxahachie supplies | 2020 | 2,278 | $0 | $2.50 | $2.50 | None |
| Cedar Hill* | Conservation | See Dallas County. | | | | | |
| | Supplemental wells | See Dallas County. | | | | | |
| | Additional DWU supplies | See Dallas County. | | | | | |
| Community Water Company (Region C only)* | Conservation | 2010 | 43 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Ennis supplies | 2010 | 204 | $0 | $2.50 | $2.50 | None |
| | Additional Corsicana | See Navarro County. | | | | | |

(Table 4F.141, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Ellis County Other | Conservation | 2010 | 94 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $8,826,000 | N/A | N/A | Q-13 |
| | Additional groundwater (Woodbine) | 2020 | 865 | $10,235,000 | $6.25 | $2.16 | Q-174 & Q-175 |
| | Additional Rockett SUD, Waxahachie, and Ennis Supplies | 2050 | 24 | $0 | $2.50 | $2.50 | None |
| Ennis | Conservation | 2010 | 1,627 | See Ennis in Section 4E. | | | |
| | Additional TRWD through TRA (Ellis County Project) | See Ennis in Section 4E. | | | | | |
| | Indirect reuse | See Ennis in Section 4E. | | | | | |
| | Treatment plant expansions | See Ennis in Section 4E. | | | | | |
| Ferris | Conservation | 2010 | 41 | $5,000 | $0.13 | $0.13 | Q-10 & Q-11 |
| | Additional Rocket SUD | 2020 | 188 | $0 | $2.50 | $2.50 | None |
| | Supplemental wells | 2010 | 0 | $1,300,000 | N/A | N/A | Q-13 |
| Files Valley WSC | Conservation | 2010 | 14 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Buena Vista-Bethel SUD | 2020 | 100 | $0 | $2.50 | $2.50 | None |
| Glenn Heights* | Conservation | See Dallas County. | | | | | |
| | Supplemental wells | See Dallas County. | | | | | |
| | Additional DWU supplies | See Dallas County. | | | | | |

**(Table 4F.141, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Grand Prairie* | Conservation | Information under Grand Prairie in Section 4E. | | | | | |
| | Additional DWU supplies | Information under Grand Prairie in Section 4E. | | | | | |
| | Supplemental wells | Information under Grand Prairie in Section 4E. | | | | | |
| | Midlothian (from TRWD) | Information under Grand Prairie in Section 4E. | | | | | |
| | Mansfield (from TRWD) | Information under Grand Prairie in Section 4E. | | | | | |
| | Arlington (from TRWD) | Information under Grand Prairie in Section 4E. | | | | | |
| Italy | Conservation | 2010 | 32 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,434,000 | N/A | N/A | Q-13 |
| | Waxahachie | 2020 | 170 | $0 | $2.50 | $2.50 | None |
| Johnson County SUD* | Conservation | 2010 | 63 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional BRA SWATS | See Region G Plan. | | | | | |
| | Additional Mansfield (TRWD) | 2020 | 3,260 | $0 | $2.50 | $2.50 | None |
| | Grand Prairie | 2020 | 6,726 | $0 | $2.50 | $2.50 | None |
| Mansfield* | Conservation | Information under Mansfield in Section 4E. | | | | | |
| | Additional TRWD | Information under Mansfield in Section 4E. | | | | | |
| | Treatment plant expansions and new plant | Information under Mansfield in Section 4E. | | | | | |

**(Table 4F.141, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Maypearl | Conservation | 2010 | 26 | $0 | $0.59 | $0.59 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,559,000 | N/A | N/A | Q-13 |
| | Waxahachie from TRWD through TRA (Ellis County Project) | 2020 | 31 | $0 | $2.50 | $2.50 | None |
| Midlothian | Conservation | 2010 | 2,133 | See Midlothian in Section 4E. | | | |
| | Additional Joe Pool Lake | See Midlothian in Section 4E. | | | | | |
| | Joe Pool Lake from Grand Prairie | See Midlothian in Section 4E. | | | | | |
| | TRWD through TRA (Ellis County Project) and WTP expansions | See Midlothian in Section 4E. | | | | | |
| Milford | Conservation | 2010 | 6 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2020 | 0 | $958,000 | N/A | N/A | Q-13 |
| Mountain Peak SUD* | Conservation | 2010 | 257 | $5,000 | $0.57 | $0.57 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,458,000 | N/A | N/A | Q-13 |
| | Overdraft groundwater (2010 - Trinity Aquifer) | 2010 | 301 | $0 | $0.19 | $0.19 | Q-186A |
| | Additional groundwater (Woodbine) | 2020 | 200 | $876,000 | $1.98 | $1.00 | Q-186 |
| | Additional Midlothian | 2010 | 368 | $0 | $2.50 | $2.50 | None |

(Table 4F.141, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Oak Leaf | Conservation | 2010 | 58 | $0 | $0.44 | $0.44 | Q-10 & Q-11 |
| | Additional Rockett SUD | 2010 | 31 | $0 | $2.50 | $2.50 | None |
| | Additional Glenn Heights (DWU) | 2010 | 207 | $0 | $2.50 | $2.50 | None |
| Ovilla* | Conservation | 2010 | 271 | $0 | $0.42 | $0.42 | Q-10 & Q-11 |
| | Additional DWU supplies | 2010 | 1,111 | $0 | $1.37 | $1.37 | None |
| Palmer | Conservation | 2010 | 23 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Rockett SUD | 2040 | 39 | $0 | $2.50 | $2.50 | None |
| | Supplemental wells | 2010 | 0 | $1,152,000 | N/A | N/A | Q-13 |
| Pecan Hill | Conservation | 2010 | 13 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Red Oak | Conservation | 2010 | 534 | $0 | $0.50 | $0.50 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,749,000 | N/A | N/A | Q-13 |
| | Additional DWU supplies | 2020 | 1,441 | $0 | $1.37 | $1.37 | None |
| | Additional Rockett SUD | 2020 | 122 | $0 | $2.50 | $2.50 | None |
| Rice WSC* | Conservation | See Navarro County. | | | | | |
| | Additional Ennis | See Navarro County. | | | | | |
| | Additional Corsicana | See Navarro County. | | | | | |
| Rockett SUD* | Conservation | 2010 | 633 | See Rockett SUD in Section 4E. | | | |
| | Additional TRWD through TRA | See Rockett SUD in Section 4E. | | | | | |
| | Treatment plant expansions | See Rockett SUD in Section 4E. | | | | | |

(Table 4F.141, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Sardis-Lone Elm WSC* | Conservation | 2010 | 411 | $5,000 | $0.49 | $0.49 | Q-10 & Q-11 |
| | Overdraft groundwater (Trinity Aquifer) | 2010 | 1,258 | $0 | $0.43 | $0.43 | Q-173 |
| | Supplemental wells | 2010 | 0 | $7,278,000 | N/A | N/A | Q-13 |
| | Rockett SUD | 2020 | 2,456 | $0 | $2.50 | $2.50 | None |
| Waxahachie | Conservation | 2010 | 2,251 | See Waxahachie in Section 4E. | | | |
| | Treatment plant expansions (Ellis County Project) | See Waxahachie in Section 4E. | | | | | |
| | Additional TRWD through TRA | See Waxahachie in Section 4E. | | | | | |
| Ellis County Irrigation | Conservation | 2010 | 51 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $394,000 | N/A | N/A | Q-13 |
| | Additional groundwater (Woodbine) | 2010 | 563 | $2,487,000 | $1.79 | $0.81 | Q-195 |
| Ellis County Livestock | Supplemental wells | 2010 | 0 | $388,000 | N/A | N/A | Q-13 |
| Ellis County Manufacturing | Supplemental wells | 2010 | 0 | $13,358,000 | N/A | N/A | Q-13 |
| | Additional Ennis | 2020 | 76 | $0 | $2.50 | $2.50 | None |
| | Additional Waxahachie | 2010 | 354 | $0 | $2.50 | $2.50 | None |
| | Additional Midlothian | 2010 | 658 | $0 | $2.50 | $2.50 | None |
| Ellis County Mining | Supplemental wells | 2010 | 0 | $388,000 | N/A | N/A | Q-13 |

**(Table 4F.141, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Ellis County Steam Electric | Waxahachie | 2040 | 4,454 | $11,512,000 | $1.39 | $0.82 | Q-189 |
| | Additional Midlothian | 2010 | 118 | $0 | $0.70 | $0.70 | None |
| | TRA direct reuse | 2060 | 2,200 | See TRA in Section 4E | | | |

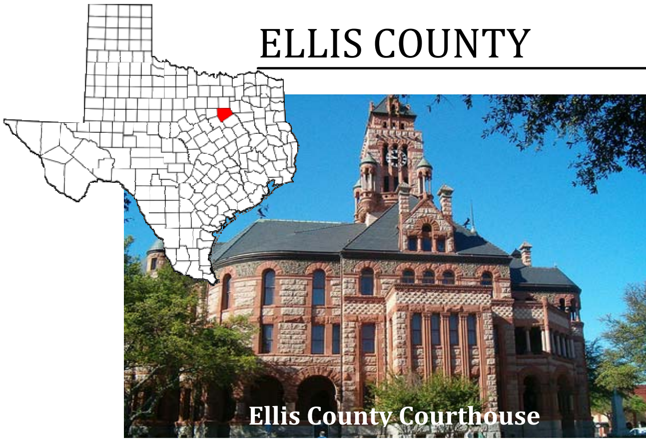
Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.142**
**Summary of Recommended Water Management Strategies for Ellis County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 10,077 | $25,000 |
| Purchase from WWP | 26,253 | $0 |
| Supplemental wells | 0 | $47,555,000 |
| Treatment capacity | 0 | $0 |
| Water transmission | 0 | $20,310,000 |
| Additional groundwater | 3,553 | $13,598,000 |
| **Total** | | **$81,488,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.




***2000 Population:*** *111,360*

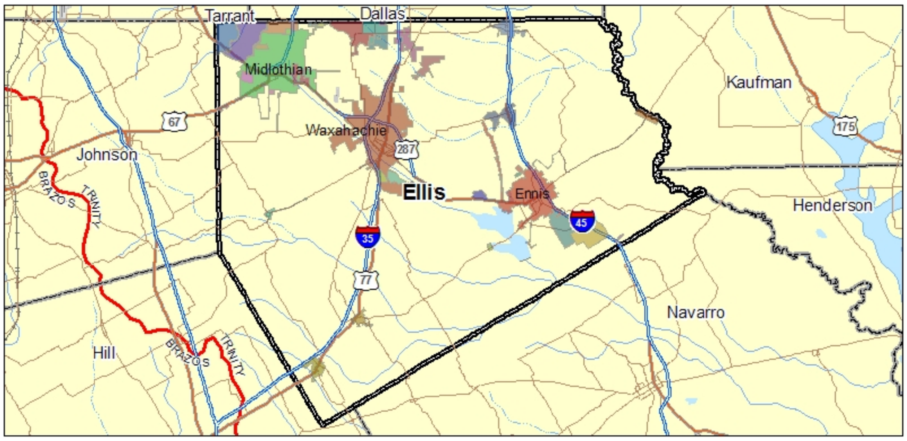
***Projected 2060 Population:*** *471,317*

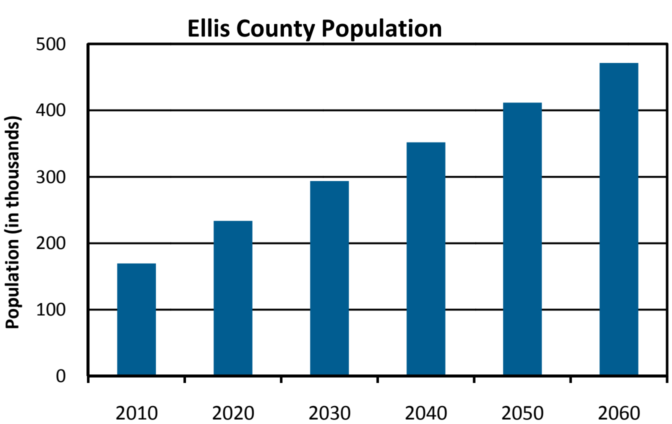
***County Seat:*** *Waxahachie*

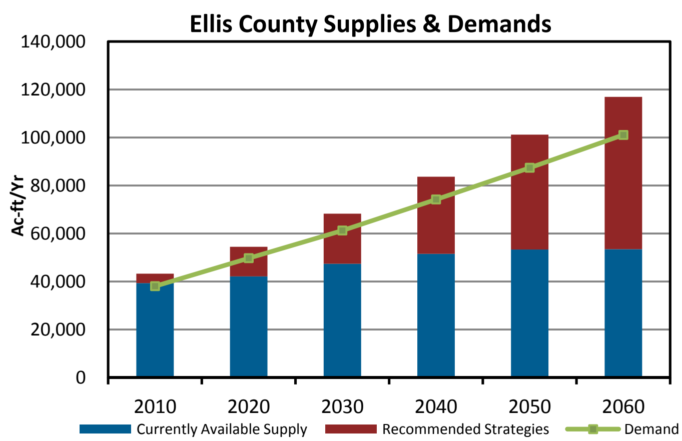
***Economy:*** *Cement, steel production; warehousing and distribution; government/services*

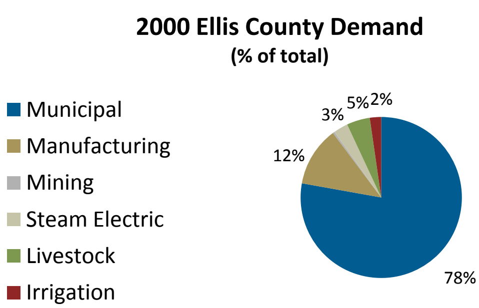
***River Basin(s):***

- Trinity (100%)

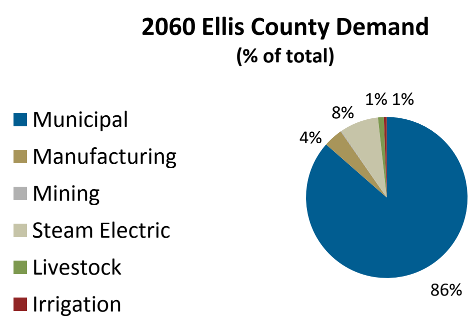



**Total=25,469 acre-feet**




**Total= 101,095 acre-feet**

| WATER USER GROUP | 2060 ELLIS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bardwell | 248 | Woodbine Aquifer and Desalination | Supplemental wells, Ennis (TRWD through TRA) |
| Brandon-Irene WSC [a] | 15 | Lake Aquilla (Aquilla WSD) | None |
| Buena Vista-Bethel SUD | 4,180 | Trinity Aquifer, Waxahachie (TRWD through TRA) | Supplemental wells, Additional Waxahachie supplies, Overdraft Trinity Aquifer (2010) |
| Cedar Hill | 10 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU supplies |
| Community Water Company [a] | 304 | Ennis | Additional Ennis |
| Ennis | 11,308 | Lake Bardwell (TRA), TRWD (through TRA), Direct reuse | Indirect reuse (TRA), Additional TRWD, WTP expansions |
| Ferris | 700 | Woodbine Aquifer, Rockett SUD | Supplemental wells, Rockett SUD |
| Files Valley WSC | 309 | Aquilla WSD (Lake Aquilla) | Ellis County Water Supply Project |
| Glenn Heights [a] | 1,014 | Trinity Aquifer, DWU | Supplemental wells, Additional DWU |
| Grand Prairie [a] | 1,842 | Trinity Aquifer, Fort Worth (TRWD), Joe Pool Lake (irrigation), DWU | Supplemental wells, Midlothian (TRWD), Additional DWU, Mansfield (TRWD), Arlington (TRWD), Additional Fort Worth |
| Italy | 489 | Trinity and Woodbine Aquifers | Supplemental wells, Waxahachie (TRWD through TRA) |
| Johnson County SUD [a] | 122 | Mansfield (TRWD), Other supplies in Region G | Additional Mansfield, Grand Prairie |
| Mansfield [a] | 2,850 | TRWD | WTP expansions, New WTP, Additional TRWD supplies |
| Maypearl | 272 | Trinity and Woodbine Aquifers | Supplemental wells, Waxahachie (TRWD through TRA) |
| Midlothian | 15,206 | TRA (Joe Pool Lake) | TRWD (through TRA), WTP expansions, New WTP |
| Milford | 122 | Woodbine Aquifer, Files Valley WSC (Lake Aquilla) | Supplemental wells |
| Mountain Peak WSC [a] | 2,452 | Trinity Aquifer, Midlothian | Supplemental wells, Additional Midlothian, Overdraft Trinity Aquifer (2010), New wells |
| Oak Leaf | 640 | Glenn Heights, Rockett SUD (TRWD) | Additional Glenn Heights, Additional Rockett SUD |
| Ovilla [a] | 2,355 | DWU | Additional DWU |
| Palmer | 342 | Woodbine Aquifer | Supplemental wells, Rockett SUD |
| Pecan Hill | 285 | Rockett SUD | None |
| Red Oak | 5,986 | Woodbine Aquifer, Rockett SUD, DWU | Supplemental wells, Additional Rockett SUD, Additional DWU |

| WATER USER GROUP | 2060 ELLIS CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Rice WSC [a] | 338 | Ennis, Corsicana | Additional Ennis, Additional Corsicana |
| Rockett SUD [a] | 8,704 | Midlothian, TRWD (through TRA) | Additional TRWD (through TRA), WTP expansions |
| Sardis-Lone Elm WSC [a] | 4,010 | Trinity Aquifer | Supplemental wells, Overdraft Trinity Aquifer (2010), Rockett SUD |
| Venus | - | Midlothian (TRWD) | Additional Midlothian (TRWD) |
| Waxahachie | 21,341 | Lake Bardwell (TRA), Lake Waxahachie, TRWD (through TRA), Reuse, Rockett SUD | Additional TRWD (through TRA), Additional reuse, Water plant expansions |
| County-Other | 1,955 | Other, Trinity, and Woodbine Aquifers, Ennis, Waxahachie, TRWD | Supplemental wells, Rockett SUD, Additional Ennis, Additional Waxahachie, Additional Woodbine Aquifer |
| Irrigation | 583 | Trinity Aquifer, Local supplies, Reuse | New wells in Woodbine Aquifer, Supplemental wells |
| Livestock | 1,183 | Woodbine Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 3,912 | Trinity and Woodbine Aquifers, Midlothian, Waxahachie, Ennis | Supplemental wells, Additional Ennis, Additional Midlothian, Additional Waxahachie |
| Mining | 140 | Woodbine Aquifer | Supplemental wells |
| Steam Electric Power | 7,878 | Ennis direct reuse, Ennis, Midlothian | Additional Midlothian, TRA direct reuse, Waxahachie |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

### *4F.6 Fannin County*

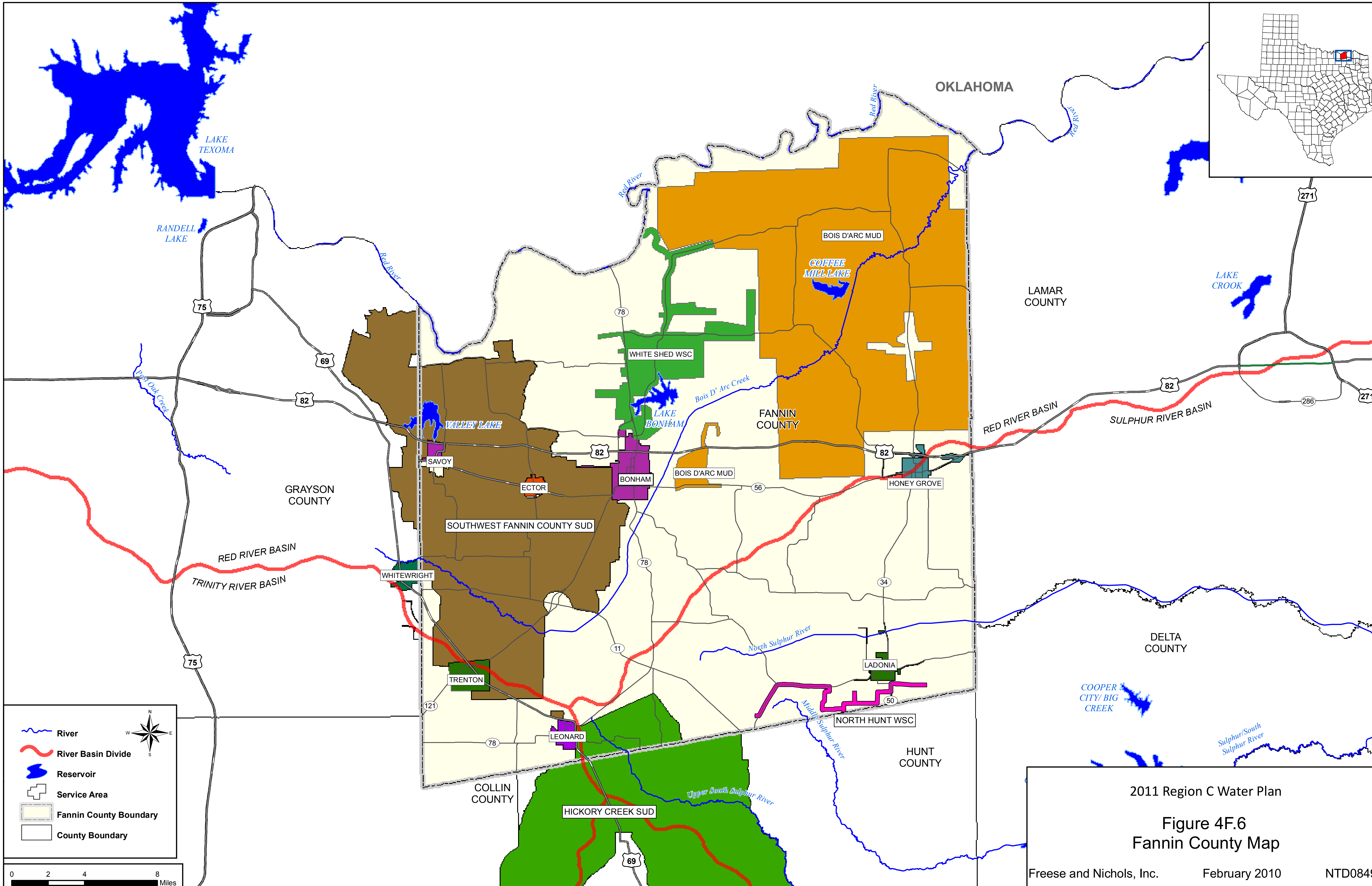
Figure 4F.6 is a map of Fannin County. Most Fannin County water user groups use groundwater to meet their current needs. Bonham relies on Lake Bonham, and most of the county's current steam electric use is supplied from Lake Texoma (by diversions from the Red River to Valley Lake). There are also substantial run-of-the-river irrigation water rights in the Red River.

Current groundwater pumping from the Woodbine aquifer in Fannin County slightly exceeds the managed available groundwater as determined by the Texas Water Development Board (TWBD). The managed available groundwater in the Woodbine aquifer is 3,297 acre-feet per year, and 2006 pumping from the Woodbine was 3,910 acre-feet per year. This plan calls for the use of other sources of supply to reduce use of the Woodbine to the managed available groundwater. The managed available groundwater for the Trinity aquifer in Fannin County is 700 acre-feet per year. According to TWDB records, the pumping from the Trinity aquifer in Fannin County in 2006 was 663 acre-feet.

The North Texas Municipal Water District (NTMWD) plans to develop Lower Bois d'Arc Creek Reservoir in Fannin County by 2020. The Upper Trinity Regional Water District plans to develop Lake Ralph Hall by 2020 as well. Both reservoirs will provide supplies for Fannin County as well as for other users in Region C.

NTMWD, the Greater Texoma Utility Authority (GTUA) and local suppliers in Fannin County have begun to develop the Fannin County Water Supply Project which will supply treated surface water (from Lower Bois d'Arc Creek Reservoir) to customers in Fannin County (Table 4F.143). Water for the Fannin County Water Supply Project will be delivered from NTMWD's planned surface water treatment plant in Fannin County near Leonard. This strategy will require treated water transmission facilities to deliver water to water user groups. The Fannin County Water Supply Project will be developed by a combination of NTMWD, GTUA, and suppliers in the county. For this plan, the capital costs ($38,471,000) are included under NTMWD in Section 4E.

Water management strategies for Fannin County water user groups are discussed below. Table 4F.160 on page 4F.203 shows the estimated capital costs for the Fannin




2011 Region C Water Plan

Figure 4F.6
Fannin County Map

Freese and Nichols, Inc. February 2010 NTD08492

**Table 4F.143**
**Supplies from the Fannin County Water Supply Project**

| Water User Group | Supplies from the Fannin Co. WSP (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Bonham | 0 | 402 | 459 | 585 | 1,286 | 2,769 |
| Ector | 0 | 2 | 3 | 4 | 6 | 9 |
| Fannin County Other | 0 | 408 | 320 | 233 | 155 | 98 |
| Honey Grove | 0 | 65 | 123 | 228 | 328 | 433 |
| Leonard | 0 | 62 | 200 | 487 | 848 | 1,138 |
| Savoy | 0 | 7 | 3 | 1 | 3 | 5 |
| Southwest Fannin Co. SUD | 0 | 399 | 560 | 666 | 756 | 859 |
| Trenton | 0 | 110 | 294 | 586 | 975 | 1,362 |
| Fannin County Manufacturing | 0 | 0 | 0 | 0 | 0 | 11 |
| **Total** | **0** | **1,455** | **1,962** | **2,790** | **4,357** | **6,684** |

County water management strategies not associated with the wholesale water providers, and Table 4F.161 on page 4F.206 is a summary of the costs by category. Table 4F.161 is followed by a summary for Fannin County.

## Bonham

Bonham is a city of about 11,500 located in central Fannin County. The city uses raw water from Lake Bonham, which is treated by NTMWD. Water management strategies for Bonham include conservation, water treatment plant expansions, and participation in the Fannin County Water Supply Project. Table 4F.144 shows the projected population and demand, the current supplies, and the water management strategies for Bonham.

**Table 4F.144**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Bonham**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **11,516** | **12,603** | **16,000** | **22,000** | **30,000** | **37,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,348 | 2,527 | 3,172 | 4,337 | 5,881 | 7,253 |
| Fannin County - Manufacturing | 73 | 82 | 90 | 98 | 105 | 114 |
| ***Total Projected Water Demand*** | ***2,421*** | ***2,609*** | ***3,262*** | ***4,435*** | ***5,986*** | ***7,367*** |

**(Table 4F.144, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Lake Bonham | 2,405 | 2,139 | 2,332 | 2,853 | 3,468 | 3,477 |
| ***Total Current Supplies*** | ***2,405*** | ***2,139*** | ***2,332*** | ***2,853*** | ***3,468*** | ***3,477*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***16*** | ***470*** | ***930*** | ***1,582*** | ***2,518*** | ***3,890*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 16 | 103 | 176 | 282 | 431 | 594 |
| Expand Treatment Plant | 0 | 367 | 754 | 1,300 | 1,872 | 1,863 |
| Fannin County Water Supply Project | | 0 | 0 | 0 | 215 | 1,433 |
| ***Total Water Management Strategies*** | ***16*** | ***470*** | ***930*** | ***1,582*** | ***2,518*** | ***3,890*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Ector

Ector has a population of about 650 and is located in western Fannin County. The city currently gets its water supplies from the Woodbine aquifer. Water management strategies for Ector include water conservation, participation in the Fannin County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.145 shows the projected population and demand, the current supplies, and the water management strategies for Ector.

**Table 4F.145**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Ector**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **652** | **691** | **720** | **741** | **763** | **786** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 96 | 99 | 101 | 102 | 104 | 107 |
| ***Total Projected Demand*** | ***96*** | ***99*** | ***101*** | ***102*** | ***104*** | ***107*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 113 | 113 | 113 | 113 | 113 | 113 |
| ***Total Current Supplies*** | ***113*** | ***113*** | ***113*** | ***113*** | ***113*** | ***113*** |

(Table 4F.145, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 4 | 5 | 6 | 6 | 7 |
| Fannin County Water Supply Project | 0 | 2 | 3 | 4 | 6 | 9 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1*** | ***6*** | ***8*** | ***10*** | ***12*** | ***16*** |
| **Reserve (Shortage)** | **18** | **20** | **20** | **21** | **21** | **22** |

## Fannin County Irrigation

Table 4F.146 shows the projected demand, the current supplies, and the water management strategies for Fannin County Irrigation. As shown in Table 4F.146, diversions from the Red River and groundwater from other aquifer water (the alluvium of the Red River) are available for irrigation use in Fannin County and far exceed projected demands. It should be noted that these supplies are available only along the Red River and are not suitable for municipal use without desalination or blending. The only water management strategy for Fannin County Irrigation is supplemental wells to replace existing wells.

**Table 4F.146**
**Projected and Demand, Current Supplies,**
**and Water Management Strategies for Fannin County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **4,608** | **4,608** | **4,608** | **4,608** | **4,608** | **4,608** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Red River | 14,758 | 14,758 | 14,758 | 14,758 | 14,758 | 14,758 |
| Other Aquifer | 2,620 | 2,620 | 2,620 | 2,620 | 2,620 | 2,620 |
| ***Total Current Supplies*** | ***17,378*** | ***17,378*** | ***17,378*** | ***17,378*** | ***17,378*** | ***17,378*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |

(Table 4F.146, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **12,770** | **12,770** | **12,770** | **12,770** | **12,770** | **12,770** |

## Fannin County Livestock

Table 4F.147 shows the projected demand, current supplies, and water management strategies for Fannin County Livestock. The current supplies for Fannin County Livestock are local surface water supplies and groundwater (Trinity and Woodbine aquifers). These sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.147**
**Projected and Demand, Current Supplies,**
**and Water Management Strategies for Fannin County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,270** | **1,270** | **1,270** | **1,270** | **1,270** | **1,270** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 1,583 | 1,583 | 1,583 | 1,583 | 1,583 | 1,583 |
| Trinity Aquifer | 72 | 72 | 72 | 72 | 72 | 72 |
| Woodbine Aquifer | 302 | 302 | 302 | 302 | 302 | 302 |
| ***Total Current Supplies*** | ***1,957*** | ***1,957*** | ***1,957*** | ***1,957*** | ***1,957*** | ***1,957*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **687** | **687** | **687** | **687** | **687** | **687** |

## Fannin County Manufacturing

Table 4F.148 shows the projected demand, the current supplies, and the water management strategies for Fannin County Manufacturing. The current supply is water from Lake Bonham through the City of Bonham, and there are no water management strategies for this water user group.

**Table 4F.148**
**Projected and Demand, Current Supplies,**
**and Water Management Strategies for Fannin County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **73** | **82** | **90** | **98** | **105** | **114** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Bonham | 73 | 82 | 90 | 98 | 105 | 114 |
| ***Total Current Supplies*** | ***73*** | ***82*** | ***90*** | ***98*** | ***105*** | ***114*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Fannin County Mining

Table 4F.149 shows the projected demand, the current supplies, and the water management strategies for Fannin County Mining. Fannin County Mining is supplied from run-of-the river diversions. There are no water management strategies for this water user group.

**Table 4F.149**
**Projected and Demand, Current Supplies,**
**and Water Management Strategies for Fannin County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **12** | **12** | **12** | **12** | **12** | **12** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Run-Of-River | 72 | 72 | 72 | 72 | 72 | 72 |
| ***Total Current Supplies*** | ***72*** | ***72*** | ***72*** | ***72*** | ***72*** | ***72*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |

(Table 4F.149, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **60** | **60** | **60** | **60** | **60** | **60** |

## Fannin County Other

Fannin County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Fannin County Other supply about 11,600 people and receive their water supply from Lake Bonham (as treated water from Bonham), NTMWD supplies, run-of-the-river diversions from the Red and Sulphur Rivers, and groundwater (Trinity and Woodbine aquifers). Water management strategies for these entities include conservation, participation in the Fannin County Water Supply Project, and supplemental wells to replace existing water wells. Table 4F.150 shows the projected population and demand, the current supplies, and the water management strategies for Fannin County Other.

**Table 4F.150**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Fannin County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **11,610** | **11,568** | **11,391** | **11,091** | **10,735** | **10,322** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,496 | 1,452 | 1,390 | 1,317 | 1,251 | 1,202 |
| ***Total Projected Water Demand*** | ***1,496*** | ***1,452*** | ***1,390*** | ***1,317*** | ***1,251*** | ***1,202*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Bonham (NTMWD) | 286 | 409 | 491 | 554 | 0 | 0 |
| Run-of-river - Red River | 20 | 20 | 20 | 20 | 20 | 20 |
| Run-of-river - Sulphur River | 49 | 49 | 49 | 49 | 49 | 49 |
| Trinity Aquifer | 308 | 308 | 308 | 308 | 308 | 308 |
| Woodbine Aquifer | 831 | 831 | 831 | 831 | 831 | 831 |
| ***Total Current Supplies*** | ***1,494*** | ***1,617*** | ***1,699*** | ***1,762*** | ***1,208*** | ***1,208*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***0*** | ***0*** | ***0*** | ***43*** | ***0*** |

**(Table 4F.150, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 16 | 53 | 70 | 74 | 75 | 76 |
| Fannin County Water Supply Project | 0 | 62 | 145 | 237 | 258 | 265 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***16*** | ***115*** | ***215*** | ***311*** | ***333*** | ***341*** |
| **Reserve (Shortage)** | **14** | **280** | **524** | **756** | **290** | **347** |

## Fannin County Steam Electric Power

Table 4F.151 shows the projected demand, the current supplies, and the water management strategies for Fannin County Steam Electric Power. Fannin County Steam Electric Power is currently supplied by water from Lake Texoma (released into the Red River and diverted into Valley Lake) and groundwater from the Woodbine aquifer. These supplies are adequate to meet projected demands, and the only recommended water management strategy is supplemental wells to replace existing wells. The surface water supply available for Fannin County Steam Electric Power is committed to a single power provider. If some other power company develops a power plant in Fannin County, development of a supply from Lake Texoma would be an alternative water management strategy.

**Table 4F.151**
**Projected Current Supplies, and Water Management Strategies for Fannin County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,261** | **6,363** | **11,474** | **11,910** | **12,443** | **13,092** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Texoma | 16,400 | 16,400 | 16,400 | 16,400 | 16,400 | 16,400 |
| Woodbine Aquifer | 80 | 80 | 80 | 80 | 80 | 80 |
| ***Total Current Supplies*** | ***16,480*** | ***16,480*** | ***16,480*** | ***16,480*** | ***16,480*** | ***16,480*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |

(Table 4F.151, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **15,219** | **10,117** | **5,006** | **4,570** | **4,037** | **3,388** |

## Hickory Creek Special Utility District

Hickory Creek SUD serves about 2,600 people in eastern Collin County, southern Fannin County, and northwestern Hunt County. The SUD is primarily located in Hunt County in the Northeast Texas Region (Region D), and supplies for Region C are groundwater from the Woodbine aquifer in Hunt County in the Northeast Texas Region. The only Region C water management strategy is conservation. Table 4F.152 shows the projected population and demand, the current supplies, and the water management strategies for Hickory Creek SUD in Region C. Plans for the Northeast Texas Region are covered in that regional water plan.

**Table 4F.152**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Hickory Creek SUD (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population in Region C** | **244** | **285** | **319** | **349** | **380** | **415** |
| **Projected Water Demand in Region C** | | | | | | |
| Municipal Demand | 42 | 48 | 53 | 56 | 61 | 67 |
| ***Total Projected Region C Demand*** | ***42*** | ***48*** | ***53*** | ***56*** | ***61*** | ***67*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer in Region D | 40 | 45 | 49 | 51 | 55 | 60 |
| ***Total Current Supplies*** | ***40*** | ***45*** | ***49*** | ***51*** | ***55*** | ***60*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 3 | 4 | 5 | 6 | 7 |
| ***Total Water Management Strategies*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Honey Grove

Honey Grove is a city of about 1,900 located in eastern Fannin County. The city currently gets its water supplies from the Woodbine aquifer. Water management strategies for Honey Grove include water conservation, participation in the Fannin County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.153 shows the projected population and demand, the current supplies, and the water management strategies for Honey Grove.

**Table 4F.153**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Honey Grove**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,858** | **2,100** | **2,500** | **3,000** | **3,500** | **4,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 421 | 466 | 546 | 645 | 749 | 856 |
| ***Total Projected Demand*** | ***421*** | ***466*** | ***546*** | ***645*** | ***749*** | ***856*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 463 | 463 | 463 | 463 | 463 | 463 |
| ***Total Current Supplies*** | ***463*** | ***463*** | ***463*** | ***463*** | ***463*** | ***463*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***3*** | ***83*** | ***182*** | ***286*** | ***393*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 31 | 69 | 88 | 108 | 131 |
| Fannin County Water Supply Project | 0 | 65 | 123 | 223 | 328 | 433 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***96*** | ***192*** | ***311*** | ***436*** | ***564*** |
| **Reserve (Shortage)** | **45** | **93** | **109** | **129** | **150** | **171** |

## Ladonia

Ladonia has a population of about 800 people and is located in southeastern Fannin County. The city gets its water from the Trinity aquifer, and water management strategies include conservation, purchasing raw water from Upper Trinity Regional Water District and treating it, and supplemental wells to replace existing wells. Table 4F.154 shows the projected population and demand, the current supplies, and the water management strategies for Ladonia.

**Table 4F.154**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Ladonia**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **800** | **1,600** | **2,000** | **2,200** | **2,500** | **3,000** |
| **Projected Water Demand** | 291 | 577 | 715 | 779 | 879 | 1,055 |
| Municipal Demand | 291 | 577 | 715 | 779 | 879 | 1,055 |
| ***Total Projected Demand*** | ***291*** | ***577*** | ***715*** | ***779*** | ***879*** | ***1,055*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 320 | 320 | 320 | 320 | 320 | 320 |
| ***Total Current Supplies*** | ***320*** | ***320*** | ***320*** | ***320*** | ***320*** | ***320*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***257*** | ***395*** | ***459*** | ***559*** | ***735*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 31 | 46 | 57 | 72 | 95 |
| Upper Trinity Regional Water District (Ralph Hall Lake) | 0 | 342 | 492 | 558 | 663 | 851 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***5*** | ***373*** | ***538*** | ***615*** | ***735*** | ***946*** |
| **Reserve (Shortage)** | **34** | **116** | **143** | **156** | **176** | **211** |

### Leonard

Leonard is located in southwestern Fannin County and has a population of about 2,100 people. The city gets its water from the Woodbine aquifer. Water management strategies for Leonard include conservation, participating in the Fannin County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.155 shows the projected population and demand, the current supplies, and the water management strategies for Leonard.

**Table 4F.155**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Leonard**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **2,149** | **2,502** | **3,500** | **5,500** | **8,000** | **10,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 303 | 342 | 466 | 720 | 1,040 | 1,299 |
| ***Total Projected Demand*** | ***303*** | ***342*** | ***466*** | ***720*** | ***1,040*** | ***1,299*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 333 | 333 | 333 | 333 | 333 | 333 |
| ***Total Current Supplies*** | ***333*** | ***333*** | ***333*** | ***333*** | ***333*** | ***333*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***9*** | ***133*** | ***387*** | ***707*** | ***966*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 15 | 26 | 44 | 67 | 88 |
| Fannin County Water Supply Project | 0 | 62 | 200 | 487 | 848 | 1,138 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***6*** | ***77*** | ***226*** | ***531*** | ***915*** | ***1,226*** |
| **Reserve (Shortage)** | **36** | **68** | **93** | **144** | **208** | **260** |

## North Hunt Water Supply Corporation

North Hunt WSC serves about 3,300 people in southern Fannin County and Delta and Hunt Counties in the Northeast Texas Region (Region D). The WSC is primarily located in the Northeast Texas Region (Region D). North Hunt WSC supplies in Region C are groundwater from the Woodbine aquifer, and Region C water management strategies are conservation and supplemental wells to replace existing wells. Table 4F.156 shows the projected population and demand, the current supplies, and the water management strategies for North Hunt WSC in Region C. Plans for the Northeast Texas Region are covered in that regional water plan.

**Table 4F.156**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the North Hunt Water Supply Corporation (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population in Region C** | **380** | **427** | **462** | **488** | **514** | **542** |
| **Projected Water Demand in Region C** | | | | | | |
| Municipal Demand | 49 | 55 | 60 | 63 | 66 | 70 |
| ***Total Projected Demand in Region C*** | ***49*** | ***55*** | ***60*** | ***63*** | ***66*** | ***70*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 77 | 77 | 77 | 77 | 77 | 77 |
| ***Total Current Supplies*** | ***77*** | ***77*** | ***77*** | ***77*** | ***77*** | ***77*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 2 | 3 | 3 | 4 | 4 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1*** | ***2*** | ***3*** | ***3*** | ***4*** | ***4*** |
| **Reserve (Shortage)** | **29** | **24** | **20** | **17** | **15** | **11** |

## Savoy

Savoy is a city of about 900 located in western Fannin County. The city currently gets its water supplies from the Woodbine aquifer. Water management strategies for Savoy include water conservation, participation in the Fannin County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.157 shows the projected population and demand, the current supplies, and the water management strategies for Savoy.

**Table 4F.157**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Savoy**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **869** | **889** | **910** | **930** | **952** | **974** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 108 | 108 | 106 | 105 | 107 | 109 |
| ***Total Projected Demand*** | ***108*** | ***108*** | ***106*** | ***105*** | ***107*** | ***109*** |

(Table 4F.157, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 119 | 119 | 119 | 119 | 119 | 119 |
| ***Total Current Supplies*** | ***119*** | ***119*** | ***119*** | ***119*** | ***119*** | ***119*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 4 | 5 | 6 | 6 | 7 |
| Fannin County Water Supply Project | 0 | 7 | 3 | 1 | 3 | 5 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1*** | ***11*** | ***8*** | ***7*** | ***9*** | ***12*** |
| **Reserve (Shortage)** | **12** | **22** | **21** | **21** | **21** | **22** |

## Southwest Fannin County Special Utility District

Southwest Fannin County SUD serves about 7,500 people in western Fannin County and eastern Grayson County. The SUD's existing water supply comes from the Woodbine aquifer. Water management strategies for Southwest Fannin County SUD include water conservation, participation in the Fannin County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.158 shows the projected population and demand, the current supplies, and the water management strategies for Southwest Fannin County SUD.

**Table 4F.158**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Southwest Fannin County Special Utility District**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **7,491** | **8,940** | **9,947** | **10,852** | **11,657** | **12,945** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 722 | 1,042 | 1,192 | 1,288 | 1,371 | 1,466 |
| ***Total Projected Demand*** | ***722*** | ***1,042*** | ***1,192*** | ***1,288*** | ***1,371*** | ***1,466*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 803 | 803 | 803 | 803 | 803 | 803 |
| ***Total Current Supplies*** | ***803*** | ***803*** | ***803*** | ***803*** | ***803*** | ***803*** |

(Table 4F.158, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***239*** | ***389*** | ***485*** | ***568*** | ***663*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 15 | 44 | 62 | 72 | 82 | 93 |
| Fannin County Water Supply Project | 0 | 338 | 627 | 868 | 942 | 1,027 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***15*** | ***382*** | ***689*** | ***940*** | ***1,024*** | ***1,120*** |
| **Reserve (Shortage)** | **96** | **143** | **300** | **455** | **456** | **457** |

## Trenton

Trenton is located in southwestern Fannin County and has a population of about 1,000 people. The city gets its water from the Woodbine aquifer. Water management strategies for Trenton include conservation, participation in the Fannin County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.159 shows the projected population and demand, the current supplies, and the water management strategies for Trenton.

**Table 4F.159**
**Projected Population and Demand, Current Supplies, and**
**Water Management Strategies for the City of Trenton**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,000** | **1,500** | **2,500** | **4,000** | **6,000** | **8,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 206 | 302 | 496 | 780 | 1,163 | 1,550 |
| ***Total Projected Demand*** | ***206*** | ***302*** | ***496*** | ***780*** | ***1,163*** | ***1,550*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 214 | 214 | 214 | 214 | 214 | 214 |
| ***Total Current Supplies*** | ***214*** | ***214*** | ***214*** | ***214*** | ***214*** | ***214*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***88*** | ***282*** | ***566*** | ***949*** | ***1,336*** |
| | | | | | | |

(Table 4F.159, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 26 | 74 | 123 | 194 | 271 |
| Fannin County Water Supply Project | 0 | 110 | 294 | 586 | 975 | 1,362 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***136*** | ***368*** | ***709*** | ***1,169*** | ***1,633*** |
| **Reserve (Shortage)** | **12** | **48** | **86** | **143** | **220** | **297** |

### Whitewright

Whitewright is a city of about 2,000 people located in eastern Grayson County with a small area in Fannin County. The city's water supply plans are discussed on page 4F.247 under Grayson County.

### Costs for Fannin County Water User Groups

Table 4F.160 shows the estimated capital costs for Fannin County water management strategies not covered under the wholesale water providers, and Table 4F.161 summarizes the costs by category. Table 4F.162 gives the cost of the alternative water management strategy for Fannin County not covered under major water providers and is followed by a summary for Fannin County.

**Table 4F.160**
**Costs for Recommended Water Management Strategies for Fannin County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Bonham | Conservation | 2010 | 594 | $0 | $0.54 | $0.54 | Q-10 & Q-11 |
| | Fannin County Water Supply Project | 2020 | 3,296 | See NTMWD in Section 4E. | | | |
| Ector | Conservation | 2010 | 7 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,332,000 | N/A | N/A | Q-13 |
| | Fannin County Water Supply Project | 2020 | 9 | See NTMWD in Section 4E. | | | |
| Fannin County Other | Conservation | 2010 | 76 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $13,498,000 | N/A | N/A | Q-13 |
| | Fannin County Water Supply Project | 2020 | 265 | See NTMWD in Section 4E. | | | |
| Hickory Creek SUD* | Conservation | 2010 | 7 | $5,000 | $0.85 | $0.85 | Q-10 & Q-11 |
| Honey Grove | Conservation | 2010 | 131 | $5,000 | $0.98 | $0.98 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,844,000 | N/A | N/A | Q-13 |
| | Fannin County Water Supply Project | 2020 | 433 | See NTMWD in Section 4E. | | | |

(Table 4F.160, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Ladonia | Conservation | 2010 | 95 | $5,000 | $0.39 | $0.39 | Q-10 & Q-11 |
| | Supplemental wells | 2020 | 0 | $2,250,000 | N/A | N/A | Q-13 |
| | Lake Ralph Hall supply | 2020 | 851 | $12,966,000 | $3.54 | $0.96 | Q-181 |
| Leonard | Conservation | 2010 | 88 | $5,000 | $0.10 | $0.10 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,442,000 | N/A | N/A | Q-13 |
| | Fannin County Water Supply Project | 2020 | 1,138 | See NTMWD in Section 4E. | | | |
| North Hunt WSC* | Conservation | See Region D Plan. | | | | | |
| | Supplemental wells | See Region D Plan. | | | | | |
| Savoy | Conservation | 2010 | 7 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2020 | 0 | $1,368,000 | N/A | N/A | Q-13 |
| | Fannin County Water Supply Project | 2020 | 5 | See NTMWD in Section 4E. | | | |
| Southwest Fannin SUD* | Conservation | 2010 | 93 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $5,488,000 | N/A | N/A | Q-13 |
| | Fannin County Water Supply Project | 2020 | 1,027 | See NTMWD in Section 4E. | | | |
| Trenton | Conservation | 2010 | 271 | $5,000 | $0.67 | $0.67 | Q-10 & Q-11 |
| | Supplemental wells | 2020 | 0 | $1,226,000 | N/A | N/A | Q-13 |
| | Fannin County Water Supply Project | 2020 | 1,362 | See NTMWD in Section 4E. | | | |

(Table 4F.160, Continued)

<table>
<tr><th rowspan="2">Water User Group</th><th rowspan="2">Strategy</th><th rowspan="2">Imple-mented by:</th><th rowspan="2">Quantity** (Ac-Ft/Yr)</th><th rowspan="2">Capital Costs</th><th colspan="2">Unit Cost ($/1000 gal)</th><th rowspan="2">Table for Details</th></tr>
<tr><th>With Debt Service</th><th>After Debt Service</th></tr>
<tr><td rowspan="3">Whitewright*</td><td>Conservation</td><td colspan="6">See Grayson County.</td></tr>
<tr><td>Supplemental wells</td><td colspan="6">See Grayson County.</td></tr>
<tr><td>Grayson County Water Supply Project</td><td colspan="6">See Grayson County.</td></tr>
<tr><td>Fannin County Irrigation</td><td>Supplemental wells</td><td>2010</td><td>0</td><td>$5,123,000</td><td>N/A</td><td>N/A</td><td>Q-13</td></tr>
<tr><td>Fannin County Livestock</td><td>Supplemental wells</td><td>2010</td><td>0</td><td>$1,472,000</td><td>N/A</td><td>N/A</td><td>Q-13</td></tr>
<tr><td>Fannin County Manufacturing</td><td>None</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Fannin County Mining</td><td>None</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Fannin County Steam Electric</td><td>Supplemental wells</td><td>2020</td><td>0</td><td>$1,186,000</td><td>N/A</td><td>N/A</td><td>Q-13</td></tr>
</table>

Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

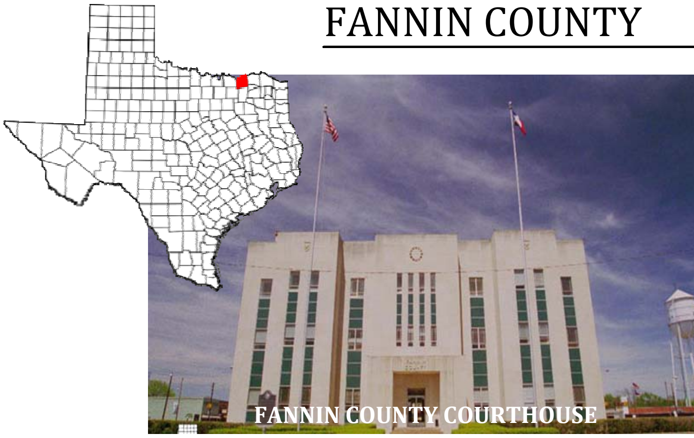
**Table 4F.161**
**Summary of Recommended Water Management Strategies for Fannin County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 1,375 | $25,000 |
| Purchase from WWP | 8,386 | $12,966,000 |
| Supplemental wells | 0 | $37,229,000 |
| Treatment capacity | 0 | $0 |
| Water transmission | 0 | $0 |
| Additional groundwater | 0 | $0 |
| **Total** | | **$50,220,000** |

* These conservation totals represent the whole county, not the sum of the individual water user groups

**Table 4F.162**
**Alternative Water Management Strategy for Fannin County**
**Not Covered Under Wholesale Water Providers**

| Strategy and Water User Group | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Water from Lake Texoma – Fannin County Steam Electric Power | 8,400 | $24,809,000 |
| **Total** | | |




***2000 Population:*** *31,242*

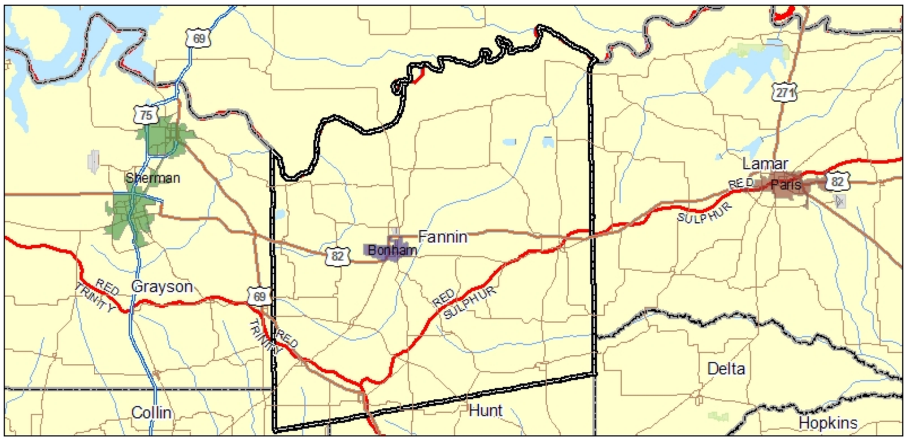
***Projected 2060 Population:*** *86,970*

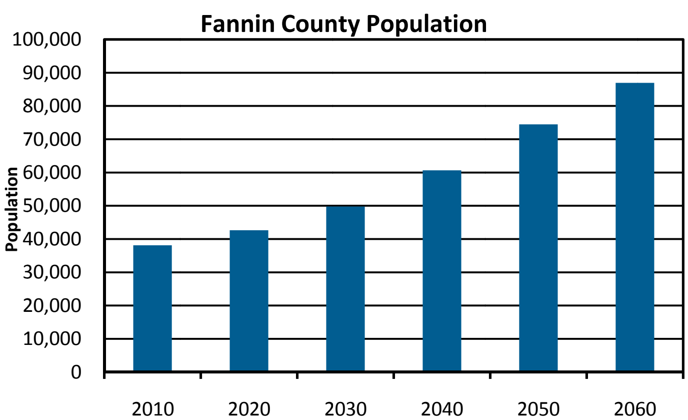
***County Seat:*** *Bonham*

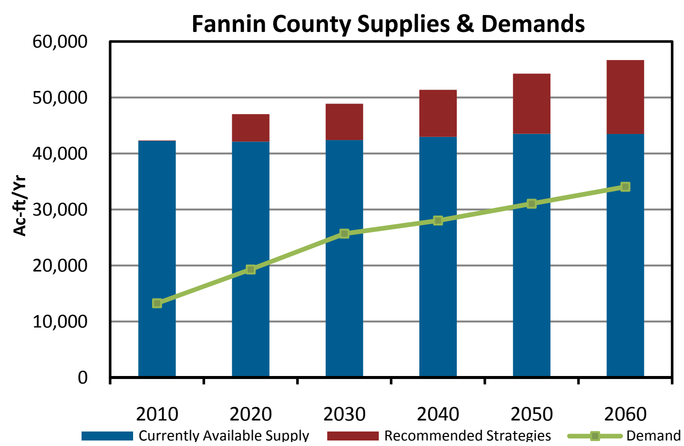
***Economy:*** *Communications; agriculture; government/services; petroleum distribution; tourism; varied manufacturing*

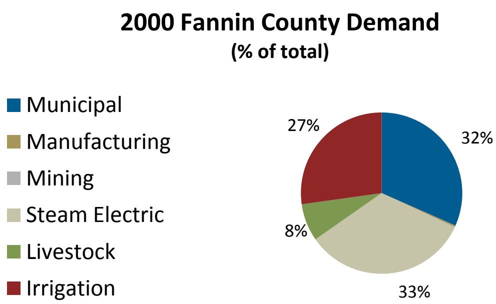
***River Basin(s):***

– Trinity (5%), Red (71%), Sulphur (23%)

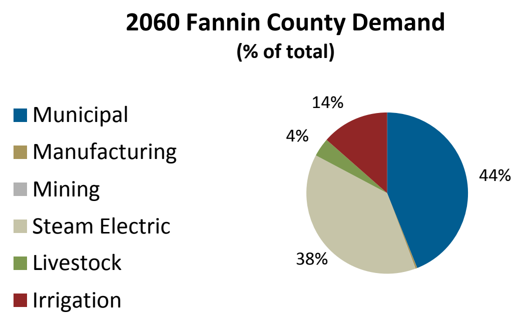



**Total=16,935 acre-feet**




**Total= 34,063 acre-feet**

| WATER USER GROUP | 2060 FANNIN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bonham | 7,253 | Lake Bonham (NTMWD Treatment) | Fannin County Water Supply Project, WTP expansion |
| Ector | 107 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Hickory Creek SUD [a] | 38 | Woodbine Aquifer (Region D) | None |
| Honey Grove | 856 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Ladonia | 1,055 | Trinity Aquifer | Supplemental wells, Lake Ralph Hall |
| Leonard | 1,299 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| North Hunt WSC [a] | 70 | Woodbine Aquifer | Supplemental wells |
| Savoy | 109 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Southwest Fannin County SUD [a] | 1,420 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Trenton | 1,550 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Whitewright [a] | 8 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| County-Other | 1,202 | Woodbine and Trinity Aquifers, Run-of-river, Lake Bonham | Supplemental wells, Fannin County Water Supply Project |
| Irrigation | 4,608 | Other Aquifer, Red River | Supplemental wells |
| Livestock | 1,270 | Woodbine and Trinity Aquifers, Local supplies | Supplemental wells |
| Manufacturing | 114 | Lake Bonham | None |
| Mining | 12 | Run-of-river | None |
| Steam Electric Power | 13,092 | Woodbine Aquifer, Lake Texoma | Supplemental wells |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

### *4F.7 Freestone County*

Figure 4F.7 is a map of Freestone County. Most Freestone County water user groups use groundwater from the Carrizo-Wilcox aquifer to meet their current needs. By far the largest demand in Freestone County is for steam electric power. Supplies for steam electric power come primarily from surface water:

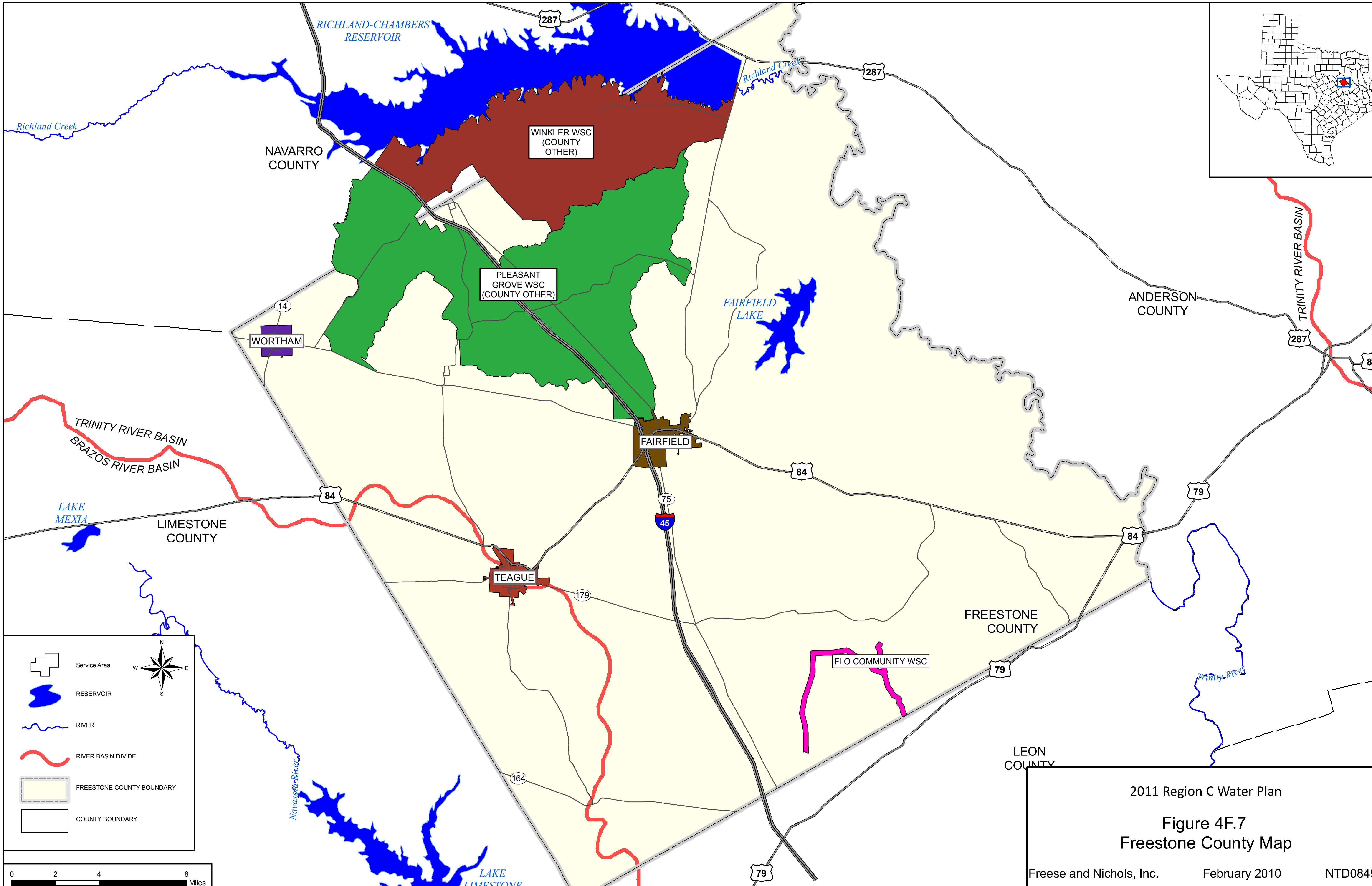
- Upstream diversions of Lake Livingston water by contract with Trinity River Authority (TRA)
- Purchase of water from Richland-Chambers Reservoir from Tarrant Regional Water District (TRWD) through TRA
- Lake Fairfield supplies.

Freestone County is in the Mid-East Texas Conservation District [(3)], which also includes Leon and Madison Counties. The managed available groundwater from the Carrizo-Wilcox aquifer in Freestone County was not yet determined at the time of this study. Based on work from the *2006 Region C Water Plan* [(2)], the assumed availability from the aquifer is 6,653 acre-feet per year. This will be updated in the next round of planning, when managed available groundwater data are available. According to TWDB records, the pumping from the Carrizo-Wilcox aquifer in Freestone County in 2006 was 2,963 acre-feet.

The proposed water management strategies for Freestone County include:

- Additional water for steam electric power from TRWD (Richland-Chambers Reservoir) through TRA
- Indirect reuse for steam electric power from TRA
- Additional wells in the Carrizo-Wilcox aquifer
- Supplemental wells
- Purchase of water from TRWD through TRA
- New and rehabilitated water treatment plants
- Purchase of water from Corsicana.

Water management strategies for Freestone County water user groups are discussed below. Table 4F.172 on page 4F.220 shows the estimated capital costs for the Freestone County water management strategies not associated with the wholesale water providers, and



RICHLAND-CHAMBERS RESERVOIR
Richland Creek
Richland Creek
287
NAVARRO COUNTY
WINKLER WSC (COUNTY OTHER)
PLEASANT GROVE WSC (COUNTY OTHER)
14
WORTHAM
FAIRFIELD LAKE
ANDERSON COUNTY
TRINITY RIVER BASIN
84
TRINITY RIVER BASIN
BRAZOS RIVER BASIN
FAIRFIELD
75
45
79
LAKE MEXIA
LIMESTONE COUNTY
TEAGUE
179
FREESTONE COUNTY
FLO COMMUNITY WSC
Trinity River
Service Area
RESERVOIR
RIVER
RIVER BASIN DIVIDE
FREESTONE COUNTY BOUNDARY
COUNTY BOUNDARY
N
S
E
W
164
Navasota River
LEON COUNTY
0 2 4 8 Miles
LAKE LIMESTONE
2011 Region C Water Plan
Figure 4F.7
Freestone County Map
Freese and Nichols, Inc.
February 2010
NTD08492

Table 4F.173 on page 4F.222 is a summary of the costs by category. Table 4F.173 is followed by a summary for Freestone County.

### Fairfield

Fairfield is a city of about 3,700 people located in central Freestone County. The city gets its water supply from the Carrizo-Wilcox aquifer. Water management strategies for Fairfield include conservation, purchasing raw water from TRWD and building a new treatment plant, a new well in the Carrizo-Wilcox aquifer, and supplemental wells to replace existing wells. Table 4F.163 shows the projected population and demand, the current supplies, and the water management strategies for Fairfield.

**Table 4F.163**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Fairfield**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,700** | **4,500** | **5,300** | **6,100** | **6,900** | **7,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 829 | 988 | 1,146 | 1,298 | 1,461 | 1,588 |
| ***Total Projected Demand*** | ***829*** | ***988*** | ***1,146*** | ***1,298*** | ***1,461*** | ***1,588*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 |
| ***Total Current Supplies*** | ***1,292*** | ***1,292*** | ***1,292*** | ***1,292*** | ***1,292*** | ***1,292*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***6*** | ***169*** | ***296*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 24 | 37 | 76 | 98 | 120 |
| Purchase water from TRWD | 0 | 0 | 0 | 4 | 100 | 176 |
| New well in Carrizo-Wilcox Aquifer | 0 | 0 | 0 | 282 | 282 | 282 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| New WTP | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***7*** | ***24*** | ***37*** | ***362*** | ***480*** | ***578*** |
| **Reserve (Shortage)** | **470** | **328** | **183** | **356** | **311** | **282** |

## Flo Community Water Supply Corporation

Flo Community WSC serves about 5,600 people in southern Freestone County and in Leon County in Region H. The current water supply in Region C is the Carrizo-Wilcox aquifer, and water management strategies are conservation and supplemental wells to replace existing wells. Table 4F.164 shows the projected population and demand, the current supplies, and the water management strategies for Flo Community WSC in Region C. Most of the WSC's service area is in Region H, and the strategies for Region H are covered in that regional water plan.

**Table 4F.164**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Flo Community WSC (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Region C Population** | **252** | **263** | **269** | **271** | **271** | **271** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand in Region C | 20 | 20 | 20 | 20 | 19 | 19 |
| ***Total Projected Region C Demand*** | ***20*** | ***20*** | ***20*** | ***20*** | ***19*** | ***19*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 25 | 25 | 25 | 25 | 25 | 25 |
| ***Total Current Supplies*** | ***25*** | ***25*** | ***25*** | ***25*** | ***25*** | ***25*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation - Basic Package | 0 | 1 | 2 | 2 | 2 | 2 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***1*** | ***2*** | ***2*** | ***2*** | ***2*** |
| **Reserve (Shortage)** | **5** | **6** | **7** | **7** | **8** | **8** |

## Freestone County Irrigation

Table 4F.165 shows the projected demand, the current supplies, and the water management strategies for Freestone County Irrigation. As shown in Table 4F.165, local supplies and groundwater from the Carrizo-Wilcox aquifer are available for irrigation use in Freestone County and exceed projected demands. The only water management strategy for Freestone County Irrigation is supplemental wells to replace existing wells.

**Table 4F.165**
**Projected Demand, Current Supplies, and Water Management Strategies for the Freestone County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **8** | **8** | **8** | **8** | **8** | **8** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 38 | 38 | 38 | 38 | 38 | 38 |
| Local Supplies | 87 | 87 | 87 | 87 | 87 | 87 |
| ***Total Current Supplies*** | ***125*** | ***125*** | ***125*** | ***125*** | ***125*** | ***125*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **117** | **117** | **117** | **117** | **117** | **117** |

## Freestone County Livestock

Table 4F.166 shows the projected demand, current supplies, and water management strategy for Freestone County Livestock. The current supplies are local surface water supplies and groundwater (Carrizo-Wilcox, Queen City, and other aquifers). These sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.166**
**Projected Demand, Current Supplies, and Water**
**Management Strategies for the Freestone County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,528** | **1,528** | **1,528** | **1,528** | **1,528** | **1,528** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 669 | 669 | 669 | 669 | 669 | 669 |
| Other Aquifer | 50 | 50 | 50 | 50 | 50 | 50 |
| Queen City Aquifer | 40 | 40 | 40 | 40 | 40 | 40 |
| Local Supplies | 1,043 | 1,043 | 1,043 | 1,043 | 1,043 | 1,043 |
| ***Total Current Supplies*** | ***1,802*** | ***1,802*** | ***1,802*** | ***1,802*** | ***1,802*** | ***1,802*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **274** | **274** | **274** | **274** | **274** | **274** |

## Freestone County Mining

Table 4F.167 shows the projected demand, the current supplies, and the water management strategies for Freestone County Mining. Freestone County Mining is supplied from local supplies and the Carrizo-Wilcox aquifer. These sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.167**
**Projected Demand, Current Supplies, and Water**
**Management Strategies for the Freestone County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **116** | **126** | **132** | **138** | **144** | **149** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 80 | 80 | 80 | 80 | 80 | 80 |
| Local Supplies | 120 | 120 | 120 | 120 | 120 | 120 |
| ***Total Current Supplies*** | ***200*** | ***200*** | ***200*** | ***200*** | ***200*** | ***200*** |

**(Table 4F.167, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **84** | **74** | **68** | **62** | **56** | **51** |

## Freestone County Other

Freestone County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Freestone County Other supply about 9,300 people and receive their water supply from the Tarrant Regional Water District, run-of-the-river diversions, and the Carrizo-Wilcox aquifer. Water management strategies for these entities include conservation, additional water from TRWD, and supplemental wells to replace existing water wells. Table 4F.168 shows the projected population and demand, the current supplies, and the water management strategies for Freestone County Other.

**Table 4F.168**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Freestone County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **9,298** | **9,717** | **9,935** | **9,998** | **9,998** | **9,998** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,251 | 1,271 | 1,265 | 1,240 | 1,229 | 1,229 |
| ***Total Projected Water Demand*** | ***1,251*** | ***1,271*** | ***1,265*** | ***1,240*** | ***1,229*** | ***1,229*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 1,380 | 1,380 | 1,380 | 1,380 | 1,380 | 1,380 |
| Run-of-River local supply | 41 | 41 | 41 | 41 | 41 | 41 |
| Tarrant Regional Water District | 271 | 316 | 302 | 270 | 236 | 206 |
| ***Total Current Supplies*** | ***1,692*** | ***1,737*** | ***1,723*** | ***1,691*** | ***1,657*** | ***1,627*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |

(Table 4F.168, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 47 | 64 | 69 | 73 | 77 |
| Additional Water from TRWD | 0 | 55 | 53 | 48 | 43 | 38 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***14*** | ***102*** | ***117*** | ***117*** | ***116*** | ***115*** |
| **Reserve (Shortage)** | **455** | **568** | **575** | **568** | **544** | **513** |

## Freestone County Steam Electric Power

Table 4F.169 shows the projected demand, the current supplies, and the water management strategies for Freestone County Steam Electric Power. Freestone County Steam Electric Power is currently supplied from the Carrizo-Wilcox aquifer, Lake Fairfield, a diversion from the Trinity River under TRA's Lake Livingston water right, and TRWD. The recommended water management strategies are additional water from TRWD under the current contract, additional water from TRWD under a new contract through TRA, a TRA reuse projects, and supplemental wells to replace existing wells.

**Table 4F.169**
**Projected Demand, Current Supplies, and Water Management Strategies for the Freestone County Freestone County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **12,173** | **18,210** | **20,524** | **23,999** | **28,234** | **33,398** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 745 | 745 | 745 | 745 | 745 | 745 |
| Lake Fairfield | 870 | 870 | 870 | 870 | 870 | 870 |
| Trinity River Authority (upstream diversion of Lake Livingston) | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| TRWD Sources | 6,722 | 6,722 | 6,026 | 5,214 | 4,566 | 3,981 |
| ***Total Current Supplies*** | ***28,337*** | ***28,337*** | ***27,641*** | ***26,829*** | ***26,181*** | ***25,596*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***2,053*** | ***7,802*** |
| | | | | | | |

(Table 4F. 169, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Additional Water from TRWD (current contract) | 4 | 4 | 700 | 1,512 | 2,160 | 2,745 |
| Additional Water from TRWD (new contract through TRA) | | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Trinity River Authority Reuse | 0 | 0 | 0 | 0 | 6,760 | 6,760 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***1,004*** | ***1,700*** | ***2,512*** | ***9,920*** | ***10,505*** |
| **Reserve (Shortage)** | **16,168** | **11,131** | **8,817** | **5,342** | **7,867** | **2,703** |

## Teague

Teague has a population of about 5,200 people and is located in western Freestone County. The city gets its water supply from the Carrizo-Wilcox aquifer. Water management strategies for Teague include conservation, new wells in the Carrizo-Wilcox aquifer, and supplemental wells to replace existing wells. Table 4F.170 shows the projected population and demand, the current supplies, and the water management strategies for Teague.

**Table 4F.170**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Teague**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,201** | **5,846** | **6,450** | **7,135** | **7,779** | **8,424** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 536 | 720 | 773 | 839 | 906 | 982 |
| ***Total Projected Demand*** | ***536*** | ***720*** | ***773*** | ***839*** | ***906*** | ***982*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 994 | 994 | 994 | 994 | 994 | 994 |
| ***Total Current Supplies*** | ***994*** | ***994*** | ***994*** | ***994*** | ***994*** | ***994*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |

(Table 4F.170, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 22 | 32 | 38 | 45 | 52 |
| Additional Carrizo-Wilcox (new wells) | 0 | 221 | 221 | 443 | 443 | 443 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***6*** | ***243*** | ***253*** | ***481*** | ***488*** | ***495*** |
| **Reserve (Shortage)** | **464** | **517** | **474** | **636** | **576** | **507** |

## Wortham

Wortham is located in western Freestone County and has a population of about 1,250. The city gets its water supply from the Bistone Municipal WSD, and the water comes from the Carrizo-Wilcox aquifer in Limestone County in the Brazos G region. Water management strategies for Wortham include conservation, buying treated water from Corsicana, buying raw water from TRWD, and a water treatment plant expansion and rehabilitation. Table 4F.171 shows the projected population and demand, the current supplies, and the water management strategies for Wortham.

**Table 4F.171**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Wortham**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,250** | **1,500** | **1,750** | **2,000** | **2,200** | **2,400** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 272 | 321 | 369 | 414 | 453 | 495 |
| ***Total Projected Demand*** | ***272*** | ***321*** | ***369*** | ***414*** | ***453*** | ***495*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Bistone Municipal WSD (Carrizo-Wilcox Aquifer, Limestone County, Region G) | 560 | 0 | 0 | 0 | 0 | 0 |
| ***Total Current Supplies*** | ***560*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***321*** | ***369*** | ***414*** | ***453*** | ***495*** |
| | | | | | | |

**(Table 4F.171, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 38 | 49 | 58 | 68 | 78 |
| Corsicana | 0 | 300 | 300 | 300 | 300 | 300 |
| Tarrant Regional Water District | 0 | 300 | 300 | 300 | 300 | 300 |
| WTP Expansion/Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***14*** | ***638*** | ***649*** | ***658*** | ***668*** | ***678*** |
| **Reserve (Shortage)** | **302** | **317** | **280** | **244** | **215** | **183** |

## Costs for Freestone County Water User Groups

Table 4F.172 shows the estimated capital costs for Freestone County water management strategies not covered under the wholesale water providers, and Table 4F.173 summarizes the costs by category and is followed by a summary for Freestone County.

**Table 4F.172**

**Costs for Recommended Water Management Strategies for Freestone County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Fairfield | Conservation | 2010 | 120 | $5,000 | $0.68 | $0.68 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,556,000 | N/A | N/A | Q-13 |
| | Additional groundwater (Carrizo-Wilcox) | 2040 | 282 | $573,000 | $0.95 | $0.49 | Q-183 |
| | Treatment plant and water from TRWD through TRA | 2040 | 400 | $8,218,000 | $6.27 | $1.69 | Q-184 |
| Flo Community WSC* (Region C only) | Conservation | 2020 | 2 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,305,000 | N/A | N/A | Q-13 |
| Freestone County Other | Conservation | 2010 | 77 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2020 | 0 | $463,000 | N/A | N/A | Q-13 |
| | Additional TRWD supplies through TRA | 2020 | 55 | $0 | $2.27 | $2.27 | None |
| | Corsicana supplies | 2030 | 39 | $0 | $2.50 | $2.50 | None |
| Teague | Conservation | 2010 | 52 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,324,000 | N/A | N/A | Q-13 |
| | Additional groundwater (Carrizo-Wilcox) | 2020 | 443 | $902,000 | $0.98 | $0.56 | Q-185 |

(Table 4F.172, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity ** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Wortham | Conservation | 2010 | 78 | $0 | $1.23 | $1.23 | Q-10 & Q-11 |
| | Corsicana supplies | 2020 | 300 | $6,228,000 | $8.37 | $3.55 | Q-187 |
| | Water treatment plant expansion/rehab | 2010 | Included Below | $4,662,000 | $1.98 | $0.70 | Q-15 |
| | TRWD supplies through TRA | 2010 | 300 | $6,255,000 | $6.80 | $2.16 | Q-186 |
| Freestone County Irrigation | Supplemental wells | 2020 | 0 | $75,000 | N/A | N/A | Q-13 |
| Freestone County Livestock | Supplemental wells | 2020 | 0 | $75,000 | N/A | N/A | Q-13 |
| Freestone County Manufacturing | None | N/A | 0 | $0 | N/A | N/A | Q-13 |
| Freestone County Mining | Supplemental wells | 2020 | 0 | $118,000 | N/A | N/A | Q-13 |
| Freestone County Steam Electric | Supplemental wells | 2020 | 0 | $374,000 | N/A | N/A | Q-13 |
| | Additional TRWD supplies through TRA | 2010 | 3,745 | $4,799,000 | $1.17 | $0.84 | Q-188 |
| | TRA direct reuse | 2050 | 6,760 | $17,266,000 | $0.96 | $0.41 | Q-189 |

Notes: Water User Groups marked with an * extend into more than one county.
**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.173**
**Summary of Recommended Water Management Strategies for Freestone County Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 328 | $5,000 |
| Purchase from WWP | 4,439 | $17,282,000 |
| Supplemental wells | 0 | $8,290,000 |
| Treatment capacity | 400 | $12,880,000 |
| Reuse | 6,760 | $17,266,000 |
| Additional groundwater | 725 | $1,475,000 |
| **Total** | | **$57,198,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.


***2000 Population:*** *17,867*

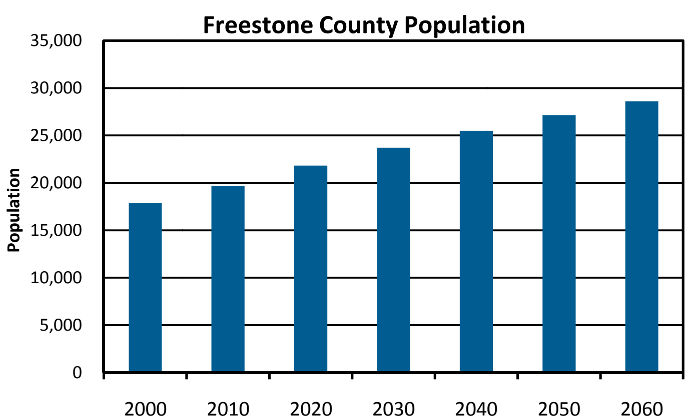
***Projected 2060 Population:*** *28,593*

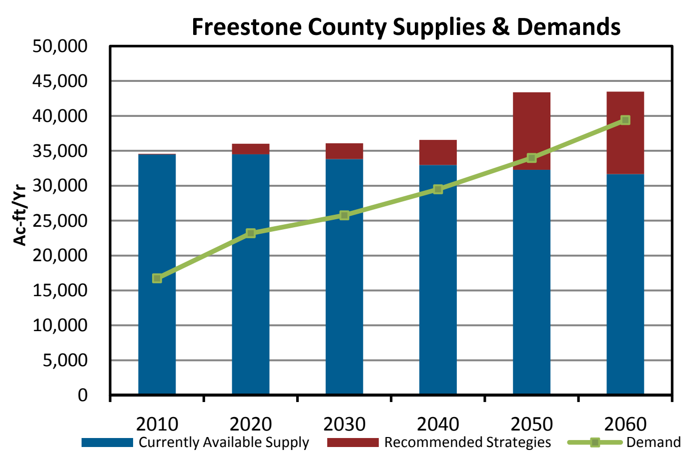
***County Seat:*** *Fairfield*

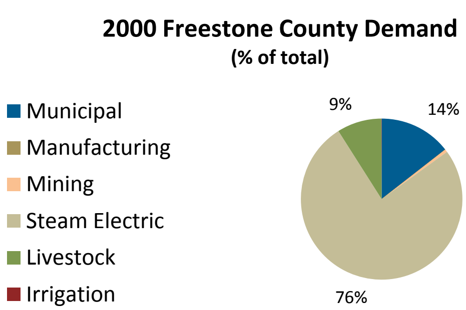
***Economy:*** *Natural gas, mining, electricity generating plants, agriculture.*

***River Basin(s):***

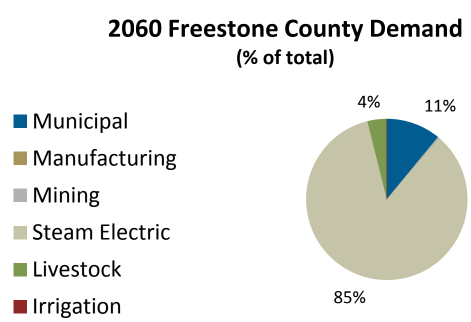
– Trinity (89%), Brazos (11%)


**Total= 17,107 acre-feet**




**Total= 39,396 acre-feet**

| WATER USER GROUP | 2060 FREESTONE CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Fairfield | 1,588 | Carrizo-Wilcox Aquifer | New WTP, TRWD, Additional Carrizo-Wilcox Aquifer, Supplemental wells |
| Flo Community WSC [a] | 19 | Carrizo-Wilcox Aquifer | Supplemental wells |
| Freestone County-Irrigation | 8 | Carrizo-Wilcox Aquifer, Local supplies | Supplemental wells |
| Freestone County-Livestock | 1,528 | Carrizo-Wilcox, Other, and Queen City Aquifers, Local supplies | Supplemental wells |
| Freestone County-Manufacturing | 0 | None | None |
| Freestone County-Mining | 149 | Carrizo-Wilcox Aquifer, Local supplies | Supplemental wells |
| Freestone County-Other | 1,229 | Carrizo-Wilcox Aquifer, Run-of-river, TRWD | Additional water from TRWD, Supplemental wells |
| Freestone County-Steam Electric Power | 33,398 | Carrizo-Wilcox Aquifer, Lake Fairfield, Lake Livingston (upstream diversion), TRWD | Supplemental wells, Additional water from TRWD through TRA, TRA reuse |
| Teague | 982 | Carrizo-Wilcox Aquifer | Supplemental wells, Additional Carrizo-Wilcox Aquifer |
| Wortham | 495 | Bistone Municipal Water Supply District (Carrizo-Wilcox Aquifer in Limestone County) | Corsicana, TRWD (through TRA), WTP expansion/rehabilitation |

[a] Freestone County portion only
[b] Water conservation is a strategy for every municipal user group

### 4F.8 Grayson County

Figure 4F.8 is a map of Grayson County. Most Grayson County water user groups use groundwater to meet all or part of their current needs, but there are also large surface water supplies in the county. Sherman operates a desalination plant to treat Lake Texoma water purchased from the Greater Texoma Utility Authority (GTUA). Sherman also supplies raw water from Lake Texoma (from GTUA) to a power plant in the city. Denison uses water from Randell Lake and Lake Texoma, blending to maintain acceptable water quality. Howe and Van Alstyne get treated water from the North Texas Municipal Water District from the Collin-Grayson Municipal Alliance pipeline, developed in cooperation with GTUA.

The proposed Grayson County Water Supply Project will provide additional surface water for water user groups in Grayson County, supplementing the existing groundwater and surface water supplies. The Grayson County Water Supply Project will be developed by GTUA and water suppliers in the county. For the purpose of this plan, the costs of the project ($282,087,000) are included under GTUA and Sherman in Section 4.E. Elements of the project include:

- A new GTUA water right from Lake Texoma, which can be contracted to water suppliers in Grayson County and other parts of the GTUA service area.
- Expansions to raw water facilities delivering water to the Sherman Water Treatment Plant.
- Expansions to the Sherman Water Treatment Plant.
- Construction of new raw water transmission facilities and water treatment plants to treat water from Lake Texoma.
- Construction of treated water transmission lines to deliver water to suppliers.

Table 4F.174 shows the expected supplies from the Grayson County Water Supply Project for Grayson County water user groups.

GTUA will also expand the Collin-Grayson Municipal Alliance project to increase supplies to Howe and Van Alstyne (as well as Anna and Melissa in Collin County). The costs of this project ($77,366,000) are also included under GTUA in Section 4.E.

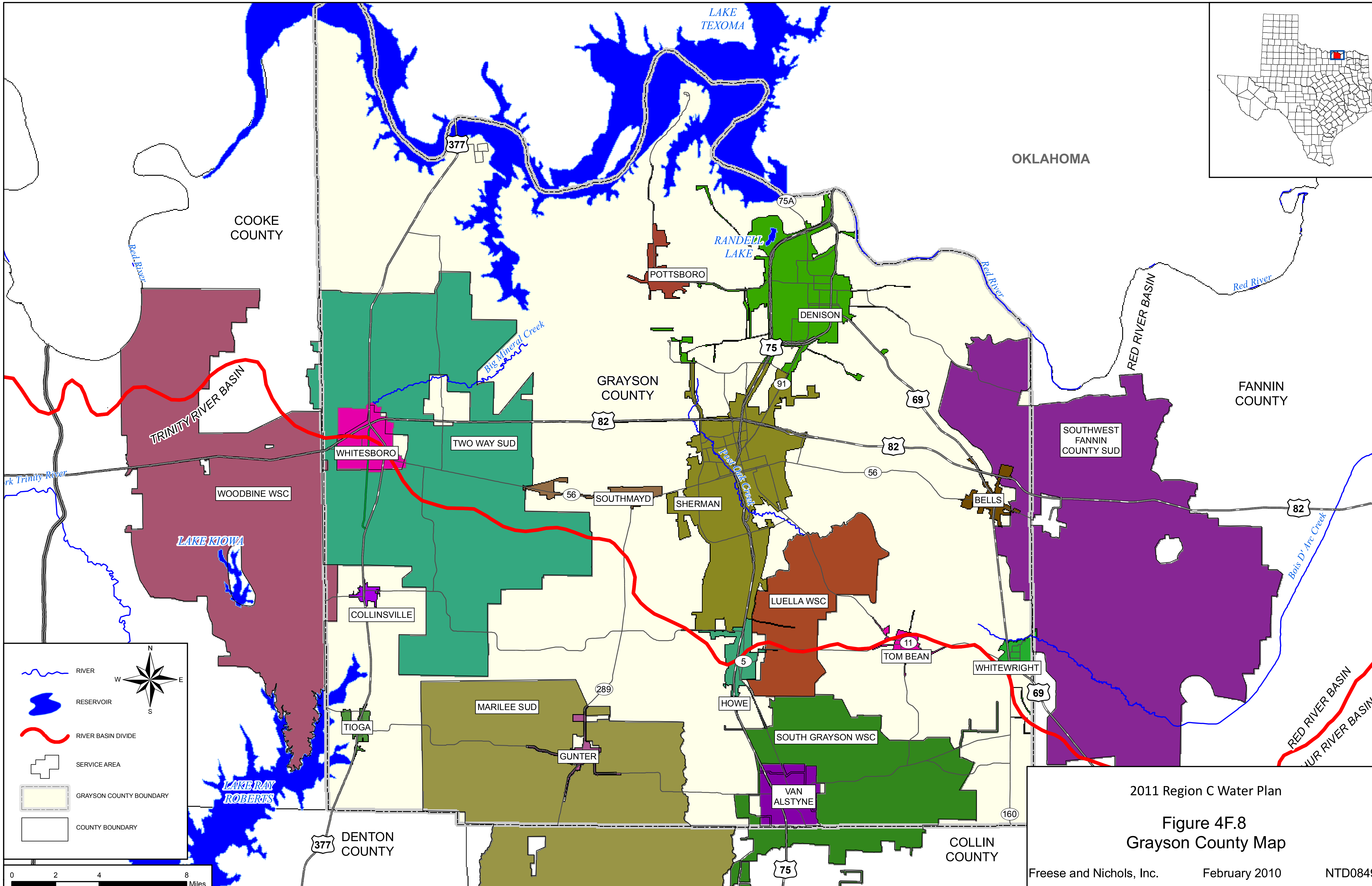

LAKE TEXOMA
OKLAHOMA
COOKE COUNTY
GRAYSON COUNTY
FANNIN COUNTY
DENTON COUNTY
COLLIN COUNTY
RANDELL LAKE
POTTSBORO
DENISON
TWO WAY SUD
WHITESBORO
WOODBINE WSC
SOUTHMAYD
SHERMAN
BELLS
SOUTHWEST FANNIN COUNTY SUD
LUELLA WSC
COLLINSVILLE
TOM BEAN
WHITEWRIGHT
MARILEE SUD
TIOGA
GUNTER
HOWE
SOUTH GRAYSON WSC
VAN ALSTYNE
LAKE KIOWA
LAKE RAY ROBERTS
TRINITY RIVER BASIN
RED RIVER BASIN
SULPHUR RIVER BASIN
Red River
Big Mineral Creek
Post Oak Creek
Bois D' Arc Creek
Elm Fork Trinity River
RIVER
RESERVOIR
RIVER BASIN DIVIDE
SERVICE AREA
GRAYSON COUNTY BOUNDARY
COUNTY BOUNDARY
N
S
E
W
0 2 4 8 Miles
2011 Region C Water Plan
Figure 4F.8
Grayson County Map
Freese and Nichols, Inc.
February 2010
NTD08492

**Table 4F.174**
**Supplies from the Grayson County Water Supply Project**

| Water User Group | Supplies from the Grayson Co. WSP (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Through GTUA and Sherman** | | | | | | |
| Sherman | 2,535 | 3,694 | 5,150 | 6,802 | 9,040 | 12,258 |
| Grayson County Manufacturing | 5,149 | 5,849 | 6,478 | 7,064 | 7,539 | 8,280 |
| Grayson County Steam Electric | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 |
| Bells | 0 | 80 | 150 | 210 | 260 | 300 |
| Grayson County Other | 75 | 100 | 100 | 200 | 300 | 600 |
| Gunter | 0 | 180 | 350 | 530 | 700 | 820 |
| Luella WSC | 0 | 38 | 80 | 140 | 150 | 220 |
| Marilee SUD | 125 | 150 | 400 | 650 | 1,000 | 1,350 |
| Tioga | 0 | 225 | 375 | 425 | 475 | 500 |
| Tom Bean | 0 | 10 | 40 | 75 | 120 | 130 |
| Whitewright | 0 | 200 | 400 | 600 | 750 | 900 |
| | **13,484** | **16,126** | **19,123** | **22,296** | **25,934** | **30,958** |
| **Plant North of Pottsboro** | | | | | | |
| Grayson County Other | 0 | 200 | 300 | 400 | 500 | 600 |
| Pottsboro | 0 | 280 | 600 | 870 | 1,150 | 1,275 |
| Southmayd | 0 | 40 | 100 | 220 | 400 | 525 |
| | **0** | **520** | **1,000** | **1,490** | **2,050** | **2,400** |
| **Plant in Northwest** | | | | | | |
| Collinsville | 0 | 100 | 200 | 300 | 400 | 500 |
| South Grayson WSC | 0 | 0 | 0 | 75 | 175 | 300 |
| Whitesboro | 0 | 50 | 150 | 200 | 350 | 700 |
| Two Way SUD | 0 | 200 | 350 | 500 | 650 | 800 |
| Grayson County Other | 0 | 560 | 560 | 560 | 560 | 560 |
| | **0** | **910** | **1,260** | **1,635** | **2,135** | **2,860** |
| | | | | | | |
| **Total** | **13,484** | **17,556** | **21,383** | **25,421** | **30,119** | **36,218** |

Note: 2010 demand is met by Sherman from existing sources. Grayson County Water Supply Project is assumed to be implemented before 2020.

Strategies in addition to the surface water projects described above include:

- Denison will use additional Lake Texoma water.
- South Grayson WSC will purchase water from North Texas Municipal Water District through the Collin-Grayson Municipal Alliance in addition to participating in the Grayson County Water Supply Project.
- Many suppliers will use additional groundwater.

Water management strategies for Grayson County water user groups are discussed below. Table 4F.197 on page 4F.249 shows the estimated capital costs for the Grayson County water management strategies not associated with the wholesale water providers, and Table 4F.198 on page 4F.253 is a summary of the costs by category. Table 4F.198 is followed by a summary for Grayson County.

### Bells

Bells is a city of about 1,800 people located in eastern Grayson County. The city gets its water supply from the Trinity and Woodbine aquifers. Water management strategies for Bells include conservation, participating in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.175 shows the projected population and demand, the current supplies, and the water management strategies for Bells.

**Table 4F.175**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Bells**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,800** | **2,300** | **2,750** | **3,250** | **3,700** | **4,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 185 | 271 | 348 | 404 | 456 | 493 |
| ***Total Projected Demand*** | ***185*** | ***271*** | ***348*** | ***404*** | ***456*** | ***493*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 161 | 161 | 161 | 161 | 161 | 161 |
| Woodbine Aquifer | 43 | 43 | 43 | 43 | 43 | 43 |
| ***Total Current Supplies*** | ***204*** | ***204*** | ***204*** | ***204*** | ***204*** | ***204*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***67*** | ***144*** | ***200*** | ***252*** | ***289*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 13 | 20 | 25 | 30 | 34 |
| Grayson County Water Supply Project (Sherman) | 0 | 80 | 150 | 210 | 260 | 300 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***93*** | ***170*** | ***235*** | ***290*** | ***334*** |
| **Reserve (Shortage)** | **23** | **26** | **26** | **35** | **38** | **45** |

## Collinsville

Collinsville has a population of about 2,000 and is located in western Grayson County. The city gets its water supply from the Trinity aquifer. Water management strategies for Collinsville include conservation, participating in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.176 shows the projected population and demand, the current supplies, and the water management strategies for Collinsville.

**Table 4F.176**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Collinsville**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **2,035** | **2,835** | **3,635** | **4,435** | **5,235** | **6,035** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 324 | 441 | 558 | 666 | 780 | 899 |
| ***Total Projected Water Demand*** | ***324*** | ***441*** | ***558*** | ***666*** | ***780*** | ***899*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 356 | 356 | 356 | 356 | 356 | 356 |
| ***Total Current Supplies*** | ***356*** | ***356*** | ***356*** | ***356*** | ***356*** | ***356*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***85*** | ***202*** | ***310*** | ***424*** | ***543*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 19 | 29 | 38 | 47 | 57 |
| Grayson County Water Supply Project (Northwest WTP) | 0 | 100 | 200 | 300 | 400 | 500 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***7*** | ***119*** | ***229*** | ***338*** | ***447*** | ***557*** |
| **Reserve (Shortage)** | **39** | **34** | **27** | **28** | **23** | **14** |

## Denison

With a population of about 25,000, Denison is one of the two largest cities in Grayson County and is located in the northern part of the county. Denison's current supplies are Lake Randell, Lake Texoma, and groundwater (Trinity and Woodbine aquifers). Water management strategies for Denison include conservation, a water plant expansion and additional water from Lake Texoma, infrastructure improvements, and supplemental wells to replace existing wells. Table 4F.177 shows the projected population and demand, the current supplies, and the water management strategies for Denison.

**Table 4F.177**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Denison**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population (in City)** | **25,000** | **28,000** | **30,000** | **31,000** | **32,000** | **33,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 5,489 | 6,053 | 6,385 | 6,493 | 6,667 | 6,875 |
| Manufacturing and Customers | 1,417 | 1,480 | 1,516 | 1,559 | 1,612 | 1,686 |
| ***Total Projected Demand*** | ***6,906*** | ***7,533*** | ***7,901*** | ***8,052*** | ***8,279*** | ***8,561*** |
| **Currently Available Water Supplies** | | | | | | |
| Lake Randell | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 |
| Lake Texoma | 5,791 | 5,791 | 5,791 | 5,791 | 5,791 | 5,791 |
| Trinity Aquifer | 157 | 157 | 157 | 157 | 157 | 157 |
| Woodbine Aquifer | 155 | 155 | 155 | 155 | 155 | 155 |
| ***Total Current Supplies*** | ***7,503*** | ***7,503*** | ***7,503*** | ***7,503*** | ***7,503*** | ***7,503*** |
| ***Need (Demand - Current Supply)*** | ***0*** | ***30*** | ***398*** | ***549*** | ***776*** | ***1,058*** |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 43 | 145 | 409 | 535 | 605 | 681 |
| 2 MGD WTP Expansion and more Texoma | 0 | 0 | 0 | 1,121 | 1,121 | 1,121 |
| Infrastructure Improvements | 0 | 0 | 0 | 0 | 0 | 0 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***43*** | ***145*** | ***409*** | ***1,656*** | ***1,726*** | ***1,802*** |
| **Reserve (Shortage)** | **640** | **115** | **11** | **1,107** | **950** | **744** |

## Grayson County Irrigation

Table 4F.178 shows the projected demand, the current supplies, and the water management strategies for Grayson County Irrigation. As shown in Table 4F.178, local supplies, groundwater (Woodbine aquifer) and Lake Texoma water from the Red River Authority supply irrigation in Grayson County. Supplemental wells to replace existing wells are the only water management strategies for this water user group.

**Table 4F.178**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Grayson County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **3,561** | **3,751** | **3,950** | **4,158** | **4,381** | **4,616** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 2,347 | 2,347 | 2,347 | 2,347 | 2,347 | 2,347 |
| Red River Authority (Lake Texoma) | 150 | 150 | 150 | 150 | 150 | 150 |
| Local Supplies | 2,394 | 2,394 | 2,394 | 2,394 | 2,394 | 2,394 |
| ***Total Current Supplies*** | ***4,891*** | ***4,891*** | ***4,891*** | ***4,891*** | ***4,891*** | ***4,891*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **1,330** | **1,140** | **941** | **733** | **510** | **275** |

## Grayson County Livestock

Table 4F.179 shows the projected demand, current supplies, and water management strategies for Grayson County Livestock. The current supplies are local surface water supplies and groundwater (Woodbine aquifer). These sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.179**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Grayson County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,297** | **1,297** | **1,297** | **1,297** | **1,297** | **1,297** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 360 | 360 | 360 | 360 | 360 | 360 |
| Local Supplies | 1,683 | 1,683 | 1,683 | 1,683 | 1,683 | 1,683 |
| ***Total Current Supplies*** | ***2,043*** | ***2,043*** | ***2,043*** | ***2,043*** | ***2,043*** | ***2,043*** |

(Table 4F.179, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **746** | **746** | **746** | **746** | **746** | **746** |

## Grayson County Manufacturing

Table 4F.180 shows the projected demand, the current supplies, and the water management strategies for Grayson County Manufacturing. Current supplies include Sherman (from GTUA and Lake Texoma), Denison (from Lake Randell), Howe (from GTUA and NTMWD), local supplies, and groundwater (Woodbine aquifer). Water conservation, additional supplies from Sherman, Denison, and Howe, and supplemental wells to replace existing wells are the water management strategies for this water user group.

**Table 4F.180**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Grayson County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **7,010** | **7,781** | **8,453** | **9,088** | **9,621** | **10,444** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Sherman (GTUA - Lake Texoma) | 5,225 | 3,914 | 3,284 | 2,851 | 2,460 | 2,163 |
| Denison (Lake Randell) | 500 | 500 | 500 | 500 | 500 | 500 |
| Howe (NTMWD through GTUA)) | 68 | 49 | 33 | 25 | 20 | 17 |
| Woodbine Aquifer | 1,215 | 1,215 | 1,215 | 1,215 | 1,215 | 1,215 |
| Local Supplies | 30 | 30 | 30 | 30 | 30 | 30 |
| ***Total Current Supplies*** | ***7,038*** | ***5,708*** | ***5,062*** | ***4,621*** | ***4,225*** | ***3,925*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***2,073*** | ***3,391*** | ***4,467*** | ***5,396*** | ***6,519*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 15 | 175 | 255 | 272 | 291 |
| Additional Howe | 0 | 15 | 25 | 33 | 41 | 48 |
| Additional Denison | 46 | 109 | 145 | 188 | 241 | 315 |

**(Table 4F.180, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Additional Sherman (Grayson County Water Supply Project) | 0 | 1,935 | 3,194 | 4,213 | 5,079 | 6,117 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***46*** | ***2,074*** | ***3,539*** | ***4,689*** | ***5,633*** | ***6,771*** |
| **Reserve (Shortage)** | **74** | **1** | **148** | **222** | **237** | **252** |

## Grayson County Mining

Table 4F.181 shows the projected demand, the current supplies, and the water management strategies for Grayson County Mining. Grayson County Mining is supplied from groundwater (Trinity and Woodbine aquifers). The only water management strategy for this water user group is supplemental wells.

**Table 4F.181**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Grayson County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,052** | **1,050** | **1,049** | **1,048** | **1,047** | **1,046** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 595 | 595 | 595 | 595 | 595 | 595 |
| Woodbine Aquifer | 559 | 559 | 559 | 559 | 559 | 559 |
| ***Total Current Supplies*** | ***1,154*** | ***1,154*** | ***1,154*** | ***1,154*** | ***1,154*** | ***1,154*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **102** | **104** | **105** | **106** | **107** | **108** |

## Grayson County Other

Grayson County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Grayson County Other supply about 27,000 people and receive their water supply from Denison (Lake Texoma and Lake Randell), the Red River Authority (Lake Texoma), Sherman (GTUA and Lake Texoma), and groundwater (Trinity, Woodbine, and other aquifers). Water management strategies for these entities include conservation, participation in the Grayson County Water Supply Project, and supplemental wells to replace existing water wells. Table 4F.182 shows the projected population and demand, the current supplies, and the water management strategies for Grayson County Other.

**Table 4F.182**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Grayson County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **26,925** | **26,799** | **26,482** | **25,160** | **23,185** | **20,727** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 3,468 | 3,393 | 3,263 | 3,016 | 2,753 | 2,461 |
| ***Total Projected Water Demand*** | ***3,468*** | ***3,393*** | ***3,263*** | ***3,016*** | ***2,753*** | ***2,461*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Denison (Lake Randell) | 60 | 60 | 60 | 60 | 60 | 60 |
| Red River Authority (Lake Texoma) | 641 | 641 | 641 | 641 | 641 | 641 |
| Denison (Lake Texoma) | 250 | 250 | 250 | 250 | 250 | 250 |
| Sherman (GTUA - Lake Texoma) | 76 | 67 | 51 | 81 | 98 | 157 |
| Other Aquifer | 35 | 35 | 35 | 35 | 35 | 35 |
| Trinity Aquifer | 1,170 | 1,170 | 1,170 | 1,170 | 1,170 | 1,170 |
| Woodbine Aquifer | 1,659 | 1,659 | 1,659 | 1,659 | 1,659 | 1,659 |
| ***Total Current Supplies*** | ***3,891*** | ***3,882*** | ***3,866*** | ***3,896*** | ***3,913*** | ***3,972*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 37 | 123 | 165 | 168 | 164 | 155 |
| Grayson County Water Supply Project (Sherman WTP) | 75 | 100 | 100 | 200 | 300 | 600 |

**(Table 4F.182, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Grayson County Water Supply Project (North WTP) | 0 | 200 | 300 | 400 | 500 | 600 |
| Grayson County Water Supply Project (Northwest WTP) | 0 | 560 | 560 | 560 | 560 | 560 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***112*** | ***983*** | ***1,125*** | ***1,328*** | ***1,524*** | ***1,915*** |
| **Reserve (Shortage)** | **535** | **1,472** | **1,728** | **2,208** | **2,684** | **3,426** |

## Grayson County Steam Electric Power

Table 4F.183 shows the projected demand, the current supplies, and the water management strategies for Grayson County Steam Electric Power. The current supply for this water user group is treated water from Sherman (GTUA and Lake Texoma). The water management strategy is additional water from GTUA (Lake Texoma).

**Table 4F.183**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Grayson County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **5,600** | **8,963** | **12,326** | **12,326** | **12,326** | **12,326** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Sherman (GTUA - Lake Texoma) | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 | 5,600 |
| ***Total Current Supplies*** | ***5,600*** | ***5,600*** | ***5,600*** | ***5,600*** | ***5,600*** | ***5,600*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***3,363*** | ***6,726*** | ***6,726*** | ***6,726*** | ***6,726*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| GTUA (Lake Texoma) | 0 | 6,726 | 6,726 | 6,726 | 6,726 | 6,726 |
| ***Total Water Management Strategies*** | ***0*** | ***6,726*** | ***6,726*** | ***6,726*** | ***6,726*** | ***6,726*** |
| **Reserve (Shortage)** | **0** | **3,363** | **0** | **0** | **0** | **0** |

### Gunter

Gunter is located in southern Grayson County and has a population of about 2,000. The city gets its current water supply from the Trinity aquifer. Water management strategies for Gunter include conservation, participating in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.184 shows the projected population and demand, the current supplies, and the water management strategies for Gunter.

**Table 4F.184**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Gunter**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population (In City Only)** | **2,000** | **3,500** | **5,000** | **6,500** | **8,000** | **9,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 271 | 467 | 655 | 837 | 1,022 | 1,149 |
| ***Total Projected Demand*** | ***271*** | ***467*** | ***655*** | ***837*** | ***1,022*** | ***1,149*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 298 | 298 | 298 | 298 | 298 | 298 |
| ***Total Current Supplies*** | ***298*** | ***298*** | ***298*** | ***298*** | ***298*** | ***298*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***169*** | ***357*** | ***539*** | ***724*** | ***851*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 19 | 32 | 44 | 57 | 68 |
| Grayson County Water Supply Project (Sherman WTP) | 0 | 180 | 350 | 530 | 700 | 820 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***5*** | ***199*** | ***382*** | ***574*** | ***757*** | ***888*** |
| **Reserve (Shortage)** | **32** | **30** | **25** | **35** | **33** | **37** |

### Howe

Howe is a city of about 3,000 located in southern Grayson County, on the border between the Red and Trinity river basins. The city gets its current supplies from the Woodbine aquifer and the North Texas Municipal Water District (NTMWD) via GTUA and the Collin-Grayson Municipal Alliance Project. Water management strategies for Howe include conservation, additional water from NTMWD (from an expanded Collin-Grayson Municipal Alliance project), and supplemental wells to replace existing wells. Table 4F.185 shows the projected population and demand, the current supplies, and the water management strategies for Howe.

**Table 4F.185**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Howe**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,000** | **4,500** | **6,500** | **8,500** | **9,772** | **10,781** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 403 | 590 | 837 | 1,085 | 1,237 | 1,365 |
| Grayson County Manufacturing | 70 | 78 | 85 | 91 | 96 | 104 |
| ***Total Projected Demand*** | ***473*** | ***668*** | ***922*** | ***1,176*** | ***1,333*** | ***1,469*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 301 | 301 | 301 | 301 | 301 | 301 |
| North Texas Municipal WD (Collin-Grayson Municipal Alliance Pipeline) | 215 | 215 | 215 | 215 | 215 | 215 |
| ***Total Current Supplies*** | ***516*** | ***516*** | ***516*** | ***516*** | ***516*** | ***516*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***152*** | ***406*** | ***660*** | ***817*** | ***953*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 9 | 27 | 47 | 65 | 79 | 91 |
| Additional Water from NTMWD (Expanded CGMA Pipeline) | 0 | 125 | 359 | 595 | 738 | 862 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***9*** | ***152*** | ***406*** | ***660*** | ***817*** | ***953*** |
| **Reserve (Shortage)** | **52** | **0** | **0** | **0** | **0** | **0** |

## Luella Water Supply Corporation

The Luella WSC serves about 3,300 people in central Grayson County. The WSC gets its current water supply from the Woodbine aquifer, and water management strategies include conservation, participation in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.186 shows the projected population and demand, the current supplies, and the water management strategies for Luella WSC.

**Table 4F.186**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Luella Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,300** | **3,800** | **4,300** | **4,950** | **5,080** | **5,770** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 410 | 460 | 511 | 582 | 592 | 672 |
| ***Total Projected Demand*** | ***410*** | ***460*** | ***511*** | ***582*** | ***592*** | ***672*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 450 | 450 | 450 | 450 | 450 | 450 |
| ***Total Current Supplies*** | ***450*** | ***450*** | ***450*** | ***450*** | ***450*** | ***450*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***10*** | ***61*** | ***132*** | ***142*** | ***222*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 18 | 27 | 33 | 36 | 43 |
| Grayson County Water Supply Project (Sherman WTP) | 0 | 38 | 80 | 140 | 150 | 220 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***5*** | ***56*** | ***107*** | ***173*** | ***186*** | ***263*** |
| **Reserve (Shortage)** | **45** | **46** | **46** | **41** | **44** | **41** |

## Marilee Special Utility District (Formerly called Gunter Rural WSC)

Marilee SUD serves about 4,300 people and is located in northeastern Collin County and southwestern Grayson County. The SUD currently gets its water supplies from treated water purchased from Sherman (part of the Grayson County Water Supply Project) and from the Trinity aquifer. Water management strategies include conservation, additional water from the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.187 shows the projected population and demand, the current supplies, and the water management strategies for Marilee SUD.

**Table 4F.187**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Marilee Special Utility District**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,300** | **6,400** | **8,653** | **10,679** | **13,471** | **16,560** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 530 | 774 | 1,027 | 1,256 | 1,585 | 1,948 |
| ***Total Projected Demand*** | ***530*** | ***774*** | ***1,027*** | ***1,256*** | ***1,585*** | ***1,948*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 634 | 634 | 634 | 634 | 634 | 634 |
| Grayson County Water Supply Project (Sherman Plant) | 127 | 100 | 203 | 262 | 326 | 353 |
| ***Total Current Supplies*** | ***761*** | ***734*** | ***837*** | ***896*** | ***960*** | ***987*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***40*** | ***190*** | ***360*** | ***625*** | ***961*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 50 | 74 | 96 | 126 | 162 |
| Additional Water from Grayson County Water Supply Project | 0 | 50 | 197 | 388 | 674 | 997 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***14*** | ***100*** | ***271*** | ***484*** | ***800*** | ***1,159*** |
| **Reserve (Shortage)** | **245** | **60** | **81** | **124** | **175** | **198** |

## Pottsboro

Pottsboro is a city of 3,000 located in northern Grayson County, near Lake Texoma. The city gets its current supplies from the Woodbine aquifer and treated water purchased from Denison. Water management strategies for Pottsboro include conservation, participation in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.188 shows the projected population and demand, the current supplies, and the water management strategies for Pottsboro.

**Table 4F.188**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Pottsboro**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,000** | **5,000** | **7,000** | **9,000** | **11,000** | **12,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 504 | 851 | 1,176 | 1,492 | 1,811 | 1,976 |
| ***Total Projected Demand*** | ***504*** | ***851*** | ***1,176*** | ***1,492*** | ***1,811*** | ***1,976*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 123 | 123 | 123 | 123 | 123 | 123 |
| Denison | 560 | 560 | 560 | 560 | 560 | 560 |
| ***Total Current Supplies*** | ***683*** | ***683*** | ***683*** | ***683*** | ***683*** | ***683*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***168*** | ***493*** | ***809*** | ***1,128*** | ***1,293*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 12 | 59 | 97 | 137 | 182 | 216 |
| Grayson County Water Supply Project (North WTP) | 0 | 280 | 600 | 870 | 1,150 | 1,275 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***12*** | ***339*** | ***697*** | ***1,007*** | ***1,332*** | ***1,491*** |
| **Reserve (Shortage)** | **191** | **171** | **204** | **198** | **204** | **198** |

### Sherman

Sherman is the largest city in Grayson County, with a population of about 39,000, and is located in the center of the county. Sherman is a wholesale water provider, and its water supply plans are discussed in page 4E.100 of Section 4E.

### South Grayson Water Supply Corporation

South Grayson Water Supply Corporation is located in southern Grayson County and northern Collin County and has an estimated service area population of 2,700. The WSC gets its current supplies from the Trinity and Woodbine aquifers. Water management strategies for South Grayson WSC include conservation, getting water from North Texas Municipal Water District via GTUA and the Collin-Grayson Municipal Alliance project, participation in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.189 shows the projected population and demand, the current supplies, and the water management strategies for South Grayson WSC.

**Table 4F.189**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the South Grayson Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,700** | **3,450** | **4,100** | **4,825** | **5,650** | **6,675** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 381 | 479 | 561 | 654 | 760 | 897 |
| ***Total Projected Demand*** | ***381*** | ***479*** | ***561*** | ***654*** | ***760*** | ***897*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 360 | 360 | 360 | 360 | 360 | 360 |
| Woodbine Aquifer | 360 | 360 | 360 | 360 | 360 | 360 |
| ***Total Current Supplies*** | ***720*** | ***720*** | ***720*** | ***720*** | ***720*** | ***720*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***40*** | ***177*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 22 | 31 | 39 | 48 | 60 |
| Collin-Grayson Municipal Alliance (GTUA and NTMWD) | 0 | 100 | 100 | 100 | 100 | 100 |
| Grayson County Water Supply Project (GTUA - Northwest WTP) | 0 | 0 | 0 | 75 | 175 | 300 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***6*** | ***122*** | ***131*** | ***214*** | ***323*** | ***460*** |
| **Reserve (Shortage)** | **345** | **363** | **290** | **280** | **283** | **283** |

## Southmayd

Southmayd is located in central Grayson County and has a population of about 1,200. Part of the city is provided retail service by Monarch Water Company (from the Woodbine aquifer), and the rest of the city gets water from the Trinity aquifer. Southmayd intends to take over area in the city currently supplied by Monarch WC. Water management strategies for Southmayd include conservation, a new well in the Woodbine aquifer, participation in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.190 shows the projected population and demand, the current supplies, and the water management strategies for Southmayd.

**Table 4F.190**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Southmayd**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,200** | **1,500** | **2,000** | **3,000** | **4,500** | **5,600** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 160 | 197 | 258 | 380 | 565 | 703 |
| ***Total Projected Demand*** | ***160*** | ***197*** | ***258*** | ***380*** | ***565*** | ***703*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 130 | 130 | 130 | 130 | 130 | 130 |
| Monarch Water Company (Woodbine Aquifer) | 60 | 0 | 0 | 0 | 0 | 0 |
| ***Total Current Supplies*** | ***190*** | ***130*** | ***130*** | ***130*** | ***130*** | ***130*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***67*** | ***128*** | ***250*** | ***435*** | ***573*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 8 | 13 | 21 | 33 | 43 |
| Woodbine Aquifer (new well) | 0 | 60 | 60 | 60 | 60 | 60 |
| Grayson County Water Supply Project (North WTP) | 0 | 40 | 100 | 220 | 400 | 525 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***108*** | ***173*** | ***301*** | ***493*** | ***628*** |
| **Reserve (Shortage)** | **32** | **41** | **45** | **51** | **58** | **55** |

## Southwest Fannin County Special Utility District

Southwest Fannin County SUD serves about 7,500 people in western Fannin County and eastern Grayson County. The water supply plan for Southwest Fannin County SUD is discussed on page 4F.200 under Fannin County.

## Tioga

Tioga is a city of about 1,100 people located in southwestern Grayson County. The city gets its water supply from the Trinity aquifer. Water management strategies for Tioga include conservation, participating in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.191 shows the projected population and demand, the current supplies, and the water management strategies for Tioga.

**Table 4F.191**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Tioga**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,100** | **2,500** | **3,500** | **4,000** | **4,400** | **4,600** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 192 | 428 | 588 | 663 | 725 | 757 |
| ***Total Projected Demand*** | ***192*** | ***428*** | ***588*** | ***663*** | ***725*** | ***757*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 211 | 211 | 211 | 211 | 211 | 211 |
| ***Total Current Supplies*** | ***211*** | ***211*** | ***211*** | ***211*** | ***211*** | ***211*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***217*** | ***377*** | ***452*** | ***514*** | ***546*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 31 | 55 | 68 | 80 | 90 |
| Grayson County Water Supply Project (Sherman WTP) | 0 | 225 | 375 | 425 | 475 | 500 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***256*** | ***430*** | ***493*** | ***555*** | ***590*** |
| **Reserve (Shortage)** | **23** | **39** | **53** | **41** | **41** | **44** |

## Tom Bean

Tom Bean has a population of about 1,100 and is located in southeastern Grayson County. The city gets its water supply from the Woodbine aquifer. Water management strategies for Tom Bean include conservation, participating in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.192 shows the projected population and demand, the current supplies, and the water management strategies for Tom Bean.

**Table 4F.192**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Tom Bean**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,100** | **1,300** | **1,500** | **1,700** | **1,900** | **2,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 259 | 301 | 343 | 383 | 426 | 448 |
| ***Total Projected Demand*** | ***259*** | ***301*** | ***343*** | ***383*** | ***426*** | ***448*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 247 | 247 | 247 | 247 | 247 | 247 |
| ***Total Current Supplies*** | ***247*** | ***247*** | ***247*** | ***247*** | ***247*** | ***247*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***12*** | ***54*** | ***96*** | ***136*** | ***179*** | ***201*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 25 | 71 | 85 | 98 | 113 | 122 |
| Grayson County Water Supply Project (Sherman WTP) | 0 | 10 | 40 | 75 | 120 | 130 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***25*** | ***81*** | ***125*** | ***173*** | ***233*** | ***252*** |
| **Reserve (Shortage)** | **13** | **27** | **29** | **37** | **54** | **51** |

## Two Way Special Utility District

Two Way SUD serves about 5,000 people in eastern Cooke County and western Grayson County. The SUD currently gets its water supplies from the Trinity aquifer. Water management strategies for Two Way SUD include conservation, water from the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.193 shows the projected population and demand, the current supplies, and the water management strategies for Two Way SUD.

**Table 4F.193**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Two Way Special Utility District**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **5,081** | **6,720** | **8,251** | **9,819** | **11,382** | **12,945** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 575 | 813 | 979 | 1,155 | 1,326 | 1,508 |
| ***Total Projected Demand*** | ***575*** | ***813*** | ***979*** | ***1,155*** | ***1,326*** | ***1,508*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 622 | 622 | 622 | 622 | 622 | 622 |
| ***Total Current Supplies*** | ***622*** | ***622*** | ***622*** | ***622*** | ***622*** | ***622*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***191*** | ***357*** | ***533*** | ***704*** | ***886*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 13 | 40 | 59 | 75 | 91 | 109 |
| Grayson County Water Supply Project | 0 | 200 | 350 | 500 | 650 | 800 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***13*** | ***240*** | ***409*** | ***575*** | ***741*** | ***909*** |
| **Reserve (Shortage)** | **60** | **49** | **52** | **42** | **37** | **23** |

## Van Alstyne

Van Alstyne is a city of about 3,000 located in southern Grayson County on the border with Collin County. The city gets its current supplies from the Trinity and Woodbine aquifers and the North Texas Municipal Water District (NTMWD) via GTUA and the Collin-Grayson Municipal Alliance Project. Water management strategies for Van Alstyne include conservation, additional water from NTMWD (from an expanded Collin-Grayson Municipal Alliance project), and supplemental wells to replace existing wells. Table 4F.194 shows the projected population and demand, the current supplies, and the water management strategies for Van Alstyne.

**Table 4F.194**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Van Alstyne**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,000** | **7,500** | **13,500** | **17,000** | **18,500** | **19,200** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 504 | 1,411 | 2,510 | 3,142 | 3,419 | 3,549 |
| ***Total Projected Demand*** | ***504*** | ***1,411*** | ***2,510*** | ***3,142*** | ***3,419*** | ***3,549*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 235 | 235 | 235 | 235 | 235 | 235 |
| Woodbine Aquifer | 215 | 215 | 215 | 215 | 215 | 215 |
| Greater Texoma Utility Authority (Collin-Grayson Municipal Alliance Pipeline from NTMWD) | 46 | 782 | 1,291 | 1,291 | 1,291 | 1,291 |
| ***Total Current Supplies*** | ***496*** | ***1,232*** | ***1,741*** | ***1,741*** | ***1,741*** | ***1,741*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***8*** | ***179*** | ***769*** | ***1,401*** | ***1,678*** | ***1,808*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 8 | 82 | 178 | 253 | 306 | 348 |
| Additional Water from GTUA and Expanded CGMA Pipeline | 0 | 97 | 591 | 1,148 | 1,372 | 1,460 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***8*** | ***179*** | ***769*** | ***1,401*** | ***1,678*** | ***1,808*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Whitesboro

Whitesboro is a city of about 4,400 people located in western Grayson County. The city gets its water supply from the Trinity aquifer. Water management strategies for Whitesboro include conservation, participating in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.195 shows the projected population and demand, the current supplies, and the water management strategies for Whitesboro.

**Table 4F.195**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Whitesboro**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,400** | **5,000** | **5,700** | **6,500** | **7,500** | **10,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 764 | 851 | 958 | 1,070 | 1,227 | 1,635 |
| ***Total Projected Demand*** | ***764*** | ***851*** | ***958*** | ***1,070*** | ***1,227*** | ***1,635*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 840 | 840 | 840 | 840 | 840 | 840 |
| ***Total Current Supplies*** | ***840*** | ***840*** | ***840*** | ***840*** | ***840*** | ***840*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***11*** | ***118*** | ***230*** | ***387*** | ***795*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 45 | 66 | 84 | 107 | 157 |
| Grayson County Water Supply Project (Northwest WTP) | 0 | 50 | 150 | 200 | 350 | 700 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***7*** | ***95*** | ***216*** | ***284*** | ***457*** | ***857*** |
| **Reserve (Shortage)** | **83** | **84** | **98** | **54** | **70** | **62** |

## Whitewright

Whitewright is a city of about 2,000 people located in eastern Grayson County with a small area in Fannin County. The city gets its current water supply from the Woodbine aquifer, and water management strategies include conservation, participating in the Grayson County Water Supply Project, and supplemental wells to replace existing wells. Table 4F.196 shows the projected population and demand, the current supplies, and the water management strategies for Whitewright.

**Table 4F.196**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Whitewright**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **2,022** | **3,228** | **4,532** | **5,535** | **6,538** | **7,541** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 403 | 632 | 873 | 1,048 | 1,230 | 1,419 |
| ***Total Projected Demand*** | ***403*** | ***632*** | ***873*** | ***1,048*** | ***1,230*** | ***1,419*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 438 | 438 | 438 | 438 | 438 | 438 |
| ***Total Current Supplies*** | ***438*** | ***438*** | ***438*** | ***438*** | ***438*** | ***438*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***194*** | ***435*** | ***610*** | ***792*** | ***981*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 34 | 57 | 78 | 103 | 130 |
| Grayson County Water Supply Project (Sherman WTP) | 0 | 200 | 400 | 600 | 750 | 900 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***5*** | ***234*** | ***457*** | ***678*** | ***853*** | ***1,030*** |
| **Reserve (Shortage)** | **40** | **40** | **22** | **68** | **61** | **49** |

## Woodbine Water Supply Corporation

Woodbine WSC serves about 5,000 people in eastern Cooke County and western Grayson County. The water supply plan for Woodbine WSC is discussed on page 4F.54 under Cooke County.

## Costs for Grayson County Water User Groups

Table 4F.197 shows the estimated capital costs for Grayson County water management strategies not covered under the wholesale water providers. Table 4F.198 summarizes the costs by category and is followed by a summary for Grayson County.

**Table 4F.197**
**Costs for Recommended Water Management Strategies for Grayson County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Bells | Conservation | 2010 | 34 | $5,000 | $0.13 | $0.13 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,033,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 300 | See GTUA in Section 4E. | | | |
| Collinsville | Conservation | 2010 | 57 | $5,000 | $0.10 | $0.10 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,990,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 500 | See GTUA in Section 4E. | | | |
| Denison | Conservation | 2010 | 681 | $26,000 | $0.46 | $0.46 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,416,000 | N/A | N/A | Q-13 |
| | Infrastructure Improvements | 2011 | 0 | $13,847,000 | N/A | N/A | Q-190 |
| | Additional Lake Texoma (and WTP Expansion) | 2040 | 1,121 | $7,270,000 | $1.90 | $0.70 | Q-15 |
| Grayson County Other | Conservation | 2010 | 168 | 0 | 0 | 0 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $31,620,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2010 | 1,760 | See GTUA in Section 4E. | | | |
| Gunter | Conservation | 2010 | 68 | $5,000 | $0.12 | $0.12 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,475,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 820 | See GTUA in Section 4E. | | | |
| Howe | Conservation | 2010 | 91 | $5,000 | $0.11 | $0.11 | Q-10 & Q-11 |
| | Additional Collin-Grayson Municipal Alliance | 2020 | 862 | See GTUA in Section 4E. | | | |
| | Supplemental wells | 2010 | 0 | $2,286,000 | N/A | N/A | Q-13 |
| Luella WSC | Conservation | 2010 | 43 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $4,214,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 220 | See GTUA in Section 4E. | | | |

(Table 4F.197, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Marilee SUD* | Conservation | See Collin County. | | | | | |
| | Supplemental wells | See Collin County. | | | | | |
| | Grayson County WSP | 2020 | 997 | See GTUA in Section 4E. | | | |
| Pottsboro | Conservation | 2010 | 216 | $10,000 | $0.63 | $0.63 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,125,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 1,275 | See GTUA in Section 4E. | | | |
| Sherman | Conservation | 2010 | 1,968 | $33,000 | $0.56 | $0.56 | Q-10 & Q-11 |
| | Grayson County WSP | 2020 | 19,618 | See GTUA in Section 4E. | | | |
| South Grayson WSC* | Conservation | 2010 | 60 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $7,575,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2040 | 300 | See GTUA in Section 4E. | | | |
| | Collin-Grayson Municipal Alliance (GTUA and NTMWD) | 2020 | 100 | See GTUA in Section 4E. | | | |
| Southmayd | Conservation | 2010 | 43 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,519,000 | N/A | N/A | Q-13 |
| | New well in Woodbine | 2020 | 60 | $366,000 | $2.11 | $0.73 | Q-191 |
| | Grayson County WSP | 2020 | 525 | See GTUA in Section 4E. | | | |
| Southwest Fannin County SUD* | Conservation | See Fannin County. | | | | | |
| | Supplemental wells | See Fannin County. | | | | | |
| | Fannin County WSP | 2010 | 859 | See NTMWD in Section 4E. | | | |
| Tioga | Conservation | 2010 | 90 | $24,000 | $0.63 | $0.63 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,830,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 500 | See GTUA in Section 4E. | | | |
| Tom Bean | Conservation | 2010 | 122 | $10,000 | $0.81 | $0.81 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,196,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 130 | See GTUA in Section 4E. | | | |

**(Table 4F.197, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Two Way SUD* | Conservation | 2010 | 109 | $5,000 | $0.10 | $0.10 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $7,387,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 800 | See GTUA in Section 4E. | | | |
| Van Alstyne | Conservation | 2010 | 348 | $5,000 | $0.57 | $0.57 | Q-10 & Q-11 |
| | Additional Collin-Grayson Municipal Alliance | 2020 | 1,460 | See GTUA in Section 4E. | | | |
| | Supplemental wells | 2010 | 0 | $4,422,000 | N/A | N/A | Q-13 |
| Whitesboro | Conservation | 2010 | 157 | $5,000 | $0.73 | $0.73 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,708,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 700 | See GTUA in Section 4E. | | | |
| Whitewright* | Conservation | 2010 | 130 | $5,000 | $0.63 | $0.63 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $6,181,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 900 | See GTUA in Section 4E. | | | |
| Woodbine WSC* | Conservation | See Fannin County. | | | | | |
| | Supplemental wells | See Fannin County. | | | | | |
| | Cooke County WSP | 2020 | 230 | See Gainesville in Section 4E. | | | |
| Grayson County Irrigation | Supplemental wells | 2010 | 0 | $10,032,000 | N/A | N/A | Q-13 |
| Grayson County Livestock | Supplemental wells | 2010 | 0 | $1,025,000 | N/A | N/A | Q-13 |
| Grayson County Manufacturing | Conservation | 2020 | 291 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $12,982,000 | N/A | N/A | Q-13 |
| | Grayson County WSP | 2020 | 6,117 | See GTUA in Section 4E. | | | |
| | Additional Denison supplies | 2010 | 315 | $0 | $2.07 | $2.07 | None |
| | Additional Collin-Grayson Municipal Alliance (through Howe) | 2020 | 48 | See GTUA in Section 4E. | | | |

(Table 4F.197, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Grayson County Mining | Supplemental wells | 2010 | 0 | $2,885,000 | N/A | N/A | Q-13 |
| Grayson County Steam Electric | Additional Lake Texoma (GTUA) | 2020 | 6,726 | See GTUA in Section 4E. | | | |

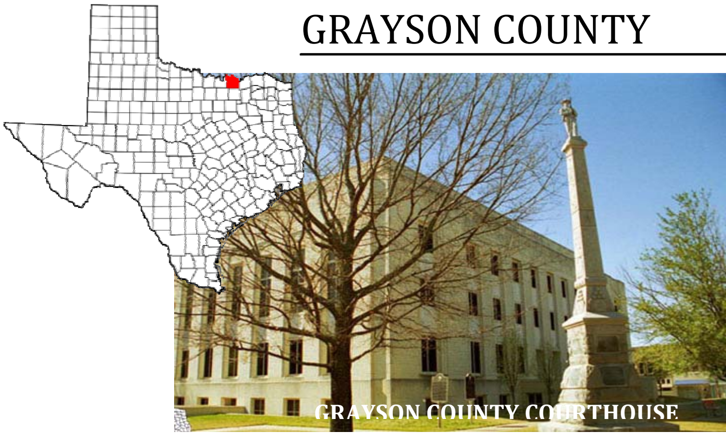
Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.198**
**Summary of Recommended Water Management Strategies for Grayson County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 4,698 | $143,000 |
| Purchase from WWP | 35,390 | 0 |
| Supplemental Wells | 0 | $108,901,000 |
| Additional Groundwater | 60 | $366,000 |
| Treatment Capacity | 1,121 | $7,270,000 |
| Water Transmission | 0 | $13,847,000 |
| **Total** | | **$130,527,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.




***2000 Population:*** *110,595*

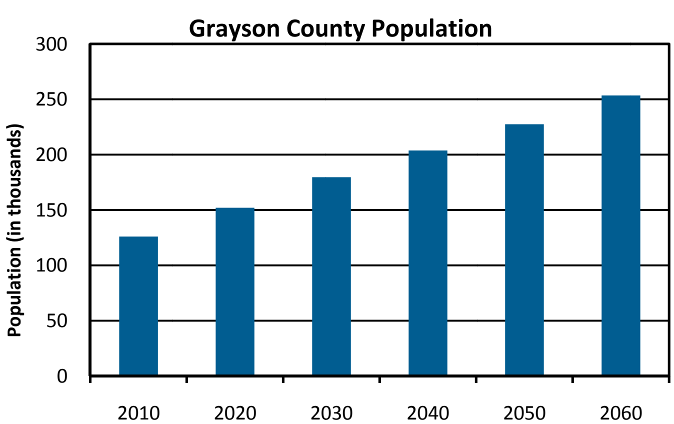
***Projected 2060 Population:*** *253,568*

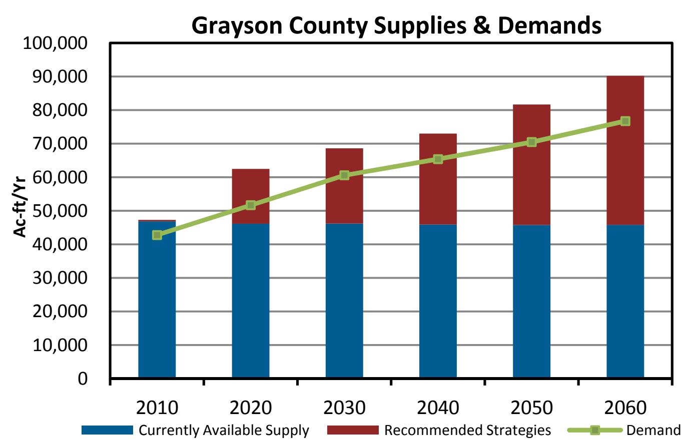
***County Seat:*** *Sherman*

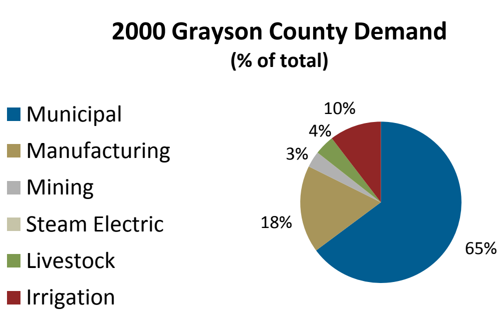
***Economy:*** *Manufacturing, distribution and trade; tourism; mineral production.*

***River Basin(s):***

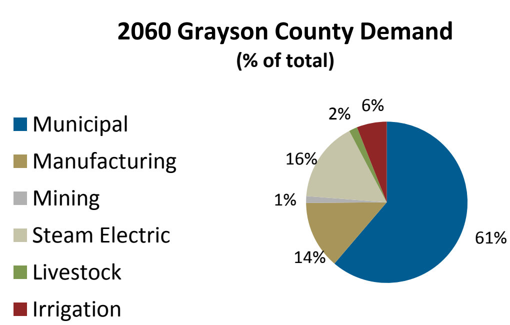
– Trinity (36%), Red (64%)


Total=32,478 acre-feet




Total= 76,742 acre-feet

| WATER USER GROUP | 2060 GRAYSON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Bells | 493 | Trinity and Woodbine Aquifers | Supplemental wells, Grayson County Water Supply Project |
| Collinsville | 899 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Denison | 6,875 | Trinity and Woodbine Aquifers, Randell Lake, Lake Texoma | Supplemental wells, Water treatment plant expansion and additional Lake Texoma, infrastructure improvements |
| Gunter | 1,149 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Howe | 588 | Woodbine Aquifer, Collin-Grayson Municipal Alliance (GTUA & NTMWD) | Supplemental wells, Additional Collin-Grayson Municipal Alliance |
| Luella WSC | 1,365 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Marilee SUD [a] | 672 | Trinity Aquifer, Grayson County Water Supply Project | Supplemental wells, Additional Grayson County Water Supply Project |
| Pottsboro | 1,976 | Woodbine Aquifer, Denison | Supplemental wells, Grayson County Water Supply Project |
| Sherman | 19,804 | Trinity and Woodbine Aquifers, Lake Texoma (GTUA) | Supplemental wells, Grayson County Water Supply Project |
| South Grayson WSC [a] | 672 | Trinity and Woodbine Aquifers | Supplemental wells, Grayson County Water Supply Project, Collin-Grayson Municipal Alliance (GTUA & NTMWD) |
| Southmayd | 703 | Trinity Aquifer, Monarch Water Company (Woodbine Aquifer) | Supplemental wells, Woodbine Aquifer, Grayson County Water Supply Project |
| Southwest Fannin County SUD [a] | 46 | Woodbine Aquifer | Supplemental wells, Fannin County Water Supply Project |
| Tioga | 757 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Tom Bean | 448 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Two Way SUD [a] | 1,497 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Van Alstyne | 3,549 | Trinity and Woodbine Aquifers, Collin-Grayson Municipal Alliance (GTUA & NTMWD) | Supplemental wells, Additional Collin-Grayson Municipal Alliance |
| Whitesboro | 1,635 | Trinity Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Whitewright [a] | 1,411 | Woodbine Aquifer | Supplemental wells, Grayson County Water Supply Project |
| Woodbine WSC [a] | 13 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project |
| County-Other | 2,461 | Other, Trinity, and Woodbine Aquifers, Sherman, Denison, Red River Authority | Supplemental wells, Grayson County Water Supply Project |

| WATER USER GROUP | 2060 GRAYSON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES (B) |
|---|---|---|---|
| Irrigation | 4,616 | Woodbine Aquifer, Local supplies, Lake Texoma | Supplemental wells |
| Livestock | 1,297 | Woodbine Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 10,444 | Woodbine Aquifer, Local supplies, Sherman, Howe (Collin-Grayson Municipal Alliance – GTUA & NTMWD), Denison | Supplemental wells, Grayson County Water Supply Project, Additional Howe, Additional Dension |
| Mining | 1,046 | Trinity and Woodbine Aquifers | Supplemental wells |
| Steam Electric Power | 12,326 | Sherman [GTUA (Lake Texoma)] | Additional Lake Texoma (GTUA) |

(a) WUG is in multiple counties

(b) Water conservation is a strategy for every municipal user group.

### *4F.9 Henderson County*

Figure 4F.9 is a map of Henderson County. The part of Henderson County in the Trinity Basin (the western part of the county) is in Region C, and the part in the Neches Basin is in the East Texas Region (Region I). There are four wholesale water providers that supply significant amounts of water in the Region C part of Henderson County:

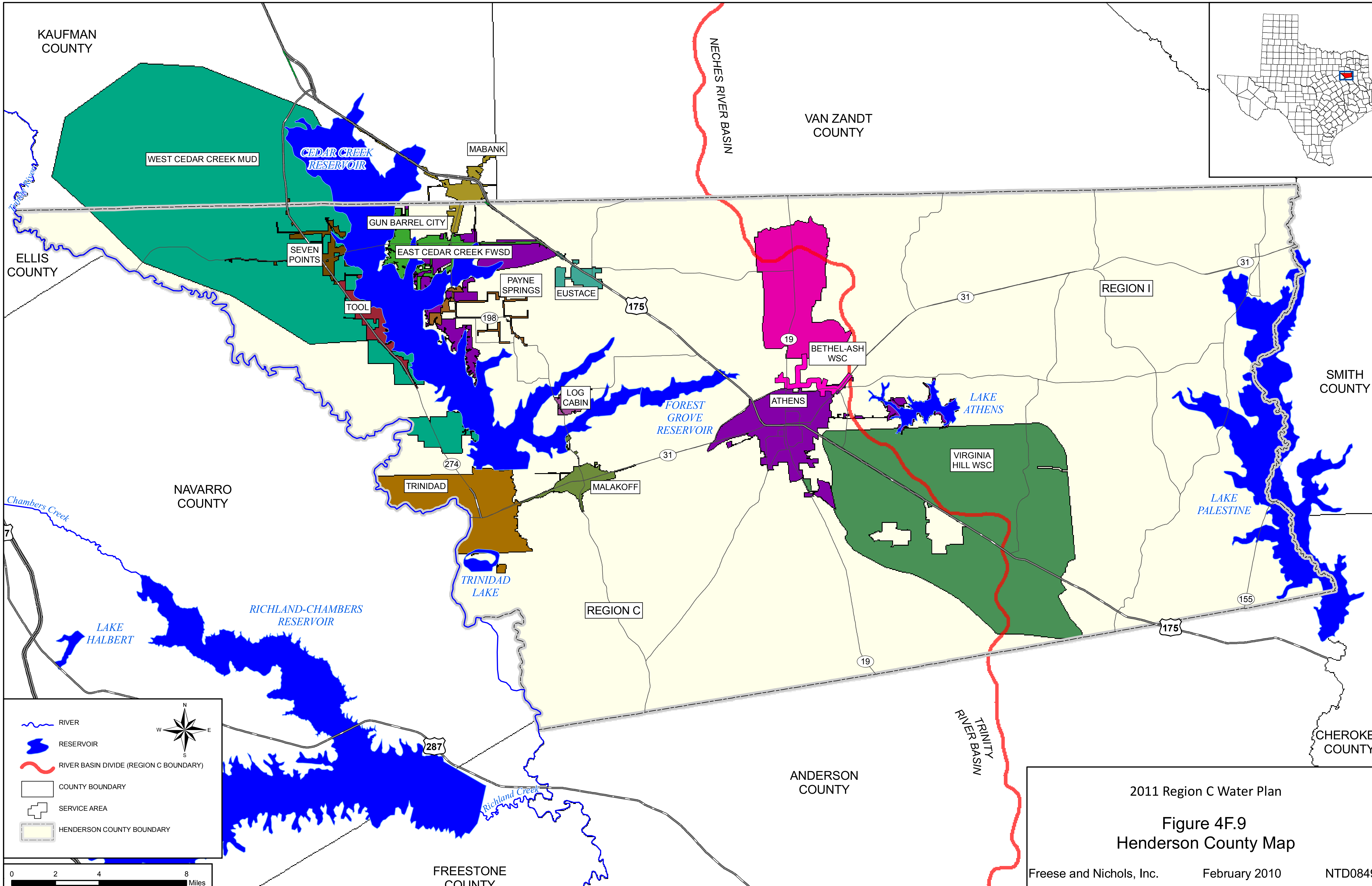
- Athens MWA provides treated water from Lake Athens to the City of Athens, which is located in Region C and Region I. Athens MWA also provides water for the Fish Hatchery in Region I (Henderson County Irrigation in the East Texas Region).
- East Cedar Creek Fresh Water Supply District provides retail service in western Henderson County, including a significant part of Gun Barrel City.
- West Cedar Creek Municipal Water District supplies retail service in western Henderson County and provides water to Seven Points and Tool.
- Tarrant Regional Water District (TRWD) provides raw water from Cedar Creek Lake to East Cedar Creek FWSD, West Cedar Creek MUD and other Henderson County water user groups.

A number of water user groups rely on the Carrizo-Wilcox and other aquifers and will continue to do so in the future. Water user groups that will obtain additional water from sources other than the wholesale water providers include the following:

- Bethel-Ash WSC is partially located in Region C, the Northeast Texas Region (Region D), and the East Texas Region (Region I). The Northeast Texas and East Texas Region plans address the needs of the portion of Bethel-Ash WSC that falls in those regions.

- Eustace, Log Cabin, Payne Springs, and Virginia Hill WSC will use additional water from the Carrizo-Wilcox aquifer.

Water management strategies for Henderson County water user groups are discussed below. Table 4F.216 on page 4F.275 shows the estimated capital costs for the Henderson County water management strategies not associated with the wholesale water providers, and Table 4F.217 on page 4F.277 is a summary of the costs by category. Table 4F.277 is followed by a Henderson County summary.


KAUFMAN COUNTY
WEST CEDAR CREEK MUD
CEDAR CREEK RESERVOIR
MABANK
GUN BARREL CITY
SEVEN POINTS
EAST CEDAR CREEK FWSD
PAYNE SPRINGS
EUSTACE
TOOL
ELLIS COUNTY
NECHES RIVER BASIN
VAN ZANDT COUNTY
REGION I
BETHEL-ASH WSC
LOG CABIN
FOREST GROVE RESERVOIR
ATHENS
LAKE ATHENS
SMITH COUNTY
VIRGINIA HILL WSC
MALAKOFF
TRINIDAD
NAVARRO COUNTY
Chambers Creek
LAKE PALESTINE
TRINIDAD LAKE
REGION C
RICHLAND-CHAMBERS RESERVOIR
LAKE HALBERT
RIVER
RESERVOIR
RIVER BASIN DIVIDE (REGION C BOUNDARY)
COUNTY BOUNDARY
SERVICE AREA
HENDERSON COUNTY BOUNDARY
Richland Creek
ANDERSON COUNTY
TRINITY RIVER BASIN
CHEROKEE COUNTY
FREESTONE COUNTY
0 2 4 8 Miles
2011 Region C Water Plan
Figure 4F.9
Henderson County Map
Freese and Nichols, Inc.
February 2010
NTD08492

## Athens

The City of Athens is located in central Henderson County, and its population of about 13,600 is divided between the Trinity River Basin (Region C) and the Neches River Basin (the East Texas Region). Athens purchases treated water from the Athens Municipal Water Authority (a wholesale water provider that treats water from Lake Athens) and uses groundwater from the Woodbine aquifer. Water management strategies for Athens include conservation, additional water from Athens MWA (from new wells in the Carrizo-Wilcox aquifer and other sources), and supplemental wells to replace existing wells. Table 4F.199 shows the projected population and demand, the current supplies, and the water management strategies for Athens. Plans for Athens MWA, which provides most of Athens' water supply, are discussed on page 4E.63 of Section E.

**Table 4F.199**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Athens (Total of Region C and Region I)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **13,588** | **16,343** | **19,657** | **23,643** | **28,438** | **34,204** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,770 | 3,276 | 3,875 | 4,555 | 5,447 | 6,552 |
| Henderson County Manufacturing | 99 | 106 | 120 | 136 | 155 | 176 |
| ***Total Projected Demand*** | ***2,869*** | ***3,382*** | ***3,995*** | ***4,691*** | ***5,602*** | ***6,728*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 685 | 685 | 685 | 685 | 685 | 685 |
| Athens Municipal Water Authority | 1,626 | 1,762 | 1,891 | 2,005 | 2,122 | 2,229 |
| ***Total Current Supplies*** | ***2,311*** | ***2,447*** | ***2,576*** | ***2,690*** | ***2,807*** | ***2,914*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***558*** | ***935*** | ***1,419*** | ***2,001*** | ***2,795*** | ***3,814*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 46 | 209 | 344 | 452 | 589 | 761 |
| Additional Water from Athens MWA | 512 | 726 | 1,075 | 1,549 | 2,206 | 3,053 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***558*** | ***935*** | ***1,419*** | ***2,001*** | ***2,795*** | ***3,814*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Bethel-Ash WSC

Bethel-Ash WSC provides water for about 5,600 people in Henderson County (Region C and the East Texas Region) and in Van Zandt County (the Northeast Texas Region). Table 4F.200 shows the projected population and demand, the current supplies, and the water management strategies for Bethel-Ash WSC in Region C. The current supply for the WSC is the Carrizo-Wilcox aquifer, and water management strategies include conservation and supplemental wells to replace existing wells.

**Table 4F.200**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Bethel-Ash WSC (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Region C Population** | **2,025** | **2,474** | **2,917** | **3,371** | **3,925** | **4,625** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 163 | 194 | 222 | 253 | 290 | 342 |
| ***Total Projected Region C Demand*** | ***163*** | ***194*** | ***222*** | ***253*** | ***290*** | ***342*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 480 | 480 | 480 | 480 | 480 | 480 |
| ***Total Current Supplies*** | ***480*** | ***480*** | ***480*** | ***480*** | ***480*** | ***480*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 13 | 18 | 22 | 27 | 33 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***13*** | ***18*** | ***22*** | ***27*** | ***33*** |
| **Reserve (Shortage)** | **321** | **299** | **276** | **249** | **217** | **171** |

## East Cedar Creek Fresh Water Supply District

East Cedar Creek FWSD supplies water to retail customers on the east side of Cedar Creek Lake in Henderson County, including retail customers in Gun Barrel City. The District is a wholesale water provider, and its plans are discussed on page 4E.73 in Section 4E.

## Eustace

Eustace is a city of about 900 people located in northern Henderson County. The city's current supply is groundwater from the Carrizo-Wilcox aquifer, and conservation and supplemental wells to replace existing wells are the only water management strategies. Table 4F.201 shows the projected population and demand, the current supplies, and the water management strategies for Eustace.

**Table 4F.201**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Eustace**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **865** | **865** | **865** | **865** | **865** | **865** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 146 | 143 | 140 | 138 | 137 | 137 |
| ***Total Projected Demand*** | ***146*** | ***143*** | ***140*** | ***138*** | ***137*** | ***137*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 152 | 152 | 152 | 152 | 152 | 152 |
| ***Total Current Supplies*** | ***152*** | ***152*** | ***152*** | ***152*** | ***152*** | ***152*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 5 | 7 | 7 | 8 | 8 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***5*** | ***7*** | ***7*** | ***8*** | ***8*** |
| **Reserve (Shortage)** | **8** | **14** | **19** | **21** | **23** | **23** |

## Gun Barrel City

Gun Barrel City is located on the east shore of Cedar Creek Lake, in northern Henderson County, and has a population of about 6,100. Mabank and East Cedar Creek FWSD have historically provided retail water service in Gun Barrel City, both using raw water provided by TRWD. Mabank plans to stop providing water to Gun Barrel City, and both East Cedar Creek FWSD and Gun Barrel City itself are seeking to take over Mabank's meters in the city. The issue will be decided by the Texas Commission on Environmental Quality. For this plan, we are including supplies for the city from Gun Barrel City and East Cedar Creek FWSD, so that either approach can be implemented.  If Gun Barrel City supplies a part of its own water, it will purchase raw water from TRWD and construct a water treatment plant. Table 4F.202 shows the projected population and demand, the current supplies, and the water management strategies for Gun Barrel City.

**Table 4F.202**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Gun Barrel City**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population (In City Only)** | **6,131** | **7,201** | **8,256** | **9,338** | **10,658** | **12,324** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,408 | 1,629 | 1,840 | 2,071 | 2,352 | 2,720 |
| ***Total Projected Demand*** | ***1,408*** | ***1,629*** | ***1,840*** | ***2,071*** | ***2,352*** | ***2,720*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Mabank (TRWD) | 704 | 0 | 0 | 0 | 0 | 0 |
| East Cedar Creek Freshwater Supply District (TRWD) | 693 | 896 | 861 | 839 | 834 | 841 |
| ***Total Current Supplies*** | ***1,397*** | ***896*** | ***861*** | ***839*** | ***834*** | ***841*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***11*** | ***733*** | ***979*** | ***1,232*** | ***1,518*** | ***1,879*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 11 | 72 | 105 | 136 | 174 | 224 |
| Additional East Cedar Creek FWSD | 0 | 23 | 139 | 269 | 404 | 568 |
| TRWD and Water Treatment Plant | 0 | 638 | 735 | 827 | 940 | 1,087 |
| ***Total Water Management Strategies*** | ***11*** | ***733*** | ***979*** | ***1,232*** | ***1,518*** | ***1,879*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Henderson County Irrigation (Region C Only)

Table 4F.203 shows the projected demand, the current supplies, and the water management strategies for Henderson County Irrigation in Region C.  As shown in Table 4F.203, there is no projected demand for irrigation in Henderson County, but there is supply available from local supplies, groundwater (Carrizo-Wilcox aquifer), and direct reuse. Supplemental wells to replace existing wells are the only water management strategies for this water user group.

**Table 4F.203**
**Projected Demand, Current Supplies, and Water Management Strategies for Henderson County Irrigation (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand in Region C** | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 25 | 25 | 25 | 25 | 25 | 25 |
| Direct reuse | 32 | 32 | 32 | 32 | 32 | 32 |
| Local supplies | 415 | 415 | 415 | 415 | 415 | 415 |
| ***Total Current Supplies*** | ***472*** | ***472*** | ***472*** | ***472*** | ***472*** | ***472*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **472** | **472** | **472** | **472** | **472** | **472** |

## Henderson County Livestock (Region C Only)

Table 4F.204 shows the projected demand, current supplies, and water management strategies for Henderson County Livestock. The current supplies are local surface water supplies and groundwater (Carrizo-Wilcox, Queen City, and other aquifers). These sources are sufficient to meet projected demands, and supplemental wells are the only water management strategy.

**Table 4F.204**
**Projected Demand, Current Supplies, and Water Management Strategies for Henderson County Livestock (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand in Region C** | **854** | **854** | **854** | **854** | **854** | **854** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |

**Table 4F.204, Continued**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Carrizo-Wilcox Aquifer | 518 | 518 | 518 | 518 | 518 | 518 |
| Other Aquifer | 126 | 126 | 126 | 126 | 126 | 126 |
| Queen City Aquifer | 43 | 43 | 43 | 43 | 43 | 43 |
| Local Supplies | 341 | 341 | 341 | 341 | 341 | 341 |
| ***Total Current Supplies*** | ***1,028*** | ***1,028*** | ***1,028*** | ***1,028*** | ***1,028*** | ***1,028*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **174** | **174** | **174** | **174** | **174** | **174** |

## Henderson County Manufacturing (Region C Only)

Table 4F.205 shows the projected demand, the current supplies, and the water management strategies for Henderson County Manufacturing. Current supplies include groundwater (Carrizo-Wilcox aquifer) and water from Athens (from groundwater and from Lake Athens via Athens MWA). Water conservation, additional supplies from Athens, and supplemental wells to replace existing wells are the water management strategies for this water user group.

**Table 4F.205**
**Projected Demand, Current Supplies, and Water Management Strategies for Henderson County Manufacturing (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand in Region C** | **110** | **118** | **133** | **151** | **172** | **195** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 408 | 408 | 408 | 408 | 408 | 408 |
| Athens (Athens MWA and Groundwater) | 99 | 72 | 71 | 70 | 69 | 67 |
| ***Total Current Supplies*** | ***507*** | ***480*** | ***479*** | ***478*** | ***477*** | ***475*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |

**(Table 4F.205, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 0 | 3 | 4 | 5 | 5 |
| Additional Water from Athens (Athens MWA) | 0 | 34 | 49 | 66 | 86 | 109 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***34*** | ***52*** | ***70*** | ***91*** | ***114*** |
| **Reserve (Shortage)** | **397** | **396** | **398** | **397** | **396** | **394** |

## Henderson County Mining (Region C Only)

Table 4F.206 shows the projected demand, the current supplies, and the water management strategies for Henderson County Mining. The current supply is from TRWD and groundwater (Carrizo-Wilcox aquifer). The only water management strategy for this water user group is supplemental wells.

**Table 4F.206**
**Projected Demand, Current Supplies, and Water Management Strategies for Henderson County Mining (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand in Region C** | **265** | **302** | **327** | **352** | **378** | **399** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 439 | 439 | 439 | 439 | 439 | 439 |
| Tarrant Regional Water District | 79 | 83 | 76 | 72 | 67 | 62 |
| ***Total Current Supplies*** | ***518*** | ***522*** | ***515*** | ***511*** | ***506*** | ***501*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **253** | **220** | **188** | **159** | **128** | **102** |

## Henderson County Other (Region C Only)

Henderson County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Henderson County Other in Region C supply about 1,300 people and receive their water supply from TRWD and groundwater (Carrizo-Wilcox and other aquifers). Water management strategies for these entities include conservation and supplemental wells to replace existing water wells. Table 4F.207 shows the projected population and demand, the current supplies, and the water management strategies for Henderson County Other.

**Table 4F.207**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Henderson County Other (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population in Region C** | **1,328** | **1,327** | **1,326** | **1,326** | **1,325** | **1,324** |
| **Projected Water Demand in Region C** | | | | | | |
| Municipal Demand | 262 | 257 | 253 | 248 | 246 | 246 |
| ***Total Projected Water Demand*** | ***262*** | ***257*** | ***253*** | ***248*** | ***246*** | ***246*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 290 | 290 | 290 | 290 | 290 | 290 |
| Other Aquifer | 41 | 41 | 41 | 41 | 41 | 41 |
| Tarrant Regional Water District | 78 | 71 | 59 | 50 | 44 | 38 |
| ***Total Current Supplies*** | ***409*** | ***402*** | ***390*** | ***381*** | ***375*** | ***369*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 7 | 9 | 10 | 11 | 12 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***7*** | ***9*** | ***10*** | ***11*** | ***12*** |
| **Reserve (Shortage)** | **149** | **152** | **146** | **143** | **140** | **135** |

## Henderson County Steam Electric Power (Region C Only)

Table 4F.208 shows the projected demand, the current supplies, and the water management strategies for Henderson County Steam Electric Power. The current supply for this water user group is Lake Trinidad. The water management strategy is water from TRWD (Cedar Creek Lake).

**Table 4F.208**
**Projected Demand, Current Supplies, and Water Management Strategies for Henderson County Steam Electric Power (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand in Region C** | **460** | **427** | **7,000** | **8,000** | **9,000** | **10,000** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Lake Trinidad | 3,050 | 3,050 | 3,050 | 3,050 | 3,050 | 3,050 |
| ***Total Current Supplies*** | ***3,050*** | ***3,050*** | ***3,050*** | ***3,050*** | ***3,050*** | ***3,050*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***3,950*** | ***4,950*** | ***5,950*** | ***6,950*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Tarrant Regional Water District | 0 | 0 | 3,950 | 4,950 | 5,950 | 6,950 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***3,950*** | ***4,950*** | ***5,950*** | ***6,950*** |
| **Reserve (Shortage)** | **2,590** | **2,623** | **0** | **0** | **0** | **0** |

## Log Cabin

Log Cabin is a community of about 900 people located in western Henderson County. The city's current water supply is groundwater from the Carrizo-Wilcox aquifer, and the only water management strategies are conservation and supplemental wells to replace existing wells. Table 4F.209 shows the projected population and demand, the current supplies, and the water management strategies for Log Cabin.

**Table 4F.209**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Log Cabin**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **883** | **1,046** | **1,200** | **1,200** | **1,200** | **1,200** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 96 | 128 | 144 | 142 | 141 | 141 |
| ***Total Projected Demand*** | ***96*** | ***128*** | ***144*** | ***142*** | ***141*** | ***141*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 275 | 275 | 275 | 275 | 275 | 275 |
| ***Total Current Supplies*** | ***275*** | ***275*** | ***275*** | ***275*** | ***275*** | ***275*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 6 | 8 | 9 | 8 | 10 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***6*** | ***8*** | ***9*** | ***8*** | ***10*** |
| **Reserve (Shortage)** | **181** | **153** | **139** | **142** | **142** | **144** |

## Mabank

Mabank has a population of about 3,100 and is located in southeastern Kaufman County and northern Henderson County. Projected demands and water management strategies for Mabank are discussed on page 4F.309 under Kaufman County.

## Malakoff

Malakoff is a city of about 2,400 people located in western Henderson County. The city gets its water supply from the Carrizo-Wilcox aquifer and from purchasing raw water from TRWD. These sources are sufficient to meet projected demands, and the only water management strategies are conservation and supplemental wells to replace existing wells. Table 4F.210 shows the projected population and demand, the current supplies, and the water management strategies for Malakoff.

**Table 4F.210**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Malakoff**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,390** | **2,535** | **2,678** | **2,824** | **3,003** | **3,228** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 348 | 361 | 372 | 383 | 404 | 434 |
| ***Total Projected Demand*** | ***348*** | ***361*** | ***372*** | ***383*** | ***404*** | ***434*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 410 | 410 | 410 | 410 | 410 | 410 |
| Tarrant Regional Water District | 171 | 165 | 145 | 129 | 119 | 112 |
| ***Total Current Supplies*** | ***581*** | ***575*** | ***555*** | ***539*** | ***529*** | ***522*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 11 | 15 | 17 | 20 | 22 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***11*** | ***15*** | ***17*** | ***20*** | ***22*** |
| **Reserve (Shortage)** | **236** | **225** | **198** | **173** | **145** | **110** |

## Payne Springs

Payne Springs has a population of about 700 and is located in northern Henderson County. The city gets its water supply from the Carrizo-Wilcox aquifer. The water management strategies for Payne Springs are conservation, additional wells in the Carrizo-Wilcox aquifer, and supplemental wells to replace existing wells. Table 4F.211 shows the projected population and demand, the current supplies, and the water management strategies for Payne Springs.

**Table 4F.211**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Payne Springs**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **730** | **781** | **831** | **882** | **945** | **1,024** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 165 | 174 | 182 | 191 | 203 | 220 |
| ***Total Projected Demand*** | ***165*** | ***174*** | ***182*** | ***191*** | ***203*** | ***220*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 96 | 96 | 96 | 96 | 96 | 96 |
| ***Total Current Supplies*** | ***96*** | ***96*** | ***96*** | ***96*** | ***96*** | ***96*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***69*** | ***78*** | ***86*** | ***95*** | ***107*** | ***124*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 11 | 14 | 17 | 20 | 23 |
| Carrizo-Wilcox Aquifer (new wells) | 154 | 154 | 154 | 154 | 154 | 154 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***161*** | ***165*** | ***168*** | ***171*** | ***174*** | ***177*** |
| **Reserve (Shortage)** | **92** | **87** | **82** | **76** | **67** | **53** |

## Seven Points

Seven Points is a city in northwestern Henderson County, with a population of about 1,400. The water supply for the city is West Cedar Creek MUD, which treats raw water supplied by TRWD from Cedar Creek Lake. The water management strategies for Seven Points are conservation and additional water from West Cedar Creek MUD. Table 4F.212 shows the projected population and demand, the current supplies, and the water management strategies for Seven Points.

**Table 4F.212**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Seven Points**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,402** | **1,681** | **1,956** | **2,238** | **2,582** | **3,016** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 188 | 222 | 254 | 288 | 330 | 385 |
| ***Total Projected Demand*** | ***188*** | ***222*** | ***254*** | ***288*** | ***330*** | ***385*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| West Cedar Creek Municipal Utility District (TRWD) | 186 | 204 | 198 | 194 | 195 | 198 |
| ***Total Current Supplies*** | ***186*** | ***204*** | ***198*** | ***194*** | ***195*** | ***198*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***18*** | ***56*** | ***94*** | ***135*** | ***187*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 8 | 12 | 15 | 18 | 23 |
| Additional Water from WCCMUD | 0 | 10 | 44 | 79 | 117 | 164 |
| ***Total Water Management Strategies*** | ***2*** | ***18*** | ***56*** | ***94*** | ***135*** | ***187*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Tool

Tool is a city of about 2,600 people in northwestern Henderson County. The water supply for the city is West Cedar Creek MUD, which treats raw water supplied by TRWD from Cedar Creek Lake. The water management strategies for Tool are conservation and additional water from West Cedar Creek MUD. Table 4F.213 shows the projected population and demand, the current supplies, and the water management strategies for Tool.

**Table 4F.213**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Tool**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,618** | **2,990** | **3,357** | **3,733** | **4,192** | **4,771** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 405 | 452 | 500 | 548 | 610 | 695 |
| ***Total Projected Demand*** | ***405*** | ***452*** | ***500*** | ***548*** | ***610*** | ***695*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| West Cedar Creek Municipal Utility District (TRWD) | 401 | 415 | 390 | 370 | 360 | 358 |
| ***Total Current Supplies*** | ***401*** | ***415*** | ***390*** | ***370*** | ***360*** | ***358*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***4*** | ***37*** | ***110*** | ***178*** | ***250*** | ***337*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 15 | 21 | 26 | 31 | 38 |
| Additional Water from WCCMUD | 0 | 22 | 89 | 152 | 219 | 299 |
| ***Total Water Management Strategies*** | ***4*** | ***37*** | ***110*** | ***178*** | ***250*** | ***337*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Trinidad

Trinidad is a city of about 1,100 located in western Henderson County. The city gets its water supply from Trinidad City Lake, which is adequate to meet projected demands. The only water management strategy for Trinidad is conservation, and Table 4F.214 shows the projected population and demand, the current supplies, and the water management strategies for the city.

**Table 4F.214**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Trinidad**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,112** | **1,135** | **1,158** | **1,181** | **1,210** | **1,246** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 183 | 183 | 183 | 181 | 184 | 190 |
| ***Total Projected Demand*** | ***183*** | ***183*** | ***183*** | ***181*** | ***184*** | ***190*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinidad City Lake | 450 | 450 | 450 | 450 | 450 | 450 |
| ***Total Current Supplies*** | ***450*** | ***450*** | ***450*** | ***450*** | ***450*** | ***450*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 6 | 8 | 9 | 10 | 11 |
| ***Total Water Management Strategies*** | ***2*** | ***6*** | ***8*** | ***9*** | ***10*** | ***11*** |
| **Reserve (Shortage)** | **269** | **273** | **275** | **278** | **276** | **271** |

## Virginia Hill Water Supply Corporation

Virginia Hill WSC serves about 3,100 people in southern Henderson County. The WSC gets its water supply from the Carrizo-Wilcox aquifer, and the supply is sufficient to meet the projected demand. The water management strategies for Virginia Hill WSC are conservation and supplemental wells to replace existing wells. Table 4F.215 shows the projected population and demand, the current supplies, and the water management strategies for Virginia Hill WSC.

**Table 4F.215**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Virginia Hill Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,131** | **3,146** | **3,161** | **3,176** | **3,195** | **3,219** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 393 | 384 | 375 | 366 | 361 | 364 |

**(Table 4F.215, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| ***Total Projected Demand*** | ***393*** | ***384*** | ***375*** | ***366*** | ***361*** | ***364*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 443 | 443 | 443 | 443 | 443 | 443 |
| ***Total Current Supplies*** | ***443*** | ***443*** | ***443*** | ***443*** | ***443*** | ***443*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 14 | 20 | 21 | 22 | 24 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***14*** | ***20*** | ***21*** | ***22*** | ***24*** |
| **Reserve (Shortage)** | **54** | **73** | **88** | **98** | **104** | **103** |

## West Cedar Creek Municipal Utility District

West Cedar Creek MUD supplies water to about 21,000 people in northwestern Henderson County and northwestern Kaufman County, including retail customers in Seven Points and Tool. The District is a wholesale water provider, and its plans are discussed on page 4E.111 in Section 4E.

## Costs for Henderson County Water User Groups (Region C Only)

Table 4F.216 shows the estimated capital costs for Region C Henderson County water management strategies not covered under the wholesale water providers. Table 4F.217 summarizes the costs by category and is followed by a summary for Region C in Henderson County. Costs for the part of Henderson County in the Neches Basin are covered in the East Texas Region (Region I) regional water plan.

**Table 4F.216**
**Costs for Recommended Water Management Strategies for Henderson County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Athens* | Conservation | 2010 | 761 | $31,000 | $0.49 | $0.49 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,959,000 | N/A | N/A | Q-13 |
| | Additional Athens MWA | 2020 | 3,247 | $0 | $2.50 | $2.50 | None |
| Bethel-Ash WSC* | Conservation | 2010 | 33 | $5,000 | $0.15 | $0.15 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,712,000 | N/A | N/A | Q-13 |
| East Cedar Creek FWSD | Conservation | 2010 | 292 | See East Cedar Creek FWSD in Section 4E. | | | |
| | Additional TRWD | 2010 | 1,054 | See East Cedar Creek FWSD in Section 4E. | | | |
| | Water Treatment Plant Expansions | 2020 | 0 | See East Cedar Creek FWSD in Section 4E. | | | |
| Eustace | Conservation | 2010 | 8 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,035,000 | N/A | N/A | Q-13 |
| Gun Barrel City | Conservation | 2010 | 224 | $0 | $0.45 | $0.45 | Q-10 & Q-11 |
| | TRWD | 2020 | 1,087 | $0 | $0.69 | $0.69 | None |
| | Water Treatment Plant | 2020 | 0 | $11,576,000 | $3.01 | $0.70 | Q-14 |
| | Additional East CC FWSD | 2020 | 568 | $0 | $2.50 | $2.50 | None |
| Henderson County Other (Region C only) | Conservation | 2010 | 12 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $404,000 | N/A | N/A | Q-13 |
| Log Cabin | Conservation | 2010 | 10 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,400,000 | N/A | N/A | Q-13 |
| Mabank* | Conservation | See Kaufman County. | | | | | |
| | Additional TRWD | See Kaufman County. | | | | | |
| Malakoff | Conservation | 2010 | 22 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,512,000 | N/A | N/A | Q-13 |

(Table 4F.216, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Payne Springs | Conservation | 2010 | 23 | $5,000 | $0.60 | $0.60 | Q-10 & Q-11 |
| | New wells | 2010 | 154 | $378,000 | $1.14 | $0.60 | Q-256 |
| | Supplemental wells | 2020 | 0 | $688,000 | N/A | N/A | Q-13 |
| Seven Points | Conservation | 2010 | 23 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional West CC MUD | 2010 | 164 | $0 | $2.50 | $2.50 | None |
| Tool | Conservation | 2010 | 38 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional West CC MUD | 202 | 299 | $0 | $2.50 | $2.50 | None |
| Trinidad | Conservation | 2010 | 11 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Virginia Hill WSC | Conservation | 2010 | 24 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,096,000 | N/A | N/A | Q-13 |
| West Cedar Creek MUD* | Conservation | 2010 | 429 | See West Cedar Creek MUD in Section 4E. | | | |
| | Additional TRWD | 2010 | 3,790 | See West Cedar Creek MUD in Section 4E. | | | |
| | Water Treatment Plant Expansions | 2030 | 5,600 | See West Cedar Creek MUD in Section 4E. | | | |
| Henderson County Irrigation (Region C only) | Supplemental wells | 2010 | 0 | $56,000 | N/A | N/A | Q-13 |
| Henderson County Livestock (Region C only) | Supplemental wells | 2010 | 0 | $56,000 | N/A | N/A | Q-13 |
| Henderson County Manufacturing (Region C only) | Conservation | 2030 | 5 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $315,000 | N/A | N/A | Q-13 |
| | Additional from Athens | 2020 | 109 | $0 | $2.50 | $2.50 | none |
| Henderson County Mining (Region C only) | Supplemental wells | 2010 | 0 | $82,000 | N/A | N/A | Q-13 |

(Table 4F.216, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Henderson County Steam Electric (Region C only) | TRWD (Cedar Creek Lake) | 2030 | 6,950 | $14,103,000 | $1.42 | $0.95 | Q-196 |

Notes: Water User Groups marked with an * extend into more than one county or into the Region I part of Henderson County.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.217**
**Summary of Recommended Water Management Strategies for Henderson County Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 1,724 | $41,000 |
| Purchase from WWP | 17,268 | $14,103,000 |
| Supplemental Wells | 0 | $14,315,000 |
| Treatment Capacity | 0 | $11,576,000 |
| Additional Groundwater | 0 | $378,000 |
| Water Transmission | 0 | $0 |
| **Total** | | **$40,413,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.


***2000 Population:** 51,984*

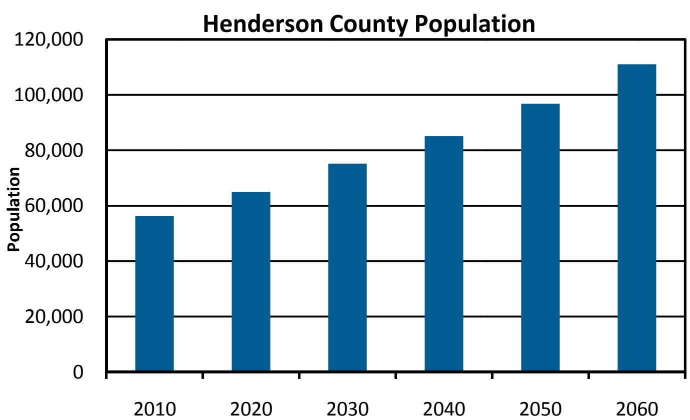
***Projected 2060 Population:** 111,026*

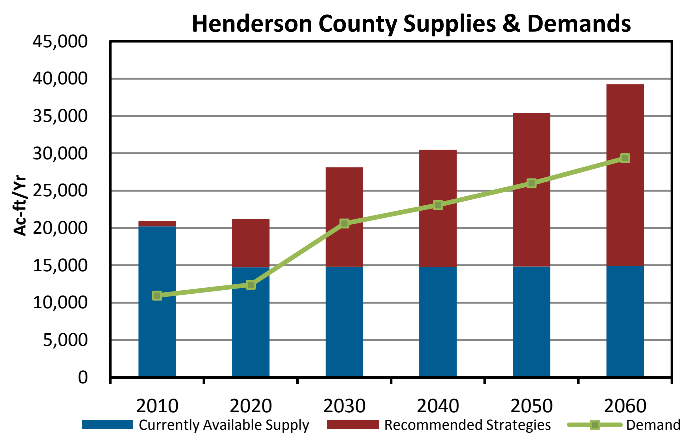
***County Seat:** Athens*

***Economy:** Agribusiness; manufacturing; minerals; tourism.*

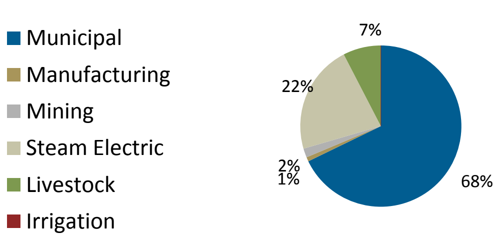
***River Basin(s):***

- Trinity (61%), Sabine (39%)

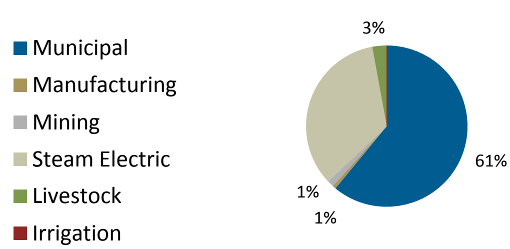




**2000 Henderson County Demand**
**(% of total)**




**Total=11,244 acre-feet**

**2060 Henderson County Demand**
**(% of total)**



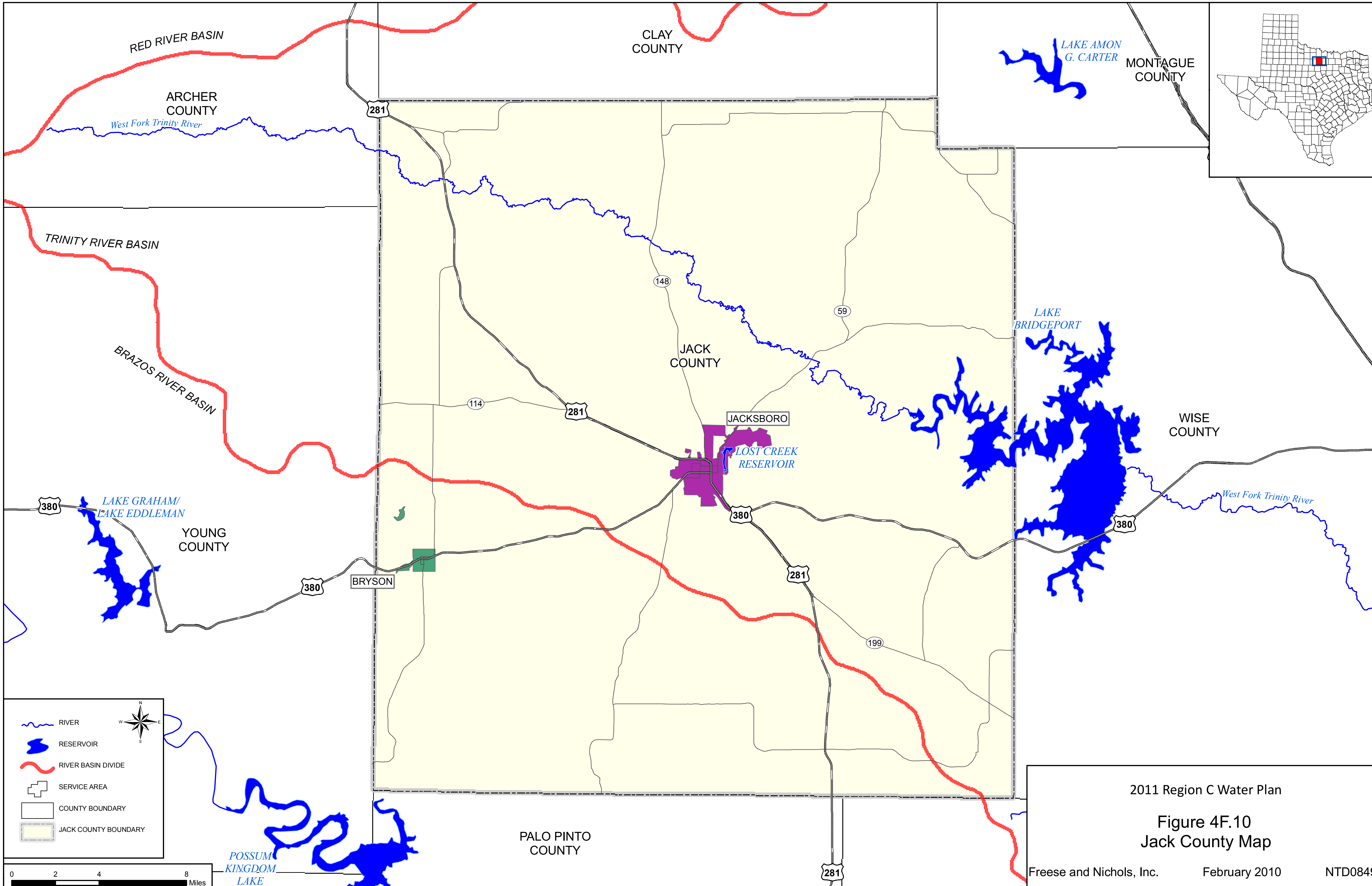

**Total= 29,342 acre-feet**

| WATER USER GROUP | 2060 HENDERSON CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGTIES [c] |
|---|---|---|---|
| Athens [a] | 6,306 | Carrizo-Wilcox Aquifer, Athens MWA (Lake Athens) | Supplemental wells, Additional Athens MWA supplies |
| Bethel-Ash WSC [a] | 342 | Carrizo-Wilcox Aquifer | Supplemental wells |
| East Cedar Creek FWSD | 2,777 | TRWD | Additional TRWD supplies, WTP expansions |
| Eustace | 137 | Carrizo-Wilcox Aquifer | Supplemental wells |
| Gun Barrel City | 2,720 | East Cedar Creek FWSD (TRWD), Mabank (TRWD) | Additional East Cedar Creek FWSD, TRWD supplies, Water Treatment Plant |
| Log Cabin | 141 | Carrizo-Wilcox Aquifer | Supplemental wells |
| Mabank [a] | 184 | TRWD sources | Additional TRWD supplies, WTP expansions |
| Malakoff | 434 | Carrizo-Wilcox Aquifer, TRWD | Supplemental wells |
| Payne Springs | 220 | Carrizo-Wilcox Aquifer | Supplemental wells, Additional Carrizo-Wilcox Aquifer |
| Seven Points | 385 | West Cedar Creek MUD (TRWD) | Additional West Cedar Creek MUD supplies |
| Tool | 695 | West Cedar Creek MUD (TRWD) | Additional West Cedar Creek MUD supplies |
| Trinidad | 190 | Trinidad City Lake | None |
| Virginia Hill WSC | 364 | Carrizo-Wilcox Aquifer | Supplemental wells |
| West Cedar Creek MUD [a] | 2,753 | TRWD | Additional TRWD supplies, Water Treatment Plant expansions |
| County-Other [b] | 246 | Carrizo-Wilcox Aquifer, Other Aquifer, TRWD | Supplemental wells |
| Irrigation [b] | 0 | Carrizo-Wilcox Aquifer, Direct reuse, Local supplies | Supplemental wells |
| Livestock [b] | 854 | Carrizo-Wilcox Aquifer, Other Aquifer, Queen City Aquifer, Local supplies | Supplemental wells |
| Manufacturing [b] | 195 | Carrizo-Wilcox Aquifer, Athens | Supplemental wells, Additional Athens supplies |
| Mining | 399 | Carrizo-Wilcox Aquifer, TRWD | Supplemental wells |
| Steam Electric Power [b] | 10,000 | Lake Trinidad | TRWD supplies |

[a] WUG is in multiple counties
[b] Region C only
[c] Water conservation is a strategy for every municipal user group.

### *4F.10  Jack County*

Figure 4F.10 is a map of Jack County.  Three of the eight water user groups in this county will need additional supplies during the planning period.  Water management strategies for Jack County water user groups are discussed on the following pages.  Table 4F.226 on page 4F.289 shows the estimated capital costs for the Jack County water management strategies not associated with the wholesale water providers, and Table 4F.227 on page 4F.290 is a summary of the costs by category.  Table 4F.227 is followed by a Jack County summary.


RED RIVER BASIN
CLAY COUNTY
LAKE AMON G. CARTER
MONTAGUE COUNTY
ARCHER COUNTY
West Fork Trinity River
TRINITY RIVER BASIN
BRAZOS RIVER BASIN
JACK COUNTY
JACKSBORO
LOST CREEK RESERVOIR
LAKE BRIDGEPORT
WISE COUNTY
LAKE GRAHAM/ LAKE EDDLEMAN
YOUNG COUNTY
BRYSON
PALO PINTO COUNTY
POSSUM KINGDOM LAKE
281
380
148
59
114
199
RIVER
RESERVOIR
RIVER BASIN DIVIDE
SERVICE AREA
COUNTY BOUNDARY
JACK COUNTY BOUNDARY
0 2 4 8 Miles
2011 Region C Water Plan
Figure 4F.10
Jack County Map
Freese and Nichols, Inc.
February 2010
NTD08492

## Bryson

Bryson is a city of about 540 people located in western Jack County. The current source of supply for Bryson is treated surface water from Graham, delivered through Fort Belknap WSC. The only water management strategy for Bryson is water conservation. Table 4F.218 shows the projected population and demand, the current supplies, and the water management strategies for Bryson.

**Table 4F.218**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Bryson**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **542** | **559** | **570** | **570** | **570** | **570** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 96 | 97 | 96 | 94 | 94 | 94 |
| ***Total Projected Demand*** | ***96*** | ***97*** | ***96*** | ***94*** | ***94*** | ***94*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Graham (through Fort Belknap WSC) | 93 | 91 | 88 | 86 | 85 | 85 |
| ***Total Current Supplies*** | ***93*** | ***91*** | ***88*** | ***86*** | ***85*** | ***85*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***3*** | ***6*** | ***8*** | ***8*** | ***9*** | ***9*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 6 | 8 | 8 | 9 | 9 |
| ***Total Water Management Strategies*** | ***3*** | ***6*** | ***8*** | ***8*** | ***9*** | ***9*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Jack County Irrigation

Table 4F.219 shows the projected demand, the current supplies, and the water management strategies for Jack County Irrigation. There is no projected demand for irrigation in Jack County, but there are available sources of supply, including local supplies, indirect reuse, direct reuse, and groundwater (other aquifer). Water management strategies include converting indirect reuse from irrigation to mining (which reduces the supply available for irrigation) and supplemental wells to replace existing wells.

**Table 4F.219**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Jack County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Other Aquifer | 25 | 25 | 25 | 25 | 25 | 25 |
| Indirect Reuse | 385 | 385 | 385 | 385 | 385 | 385 |
| Direct reuse | 27 | 27 | 26 | 26 | 25 | 25 |
| Local supplies | 110 | 110 | 110 | 110 | 110 | 110 |
| ***Total Current Supplies*** | ***547*** | ***547*** | ***546*** | ***546*** | ***545*** | ***545*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Jacksboro Indirect Reuse to Mining | -385 | -385 | -385 | -385 | -385 | -385 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***-385*** | ***-385*** | ***-385*** | ***-385*** | ***-385*** | ***-385*** |
| **Reserve (Shortage)** | **162** | **162** | **161** | **161** | **160** | **160** |

## Jack County Livestock

Table 4F.220 shows the projected demand, current supplies, and water management strategies for Jack County Livestock. The current supplies are local surface water supplies and groundwater (other aquifer). These sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.220**
**Projected Demand, Current Supplies, and Water**
**Management Strategies for Jack County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,025** | **1,025** | **1,025** | **1,025** | **1,025** | **1,025** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Other Aquifer | 135 | 135 | 135 | 135 | 135 | 135 |
| Local Supplies | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 |
| ***Total Current Supplies*** | ***1,800*** | ***1,800*** | ***1,800*** | ***1,800*** | ***1,800*** | ***1,800*** |

(Table 4F.220, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **775** | **775** | **775** | **775** | **775** | **775** |

## Jack County Manufacturing

Table 4F.221 shows the projected demand and current supplies for Jack County Manufacturing. Current supplies are treated water from Jacksboro (originating from the Lost Creek Reservoir/Lake Jacksboro system), and they are sufficient to meet projected demands. There are no water management strategies for this water user group.

**Table 4F.221**
**Projected Demand, Current Supplies, and Water Management Strategies for Jack County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **2** | **2** | **2** | **2** | **2** | **2** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Jacksboro (Lost Creek/Jacksboro system) | 2 | 2 | 2 | 2 | 2 | 2 |
| ***Total Current Supplies*** | ***2*** | ***2*** | ***2*** | ***2*** | ***2*** | ***2*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Jack County Mining

Table 4F.222 shows the projected demand, the current supplies, and the water management strategies for Jack County Mining. Jack County Mining is supplied from local supplies and groundwater (other aquifer). The water management strategies for this water user group are water from Jacksboro (from the Lost Creek Reservoir/Lake Jacksboro system), the conversion of Jacksboro's permitted indirect reuse from irrigation to mining, and supplemental wells.

**Table 4F.222**
**Projected Demand, Current Supplies, and Water Management Strategies for Jack County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **993** | **983** | **973** | **973** | **973** | **973** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Other Aquifer | 284 | 284 | 284 | 284 | 284 | 284 |
| Local Supplies | 370 | 370 | 370 | 370 | 370 | 370 |
| ***Total Current Supplies*** | ***654*** | ***654*** | ***654*** | ***654*** | ***654*** | ***654*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***339*** | ***329*** | ***319*** | ***319*** | ***319*** | ***319*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Jacksboro Indirect Reuse to Mining | 385 | 385 | 385 | 385 | 385 | 385 |
| Jacksboro (Lost Creek/Jacksboro system) | 11 | 11 | 11 | 11 | 11 | 11 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***396*** | ***396*** | ***396*** | ***396*** | ***396*** | ***396*** |
| **Reserve (Shortage)** | **57** | **67** | **77** | **77** | **77** | **77** |

## Jack County Other

Jack County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Jack County Other supply about 4,400 people and receive their water supply from Jacksboro (the Lost Creek Reservoir/Lake Jacksboro system) and groundwater (Trinity and other aquifers). Water management strategies for these entities include conservation, additional water from Jacksboro, and supplemental wells to replace existing water wells. Table 4F.223 shows the projected population and demand, the current supplies, and the water management strategies for Jack County Other.

**Table 4F.223**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Jack County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,375** | **4,918** | **5,448** | **5,948** | **6,448** | **6,948** |
| **Projected Water Demand in Region C** | | | | | | |
| Municipal Demand | 549 | 600 | 647 | 686 | 736 | 793 |
| ***Total Projected Water Demand*** | ***549*** | ***600*** | ***647*** | ***686*** | ***736*** | ***793*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Jacksboro (Lost Creek/Jacksboro system) | 5 | 5 | 5 | 5 | 5 | 5 |
| Other Aquifer | 415 | 415 | 415 | 415 | 415 | 415 |
| Trinity Aquifer | 100 | 100 | 100 | 100 | 100 | 100 |
| ***Total Current Supplies*** | ***520*** | ***520*** | ***520*** | ***520*** | ***520*** | ***520*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***29*** | ***80*** | ***127*** | ***166*** | ***216*** | ***273*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 23 | 33 | 39 | 44 | 50 |
| Additional Water from Jacksboro | 22 | 57 | 94 | 127 | 172 | 223 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***29*** | ***80*** | ***127*** | ***166*** | ***216*** | ***273*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Jack County Steam Electric Power

Table 4F.224 shows the projected demand, the current supplies, and the water management strategies for Jack County Steam Electric Power. The current supply for this water user group is Tarrant Regional Water District (Lake Bridgeport). There are no water management strategies for Jack County Steam Electric Power.

**Table 4F.224**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Jack County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **2,162** | **2,500** | **2,700** | **2,900** | **3,100** | **3,300** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District | 2,162 | 2,500 | 2,700 | 2,900 | 3,100 | 3,300 |
| ***Total Current Supplies*** | ***2,162*** | ***2,500*** | ***2,700*** | ***2,900*** | ***3,100*** | ***3,300*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Jacksboro

Jacksboro, the county seat of Jack County, has a population of about 4,700 and is located in the center of the county. The city obtains its water supply from the Lost Creek Reservoir/Lake Jacksboro system, which it owns and operates. This source is sufficient to meet projected demands, and water conservation is the only water management strategy. Table 4F.225 shows the projected population and demand, the current supplies, and the water management strategies for Jacksboro.

**Table 4F.225**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Jacksboro**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,650** | **4,798** | **4,897** | **4,897** | **4,897** | **4,897** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 688 | 699 | 697 | 686 | 680 | 680 |
| Customers and Manufacturing Demand | 40 | 75 | 112 | 145 | 190 | 241 |
| ***Total Projected Demand*** | ***728*** | ***774*** | ***809*** | ***831*** | ***870*** | ***921*** |
| | | | | | | |

**(Table 4F.225, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Lost Creek/Jacksboro system | 991 | 991 | 991 | 991 | 991 | 991 |
| ***Total Current Supplies*** | ***991*** | ***991*** | ***991*** | ***991*** | ***991*** | ***991*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 19 | 26 | 28 | 30 | 33 |
| ***Total Water Management Strategies*** | ***6*** | ***19*** | ***26*** | ***28*** | ***30*** | ***33*** |
| **Reserve (Shortage)** | **269** | **236** | **208** | **188** | **151** | **103** |

## Costs for Jack County Water User Groups

Table 4F.226 shows the estimated capital costs for Jack County water management strategies not covered under the wholesale water providers. Table 4F.227 summarizes the costs by category and is followed by a summary for Jack County.

**Table 4F.226**
**Costs for Recommended Water Management Strategies for Jack County**
**Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Bryson | Conservation | 2010 | 9 | $0 | $0.68 | $0.68 | Q-10 & Q-11 |
| Jack County Other | Conservation | 2010 | 50 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $372,000 | N/A | N/A | Q-13 |
| | Additional Jacksboro (Lost Creek/Lake Jacksboro) | 2010 | 223 | $4,602,000 | $5.95 | $2.53 | Q-195 |
| Jacksboro | Conservation | 2010 | 33 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Jack County Irrigation | Supplemental wells | 2010 | 0 | $43,000 | N/A | N/A | Q-13 |
| Jack County Livestock | Supplemental wells | 2010 | 0 | $43,000 | N/A | N/A | Q-13 |
| Jack County Manufacturing | None | N/A | N/A | N/A | N/A | N/A | N/A |
| Jack County Mining | Supplemental wells | 2010 | 0 | $63,000 | N/A | N/A | Q-13 |
| | Jacksboro (Lost Creek/Lake Jacksboro) | 2010 | 11 | $0 | $2.00 | $2.00 | None |
| | Jacksboro Indirect Reuse to Mining | 2010 | 385 | $200,000 | $0.00 | $0.00 | None |
| Jack County Steam Electric | None | N/A | N/A | N/A | N/A | N/A | N/A |

**Quantities listed are for the WUG only.  They do not include the WUG's customers.

**Table 4F.227**
**Summary of Recommended Water Management Strategies for Jack County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 93 | $0 |
| Purchase from WWP or WUG | 234 | $4,602,000 |
| Supplemental wells | 0 | $521,000 |
| Groundwater | 0 | $0 |
| Indirect reuse | 385 | $200,000 |
| Water transmission | 0 | $0 |
| **Total** | | **$5,323,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.

# JACK COUNTY


***2000 Population:*** *8,763*

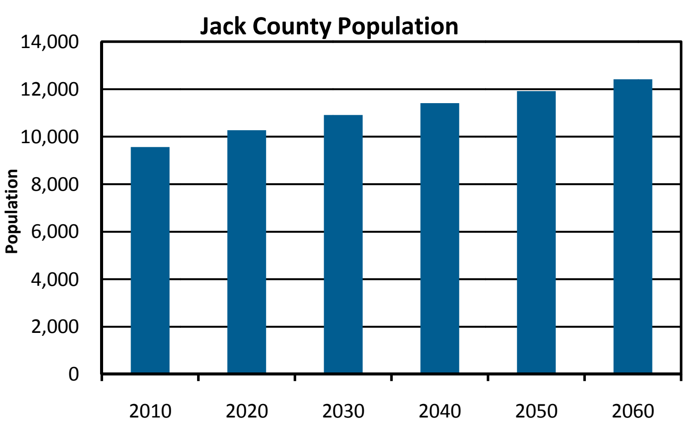
***Projected 2060 Population:*** *12,415*

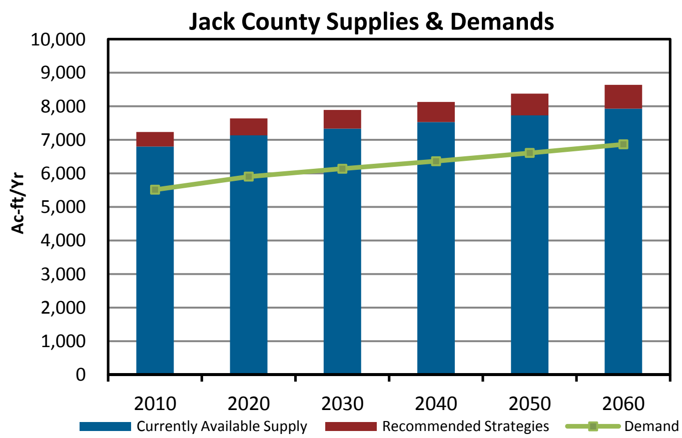
***County Seat:*** *Jacksboro*

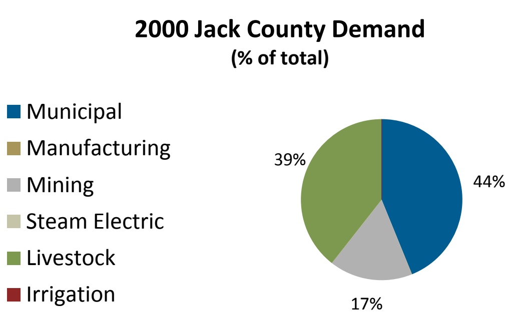
***Economy:*** *Petroleum production, oil-field services, livestock, manufacturing tourism.*

***River Basin(s):***

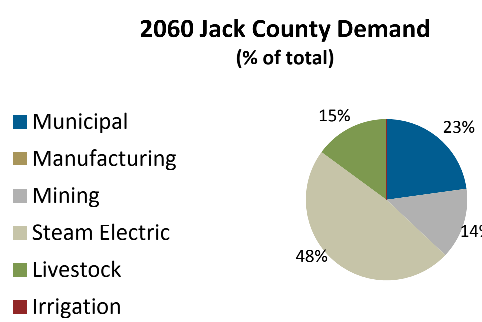
– Trinity (71%), Brazos (29%)


**Total=2,600 acre-feet**




**Total= 6,867 acre-feet**

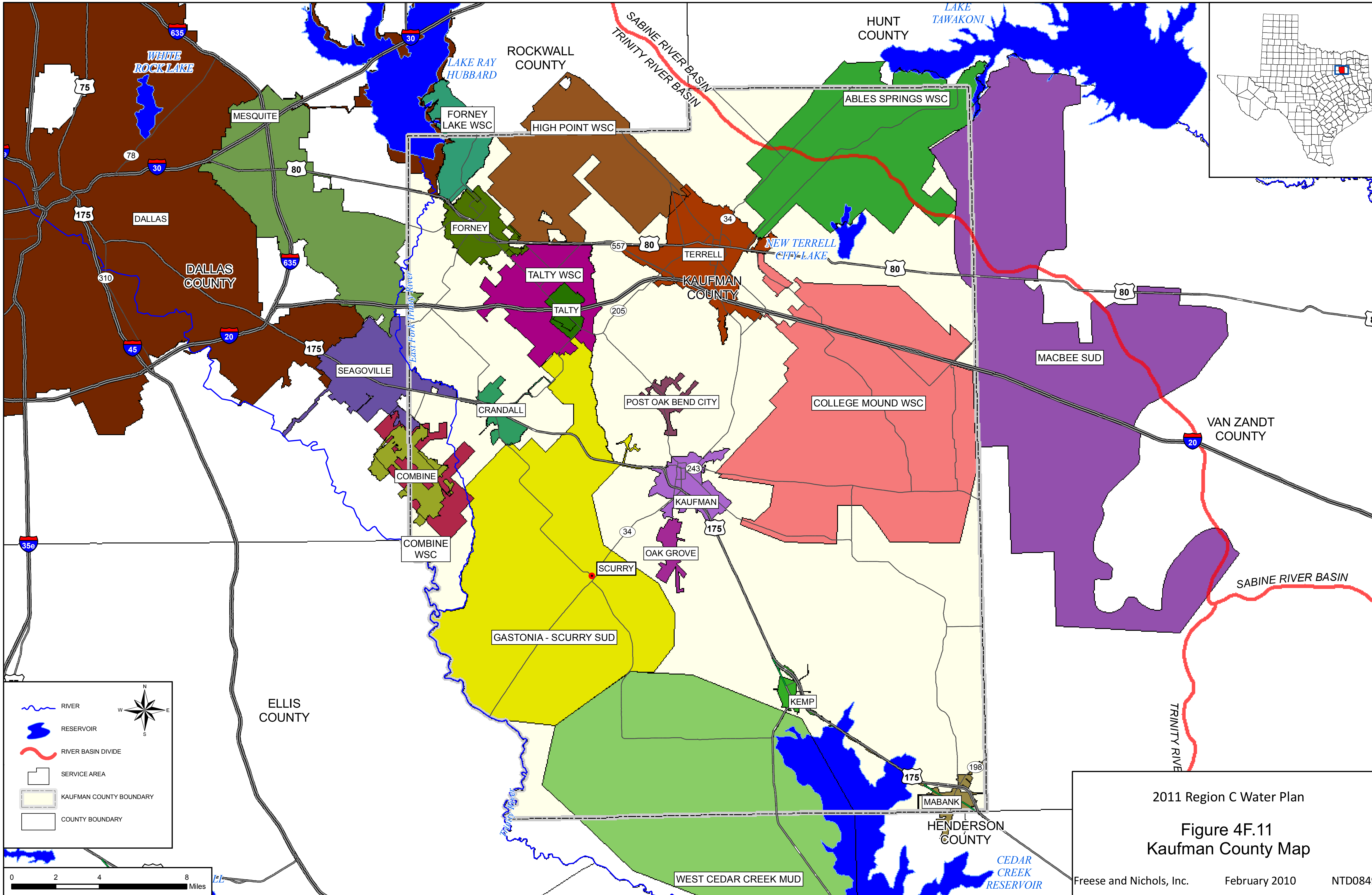
| WATER USER GROUP | 2060 DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [a] |
|---|---|---|---|
| Bryson | 94 | Graham through Fort Belknap WSC | None |
| Jacksboro | 680 | Lost Creek/ Jacksboro System | None |
| County-Other | 793 | Other and Trinity Aquifers, Jacksboro (Lost Creek/Jacksboro System) | Supplemental wells, Additional Lost Creek/Jacksboro System |
| Irrigation | 0 | Other Aquifer, Local supplies, Indirect reuse, Direct reuse | Supplemental wells, Jacksboro Indirect reuse to mining |
| Livestock | 1,025 | Other Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 2 | Jacksboro (Lost Creek/Jacksboro System) | None |
| Mining | 973 | Other Aquifer, Local supplies | Supplemental wells, Lost Creek/Jacksboro System, Reuse (Jacksboro) |
| Steam Electric Power | 3,300 | TRWD | None |

[a] Water conservation is a strategy for every municipal user group.

### *4F.11 Kaufman County*

Figure 4F.11 is a map of Kaufman County. There is very little groundwater available in Kaufman County. The majority of the water user groups in Kaufman County rely on surface water provided by North Texas Municipal Water District (NTMWD), Tarrant Regional Water District (TRWD), and Dallas Water Utilities (DWU). NTMWD provides most of the water used in the county. There is also a substantial supply for steam electric demand from direct reuse of Garland's treated wastewater effluent by way of Forney.

Water management strategies for Kaufman County water user groups are discussed on the following pages. Table 4F.250 on page 4F.316 shows the estimated capital costs for the Kaufman County water management strategies not associated with the wholesale water providers, and Table 4F.251 on page 4F.319 is a summary of the costs by category. Table 4F.251 is followed by a Kaufman County summary.


2011 Region C Water Plan
Figure 4F.11
Kaufman County Map
Freese and Nichols, Inc.
February 2010
NTD08492
RIVER
RESERVOIR
RIVER BASIN DIVIDE
SERVICE AREA
KAUFMAN COUNTY BOUNDARY
COUNTY BOUNDARY
0 2 4 8 Miles
KAUFMAN COUNTY
DALLAS COUNTY
ROCKWALL COUNTY
HUNT COUNTY
VAN ZANDT COUNTY
HENDERSON COUNTY
ELLIS COUNTY
WHITE ROCK LAKE
LAKE RAY HUBBARD
LAKE TAWAKONI
NEW TERRELL CITY LAKE
CEDAR CREEK RESERVOIR
SABINE RIVER BASIN
TRINITY RIVER BASIN
East Fork Trinity River
DALLAS
MESQUITE
SEAGOVILLE
FORNEY LAKE WSC
HIGH POINT WSC
ABLES SPRINGS WSC
FORNEY
TALTY WSC
TALTY
TERRELL
MACBEE SUD
CRANDALL
POST OAK BEND CITY
COLLEGE MOUND WSC
COMBINE
COMBINE WSC
KAUFMAN
OAK GROVE
SCURRY
GASTONIA - SCURRY SUD
KEMP
MABANK
WEST CEDAR CREEK MUD

## Ables Springs Water Supply Corporation

Ables Springs Water Supply Corporation supplies about 5,200 people in northeastern Kaufman County and southern Hunt County. (Hunt County is in the Northeast Texas Region, also called Region D.) The WSC currently gets its water supply from treated water purchased from MacBee WSC (which buys raw water from the Sabine River Authority from Lake Tawakoni and treats it). Ables Springs WSC plans to purchase treated water from North Texas Municipal Water District (NTMWD) when NTMWD's Lake Tawakoni water treatment plant, currently under construction, is completed. The water management strategies for Ables Springs WSC are conservation and connecting to NTMWD and purchasing water. Table 4F.228 shows the projected population and demand, the current supplies, and the water management strategies for Ables Springs WSC.

**Table 4F.228**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Ables Springs Water Supply Corporation**

| Regions C and D (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **5,227** | **7,046** | **8,956** | **11,153** | **14,106** | **17,943** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 556 | 845 | 1,054 | 1,299 | 1,644 | 2,090 |
| ***Total Projected Water Demand*** | ***556*** | ***845*** | ***1,054*** | ***1,299*** | ***1,644*** | ***2,090*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| SRA sources (through MacBee SUD) | 965 | 0 | 0 | 0 | 0 | 0 |
| ***Total Current Supplies*** | ***965*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***845*** | ***1,054*** | ***1,299*** | ***1,644*** | ***2,090*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 13 | 40 | 61 | 80 | 104 | 135 |
| Connect to NTMWD and Purchase Water | 0 | 560 | 560 | 560 | 560 | 560 |
| Additional Delivery Capacity | | 245 | 433 | 659 | 980 | 1,395 |
| ***Total Water Management Strategies*** | ***13*** | ***845*** | ***1,054*** | ***1,299*** | ***1,644*** | ***2,090*** |
| **Reserve (Shortage)** | **422** | **0** | **0** | **0** | **0** | **0** |

## College Mound Water Supply Corporation

College Mound WSC supplies about 9,000 people in eastern Kaufman County. The WSC gets water directly from NTMWD and from Terrell (which in turn gets its supplies from NTMWD). Water management strategies for College Mound WSC include conservation and additional water from NTMWD. Table 4F.229 shows the projected population and demand, the current supplies, and the water management strategies for College Mound WSC.

**Table 4F.229**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for College Mound Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **9,150** | **11,333** | **13,576** | **16,062** | **19,140** | **22,958** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 758 | 1,155 | 1,582 | 1,853 | 2,187 | 2,623 |
| ***Total Projected Water Demand*** | ***758*** | ***1,155*** | ***1,582*** | ***1,853*** | ***2,187*** | ***2,623*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District (directly and through Terrell) | 745 | 940 | 1,118 | 1,177 | 1,256 | 1,400 |
| ***Total Current Supplies*** | ***745*** | ***940*** | ***1,118*** | ***1,177*** | ***1,256*** | ***1,400*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***13*** | ***215*** | ***464*** | ***676*** | ***931*** | ***1,223*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 13 | 55 | 86 | 108 | 136 | 172 |
| Additional Water from NTMWD and Upsize Pipeline to Terrell | 0 | 160 | 378 | 568 | 795 | 1,051 |
| ***Total Water Management Strategies*** | ***13*** | ***215*** | ***464*** | ***676*** | ***931*** | ***1,223*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Combine

Combine has a population of about 2,400 people and is located in southeast Dallas County and western Kaufman County. Combine WSC provides retail service within the city of Combine, and Combine WSC in turn gets its water from Dallas Water Utilities (DWU). Water conservation and additional water from Combine WSC are the water management strategies for Combine. Table 4F.230 shows the projected population and demand, the current supplies, and the water management strategies for Combine.

**Table 4F.230**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Combine**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,393** | **2,969** | **3,474** | **4,019** | **4,702** | **5,563** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 282 | 356 | 405 | 463 | 537 | 635 |
| ***Total Projected Water Demand*** | ***282*** | ***356*** | ***405*** | ***463*** | ***537*** | ***635*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Combine WSC (DWU) | 260 | 268 | 291 | 312 | 334 | 347 |
| ***Total Current Supplies*** | ***260*** | ***268*** | ***291*** | ***312*** | ***334*** | ***347*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***22*** | ***88*** | ***114*** | ***151*** | ***203*** | ***288*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 15 | 23 | 28 | 34 | 43 |
| Additional Combine WSC (DWU) | 18 | 73 | 91 | 123 | 169 | 245 |
| ***Total Water Management Strategies*** | ***22*** | ***88*** | ***114*** | ***151*** | ***203*** | ***288*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Combine Water Supply Corporation

Combine WSC serves about 6,500 retail customers in and around Combine in southeast Dallas County and western Kaufman County. Combine WSC gets water from DWU. Water conservation and additional water from DWU are the water management strategies for Combine WSC. Table 4F.231 shows the projected population and demand, the current supplies, and the water management strategies for Combine WSC.

**Table 4F.231**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Combine Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | | | | | | |
| Outside Combine | 4,122 | 5,737 | 7,202 | 8,795 | 10,785 | 13,285 |
| In Combine | 2,393 | 2,969 | 3,474 | 4,019 | 4,702 | 5,563 |
| Total Population Served | **6,515** | **8,706** | **10,676** | **12,814** | **15,487** | **18,848** |
| **Projected Water Demand** | | | | | | |
| Outside Combine | 462 | 688 | 855 | 1,035 | 1,268 | 1,562 |
| In Combine | 282 | 356 | 405 | 463 | 537 | 635 |
| ***Total Projected Demand*** | ***744*** | ***1,044*** | ***1,260*** | ***1,498*** | ***1,805*** | ***2,197*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 684 | 785 | 904 | 1,009 | 1,122 | 1,201 |
| ***Total Current Supplies*** | ***684*** | ***785*** | ***904*** | ***1,009*** | ***1,122*** | ***1,201*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***60*** | ***259*** | ***356*** | ***489*** | ***683*** | ***996*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 12 | 45 | 69 | 88 | 111 | 143 |
| Additional Water from DWU | 48 | 214 | 287 | 401 | 572 | 853 |
| ***Total Water Management Strategies*** | ***60*** | ***259*** | ***356*** | ***489*** | ***683*** | ***996*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Crandall

Crandall is a city of about 4,400 people in western Kaufman County. The city gets its current water supplies from NTMWD. Crandall plans to purchase water from DWU (delivered through Seagoville) and to continue using NTMWD water. Water management strategies for Crandall are conservation, additional water from NTMWD, and purchasing water from DWU through Seagoville. Table 4F.232 shows the projected population and demand, the current supplies, and the water management strategies for Crandall.

**Table 4F.232**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Crandall**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,373** | **5,933** | **7,537** | **9,314** | **11,515** | **14,245** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 730 | 1,004 | 1,258 | 1,544 | 1,909 | 2,362 |
| ***Total Projected Demand*** | ***730*** | ***1,004*** | ***1,258*** | ***1,544*** | ***1,909*** | ***2,362*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 715 | 545 | 474 | 426 | 385 | 358 |
| ***Total Current Supplies*** | ***715*** | ***545*** | ***474*** | ***426*** | ***385*** | ***358*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***15*** | ***459*** | ***784*** | ***1,118*** | ***1,524*** | ***2,004*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 15 | 72 | 119 | 160 | 215 | 286 |
| Additional water from NTMWD | 0 | 65 | 121 | 356 | 388 | 408 |
| Dallas Water Utilities (thru Seagoville) | 0 | 322 | 544 | 602 | 921 | 1,310 |
| ***Total Water Management Strategies*** | ***15*** | ***459*** | ***784*** | ***1,118*** | ***1,524*** | ***2,004*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Dallas

Dallas Water Utilities (DWU) is the water utility of the City of Dallas, which has a population of about 1,300,000. The City of Dallas is primarily in Dallas County but extends into Kaufman County (and several other counties). DWU is a wholesale water provider, and there is a detailed discussion of water supply plans for DWU beginning on page 4E.4 in Section 4E.

### Forney

Forney has a population of about 13,000 people and is located in northwestern Kaufman County. Forney is a wholesale water provider, and water supply plans for Forney are discussed on page 4E.77 in Section 4E.

## Forney Lake Water Supply Corporation

Forney Lake WSC supplies water to about 6,300 people in northwestern Kaufman County and southwestern Rockwall County. The WSC obtains its water supply from NTMWD, and water management strategies are conservation and additional water from NTMWD. Table 4F.233 shows the projected population and demand, the current supplies, and the water management strategies for Forney Lake WSC.

**Table 4F.233**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Forney Lake Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **6,300** | **7,875** | **9,844** | **12,305** | **15,381** | **19,226** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,376 | 1,694 | 2,096 | 2,592 | 3,222 | 4,028 |
| ***Total Projected Demand*** | ***1,376*** | ***1,694*** | ***2,096*** | ***2,592*** | ***3,222*** | ***4,028*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,359 | 1,379 | 1,482 | 1,646 | 1,850 | 2,150 |
| ***Total Current Supplies*** | ***1,359*** | ***1,379*** | ***1,482*** | ***1,646*** | ***1,850*** | ***2,150*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***17*** | ***315*** | ***614*** | ***946*** | ***1,372*** | ***1,878*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 17 | 86 | 134 | 190 | 264 | 363 |
| Additional Water from NTMWD | 0 | 229 | 480 | 756 | 1,108 | 1,515 |
| ***Total Water Management Strategies*** | ***17*** | ***315*** | ***614*** | ***946*** | ***1,372*** | ***1,878*** |
| **Region C Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Gastonia-Scurry Special Utility District

Gastonia-Scurry SUD supplies water to about 8,000 people in western Kaufman County, including retail customers in Scurry. The SUD obtains its water supply from NTMWD, and water management strategies are conservation and additional water from NTMWD. Table 4F.234 shows the projected population and demand, the current supplies, and the water management strategies for Gastonia-Scurry SUD.

**Table 4F.234**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Gastonia-Scurry Special Utility District**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | | | | | | |
| Outside of Scurry | 7,322 | 9,211 | 10,730 | 13,054 | 15,944 | 19,541 |
| Scurry | 678 | 789 | 918 | 1,068 | 1,242 | 1,445 |
| **Total Population Served** | **8,000** | **10,000** | **11,648** | **14,122** | **17,186** | **20,986** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand (Outside of Scurry) | 771 | 1,104 | 1,262 | 1,506 | 1,840 | 2,255 |
| Demand in Scurry | 87 | 102 | 118 | 138 | 160 | 186 |
| ***Total Projected Demand*** | ***858*** | ***1,206*** | ***1,380*** | ***1,644*** | ***2,000*** | ***2,441*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 844 | 982 | 976 | 1,045 | 1,149 | 1,303 |
| ***Total Current Supplies*** | ***844*** | ***982*** | ***976*** | ***1,045*** | ***1,149*** | ***1,303*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***14*** | ***224*** | ***404*** | ***599*** | ***851*** | ***1,138*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 51 | 74 | 96 | 123 | 158 |
| Additional Water from NTMWD | 0 | 173 | 330 | 503 | 728 | 980 |
| ***Total Water Management Strategies*** | ***14*** | ***224*** | ***404*** | ***599*** | ***851*** | ***1,138*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## High Point Water Supply Corporation

High Point WSC supplies water to about 3,400 people in northwestern Kaufman County and southern Rockwall County. The WSC obtains its water supply from Forney and Terrell, both of which get their water in turn from NTMWD. Water management strategies for High Point WSC are conservation, additional water from Forney, and additional water from Terrell. Table 4F.235 shows the projected population and demand, the current supplies, and the water management strategies for High Point WSC.

**Table 4F.235**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for High Point Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,400** | **4,313** | **5,232** | **6,248** | **7,499** | **9,042** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 362 | 517 | 616 | 728 | 865 | 1,044 |
| ***Total Projected Demand*** | ***362*** | ***517*** | ***616*** | ***728*** | ***865*** | ***1,044*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Forney (NTMWD) | 179 | 210 | 218 | 231 | 248 | 279 |
| Terrell (NTMWD) | 179 | 210 | 218 | 231 | 248 | 279 |
| ***Total Current Supplies*** | ***358*** | ***420*** | ***436*** | ***462*** | ***496*** | ***558*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***4*** | ***97*** | ***180*** | ***266*** | ***369*** | ***486*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 21 | 33 | 42 | 53 | 68 |
| Additional Water from Forney | 0 | 38 | 74 | 112 | 158 | 209 |
| Additional Water from Terrell | 0 | 38 | 73 | 112 | 158 | 209 |
| ***Total Water Management Strategies*** | ***4*** | ***97*** | ***180*** | ***266*** | ***369*** | ***486*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Kaufman

Kaufman is a city of about 8,300 people in central Kaufman County. The city gets its current water supplies from NTMWD, and water management strategies for Kaufman are conservation and additional water from NTMWD. Table 4F.236 shows the projected population and demand, the current supplies, and the water management strategies for Kaufman.

**Table 4F.236**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Kaufman**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population In City Only)** | **8,256** | **10,864** | **13,020** | **14,753** | **16,484** | **19,883** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,322 | 1,716 | 2,013 | 2,264 | 2,511 | 3,029 |
| Customer Demand (Oak Grove) | 124 | 148 | 172 | 201 | 236 | 283 |
| ***Total Projected Demand*** | ***1,446*** | ***1,864*** | ***2,185*** | ***2,465*** | ***2,747*** | ***3,312*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,419 | 1,517 | 1,545 | 1,566 | 1,578 | 1,768 |
| ***Total Current Supplies*** | ***1,419*** | ***1,517*** | ***1,545*** | ***1,566*** | ***1,578*** | ***1,768*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***27*** | ***347*** | ***640*** | ***899*** | ***1,169*** | ***1,544*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 35 | 138 | 128 | 158 | 189 | 240 |
| Additional Water from NTMWD | 0 | 209 | 512 | 741 | 980 | 1,304 |
| ***Total Water Management Strategies*** | ***35*** | ***347*** | ***640*** | ***899*** | ***1,169*** | ***1,544*** |
| **Reserve (Shortage)** | **8** | **0** | **0** | **0** | **0** | **0** |

## Kaufman County Irrigation

Table 4F.237 shows the projected demand, the current supplies, and the water management strategies for Kaufman County Irrigation. Current sources of supply are Tarrant Regional Water District (TRWD – Cedar Creek Lake), direct reuse, NTMWD, local supplies, and groundwater (Trinity and Nacatoch aquifers). Water management strategies include conservation, additional water from NTMWD, and supplemental wells to replace existing wells.

**Table 4F.237**
**Projected Demand, Current Supplies, and Water Management Strategies for Kaufman County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **2,916** | **2,916** | **2,916** | **2,916** | **2,916** | **2,916** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional WD (Cedar Creek) | 100 | 92 | 78 | 67 | 59 | 52 |
| Direct Reuse | 576 | 758 | 758 | 758 | 758 | 758 |
| North Texas Municipal Water District | 1,984 | 1,469 | 1,276 | 1,146 | 1,037 | 963 |
| Local Supplies | 64 | 64 | 64 | 64 | 64 | 64 |
| Nacatoch Aquifer | 4 | 4 | 4 | 4 | 4 | 4 |
| Trinity Aquifer | 185 | 185 | 185 | 185 | 185 | 185 |
| ***Total Current Supplies*** | ***2,913*** | ***2,572*** | ***2,365*** | ***2,224*** | ***2,107*** | ***2,026*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***3*** | ***344*** | ***551*** | ***692*** | ***809*** | ***890*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 72 | 140 | 177 | 212 | 247 |
| Additional Water from NTMWD | 0 | 272 | 411 | 515 | 597 | 643 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***344*** | ***551*** | ***692*** | ***809*** | ***890*** |
| **Reserve (Shortage)** | **1** | **0** | **0** | **0** | **0** | **0** |

## Kaufman County Livestock

Table 4F.238 shows the projected demand, current supplies, and water management strategies for Kaufman County Livestock. The current supplies are local surface water supplies and groundwater (Woodbine and Nacatoch aquifers). These sources are sufficient to meet future demands, and supplemental wells are the only water management strategy.

**Table 4F.238**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Kaufman County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,545** | **1,545** | **1,545** | **1,545** | **1,545** | **1,545** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Nacatoch Aquifer | 73 | 73 | 73 | 73 | 73 | 73 |
| Woodbine Aquifer | 200 | 200 | 200 | 200 | 200 | 200 |
| Local Supplies | 1,622 | 1,622 | 1,622 | 1,622 | 1,622 | 1,622 |
| ***Total Current Supplies*** | ***1,895*** | ***1,895*** | ***1,895*** | ***1,895*** | ***1,895*** | ***1,895*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **350** | **350** | **350** | **350** | **350** | **350** |

## Kaufman County Manufacturing

Table 4F.239 shows the projected demand and current supplies for Kaufman County Manufacturing. Current supplies are treated water from NTMWD through Forney, Kaufman, and Terrell. The water management strategies for this water user group are conservation and additional water from NTMWD through the same suppliers.

**Table 4F.239**
**Projected Demand, Current Supplies, and Water**
**Management Strategies for Kaufman County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **760** | **813** | **869** | **928** | **993** | **1,061** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District (through Terrell, Forney, and Kaufman) | 760 | 662 | 615 | 590 | 570 | 567 |
| ***Total Current Supplies*** | ***760*** | ***662*** | ***615*** | ***590*** | ***570*** | ***567*** |
| | | | | | | |

(Table 4F.239, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***151*** | ***254*** | ***338*** | ***423*** | ***494*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 1 | 15 | 22 | 23 | 25 |
| Additional water from NTMWD | 0 | 150 | 239 | 316 | 400 | 469 |
| ***Total Water Management Strategies*** | ***0*** | ***151*** | ***254*** | ***338*** | ***423*** | ***494*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Kaufman County Mining

Table 4F.240 shows the projected demand, the current supplies, and the water management strategies for Kaufman County Mining. Kaufman County Mining is supplied from local supplies, and the supply is sufficient to meet projected demands. There are no water management strategies for this water user group.

**Table 4F.240**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Kaufman County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **79** | **80** | **81** | **82** | **83** | **84** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 86 | 86 | 86 | 86 | 86 | 86 |
| ***Total Current Supplies*** | ***86*** | ***86*** | ***86*** | ***86*** | ***86*** | ***86*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **7** | **6** | **5** | **4** | **3** | **2** |

## Kaufman County Other

Kaufman County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Kaufman County Other supply about 14,000 people and receive their water supply from the Nacatoch aquifer, NTMWD, and TRWD. Water management strategies for these entities include conservation, additional water from NTMWD, additional water from TRWD, and supplemental wells to replace existing water wells. Table 4F.241 shows the projected population and demand, the current supplies, and the water management strategies for Kaufman County Other.

**Table 4F.241**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Kaufman County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **13,767** | **13,767** | **13,767** | **13,767** | **13,767** | **13,767** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,082 | 2,066 | 2,051 | 2,036 | 2,020 | 2,020 |
| ***Total Projected Water Demand*** | ***2,082*** | ***2,066*** | ***2,051*** | ***2,036*** | ***2,020*** | ***2,020*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Nacatoch Aquifer | 241 | 241 | 241 | 241 | 241 | 241 |
| North Texas Municipal Water District | 1,437 | 1,177 | 1,015 | 905 | 812 | 755 |
| Tarrant Regional Water District | 411 | 379 | 320 | 275 | 239 | 208 |
| ***Total Current Supplies*** | ***2,089*** | ***1,797*** | ***1,576*** | ***1,421*** | ***1,292*** | ***1,204*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***269*** | ***475*** | ***615*** | ***728*** | ***816*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 25 | 68 | 91 | 99 | 105 | 112 |
| Additional Water from NTMWD | 0 | 215 | 347 | 441 | 519 | 569 |
| Additional Water from TRWD | 0 | 20 | 72 | 112 | 144 | 174 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***25*** | ***303*** | ***510*** | ***652*** | ***768*** | ***855*** |
| **Reserve (Shortage)** | **32** | **34** | **35** | **37** | **40** | **39** |

## Kaufman County Steam Electric Power

Table 4F.242 shows the projected demand, the current supplies, and the water management strategies for Kaufman County Steam Electric Power. The current supply for this water user group is direct reuse from Garland through Forney. The water management strategies for Kaufman County Steam Electric Power include buying treated water from Forney (originating from NTMWD) and reuse from the Trinity River Authority.

**Table 4F.242**
**Projected Demand, Current Supplies, and Water Management Strategies for Kaufman County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **8,979** | **10,000** | **10,000** | **10,000** | **10,000** | **10,000** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Reuse from Garland (through Forney) | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 |
| ***Total Current Supplies*** | ***8,979*** | ***8,979*** | ***8,979*** | ***8,979*** | ***8,979*** | ***8,979*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***1,021*** | ***1,021*** | ***1,021*** | ***1,021*** | ***1,021*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Forney (NTMWD) | 0 | 1,121 | 1,121 | 1,121 | 1,121 | 1,121 |
| Trinity River Authority Reuse | 0 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| ***Total Water Management Strategies*** | ***0*** | ***2,121*** | ***2,121*** | ***2,121*** | ***2,121*** | ***2,121*** |
| **Reserve (Shortage)** | **0** | **1,100** | **1,100** | **1,100** | **1,100** | **1,100** |

## Kemp

Kemp is a city of 1,400 people located in southern Kaufman County. The city buys and treats raw water from TRWD for its water supply. Water management strategies for Kemp include conservation and additional water from TRWD. Table 4F.243 shows the projected population and demand, the current supplies, and the water management strategies for Kemp.

**Table 4F.243**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Kemp**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,400** | **1,700** | **2,000** | **2,000** | **2,000** | **2,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 224 | 267 | 307 | 300 | 296 | 296 |
| ***Total Projected Demand*** | ***224*** | ***267*** | ***307*** | ***300*** | ***296*** | ***296*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District | 222 | 245 | 239 | 202 | 175 | 152 |
| ***Total Current Supplies*** | ***222*** | ***245*** | ***239*** | ***202*** | ***175*** | ***152*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***22*** | ***68*** | ***98*** | ***121*** | ***144*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 9 | 14 | 15 | 16 | 17 |
| Additional Water from TRWD | 0 | 13 | 54 | 83 | 105 | 127 |
| ***Total Water Management Strategies*** | ***2*** | ***22*** | ***68*** | ***98*** | ***121*** | ***144*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Mabank

Mabank has a population of about 3,100 and is located in southeastern Kaufman County and northern Henderson County. The city buys and treats raw water from TRWD for its water supply. The city has supplied treated water to a part of Gun Barrel City but is planning to discontinue serving those customers. Water management strategies for Mabank include conservation, additional water from TRWD, and a water treatment plant expansion. Table 4F.244 shows the projected population and demand, the current supplies, and the water management strategies for Mabank.

**Table 4F.244**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Mabank**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,074** | **3,729** | **4,401** | **5,142** | **6,058** | **7,194** |
| **Projected Water Demand** | | | | | | |

(Table 4F.244, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal Demand | 671 | 801 | 931 | 1,083 | 1,269 | 1,507 |
| Customer (Gun Barrel City) | 704 | | | | | |
| ***Total Projected Demand*** | ***1,375*** | ***801*** | ***931*** | ***1,083*** | ***1,269*** | ***1,507*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District | 1,369 | 735 | 726 | 730 | 750 | 777 |
| ***Total Current Supplies*** | ***1,369*** | ***735*** | ***726*** | ***730*** | ***750*** | ***777*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***6*** | ***66*** | ***205*** | ***353*** | ***519*** | ***730*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 71 | 173 | 210 | 257 | 318 |
| Additional Water from TRWD and Treatment Plant Expansion | 0 | 0 | 32 | 143 | 262 | 412 |
| ***Total Water Management Strategies*** | ***6*** | ***71*** | ***205*** | ***353*** | ***519*** | ***730*** |
| **Reserve (Shortage)** | **0** | **5** | **0** | **0** | **0** | **0** |

## MacBee Special Utility District

MacBee SUD supplies water to about 8,500 people in Van Zandt County, Hunt County, and a small part of northeastern Kaufman County. Most of the SUD's service area is in the Northeast Texas Region (Region D). MacBee SUD gets its water supply by treating raw water purchased from the Sabine River Authority (SRA) from Lake Tawakoni. Table 4F.245 shows the projected population and demand, the current supplies, and the water management strategies for MacBee SUD in Region C. Strategies for the Northeast Texas Region are addressed in that regional water plan.

**Table 4F.245**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for MacBee Special Utility District (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population in Region C** | **277** | **348** | **421** | **502** | **602** | **726** |
| **Projected Water Demand in Region C** | | | | | | |
| Municipal Demand | 36 | 45 | 54 | 65 | 78 | 94 |
| ***Total Projected Demand in Region C*** | ***36*** | ***45*** | ***54*** | ***65*** | ***78*** | ***94*** |

(Table 4F.245, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Sabine River Authority (Region D) | 36 | 43 | 51 | 62 | 74 | 88 |
| ***Total Current Supplies*** | ***36*** | ***43*** | ***51*** | ***62*** | ***74*** | ***88*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***2*** | ***3*** | ***3*** | ***4*** | ***6*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 2 | 3 | 3 | 4 | 6 |
| ***Total Water Management Strategies*** | ***0*** | ***2*** | ***3*** | ***3*** | ***4*** | ***6*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Mesquite

Mesquite is a city of about 140,000 people located in eastern Dallas County extending into and western Kaufman County. Mesquite's water supply is discussed on page 4F.83, under Dallas County.

## Oak Grove

Oak Grove is a city of about 900 located in central Kaufman County. The city gets its current water supplies from NTMWD through retail service by North Kaufman WSC (which is in the Kaufman County Other category and gets its NTMWD water through Kaufman and Terrell). Water management strategies for Oak Grove are conservation and additional NTMWD water from North Kaufman WSC. Table 4F.246 shows the projected population and demand, the current supplies, and the water management strategies for Oak Grove.

**Table 4F.246**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Oak Grove**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **928** | **1,141** | **1,360** | **1,602** | **1,902** | **2,274** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 124 | 148 | 172 | 201 | 236 | 283 |
| ***Total Projected Demand*** | ***124*** | ***148*** | ***172*** | ***201*** | ***236*** | ***283*** |
| | | | | | | |

**(Table 4F.246, Continued)**

| (Values in Ac-Ft/Yr)<br>**Currently Available Water Supplies** | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| North Kaufman County WSC (County Other, from NTMWD through Kaufman and Terrell) | 122 | 120 | 122 | 128 | 136 | 151 |
| ***Total Current Supplies*** | ***122*** | ***120*** | ***122*** | ***128*** | ***136*** | ***151*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***28*** | ***50*** | ***73*** | ***100*** | ***132*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 6 | 9 | 12 | 15 | 19 |
| Additional North Kaufman WSC | 0 | 22 | 41 | 61 | 85 | 113 |
| ***Total Water Management Strategies*** | ***2*** | ***28*** | ***50*** | ***73*** | ***100*** | ***132*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Post Oak Bend City

Post Oak Bend City has a population of about 650 people and is located in central Kaufman County. The city gets its current water supplies from NTMWD through retail service by Rose Hill WSC (which is in the Kaufman County Other category). Water management strategies for Post Oak Bend City are conservation and additional NTMWD water from Rose Hill WSC. Table 4F.247 shows the projected population and demand, the current supplies, and the water management strategies for Post Oak Bend City.

**Table 4F.247**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Post Oak Bend City**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **659** | **1,075** | **1,754** | **2,862** | **4,671** | **7,623** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 85 | 138 | 226 | 369 | 602 | 982 |
| ***Total Projected Demand*** | ***85*** | ***138*** | ***226*** | ***369*** | ***602*** | ***982*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Rose Hill SUD (NTMWD) | 83 | 112 | 160 | 234 | 346 | 524 |
| ***Total Current Supplies*** | ***83*** | ***112*** | ***160*** | ***234*** | ***346*** | ***524*** |
| | | | | | | |

**(Table 4F.247, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***2*** | ***26*** | ***66*** | ***135*** | ***256*** | ***458*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 6 | 12 | 20 | 35 | 61 |
| Additional Water from Rose Hill SUD | 0 | 20 | 54 | 115 | 221 | 397 |
| ***Total Water Management Strategies*** | ***2*** | ***26*** | ***66*** | ***135*** | ***256*** | ***458*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Scurry

Scurry is located in central Kaufman County and has a population of about 700. The city gets its current water supplies from NTMWD through retail service by Gastonia-Scurry SUD, which in turn gets its supplies from NTMWD. Water management strategies for Scurry are conservation and additional NTMWD water from Gastonia-Scurry WSC. Table 4F.248 shows the projected population and demand, the current supplies, and the water management strategies for Scurry.

**Table 4F.248**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Scurry**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **678** | **789** | **918** | **1,068** | **1,242** | **1,445** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 87 | 102 | 118 | 138 | 160 | 186 |
| ***Total Projected Demand*** | ***87*** | ***102*** | ***118*** | ***138*** | ***160*** | ***186*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Gastonia-Scurry WSC (NTMWD) | 85 | 83 | 83 | 88 | 92 | 99 |
| ***Total Current Supplies*** | ***85*** | ***83*** | ***83*** | ***88*** | ***92*** | ***99*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***19*** | ***35*** | ***50*** | ***68*** | ***87*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 4 | 6 | 8 | 9 | 11 |

(Table 4F.248, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Additional Water from Gastonia-Scurry WSC | 0 | 15 | 29 | 42 | 59 | 76 |
| ***Total Water Management Strategies*** | ***2*** | ***19*** | ***35*** | ***50*** | ***68*** | ***87*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Seagoville

Seagoville is a city of about 5,000 people located in southeastern Dallas County with some area in Kaufman County. Seagoville is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.98 in Section 4E.

## Talty

Talty is a city of about 1,800 located in western Kaufman County. The city gets its current water supplies from NTMWD through retail service by Gastonia-Scurry SUD (which gets its supplies from NTMWD) and Talty WSC (which is in the Kaufman County Other category and also uses water from NTMWD). Water management strategies for Talty are conservation and additional NTMWD water. Table 4F.249 shows the projected population and demand, the current supplies, and the water management strategies for Talty.

**Table 4F.249**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Talty**

| ` | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,800** | **3,832** | **5,256** | **6,834** | **8,788** | **11,211** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 813 | 1,717 | 2,337 | 3,024 | 3,878 | 4,948 |
| ***Total Projected Demand*** | ***813*** | ***1,717*** | ***2,337*** | ***3,024*** | ***3,878*** | ***4,948*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District (through Gastonia-Scurry SUD and Talty WSC [Kaufman Co. Other]) | 808 | 1,397 | 1,652 | 1,921 | 2,227 | 2,641 |
| ***Total Current Supplies*** | ***808*** | ***1,397*** | ***1,652*** | ***1,921*** | ***2,227*** | ***2,641*** |
| | | | | | | |

(Table 4F.249, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***5*** | ***320*** | ***685*** | ***1,103*** | ***1,651*** | ***2,307*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 66 | 114 | 172 | 254 | 365 |
| Additional Water from NTMWD | 0 | 254 | 571 | 931 | 1,397 | 1,942 |
| ***Total Water Management Strategies*** | ***5*** | ***320*** | ***685*** | ***1,103*** | ***1,651*** | ***2,307*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Terrell

Terrell is a city of about 16,000 people located in northern Kaufman County. Terrell is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.102 in Section 4E.

### West Cedar Creek Municipal Utility District

West Cedar Creek MUD supplies water to about 21,000 people in northwestern Henderson County and southwestern Kaufman County, including retail customers in Seven Points and Tool. The District is a wholesale water provider, and its plans are discussed on page 4E.111 in Section 4E.

### Costs for Kaufman County Water User Groups

Table 4F.250 shows the estimated capital costs for Kaufman County water management strategies not covered under the wholesale water providers. Table 4F.251 summarizes the costs by category and is followed by a summary for Kaufman County.

**Table 4F.250**
**Costs for Recommended Water Management Strategies for Kaufman County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Ables Springs WSC* | Conservation | 2010 | 135 | $5,000 | $0.10 | $0.10 | Q-10 & Q-11 |
| | Additional delivery capacity for NTMWD supplies | 2020 | 1,395 | $2,431,000 | $1.68 | $1.64 | Q-202 |
| | Connection to NTMWD and supplies | 2020 | 280 | $1,136,000 | $2.52 | $1.61 | Q-202 |
| College Mound WSC | Conservation | 2010 | 172 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD (Some through Terrell) and upsize line to Terrell | 2020 | 1,051 | $2,569,000 | $1.80 | $1.39 | Q-203 |
| Combine* | Conservation | 2010 | 43 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional DWU | 42 | 52 | $0 | $1.37 | $1.37 | None |
| Combine WSC* | Conservation | 2010 | 100 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Direct Contract with DWU | 2010 | 608 | $0 | $1.37 | $1.37 | None |
| Crandall | Conservation | 2010 | 286 | $25,000 | $0.54 | $0.54 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 408 | $0 | $1.30 | $1.30 | None |
| | Connect to DWU and purchase | 2020 | 1,310 | $6,104,000 | $1.60 | $1.04 | Q-197 |
| Dallas* | Conservation | 2010 | 52,987*** | Information under DWU in Section 4E. | | | |
| | See DWU Information in Section 4E. | Information under DWU in Section 4E. | | | | | |
| Forney | Conservation | 2010 | 673 | See Forney in Section 4E. | | | |
| | Additional NTMWD | 2020 | 2,613 | See Forney in Section 4E. | | | |
| Forney Lake WSC* | Conservation | 2010 | 363 | $0 | $0.49 | $0.49 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 1,515 | $0 | $1.30 | $1.30 | None |
| Gastonia-Scurry WSC | Conservation | 2010 | 147 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD | 2010 | 904 | $0 | $1.30 | $1.30 | None |

**(Table 4F.250, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| High Point WSC* | Conservation | 2010 | 68 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 418 | $0 | $1.30 | $1.30 | None |
| Kaufman | Conservation | 2010 | 182 | $28,000 | $0.63 | $0.63 | Q-10 & Q-11 |
| | Additional NTMWD | 2010 | 1,230 | $0 | $1.30 | $1.30 | None |
| Kaufman County Other | Conservation | 2010 | 112 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $404,000 | N/A | N/A | Q-13 |
| | Additional NTMWD | 2020 | 569 | $0 | $1.30 | $1.30 | None |
| | Additional TRWD | 2010 | 174 | $0 | $0.69 | $0.69 | None |
| Kemp | Conservation | 2010 | 17 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional TRWD | 2010 | 127 | $0 | $0.69 | $0.69 | None |
| Mabank* | Conservation | 2010 | 318 | $5,000 | $0.53 | $0.53 | Q-10 & Q-11 |
| | Additional TRWD | 2030 | 412 | $0 | $0.69 | $0.69 | None |
| | Water Treatment Plant Expansion | 2030 | 560 | $4,094,000 | $1.98 | $0.35 | Q-15 |
| MacBee SUD* | Conservation | 2020 | 6 | See Region D plan for costs. | | | |
| | Additional SRA | See Region D plan for information | | | | | |
| | Water Treatment Plant Expansions | See Region D plan for information | | | | | |
| Mesquite* | Conservation | See Dallas County. | | | | | |
| | Additional NTMWD | See Dallas County. | | | | | |
| Oak Grove | Conservation | 2010 | 19 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 113 | $0 | $1.30 | $1.30 | None |
| Post Oak Bend City | Conservation | 2010 | 61 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 397 | $0 | $1.30 | $1.30 | None |
| Scurry | Conservation | 2010 | 11 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 76 | $0 | $1.30 | $1.30 | None |
| Seagoville* | Conservation | See Dallas County. | | | | | |
| | Additional DWU | See Dallas County. | | | | | |

(Table 4F.250, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Talty | Conservation | 2010 | 365 | $0 | $0.29 | $0.29 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 1,942 | $0 | $1.30 | $1.30 | None |
| Terrell | Conservation | 2010 | 2,475 | See Terrell in Section 4E. | | | |
| | Additional NTMWD | 2020 | 9,014 | See Terrell in Section 4E. | | | |
| West Cedar Creek MUD* | Conservation | 2010 | 429 | See West Cedar Creek MUD in Section 4E. | | | |
| | Additional TRWD | 2010 | 3,790 | See West Cedar Creek MUD in Section 4E. | | | |
| | Water Treatment Plant Expansions | 2030 | 5,600 | See West Cedar Creek MUD in Section 4E. | | | |
| Kaufman County Irrigation | Supplemental wells | 2010 | 0 | $56,000 | N/A | N/A | Q-13 |
| | Additional NTMWD | 2020 | 643 | $0 | $1.30 | $1.30 | None |
| | Conservation | 2010 | 247 | $0 | $0.85 | $0.85 | Q-12 |
| Kaufman County Livestock | Supplemental wells | 2010 | 0 | $56,000 | N/A | N/A | Q-13 |
| Kaufman County Manufacturing | Conservation | 2020 | 25 | $0 | $0.85 | $0.85 | Q-12 |
| | Additional NTMWD | 2020 | 469 | $0 | $1.25 | $1.25 | None |
| Kaufman County Mining | None | N/A | N/A | N/A | N/A | N/A | N/A |
| Kaufman County Steam Electric | NTMWD (through Forney) | 2020 | 1,121 | $0 | $1.25 | $1.25 | None |
| | TRA direct reuse | 2020 | 1,000 | See TRA in Section 4E. | | | |

Notes: Water User Groups marked with an * extend into more than one county.

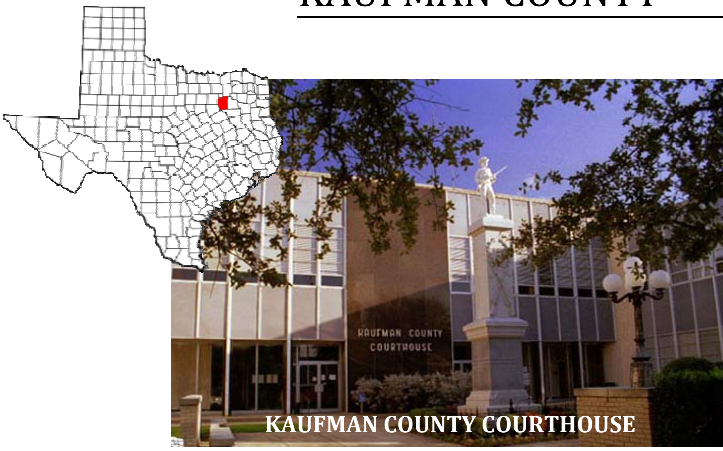
**Quantities listed are for the WUG only. They do not include the WUG's customers.

***Retail conservation

**Table 4F.251**
**Summary of Recommended Water Management Strategies for Kaufman County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 5,798 | $63,000 |
| Purchase from WWP | 29,237 | $5,000,000 |
| Supplemental Wells | 0 | $516,000 |
| Reuse | 1,000 | $0 |
| Connect to supplies | 1,590 | $7,240,000 |
| Water Treatment Plant Expansion | 0 | $4,094,000 |
| **Total** | | **$16,913,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.




***2000 Population:*** *71,313*

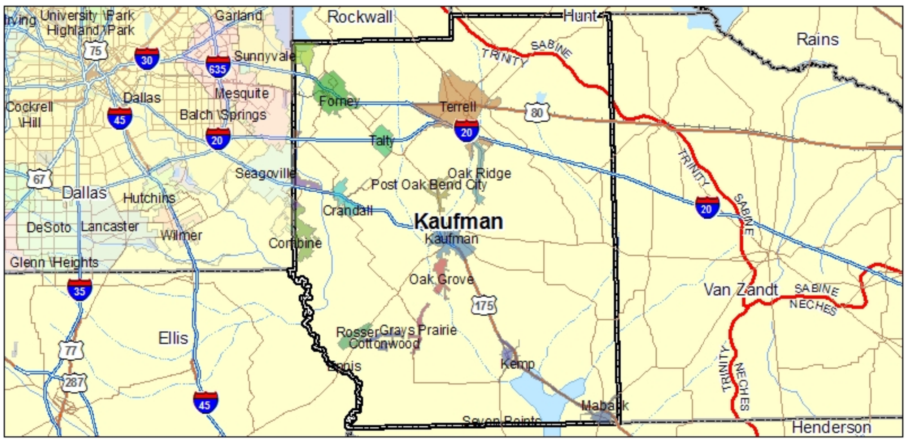
***Projected 2060 Population:*** *349,385*

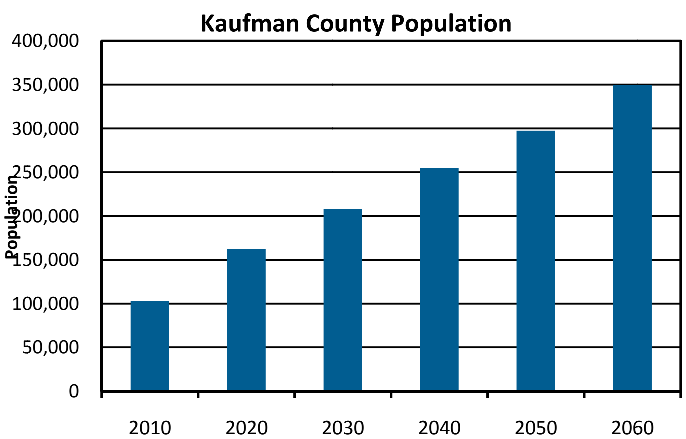
***County Seat:*** *Kaufman*

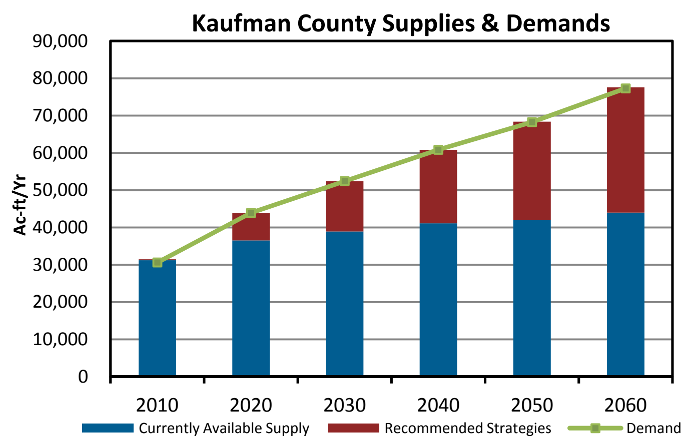
***Economy:*** *Manufacturing; government/services*

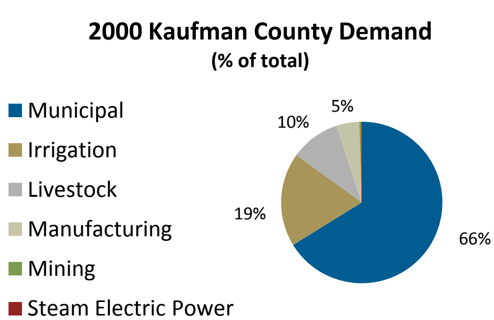
***River Basin(s):***

- Trinity (95%), Sabine (5%)

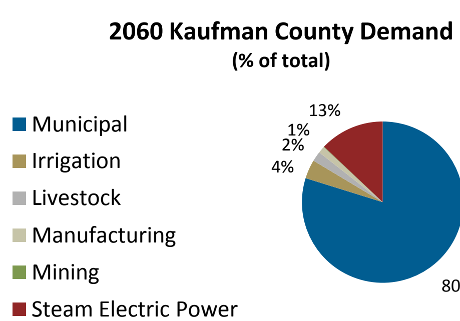



**Total=15,523 acre-feet**




**Total= 77,308 acre-feet**

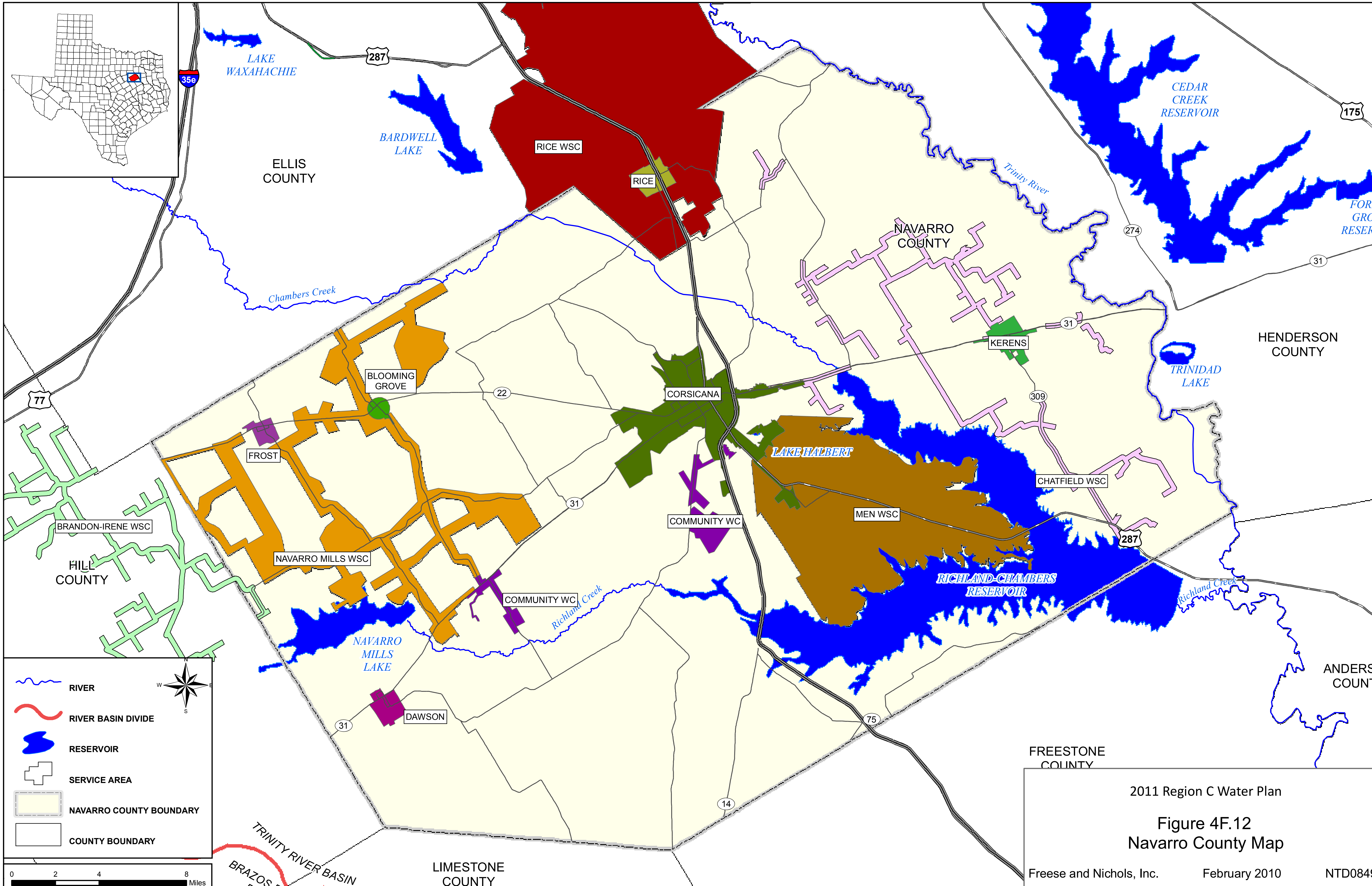
| WATER USER GROUP | 2060 KAUFMAN CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Ables Springs WSC [a] | 1,828 | SRA (through MacBee SUD) | NTMWD supplies (connect to Tawakoni WTP and additional capacity) |
| College Mound WSC | 2,623 | NTMWD | Additional NTMWD supplies |
| Combine [a] | 447 | Combine WSC (DWU) | Additional Combine WSC (DWU) |
| Combine WSC [a] | 1,189 | DWU | Additional DWU supplies |
| Crandall | 2,362 | NTMWD | Additional NTMWD supplies, DWU (through Seagoville) |
| Forney | 7,048 | NTMWD, Garland reuse (for SEP) | Additional NTMWD supplies |
| Forney Lake WSC [a] | 2,014 | NTMWD | Additional NTMWD supplies |
| Gastonia-Scurry WSC | 2,255 | NTMWD | Additional NTMWD supplies |
| High Point WSC [a] | 939 | Forney and Terrell (NTMWD) | Additional NTMWD supplies (through Forney and Terrell) |
| Kaufman | 3,029 | NTMWD | Additional NTMWD supplies |
| Kemp | 296 | TRWD | Additional TRWD supplies |
| Mabank [a] | 1,323 | TRWD | Additional TRWD supplies, Water Treatment Plant expansion |
| MacBee WSC [a] | 94 | SRA | None |
| Mesquite [a] | 2 | NTMWD | Additional NTMWD supplies |
| Oak Grove | 283 | North Kaufman WSC from NTMWD through Terrell and Kaufman | Additional North Kaufman WSC supplies |
| Post Oak Bend City | 982 | Rose Hill SUD (NTMWD) | Additional Rose Hill SUD supplies |
| Scurry | 186 | Gastonia-Scurry SUD (NTMWD) | Additional Gastonia-Scurry SUD supplies |
| Seagoville [a] | 11 | DWU | Additional DWU supplies |
| Talty | 4,948 | NTMWD (through Gastonia-Scurry WSC and Talty WSC [Kaufman County Other]) | Additional NTMWD supplies |
| Terrell | 24,643 | NTMWD | Additional NTMWD supplies |
| West Cedar Creek MUD [a] | 3,180 | TRWD | Additional TRWD supplies, Water Treatment Plant expansions |
| County-Other | 2,020 | Nacatoch Aquifer, NTMWD, TRWD | Additional NTMWD supplies, Additional TRWD supplies, Supplemental wells |
| Irrigation | 2,916 | Cedar Creek Lake (TRWD), NTMWD, Direct reuse, Local supplies, Nacatoch and Trinity Aquifers | Additional NTMWD supplies, Supplemental wells |
| Livestock | 1,545 | Local supplies, Nacatoch and Woodbine Aquifers | Supplemental wells |
| Manufacturing | 1,061 | NTMWD (through Terrell, Forney, and Kaufman) | Additional NTMWD supplies |
| Mining | 84 | Local supplies | None |
| Steam Electric Power | 10,000 | Reuse from Garland (through Forney) | Forney (NTMWD), TRA reuse |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group

### *4F.12 Navarro County*

Figure 4F.12 is a map of Navarro County. The City of Corsicana is a wholesale water provider and supplies treated water for most of the water user groups in Navarro County. A detailed discussion of the water management strategies for Corsicana is included in Section 4E of this plan. Some water user groups currently buying water from Corsicana are considering the development of independent supplies to supplement or replace water from Corsicana.

Water management strategies for Navarro County water user groups are discussed on the following pages.  Table 4F.269 on page 4F.339 shows the estimated capital costs for the Navarro County water management strategies not associated with the wholesale water providers, and Table 4F.270 on page 4F.341 is a summary of the costs by category.  Table 4F.271 shows alternative water management strategies not associated with the wholesale water providers, and it is followed by a Navarro County summary.


ELLIS COUNTY
LAKE WAXAHACHIE
BARDWELL LAKE
RICE WSC
RICE
CEDAR CREEK RESERVOIR
Trinity River
NAVARRO COUNTY
Chambers Creek
BLOOMING GROVE
CORSICANA
KERENS
HENDERSON COUNTY
TRINIDAD LAKE
FROST
LAKE HALBERT
CHATFIELD WSC
MEN WSC
COMMUNITY WC
BRANDON-IRENE WSC
HILL COUNTY
NAVARRO MILLS WSC
RICHLAND-CHAMBERS RESERVOIR
Richland Creek
NAVARRO MILLS LAKE
DAWSON
FREESTONE COUNTY
LIMESTONE COUNTY
TRINITY RIVER BASIN
RIVER
RIVER BASIN DIVIDE
RESERVOIR
SERVICE AREA
NAVARRO COUNTY BOUNDARY
COUNTY BOUNDARY
0 2 4 8 Miles
2011 Region C Water Plan
Figure 4F.12
Navarro County Map
Freese and Nichols, Inc.
February 2010
NTD08492

## Blooming Grove

Blooming Grove is a city of about 900 people located in northwestern Navarro County. The city buys treated water from Corsicana for its current supply. Water management strategies for Blooming Grove include conservation, purchasing additional water from Corsicana, and developing groundwater from the Trinity aquifer. Table 4F.252 shows the projected population and demand, the current supplies, and the water management strategies for Blooming Grove.

**Table 4F.252**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Blooming Grove**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **897** | **897** | **897** | **897** | **897** | **897** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 161 | 157 | 155 | 152 | 150 | 150 |
| ***Total Projected Water Demand*** | ***161*** | ***157*** | ***155*** | ***152*** | ***150*** | ***150*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 161 | 157 | 146 | 138 | 131 | 124 |
| ***Total Current Supplies*** | ***161*** | ***157*** | ***146*** | ***138*** | ***131*** | ***124*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***9*** | ***14*** | ***19*** | ***26*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 5 | 6 | 11 | 12 | 13 |
| Additional Water from Corsicana | 0 | 0 | 3 | 3 | 7 | 13 |
| Trinity Aquifer (New Well) | 0 | 160 | 160 | 160 | 160 | 160 |
| ***Total Water Management Strategies*** | ***2*** | ***165*** | ***169*** | ***174*** | ***179*** | ***186*** |
| **Reserve (Shortage)** | **2** | **165** | **160** | **160** | **160** | **160** |

## Brandon-Irene Water Supply Corporation

Brandon-Irene Water Supply Corporation serves about 2,400 people in Ellis, Hill and Navarro Counties. The majority of the WSC's service area is in Hill County in the Brazos G region, so the water supply plans are covered in more detail in the Brazos G Regional Water Plan. Table 4F.253 shows the projected population and demand, the current supplies, and the water management strategies for Brandon-Irene WSC in Region C. The current supply is water from Aquilla Water Supply District (which purchases raw water from the Brazos River Authority, out of Lake Aquilla, and treats it.). That supply is adequate to meet projected demands, and the only water management strategy for Brandon-Irene WSC in Region C is conservation.

**Table 4F.253**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Brandon-Irene Water Supply Corporation (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Region C Population** | **300** | **327** | **355** | **385** | **419** | **460** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 37 | 39 | 41 | 43 | 46 | 51 |
| ***Total Projected Region C Demand*** | ***37*** | ***39*** | ***41*** | ***43*** | ***46*** | ***51*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Aquilla WSD (Lake Aquilla, Region G) | 37 | 39 | 41 | 43 | 46 | 51 |
| ***Total Current Supplies*** | ***37*** | ***39*** | ***41*** | ***43*** | ***46*** | ***51*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 2 | 2 | 3 | 3 | 3 |
| ***Total Water Management Strategies*** | ***0*** | ***2*** | ***2*** | ***3*** | ***3*** | ***3*** |
| **Reserve (Shortage)** | **0** | **2** | **2** | **3** | **3** | **3** |

## Chatfield Water Supply Corporation

Chatfield WSC serves about 4,200 people in eastern Navarro County. The WSC gets its water supply by purchasing treated water from Corsicana. The water management strategies for Chatfield WSC are conservation and additional water from Corsicana. Table 4F.254 shows the projected population and demand, the current supplies, and the water management strategies for Chatfield WSC. Chatfield WSC is also considering two alternative water management strategies – a new well in the Trinity Alluvium and a joint venture project with MEN WSC to purchase and treat water from TRWD. The costs of these alternative strategies are shown in Table 4F.271 on page 4F.341.

**Table 4F.254**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Chatfield Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **4,200** | **6,000** | **7,800** | **9,799** | **11,718** | **14,075** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 428 | 726 | 935 | 1,153 | 1,378 | 1,655 |
| ***Total Projected Water Demand*** | ***428*** | ***726*** | ***935*** | ***1,153*** | ***1,378*** | ***1,655*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 428 | 726 | 878 | 1,047 | 1,201 | 1,372 |
| ***Total Current Supplies*** | ***428*** | ***726*** | ***878*** | ***1,047*** | ***1,201*** | ***1,372*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***57*** | ***106*** | ***177*** | ***283*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 30 | 49 | 65 | 83 | 105 |
| Additional Water from Corsicana | 0 | 0 | 8 | 41 | 94 | 178 |
| ***Total Water Management Strategies*** | ***6*** | ***30*** | ***57*** | ***106*** | ***177*** | ***283*** |
| **Reserve (Shortage)** | **6** | **30** | **0** | **0** | **0** | **0** |

## Community Water Company

Community Water Company is located in Regions C, D and I. In Region C, Community Water Company serves about 1,100 people in Ellis County and 1,000 people in Navarro County. The Navarro County supply is treated water purchased from Corsicana. Water management strategies in Navarro County include conservation and purchasing additional water from Corsicana. Strategies for Ellis County are discussed on page 4F.155. Table 4F.255 shows the projected population and demand, the current supplies, and the water management strategies for Community Water Company in Region C.

**Table 4F.255**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Community Water Company (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | | | | | | |
| Ellis County | 1,134 | 1,414 | 1,690 | 1,972 | 2,288 | 2,636 |
| Navarro County | 1,041 | 1,301 | 1,626 | 2,032 | 2,541 | 3,176 |
| **Total Region C Population Served** | **2,175** | **2,715** | **3,316** | **4,004** | **4,829** | **5,812** |
| **Projected Water Demand** | | | | | | |
| Ellis County | 116 | 171 | 201 | 230 | 264 | 304 |
| Navarro County | 106 | 157 | 193 | 237 | 293 | 366 |
| ***Total Region C Projected Demand*** | ***222*** | ***328*** | ***394*** | ***467*** | ***557*** | ***670*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Ennis (TRA - Lake Bardwell) | 100 | 119 | 112 | 101 | 90 | 80 |
| Corsicana (TRA - Navarro Mills Lake) | 106 | 157 | 181 | 215 | 255 | 303 |
| ***Total Current Supplies*** | ***206*** | ***276*** | ***293*** | ***316*** | ***345*** | ***383*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***16*** | ***52*** | ***101*** | ***151*** | ***212*** | ***287*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 13 | 21 | 27 | 34 | 43 |
| Additional Water from Ennis (Ellis County Water Supply Project) | 13 | 39 | 78 | 116 | 158 | 204 |
| Additional Water from Corsicana | 0 | 0 | 2 | 8 | 20 | 40 |
| ***Total Water Management Strategies*** | ***16*** | ***52*** | ***101*** | ***151*** | ***212*** | ***287*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Corsicana

Corsicana is a city of about 16,000 people located in central Navarro County. Corsicana is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.55 in Section 4E.

## Dawson

Dawson has a population of about 900 and is located in southwestern Navarro County. The city buys treated water from Corsicana for its current supply. Water management strategies for Dawson include conservation, purchasing additional water from Corsicana, and developing a new water treatment plant to treat raw water from Navarro Mills Lake. Table 4F.256 shows the projected population and demand, the current supplies, and the water management strategies for Dawson.

**Table 4F.256**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Dawson**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **909** | **971** | **1,036** | **1,106** | **1,190** | **1,293** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 177 | 185 | 195 | 204 | 219 | 238 |
| ***Total Projected Water Demand*** | ***177*** | ***185*** | ***195*** | ***204*** | ***219*** | ***238*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 177 | 185 | 183 | 185 | 191 | 197 |
| ***Total Current Supplies*** | ***177*** | ***185*** | ***183*** | ***185*** | ***191*** | ***197*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***12*** | ***19*** | ***28*** | ***41*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 5 | 7 | 13 | 16 | 19 |
| Additional Water from Corsicana | 0 | 0 | 0 | 0 | 14 | 31 |
| New Water Treatment Plant (Navarro Mills) | 0 | 56 | 56 | 56 | 56 | 56 |
| ***Total Water Management Strategies*** | ***2*** | ***61*** | ***63*** | ***69*** | ***86*** | ***106*** |
| **Reserve (Shortage)** | **2** | **61** | **51** | **50** | **58** | **65** |

## Frost

Frost is located in northwestern Navarro County and has a population of about 550. The city gets its current water supply from the Woodbine aquifer and Corsicana, and these sources are sufficient to meet projected demands. Water management strategies for Frost include conservation and supplemental wells to replace existing wells. Table 4F.257 shows the projected population and demand, the current supplies, and the water management strategies for Frost.

**Table 4F.257**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Frost**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **550** | **550** | **550** | **550** | **550** | **550** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 69 | 67 | 66 | 63 | 63 | 63 |
| ***Total Projected Demand*** | ***69*** | ***67*** | ***66*** | ***63*** | ***63*** | ***63*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 69 | 67 | 62 | 57 | 55 | 52 |
| Woodbine Aquifer | 56 | 56 | 56 | 56 | 56 | 56 |
| ***Total Current Supplies*** | ***125*** | ***123*** | ***118*** | ***113*** | ***111*** | ***108*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 3 | 4 | 4 | 4 | 4 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1*** | ***3*** | ***4*** | ***4*** | ***4*** | ***4*** |
| **Reserve (Shortage)** | **57** | **59** | **56** | **54** | **52** | **49** |

## Kerens

Kerens is a city of about 1,900 people located in eastern Navarro County. The city gets its current water supply by purchasing treated water from Corsicana. Water management strategies for Kerens include conservation and additional water from Corsicana. Table 4F.258 shows the projected population and demand, the current supplies, and the water management strategies for Kerens.

**Table 4F.258**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Kerens**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,937** | **1,937** | **1,937** | **1,937** | **1,937** | **1,937** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 460 | 453 | 447 | 440 | 436 | 436 |

**(Table 4F.258, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Projected Demand*** | ***460*** | ***453*** | ***447*** | ***440*** | ***436*** | ***436*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 368 | 368 | 368 | 368 | 368 | 361 |
| ***Total Current Supplies*** | ***368*** | ***368*** | ***368*** | ***368*** | ***368*** | ***361*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***92*** | ***85*** | ***79*** | ***72*** | ***68*** | ***75*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 10 | 14 | 16 | 17 | 19 |
| Additional Water from Corsicana | 88 | 75 | 65 | 56 | 51 | 56 |
| ***Total Water Management Strategies*** | ***92*** | ***85*** | ***79*** | ***72*** | ***68*** | ***75*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## MEN Water Supply Corporation

MEN WSC serves about 3,400 people in central and southern Navarro County. The WSC gets its water supply by purchasing treated water from Corsicana. The water management strategies for MEN WSC are conservation and purchasing additional water from Corsicana. Table 4F.259 shows the projected population and demand, the current supplies, and the water management strategies for MEN WSC. MEN WSC is also considering two alternative water management strategies – a new well in the Trinity Alluvium and a joint venture project with Chatfield WSC to purchase and treat water from TRWD. The costs of these alternative strategies are shown in Table 4F.271 on page 4F.341.

**Table 4F.259**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the MEN Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,421** | **3,755** | **4,137** | **4,477** | **4,762** | **5,180** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 441 | 471 | 510 | 542 | 571 | 621 |
| ***Total Projected Demand*** | ***441*** | ***471*** | ***510*** | ***542*** | ***571*** | ***621*** |
| | | | | | | |

(Table 4F.259, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 441 | 471 | 479 | 492 | 497 | 515 |
| ***Total Current Supplies*** | ***441*** | ***471*** | ***479*** | ***492*** | ***497*** | ***515*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***31*** | ***50*** | ***74*** | ***106*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 18 | 26 | 30 | 34 | 39 |
| Additional Water from Corsicana | 0 | 0 | 5 | 20 | 40 | 67 |
| ***Total Water Management Strategies*** | ***6*** | ***18*** | ***31*** | ***50*** | ***74*** | ***106*** |
| **Reserve (Shortage)** | **6** | **18** | **0** | **0** | **0** | **0** |

## Navarro County Irrigation

Table 4F.260 shows the projected demand, the current supplies, and the water management strategies for Navarro County Irrigation. Even though there is no demand projected for Navarro County Irrigation, water is available from local supplies. There are no water management strategies for this water user group.

**Table 4F.260**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for Navarro County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 226 | 226 | 226 | 226 | 226 | 226 |
| ***Total Current Supplies*** | ***226*** | ***226*** | ***226*** | ***226*** | ***226*** | ***226*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **226** | **226** | **226** | **226** | **226** | **226** |

## Navarro County Livestock

Table 4F.261 shows the projected demand, current supplies, and water management strategies for Navarro County Livestock. The current supplies are local surface water supplies and groundwater (Woodbine, Nacatoch and other aquifers). These sources are sufficient to meet projected demands, and supplemental wells are the only water management strategy.

**Table 4F.261**
**Projected Demand, Current Supplies, and**
**Water Management Strategies for the Navarro County Livestock**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **1,543** | **1,543** | **1,543** | **1,543** | **1,543** | **1,543** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 15 | 15 | 15 | 15 | 15 | 15 |
| Livestock Local Supply | 1,603 | 1,603 | 1,603 | 1,603 | 1,603 | 1,603 |
| Nacatoch Aquifer | 10 | 10 | 10 | 10 | 10 | 10 |
| Other Aquifer | 104 | 104 | 104 | 104 | 104 | 104 |
| ***Total Current Supplies*** | ***1,732*** | ***1,732*** | ***1,732*** | ***1,732*** | ***1,732*** | ***1,732*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **189** | **189** | **189** | **189** | **189** | **189** |

## Navarro County Manufacturing

Table 4F.262 shows the projected demand and current supplies for Navarro County Manufacturing. Current supplies are treated water from Corsicana and water from the Tarrant Regional Water District (TRWD). The water management strategies for this water user group are conservation, additional water from Corsicana, and additional water from TRWD.

**Table 4F.262**
**Projected Demand, Current Supplies, and Water Management Strategies for the Navarro County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,172** | **1,328** | **1,468** | **1,607** | **1,730** | **1,872** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 586 | 664 | 689 | 729 | 754 | 776 |
| Tarrant Regional Water District | 586 | 610 | 572 | 542 | 511 | 482 |
| ***Total Current Supplies*** | ***1,172*** | ***1,274*** | ***1,261*** | ***1,271*** | ***1,265*** | ***1,258*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***54*** | ***207*** | ***336*** | ***465*** | ***614*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 1 | 16 | 23 | 25 | 27 |
| Additional water from Corsicana | 0 | 0 | 37 | 63 | 98 | 146 |
| Additional water from TRWD | 0 | 53 | 154 | 250 | 342 | 441 |
| ***Total Water Management Strategies*** | ***0*** | ***54*** | ***207*** | ***336*** | ***465*** | ***614*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Navarro County Mining

Table 4F.263 shows the projected demand, the current supplies, and the water management strategies for Navarro County Mining. Navarro County Mining is supplied from the Carrizo-Wilcox and Nacatoch aquifers, and the supply is sufficient to meet projected demands. Supplemental wells are the only water management strategy for this water user group.

**Table 4F.263**
**Projected Demand, Current Supplies, and Water Management Strategies for Navarro County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **89** | **89** | **89** | **89** | **89** | **89** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Carrizo-Wilcox Aquifer | 73 | 73 | 73 | 73 | 73 | 73 |
| Nacatoch Aquifer | 38 | 38 | 38 | 38 | 38 | 38 |
| ***Total Current Supplies*** | ***111*** | ***111*** | ***111*** | ***111*** | ***111*** | ***111*** |

(Table 4F.263, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **22** | **22** | **22** | **22** | **22** | **22** |

## Navarro County Other

Navarro County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Navarro County Other supply about 1,800 people and receive their water supply from the Woodbine aquifer, Corsicana, and TRWD. Water management strategies for these entities include conservation, additional water from Corsicana, additional water from TRWD, and supplemental wells to replace existing water wells. Table 4F.264 shows the projected population and demand, the current supplies, and the water management strategies for Navarro County Other.

**Table 4F.264**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Navarro County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,760** | **1,760** | **1,760** | **1,760** | **1,760** | **1,760** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 250 | 244 | 239 | 233 | 229 | 229 |
| ***Total Projected Water Demand*** | ***250*** | ***244*** | ***239*** | ***233*** | ***229*** | ***229*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Woodbine Aquifer | 200 | 200 | 200 | 200 | 200 | 200 |
| Corsicana | 150 | 146 | 134 | 127 | 119 | 114 |
| Tarrant Regional Water District | 99 | 90 | 75 | 63 | 54 | 47 |
| ***Total Current Supplies*** | ***449*** | ***436*** | ***409*** | ***390*** | ***373*** | ***361*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |

**(Table 4F.264, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 8 | 11 | 12 | 13 | 14 |
| Additional Water from Corsicana | 0 | 0 | 3 | 6 | 11 | 15 |
| Additional Water from TRWD | 0 | 0 | 16 | 25 | 32 | 39 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***8*** | ***30*** | ***43*** | ***56*** | ***68*** |
| **Reserve (Shortage)** | **201** | **200** | **200** | **200** | **200** | **200** |

## Navarro County Steam Electric Power

Table 4F.265 shows the projected demand, the current supplies, and the water management strategies for Navarro County Steam Electric Power. There is no current supply or demand for this water user group. Demands are expected to increase in the future, and the water management strategy for Navarro County Steam Electric Power is buying water from Corsicana.

**Table 4F.265**
**Projected Demand, Current Supplies, and Water Management Strategies for Navarro County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **0** | **8,000** | **13,440** | **13,440** | **13,440** | **13,440** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Current Supplies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***8,000*** | ***13,440*** | ***13,440*** | ***13,440*** | ***13,440*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Corsicana | 0 | 8,000 | 13,440 | 13,440 | 13,440 | 13,440 |
| ***Total Water Management Strategies*** | ***0*** | ***8,000*** | ***13,440*** | ***13,440*** | ***13,440*** | ***13,440*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Navarro Mills Water Supply Corporation

Navarro Mills WSC provides water for about 3,000 people in northwestern Navarro County. The WSC gets its water supply by purchasing treated water from Corsicana. The water management strategies for Navarro Mills WSC are conservation, purchasing additional water from Corsicana, and a new well in the Woodbine aquifer. Table 4F.266 shows the projected population and demand, the current supplies, and the water management strategies for Navarro Mills WSC.

**Table 4F.266**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Navarro Mills Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **3,090** | **3,690** | **4,290** | **5,000** | **5,800** | **6,600** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 329 | 442 | 500 | 577 | 663 | 754 |
| ***Total Projected Demand*** | ***329*** | ***442*** | ***500*** | ***577*** | ***663*** | ***754*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 329 | 442 | 470 | 524 | 578 | 625 |
| ***Total Current Supplies*** | ***329*** | ***442*** | ***470*** | ***524*** | ***578*** | ***625*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***30*** | ***53*** | ***85*** | ***129*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 18 | 27 | 33 | 41 | 49 |
| Additional Water from Corsicana | 0 | 0 | 3 | 20 | 44 | 80 |
| Woodbine Aquifer (new well) | 0 | 44 | 44 | 44 | 44 | 44 |
| ***Total Water Management Strategies*** | ***5*** | ***62*** | ***74*** | ***97*** | ***129*** | ***173*** |
| **Reserve (Shortage)** | **5** | **62** | **44** | **44** | **44** | **44** |

## Rice

Rice has a population of about 950 and is located in northern Navarro County. The current supply for Rice is retail service from Rice WSC (which in turn gets water from Corsicana and Ennis). Water management strategies for Rice include conservation and additional water from Rice WSC. Table 4F.267 shows the projected population and demand, the current supplies, and the water management strategies for Rice.

**Table 4F.267**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Rice**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **954** | **1,123** | **1,299** | **1,490** | **1,718** | **1,998** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 229 | 265 | 304 | 347 | 398 | 463 |
| ***Total Projected Demand*** | ***229*** | ***265*** | ***304*** | ***347*** | ***398*** | ***463*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Rice Water Supply Corporation (Ennis and Corsicana) | 229 | 265 | 285 | 315 | 347 | 384 |
| ***Total Current Supplies*** | ***229*** | ***265*** | ***285*** | ***315*** | ***347*** | ***384*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***19*** | ***32*** | ***51*** | ***79*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 7 | 10 | 20 | 26 | 34 |
| Additional Water from Rice WSC | 0 | 0 | 9 | 12 | 25 | 45 |
| ***Total Water Management Strategies*** | ***2*** | ***7*** | ***19*** | ***32*** | ***51*** | ***79*** |
| **Reserve (Shortage)** | **2** | **7** | **0** | **0** | **0** | **0** |

## Rice Water Supply Corporation

Rice WSC provides retail service to about 8,600 people in northern Navarro County and southeastern Ellis County in and around the City of Rice. The WSC gets most of its water supply from Corsicana, with a small supply from Ennis. Water management strategies for Rice WSC include conservation, additional water from Corsicana, and additional water from Ennis. Table 4F.268 shows the projected population and demand, the current supplies, and the water management strategies for Rice WSC.

**Table 4F.268**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Rice Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | | | | | | |
| Outside of Rice | 7,667 | 9,734 | 11,867 | 14,161 | 16,872 | 20,152 |
| In Rice | 954 | 1,123 | 1,299 | 1,490 | 1,718 | 1,998 |
| **Total Population Served** | **8,621** | **10,857** | **13,166** | **15,651** | **18,590** | **22,150** |
| | | | | | | |
| **Projected Water Demand** | | | | | | |
| Outside of Rice | 945 | 1,167 | 1,409 | 1,650 | 1,966 | 2,347 |
| In Rice | 229 | 265 | 304 | 347 | 398 | 463 |
| ***Total Projected Demand*** | ***1,174*** | ***1,432*** | ***1,713*** | ***1,997*** | ***2,364*** | ***2,810*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Corsicana | 1,174 | 1,432 | 1,608 | 1,813 | 2,060 | 2,329 |
| Ennis | 43 | 35 | 28 | 22 | 17 | 13 |
| ***Total Current Supplies*** | ***1,217*** | ***1,467*** | ***1,636*** | ***1,835*** | ***2,077*** | ***2,342*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***77*** | ***162*** | ***287*** | ***468*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 15 | 55 | 84 | 114 | 145 | 184 |
| Additional Water from Corsicana | 0 | 0 | 0 | 20 | 109 | 247 |
| Additional Water from Ennis | 7 | 15 | 22 | 28 | 33 | 37 |
| ***Total Water Management Strategies*** | ***22*** | ***70*** | ***106*** | ***162*** | ***287*** | ***468*** |
| **Reserve (Shortage)** | **65** | **105** | **29** | **0** | **0** | **0** |

## Costs for Navarro County Water User Groups

Table 4F.269 shows the estimated capital costs for Navarro County water management strategies not covered under the wholesale water providers. Table 4F.270 summarizes the costs by category. Table 4F.271 gives the costs of alternative Navarro County water management strategies not covered under the wholesale water providers and is followed by a summary for Navarro County.

**Table 4F.269**
**Costs for Recommended Water Management Strategies for Navarro County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Blooming Grove | Conservation | 2010 | 13 | $0 | $0.74 | $0.74 | Q-10 & Q-11 |
| | Additional Corsicana | 2030 | 13 | $0 | $2.50 | $2.50 | None |
| | Groundwater | 2020 | 160 | $167,000 | $5.70 | $2.00 | Q-244 |
| Brandon-Irene WSC* (Region C only) | Conservation | 2020 | 3 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Chatfield WSC | Conservation | 2010 | 105 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Corsicana | 2030 | 178 | $0 | $2.50 | $2.50 | None |
| Community Water Company* (Navarro County only) | Conservation | 2010 | 43 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Corsicana | 2030 | 40 | $0 | $2.50 | $2.50 | None |
| Corsicana | Conservation | 2010 | 751 | See Corsicana in Section 4E. | | | |
| | New Halbert Water Treatment Plant and R-C PS | 2020 | 0 | See Corsicana in Section 4E. | | | |
| | Treatment plant expansion | 2040 | 0 | See Corsicana in Section 4E. | | | |
| | Purchase from TRWD (RC-C) | 2030 | 3,320 | See Corsicana in Section 4E. | | | |
| Dawson | Conservation | 2010 | 19 | $0 | $0.61 | $0.61 | Q-10 & Q-11 |
| | TRA (Navarro Mills) | 2020 | 0 | See TRA in Section 4E. | | | |
| | Water treatment plant | 2020 | 60 | $1,044,000 | $4.88 | $0.71 | Q-14 |
| | Additional Corsicana | 2050 | 31 | $0 | $2.50 | $2.50 | None |
| Frost | Conservation | 2010 | 4 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $558,000 | N/A | N/A | Q-13 |

(Table 4F.269, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Kerens | Conservation | 2010 | 19 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Corsicana | 2030 | 75 | $0 | $2.50 | $2.50 | None |
| MEN WSC | Conservation | 2010 | 39 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Upsize Lake Halbert Connection | 2020 | 600 | $3,002,000 | $4.64 | $3.53 | Q-248 |
| | Additional Corsicana | 2030 | 106 | $0 | $2.50 | $2.50 | None |
| Navarro County Other | Conservation | 2010 | 14 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2020 | 0 | $558,000 | N/A | N/A | Q-13 |
| | Additional Corsicana | 2030 | 15 | $0 | $2.50 | $2.50 | None |
| | Additional TRWD | 2030 | 39 | $0 | $0.69 | $0.69 | None |
| Navarro Mills WSC | Conservation | 2010 | 49 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Groundwater | 2020 | 44 | $1,200,000 | $4.62 | $1.64 | Q-245 |
| | Additional Corsicana | 2030 | 80 | $0 | $2.50 | $2.50 | None |
| Rice | Conservation | 2010 | 34 | $0 | $0.52 | $0.52 | Q-10 & Q-11 |
| | Additional Corsicana | 2030 | 45 | $0 | $2.50 | $2.50 | None |
| Rice WSC* | Conservation | 2010 | 150 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Ennis | 2010 | 37 | $0 | $2.50 | $2.50 | None |
| | Additional Corsicana | 2040 | 202 | $0 | $2.50 | $2.50 | None |
| Navarro County Irrigation | None | N/A | N/A | N/A | N/A | N/A | N/A |
| Navarro County Livestock | Supplemental wells | 2010 | 0 | $105,000 | N/A | N/A | Q-13 |
| Navarro County Manufacturing | Conservation | 2020 | 27 | $0 | $0.85 | $0.85 | Q-12 |
| | Additional Corsicana | 2030 | 146 | $0 | $2.50 | $2.50 | None |
| | Additional TRWD | 2020 | 441 | $0 | $0.69 | $0.69 | None |

**(Table 4F.269, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Navarro County Mining | Supplemental wells | 2010 | 0 | $348,000 | N/A | N/A | Q-13 |
| Navarro County Steam Electric | Corsicana (Richland-Chambers) | 2020 | 13,440 | See Corsicana in Section 4E. | | | |

Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.270**
**Summary of Recommended Water Management Strategies for Navarro County Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 1,230 | $0 |
| Purchase from WWP | 18,208 | $0 |
| Supplemental wells | 0 | $1,569,000 |
| Groundwater | 204 | $1,367,000 |
| Water transmission | 600 | $3,002,000 |
| Water treatment | 60 | $1,044,000 |
| **Total** | | **$6,982,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.

**Table 4F.271**
**Cost of Alternative Water Management Strategies for Navarro County Not Covered Under Wholesale Water Providers**

| Strategy and Supplier | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Well in Trinity Alluvium – Chatfield WSC | 2,240 | $3,500,000 |
| Well in Trinity Alluvium – MEN WSC | 2,240 | $3,500,000 |
| Purchase and Treat TRWD Water – Chatfield WSC and MEN WSC | 4,480 | $17,000,000 |
| **Total** | | **$24,000,000** |

***2000 Population:*** *45,124*

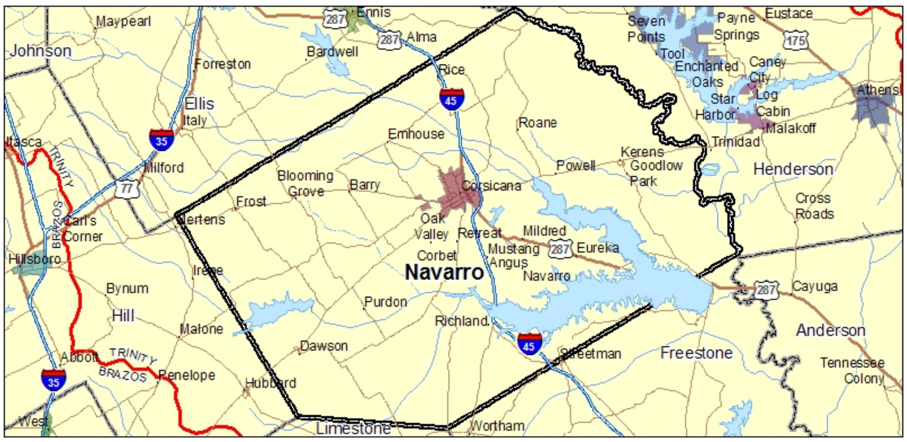
***Projected 2060 Population:*** *89,638*

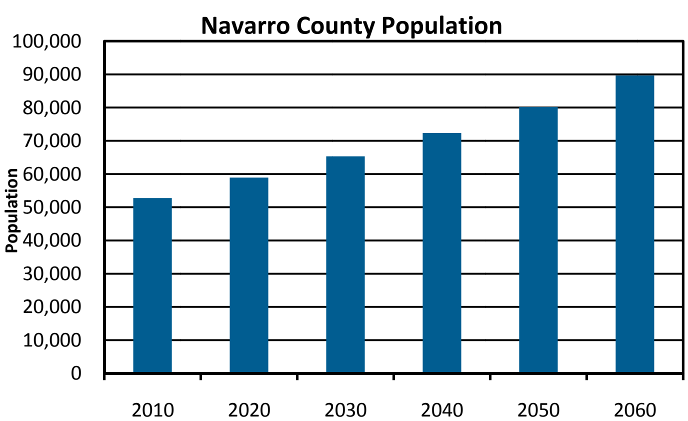
***County Seat:*** *Corsicana*

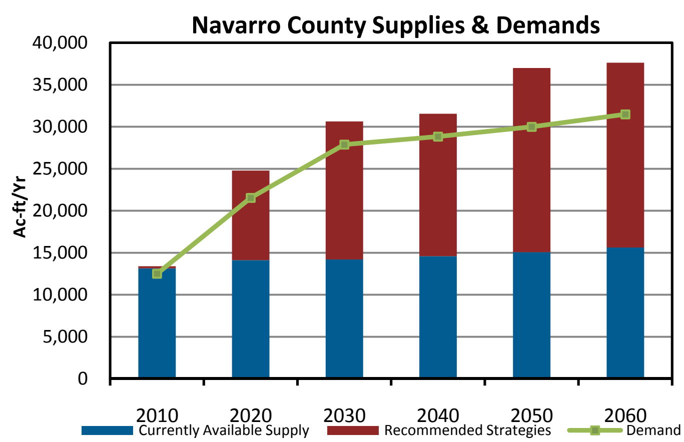
***Economy:*** *Manufacturing; agribusinesses; oil-field operations, distribution.*

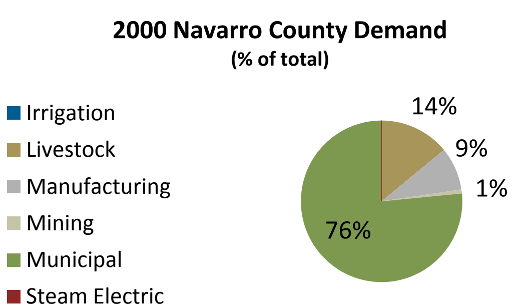
***River Basin(s):***

- Trinity (100%)

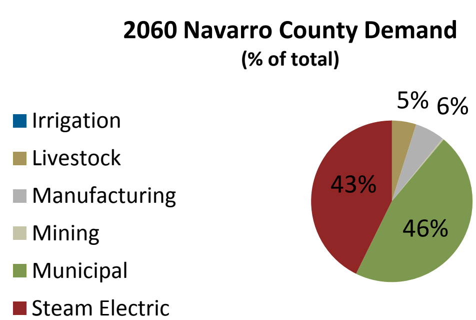



**Total=11,007 acre-feet**




**Total= 31,482 acre-feet**

| WATER USER GROUP | 2060 DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Blooming Grove | 150 | Corsicana | Additional Corsicana supplies, New well in Trinity Aquifer |
| Brandon-Irene WSC [a] | 36 | Aquilla WSD (Lake Aquilla, Region G) | None |
| Chatfield WSC | 1,655 | Corsicana | Additional Corsicana supplies |
| Community Water Company (Navarro Co. Only) [a] | 366 | Corsicana | Additional Corsicana supplies |
| Corsicana | 7,518 | Navarro Mills Reservoir, Lake Halbert/ Richland-Chambers | New pump station and WTP (Lake Halbert/Richland-Chambers), WTP expansions, TRWD supplies (Richland-Chambers Reservoir), Raw water for SEP |
| Dawson | 238 | Corsicana | Additional Corsicana supplies, New Water Treatment Plant |
| Frost | 63 | Corsicana, Woodbine Aquifer | Supplemental wells |
| Kerens | 436 | Corsicana | Additional Corsicana supplies |
| M E N WSC | 621 | Corsicana | Additional Corsicana supplies |
| Navarro Mills WSC | 754 | Corsicana | Additional Corsicana supplies, New well in Woodbine Aquifer |
| Rice | 463 | Rice WSC (from Ennis and Corsicana) | Additional Rice WSC supplies |
| Rice WSC [a] | 2,009 | Ennis, Corsicana | Additional Ennis supplies, Additional Corsicana supplies |
| County-Other | 229 | Corsicana, TRWD, Woodbine Aquifer | Additional Corsicana supplies, Additional TRWD supplies, supplemental wells |
| Irrigation | 0 | Local supplies | None |
| Livestock | 1,543 | Carrizo-Wilcox, Nacatoch, and Other Aquifers, Local supplies | Supplemental wells |
| Manufacturing | 1,872 | Corsicana, TRWD | Additional Corsicana supplies, Additional TRWD supplies |
| Mining | 89 | Carrizo-Wilcox and Nacatoch Aquifers | Supplemental wells |
| Steam Electric Power | 13,440 | None | Corsicana supplies |

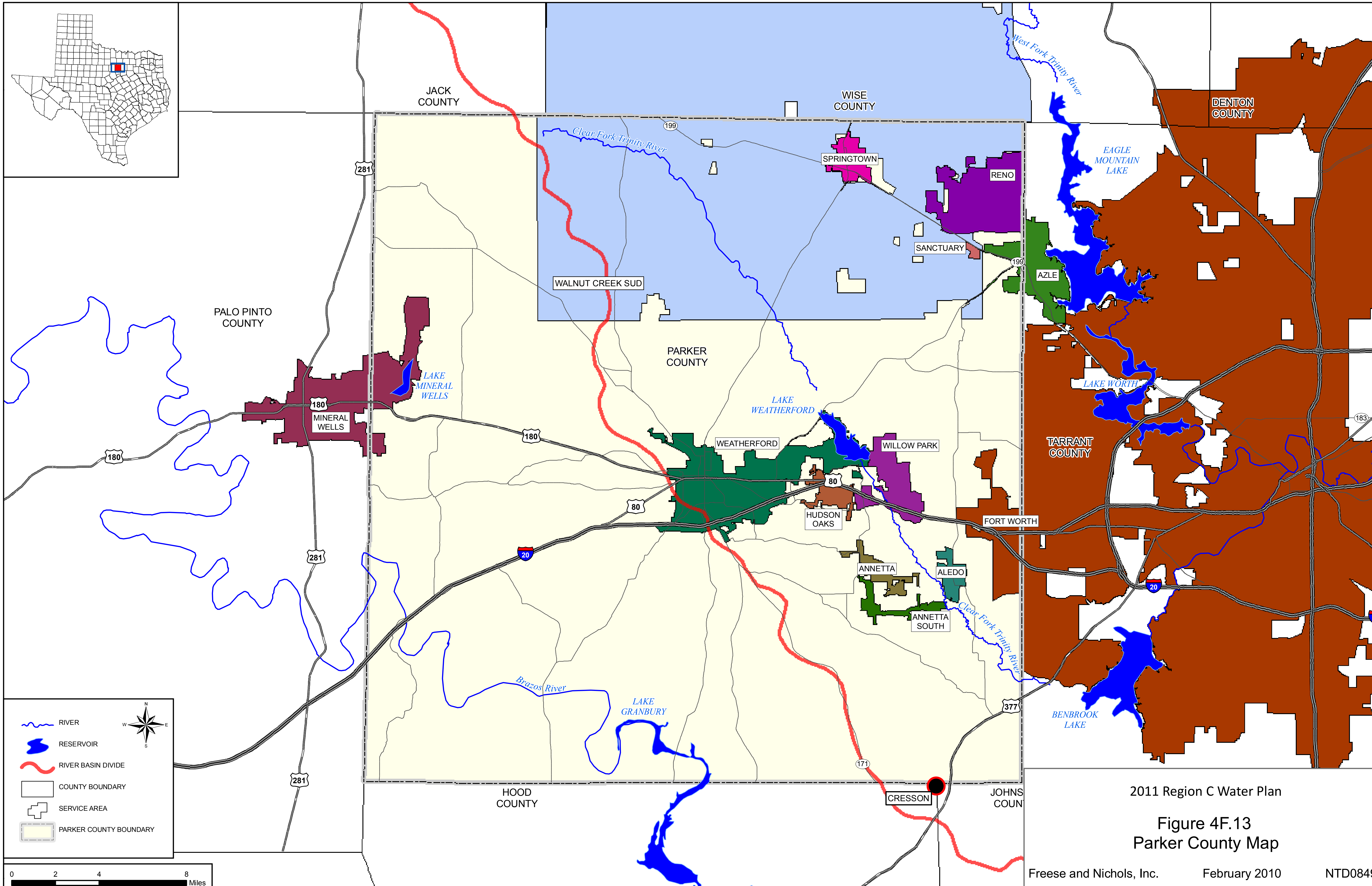
[a] WUG is in multiple counties

[b] Water conservation is a strategy for every municipal user group.

## *4F.13 Parker County*

Figure 4F.13 is a map of Parker County. The majority of the water user groups in Parker County meet their demands from groundwater, but the larger suppliers (Weatherford, Azle, Fort Worth, and Walnut Creek Special Utility District) rely on surface water. The demand in Parker County is expected to outgrow the available groundwater supply, and some suppliers will convert from groundwater to surface water. Weatherford, Springtown, and Parker County Other will build and/or expand water treatment plants in the county. Fort Worth, Azle, and Walnut Creek SUD will build and/or expand plants outside of the county and bring additional supplies into Parker County.

Water management strategies for Parker County water user groups are discussed on the following pages. Table 4F.288 on page 4F.361 shows the estimated capital costs for the Parker County water management strategies not associated with the wholesale water providers, and Table 4F.289 on page 4F.364 is a summary of the costs by category. Table 4F.289 is followed by a Parker County summary.


JACK COUNTY
WISE COUNTY
DENTON COUNTY
PALO PINTO COUNTY
PARKER COUNTY
TARRANT COUNTY
HOOD COUNTY
JOHNS COUN
West Fork Trinity River
Clear Fork Trinity River
Brazos River
EAGLE MOUNTAIN LAKE
LAKE MINERAL WELLS
LAKE WEATHERFORD
LAKE WORTH
LAKE GRANBURY
BENBROOK LAKE
SPRINGTOWN
RENO
SANCTUARY
AZLE
WALNUT CREEK SUD
MINERAL WELLS
WEATHERFORD
WILLOW PARK
HUDSON OAKS
FORT WORTH
ANNETTA
ALEDO
ANNETTA SOUTH
CRESSON
199
281
180
80
20
171
377
183
37
RIVER
RESERVOIR
RIVER BASIN DIVIDE
COUNTY BOUNDARY
SERVICE AREA
PARKER COUNTY BOUNDARY
0
2
4
8
Miles
2011 Region C Water Plan
Figure 4F.13
Parker County Map
Freese and Nichols, Inc.
February 2010
NTD08492

## Aledo

Aledo is a city of about 2,700 people located in eastern Parker County. The city gets its current water supply from wells in the Trinity aquifer. Water management strategies for Aledo include conservation, purchasing treated water from Fort Worth (which gets raw water from TRWD and treats it), and supplemental wells to replace existing wells. Table 4F.272 shows the projected population and demand, the current supplies, and the water management strategies for Aledo.

**Table 4F.272**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Aledo**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **2,710** | **5,620** | **9,120** | **12,620** | **13,258** | **13,258** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 455 | 957 | 1,532 | 2,106 | 2,213 | 2,213 |
| ***Total Projected Water Demand*** | ***455*** | ***957*** | ***1,532*** | ***2,106*** | ***2,213*** | ***2,213*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 501 | 501 | 501 | 501 | 501 | 501 |
| ***Total Current Supplies*** | ***501*** | ***501*** | ***501*** | ***501*** | ***501*** | ***501*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***456*** | ***1,031*** | ***1,605*** | ***1,712*** | ***1,712*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 10 | 68 | 131 | 199 | 228 | 247 |
| Fort Worth (Tarrant Regional WD) | 0 | 419 | 900 | 1,406 | 1,484 | 1,465 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***10*** | ***487*** | ***1,031*** | ***1,605*** | ***1,712*** | ***1,712*** |
| **Reserve (Shortage)** | **56** | **31** | **0** | **0** | **0** | **0** |

## Annetta

Annetta has a population of about 1,600 and is located in eastern Parker County. The current water supply for residents comes from wells in the Trinity aquifer. Water management strategies for Annetta include conservation, purchasing treated water from Weatherford (with the raw water supplied to Weatherford by TRWD), and supplemental wells to replace existing wells. Table 4F.273 shows the projected population and demand, the current supplies, and the water management strategies for Annetta.

**Table 4F.273**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Annetta**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,579** | **1,972** | **2,289** | **2,564** | **2,856** | **3,176** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 218 | 265 | 305 | 339 | 374 | 416 |
| ***Total Projected Water Demand*** | ***218*** | ***265*** | ***305*** | ***339*** | ***374*** | ***416*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 240 | 240 | 240 | 240 | 240 | 240 |
| ***Total Current Supplies*** | ***240*** | ***240*** | ***240*** | ***240*** | ***240*** | ***240*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***25*** | ***65*** | ***99*** | ***134*** | ***176*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 11 | 16 | 19 | 23 | 27 |
| Weatherford (Tarrant Regional WD) | 0 | 14 | 49 | 80 | 111 | 149 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***25*** | ***65*** | ***99*** | ***134*** | ***176*** |
| **Reserve (Shortage)** | **25** | **0** | **0** | **0** | **0** | **0** |

## Annetta South

Annetta South is located in eastern Parker County and has a population of about 700. The current water supply for residents comes from wells in the Trinity aquifer. Water management strategies for Annetta South include conservation, purchasing treated water from Weatherford (with the raw water supplied to Weatherford by TRWD), and supplemental wells to replace existing wells. Table 4F.274 shows the projected population and demand, the current supplies, and the water management strategies for Annetta South.

**Table 4F.274**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Annetta South**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **708** | **836** | **939** | **1,028** | **1,123** | **1,227** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 91 | 105 | 116 | 124 | 135 | 147 |
| ***Total Projected Water Demand*** | ***91*** | ***105*** | ***116*** | ***124*** | ***135*** | ***147*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 100 | 100 | 100 | 100 | 100 | 100 |
| ***Total Current Supplies*** | ***100*** | ***100*** | ***100*** | ***100*** | ***100*** | ***100*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***5*** | ***16*** | ***24*** | ***35*** | ***47*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 1 | 4 | 6 | 8 | 9 | 10 |
| Weatherford (Tarrant Regional WD) | 0 | 1 | 10 | 16 | 26 | 37 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***1*** | ***5*** | ***16*** | ***24*** | ***35*** | ***47*** |
| **Reserve (Shortage)** | **10** | **0** | **0** | **0** | **0** | **0** |

## Azle

Azle is a city of about 12,000 people located in northwestern Tarrant County and northeastern Parker County. The water management strategies for Azle are discussed on page 4F.388 under Tarrant County.

## Cresson

Cresson has a population of about 780 and is located in Parker County in Region C and Hood and Johnson Counties in Region G. In Region C, Cresson's residents are provided with retail service by Bluebonnet WSC (a part of Parker County Other), which uses groundwater from the Trinity Aquifer. Table 4F.275 shows the projected population and demand, the current supplies, and the water management strategies for Cresson in Region C. Water management strategies in Hood and Johnson Counties are discussed in the Brazos G Regional Water Plan.

**Table 4F.275**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Cresson (Region C only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Region C Population** | **403** | **492** | **601** | **734** | **896** | **1,093** |
| **Projected Water Demand** | | | | | | |
| Region C Municipal Demand | 56 | 68 | 83 | 101 | 123 | 151 |
| ***Total Projected Region C Demand*** | ***56*** | ***68*** | ***83*** | ***101*** | ***123*** | ***151*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Bluebonnet Hills WSC (Trinity Aquifer) | 166 | 166 | 166 | 166 | 166 | 166 |
| ***Total Current Supplies*** | ***166*** | ***166*** | ***166*** | ***166*** | ***166*** | ***166*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Region C Water Conservation | 1 | 3 | 4 | 5 | 7 | 9 |
| ***Total Water Management Strategies*** | ***1*** | ***3*** | ***4*** | ***5*** | ***7*** | ***9*** |
| **Reserve (Shortage)** | **111** | **101** | **87** | **70** | **50** | **24** |

### Fort Worth

Fort Worth is a city of about 743,000 located primarily in Tarrant County, with some population in Denton, Parker, and Wise Counties. Fort Worth is a wholesale water provider, and the city's water supply plans are discussed beginning on page 4E.30 in Section 4E.

### Hudson Oaks

Hudson Oaks is a city of about 2,000 people located in central and eastern Parker County. The city gets its current water supply from wells in the Trinity aquifer and treated water purchased from Weatherford (supplied from TRWD raw water). Water management strategies for Hudson Oaks include conservation, purchasing additional treated water from Weatherford, and supplemental wells to replace existing wells. Table 4F.276 shows the projected population and demand, the current supplies, and the water management strategies for Hudson Oaks.

**Table 4F.276**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Hudson Oaks**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,000** | **2,438** | **2,972** | **3,500** | **4,000** | **4,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 394 | 475 | 576 | 674 | 771 | 867 |
| ***Total Projected Demand*** | ***394*** | ***475*** | ***576*** | ***674*** | ***771*** | ***867*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 281 | 281 | 281 | 281 | 281 | 281 |
| Weatherford (TRWD) | 109 | 178 | 230 | 265 | 289 | 302 |
| ***Total Current Supplies*** | ***390*** | ***459*** | ***511*** | ***546*** | ***570*** | ***583*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***4*** | ***16*** | ***65*** | ***128*** | ***201*** | ***284*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 23 | 36 | 48 | 61 | 76 |
| Additional Water from Weatherford | 0 | 0 | 29 | 80 | 140 | 208 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***23*** | ***65*** | ***128*** | ***201*** | ***284*** |
| **Reserve (Shortage)** | **0** | **7** | **0** | **0** | **0** | **0** |

## Mineral Wells

Mineral Wells has a population of about 19,000 and is located in eastern Palo Pinto County (in the Brazos G Region) and western Parker County. The city gets its water supply from Palo Pinto County Water Control and Improvement District Number 1 (which diverts and treats water from Lake Palo Pinto in the Brazos G region). Conservation is the only water management strategy for Mineral Wells in Region C. Table 4F.277 shows the projected population and demand, the current supplies, and the water management strategies for Mineral Wells in Region C. Brazos G region strategies for Mineral Wells are discussed in the Brazos G Regional Water Plan.

**Table 4F.277**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Mineral Wells (Region C only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population in Region C** | **4,000** | **4,000** | **4,000** | **4,000** | **4,000** | **4,000** |
| **Projected Water Demand in Region C** | | | | | | |
| Municipal Demand | 766 | 753 | 744 | 730 | 726 | 726 |
| ***Total Projected Demand in Region C*** | ***766*** | ***753*** | ***744*** | ***730*** | ***726*** | ***726*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Palo Pinto County WCID # 1 | 756 | 734 | 719 | 703 | 697 | 694 |
| ***Total Current Supplies*** | ***756*** | ***734*** | ***719*** | ***703*** | ***697*** | ***694*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***10*** | ***19*** | ***25*** | ***27*** | ***29*** | ***32*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 10 | 19 | 25 | 27 | 29 | 32 |
| ***Total Water Management Strategies*** | ***10*** | ***19*** | ***25*** | ***27*** | ***29*** | ***32*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Parker County Irrigation

Table 4F.278 shows the projected demand, the current supplies, and the water management strategies for Parker County Irrigation. The current supplies are local surface water supplies, direct reuse, and groundwater (Trinity aquifer). These sources are sufficient to meet projected demands, and supplemental wells are the only water management strategy.

**Table 4F.278**
**Projected Demand, Current Supplies, and Water Management Strategies for Parker County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **422** | **422** | **422** | **422** | **422** | **422** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 239 | 239 | 239 | 239 | 239 | 239 |
| Direct Reuse | 13 | 13 | 13 | 13 | 13 | 13 |

(Table 4F.278, Continued)

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Trinity Aquifer | 521 | 521 | 521 | 521 | 521 | 521 |
| ***Total Current Supplies*** | ***773*** | ***773*** | ***773*** | ***773*** | ***773*** | ***773*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **351** | **351** | **351** | **351** | **351** | **351** |

## Parker County Livestock

Table 4F.279 shows the projected demand, current supplies, and water management strategies for Parker County Livestock. The current supplies are local surface water supplies and groundwater from the Trinity aquifer. These sources are sufficient to meet projected demands, and supplemental wells are the only water management strategy for this water user group.

**Table 4F.279**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Parker County Livestock**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,856** | **1,856** | **1,856** | **1,856** | **1,856** | **1,856** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 213 | 213 | 213 | 213 | 213 | 213 |
| Local Supplies | 1,922 | 1,922 | 1,922 | 1,922 | 1,922 | 1,922 |
| ***Total Current Supplies*** | ***2,135*** | ***2,135*** | ***2,135*** | ***2,135*** | ***2,135*** | ***2,135*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **279** | **279** | **279** | **279** | **279** | **279** |

## Parker County Manufacturing

Table 4F.280 shows the projected demand and current supplies for Parker County Manufacturing. Current supplies are groundwater (Trinity aquifer), treated water from Mineral Wells (Palo Pinto County WCID #1 and Lake Palo Pinto), and treated water from Weatherford (part from Lake Weatherford and part from TRWD). The water management strategies for this water user group are conservation, additional water from Weatherford, and supplemental wells to replace existing wells.

**Table 4F.280**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Parker County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **779** | **879** | **974** | **1,068** | **1,150** | **1,248** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Mineral Wells (Palo Pinto Co. WCID) | 25 | 25 | 25 | 25 | 25 | 25 |
| Weatherford (Lake Weatherford) | 236 | 266 | 252 | 241 | 230 | 219 |
| Trinity Aquifer | 18 | 18 | 18 | 18 | 18 | 18 |
| Weatherford (TRWD) | 623 | 645 | 608 | 577 | 544 | 514 |
| ***Total Current Supplies*** | ***902*** | ***954*** | ***903*** | ***861*** | ***817*** | ***776*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***71*** | ***207*** | ***333*** | ***472*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 1 | 6 | 9 | 9 | 10 |
| Additional water from Weatherford | 0 | 0 | 65 | 198 | 324 | 462 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***1*** | ***71*** | ***207*** | ***333*** | ***472*** |
| **Reserve (Shortage)** | **123** | **76** | **0** | **0** | **0** | **0** |

## Parker County Mining

Table 4F.281 shows the projected demand, the current supplies, and the water management strategies for Parker County Mining. Parker County Mining is supplied from local supplies, the Brazos River Authority, and the Trinity aquifer. The supply is sufficient to meet projected demands, and supplemental wells are the only water management strategy for this water user group.

**Table 4F.281**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Parker County Mining**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **5,868** | **1,702** | **1,692** | **1,702** | **1,712** | **1,720** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local supplies | 20 | 20 | 20 | 20 | 20 | 20 |
| Brazos River Authority | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Trinity Aquifer | 5,868 | 5,868 | 5,868 | 5,868 | 5,868 | 5,868 |
| ***Total Current Supplies*** | ***7,888*** | ***7,888*** | ***7,888*** | ***7,888*** | ***7,888*** | ***7,888*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **2,020** | **6,186** | **6,196** | **6,186** | **6,176** | **6,168** |

## Parker County Other

Parker County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Parker County Other supply about 38,000 people and receive their water supply from Mineral Wells (from Palo Pinto County WCID #1 and Lake Palo Pinto), Weatherford (part from Lake Weatherford and part from TRWD), and groundwater (Trinity and other aquifers). Water management strategies for these entities include conservation, a new water treatment plant to treat water from the Brazos River purchased from the Brazos River Authority, additional water from Weatherford, and supplemental wells to replace existing water wells. Table 4F.282 shows the projected population and demand, the current supplies, and the water management strategies for Parker County Other.

**Table C-282**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Parker County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **37,741** | **37,332** | **38,304** | **38,662** | **36,500** | **34,303** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 4,735 | 4,558 | 4,591 | 4,547 | 4,252 | 3,996 |
| ***Total Projected Water Demand*** | ***4,735*** | ***4,558*** | ***4,591*** | ***4,547*** | ***4,252*** | ***3,996*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 5,815 | 5,815 | 5,815 | 5,815 | 5,815 | 5,815 |
| Other Aquifer | 50 | 50 | 50 | 50 | 50 | 50 |
| Mineral Wells (Palo Pinto Co. WCID) | 474 | 479 | 479 | 479 | 479 | 479 |
| Weatherford (Lake Weatherford) | 0 | 86 | 74 | 64 | 53 | 43 |
| Weatherford (TRWD) | 0 | 145 | 129 | 113 | 95 | 81 |
| ***Total Current Supplies*** | ***6,339*** | ***6,575*** | ***6,547*** | ***6,521*** | ***6,492*** | ***6,468*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 44 | 166 | 233 | 254 | 253 | 251 |
| New WTP and Water from BRA (Region G) | 0 | 500 | 500 | 500 | 500 | 500 |
| Additional Water from Weatherford | 0 | 0 | 38 | 61 | 74 | 83 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***44*** | ***666*** | ***771*** | ***815*** | ***827*** | ***834*** |
| **Reserve (Shortage)** | **1,648** | **2,683** | **2,727** | **2,789** | **3,067** | **3,306** |

## Parker County Steam Electric Power

Table 4F.283 shows the projected demand, the current supplies, and the water management strategies for Parker County Steam Electric Power. Parker County Steam Electric Power is supplied by Weatherford (from Lake Weatherford), and the water management strategy is additional water from Weatherford.

**Table 4F.283**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Parker County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **24** | **22** | **28** | **56** | **75** | **102** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Weatherford (Lake Weatherford) | 24 | 20 | 22 | 38 | 44 | 53 |
| ***Total Current Supplies*** | ***24*** | ***20*** | ***22*** | ***38*** | ***44*** | ***53*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***2*** | ***6*** | ***18*** | ***31*** | ***49*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Weatherford | 0 | 2 | 6 | 18 | 31 | 49 |
| ***Total Water Management Strategies*** | ***0*** | ***2*** | ***6*** | ***18*** | ***31*** | ***49*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Reno

Reno is a city of about 2,600 people located in northeastern Parker County. The city gets its current water supply from wells in the Trinity aquifer and treated water purchased from Springtown (from TRWD raw water) and Walnut Creek SUD (from TRWD raw water). Water management strategies for Reno include conservation, purchasing additional treated water from Springtown, purchasing additional treated water from Walnut Creek SUD, and supplemental wells to replace existing wells. Table 4F.284 shows the projected population and demand, the current supplies, and the water management strategies for Reno.

**Table 4F.284**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Reno**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,569** | **2,676** | **2,763** | **2,838** | **2,918** | **3,005** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 319 | 321 | 322 | 321 | 327 | 337 |
| ***Total Projected Demand*** | ***319*** | ***321*** | ***322*** | ***321*** | ***327*** | ***337*** |
| | | | | | | |

**(Table 4F.284, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 167 | 167 | 167 | 167 | 167 | 167 |
| Springtown (TRWD) | 74 | 71 | 61 | 52 | 48 | 44 |
| Walnut Creek SUD (TRWD) | 74 | 70 | 60 | 52 | 47 | 44 |
| ***Total Current Supplies*** | ***315*** | ***308*** | ***288*** | ***271*** | ***262*** | ***255*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***4*** | ***13*** | ***34*** | ***50*** | ***65*** | ***82*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 13 | 17 | 19 | 21 | 22 |
| Additional Water from Springtown | 0 | 0 | 8 | 16 | 22 | 30 |
| Additional Water from Walnut Ck. SUD | 0 | 0 | 9 | 15 | 22 | 30 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***13*** | ***34*** | ***50*** | ***65*** | ***82*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Sanctuary

Sanctuary has a population of about 720 and is located in northeastern Parker County. Sanctuary's residents are provided with retail service by Walnut Creek SUD (which uses raw water from TRWD). Water management strategies for Sanctuary are conservation and additional water from Walnut Creek SUD. Table 4F.285 shows the projected population and demand, the current supplies, and the water management strategies for Sanctuary.

**Table 4F.285**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Sanctuary**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **715** | **1,675** | **2,435** | **2,875** | **3,305** | **3,708** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 92 | 216 | 314 | 370 | 426 | 478 |
| ***Total Projected Demand*** | ***92*** | ***216*** | ***314*** | ***370*** | ***426*** | ***478*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |

**(Table 4F.285, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Walnut Ck. Special Utility District (TRWD) | 90 | 198 | 245 | 250 | 252 | 246 |
| ***Total Current Supplies*** | ***90*** | ***198*** | ***245*** | ***250*** | ***252*** | ***246*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***18*** | ***69*** | ***120*** | ***174*** | ***232*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 10 | 16 | 20 | 25 | 29 |
| Additional Water from Walnut Ck. SUD | 0 | 8 | 53 | 100 | 149 | 203 |
| ***Total Water Management Strategies*** | ***2*** | ***18*** | ***69*** | ***120*** | ***174*** | ***232*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Springtown

Springtown is a city of about 3,000 people located in northern Parker County. The city gets its current water supply from wells in the Trinity aquifer and its own water treatment plant (using raw water purchased from TRWD). Water management strategies for Springtown include conservation, additional water from the Trinity aquifer (new wells), a new water treatment plant and expansions with additional raw water from TRWD, and supplemental wells to replace existing wells. Table 4F.286 shows the projected population and demand, the current supplies, and the water management strategies for Springtown.

**Table 4F.286**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Springtown**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population (In City Only)** | **3,000** | **4,000** | **5,000** | **6,000** | **7,000** | **8,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 504 | 659 | 807 | 961 | 1,113 | 1,272 |
| Sales to Reno | 74 | 71 | 69 | 68 | 70 | 74 |
| ***Total Projected Demand*** | ***578*** | ***730*** | ***876*** | ***1,029*** | ***1,183*** | ***1,346*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 52 | 52 | 52 | 52 | 52 | 52 |

**Table 4F.286, Continued**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Tarrant Regional Water District | 333 | 459 | 506 | 542 | 566 | 579 |
| ***Total Current Supplies*** | ***385*** | ***511*** | ***558*** | ***594*** | ***618*** | ***631*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***193*** | ***219*** | ***318*** | ***435*** | ***565*** | ***715*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 23 | 55 | 79 | 112 | 127 | 156 |
| Trinity Aquifer - new wells | 184 | 184 | 184 | 184 | 184 | 184 |
| Additional Water from TRWD with New WTP and Expansions | 0 | 0 | 55 | 139 | 254 | 375 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***207*** | ***239*** | ***318*** | ***435*** | ***565*** | ***715*** |
| **Reserve (Shortage)** | **14** | **20** | **0** | **0** | **0** | **0** |

## Walnut Creek Special Utility District

Walnut Creek SUD provides retail and wholesale supplies in northern Parker County and southern Wise County. The SUD is a wholesale water provider, and its water supply plans are discussed beginning on page 4E.103 in Section 4E.

## Weatherford

Weatherford is a city of about 27,000 located in central Parker County. Weatherford is a wholesale water provider, and its water supply plans are discussed beginning on page 4E.109 in Section 4E.

## Willow Park

Willow Park is located in eastern Parker County and has a population of about 4,200. Willow Park gets its water supply from groundwater (Trinity aquifer). Water management strategies for Willow Park include conservation, purchasing treated water from Weatherford (with the raw water supplied to Weatherford by TRWD), purchasing treated water from Fort Worth (raw water from TRWD), and supplemental wells to replace existing wells. Table 4F.287 shows the projected population and demand, the current supplies, and the water management strategies for Willow Park.

**Table 4F.287**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Willow Park**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,164** | **5,871** | **8,278** | **10,000** | **11,200** | **12,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 681 | 934 | 1,298 | 1,557 | 1,731 | 1,855 |
| ***Total Projected Demand*** | ***681*** | ***934*** | ***1,298*** | ***1,557*** | ***1,731*** | ***1,855*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 757 | 757 | 757 | 757 | 757 | 757 |
| ***Total Current Supplies*** | ***757*** | ***757*** | ***757*** | ***757*** | ***757*** | ***757*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***177*** | ***541*** | ***800*** | ***974*** | ***1,098*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 12 | 59 | 65 | 83 | 98 | 112 |
| Fort Worth (TRWD) | 0 | 59 | 238 | 358 | 438 | 493 |
| Weatherford (TRWD) | 0 | 59 | 238 | 359 | 438 | 493 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***12*** | ***177*** | ***541*** | ***800*** | ***974*** | ***1,098*** |
| **Reserve (Shortage)** | **88** | **0** | **0** | **0** | **0** | **0** |

## Costs for Parker County Water User Groups

Table 4F.288 shows the estimated capital costs for Parker County water management strategies not covered under the wholesale water providers. Table 4F.289 summarizes the costs by category and is followed by a summary for Parker County.

**Table 4F.288**
**Costs for Recommended Water Management Strategies for Parker County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Aledo | Conservation | 2010 | 247 | $10,000 | $0.60 | $0.60 | Q-10 & Q-11 |
| | Fort Worth (TRWD) | 2020 | 1,484 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $2,232,000 | N/A | N/A | Q-13 |
| Annetta | Conservation | 2010 | 27 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Weatherford (TRWD) | 2020 | 149 | $0 | $2.50 | $2.50 | None |
| | Supplemental wells | 2010 | 0 | $3,610,000 | N/A | N/A | Q-13 |
| Annetta South | Conservation | 2010 | 10 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Weatherford (TRWD) | 2020 | 37 | $0 | $2.50 | $2.50 | None |
| | Supplemental wells | 2010 | 0 | $3,610,000 | N/A | N/A | Q-13 |
| Azle* | Conservation | See Tarrant County. | | | | | |
| | Additional TRWD | See Tarrant County. | | | | | |
| | Water treatment plant expansions | See Tarrant County. | | | | | |
| Cresson* | Conservation | 2010 | 9 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Fort Worth* | Conservation | See Fort Worth in Section 4E. | | | | | |
| | Water treatment plant expansions | See Fort Worth in Section 4E. | | | | | |
| | Direct reuse | See Fort Worth in Section 4E. | | | | | |
| | Additional TRWD | See Fort Worth in Section 4E. | | | | | |
| Hudson Oaks | Conservation | 2010 | 76 | $5,000 | $0.55 | $0.55 | Q-10 & Q-11 |
| | Additional Weatherford | 2030 | 208 | $0 | $2.50 | $2.50 | None |
| | Supplemental wells | 2010 | 0 | $7,518,000 | N/A | N/A | Q-13 |
| Mineral Wells* | Conservation | 2010 | 32 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |

(Table 4F.288, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Parker County Other | Conservation | 2010 | 254 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | BRA supplies with new WTP and transmission | 2020 | 500 | $7,564,000 | $5.53 | $2.15 | Q-215 |
| | Additional Weatherford | 2030 | 83 | $0 | $2.50 | $2.50 | None |
| | Supplemental wells | 2010 | 0 | $331,000 | N/A | N/A | Q-13 |
| Reno | Conservation | 2010 | 22 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,316,000 | N/A | N/A | Q-13 |
| | Additional Springtown | 2030 | 30 | $0 | $2.50 | $2.50 | None |
| | Additional Walnut Creek SUD | 2030 | 30 | $0 | $2.50 | $2.50 | None |
| Sanctuary | Conservation | 2010 | 29 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Walnut Creek SUD | 2020 | 203 | $0 | $2.50 | $2.50 | None |
| Springtown | Conservation | 2010 | 156 | $24,000 | $0.54 | $0.54 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,421,000 | N/A | N/A | Q-13 |
| | New water treatment plant and expansions | 2020 | 561 | $8,188,000 | $3.96 | $0.70 | Q-14 |
| | Water treatment plant expansion | 2030 | 561 | $4,094,000 | $2.05 | $0.70 | Q-15 |
| | Additional groundwater (new wells) | 2010 | 184 | $409,000 | $1.10 | $0.60 | Q-255 |
| | Additional TRWD | 2030 | 535 | $0 | $0.69 | $0.69 | None |
| Walnut Creek SUD* | Conservation | 2010 | 555 | See Walnut Creek SUD in Section 4E. | | | |
| | New water treatment plant | 2030 | 0 | See Walnut Creek SUD in Section 4E. | | | |
| | Water treatment plant expansions | 2020 | 0 | See Walnut Creek SUD in Section 4E. | | | |
| | Transmission system improvements | 2020 | 0 | See Walnut Creek SUD in Section 4E. | | | |
| | Additional TRWD | 2020 | 6,082 | See Walnut Creek SUD in Section 4E. | | | |

**(Table 4F.288, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Weatherford | Conservation | 2010 | 1,181 | See Weatherford in Section 4E. | | | |
| | Water treatment plant expansions | 2030 | 0 | See Weatherford in Section 4E. | | | |
| | Lake Benbrook PS expansion | 2050 | 0 | See Weatherford in Section 4E. | | | |
| | Additional TRWD | 2030 | 6,359 | See Weatherford in Section 4E. | | | |
| Willow Park | Conservation | 2010 | 112 | $5,000 | $0.57 | $0.57 | Q-10 & Q-11 |
| | Weatherford (TRWD) | 2020 | 493 | $0 | $2.50 | $2.50 | None |
| | Fort Worth (TRWD) | 2020 | 493 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $5,633,000 | N/A | N/A | Q-13 |
| Parker County Irrigation | Supplemental wells | 2010 | 0 | $28,000 | N/A | N/A | Q-13 |
| Parker County Livestock | Supplemental wells | 2010 | 0 | $28,000 | N/A | N/A | Q-13 |
| Parker County Manufacturing | Conservation | 2020 | 10 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $242,000 | N/A | N/A | Q-13 |
| | Additional Weatherford | 2030 | 373 | $0 | $2.50 | $2.50 | None |
| Parker County Mining | Supplemental wells | 2010 | 0 | $38,000 | N/A | N/A | Q-13 |
| Parker County Steam Electric | Additional Weatherford | 2020 | 49 | $0 | $2.50 | $2.50 | None |

Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.289**
**Summary of Recommended Water Management Strategies for Parker County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 2,720 | $44,000 |
| Purchase from WWP | 9,960 | $0 |
| Supplemental wells | 0 | $27,007,000 |
| New wells | 184 | $409,000 |
| New water treatment plant and expansions | 5,037 | $12,282,000 |
| Transmission facilities | 500 | $7,564,000 |
| **Total** | | **$47,306,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.

# PARKER COUNTY


***2000 Population:*** *88,495*

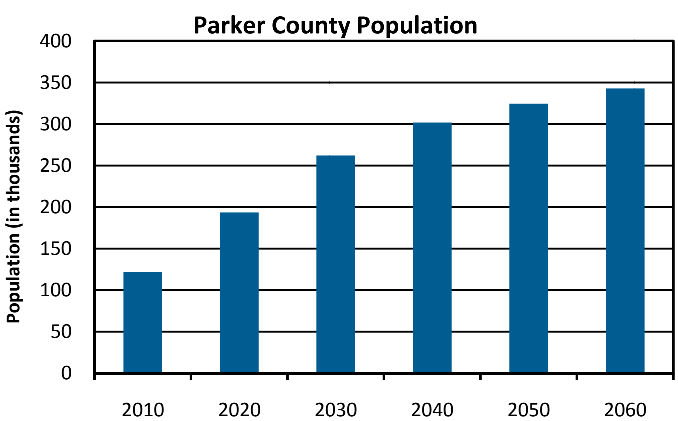
***Projected 2060 Population:*** *342,887*

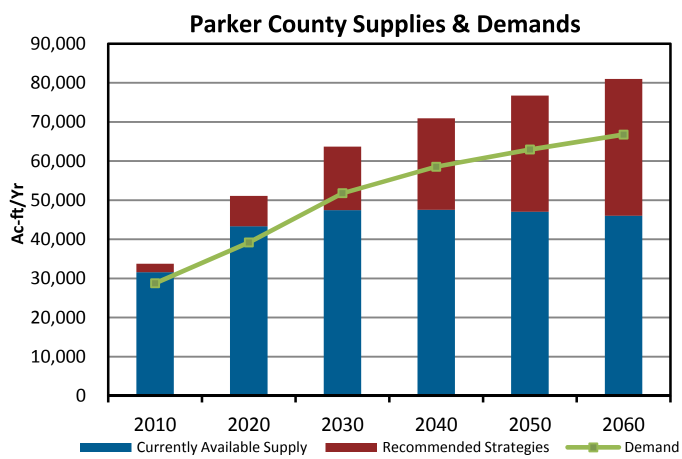
***County Seat:*** *Weatherford*

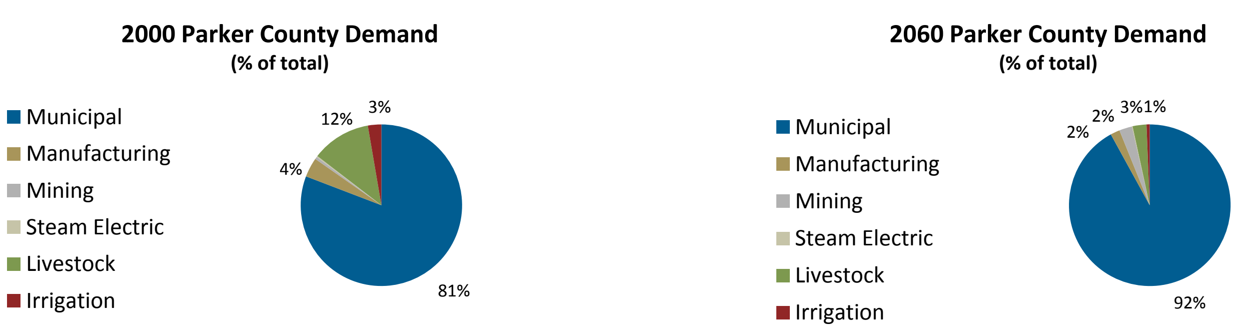
***Economy:*** *Agribusiness; manufacturing; government/services.*

***River Basin(s):***

– Trinity (53%), Brazos (47%)


**Total=15,617 acre-feet**

**Total= 66,771 acre-feet**

| WATER USER GROUP | 2060 PARKER CO. DEMANDS (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Aledo | 2,213 | Trinity Aquifer | Supplemental wells, Fort Worth (TRWD) supplies |
| Annetta | 416 | Trinity Aquifer | Supplemental wells, Weatherford (TRWD) supplies |
| Annetta South | 147 | Trinity Aquifer | Supplemental wells, Weatherford |
| Azle [a] | 811 | TRWD | WTP expansions |
| Cresson [a] | 151 | Trinity Aquifer (Bluebonnet Hills WSC) | None |
| Fort Worth [a] | 30,423 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| Hudson Oaks | 867 | Trinity Aquifer, Weatherford (TRWD) | Supplemental wells, Additional Weatherford supplies |
| Mineral Wells [a] | 726 | Palo Pinto County WCID #1 | See Brazos G Region Plan. |
| Reno | 337 | Trinity Aquifer, Springtown (TRWD), Walnut Creek SUD (TRWD) | Supplemental wells, Additional Springtown supplies, Additional Walnut Creek SUD supplies |
| Sanctuary | 478 | Walnut Creek SUD (TRWD) | Additional Walnut Creek SUD supplies |
| Springtown | 1,272 | Trinity Aquifer, TRWD | Supplemental wells, Additional TRWD supplies, New WTP, WTP expansions, New wells |
| Walnut Creek SUD [a] | 6,990 | TRWD | Additional TRWD supplies, New WTP, WTP expansions, transmission expansions |
| Weatherford | 10,741 | Lake Weatherford, TRWD | Additional TRWD supplies, WTP expansions |
| Willow Park | 1,855 | Trinity Aquifer | Supplemental wells, Weatherford (TRWD) supplies, Fort Worth (TRWD) supplies |
| County-Other | 3,996 | Trinity Aquifer, Other Aquifer, Mineral Wells (Palo Pinto County WCID #1), Weatherford (Lake Weatherford and TRWD) | Supplemental wells, Additional Weatherford supplies, New WTP and BRA supplies (Region G) |
| Irrigation | 422 | Trinity Aquifer, Local supplies, Direct reuse | Supplemental wells |
| Livestock | 1,856 | Trinity Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 1,248 | Trinity Aquifer, Mineral Wells (Palo Pinto County WCID #1), Weatherford (Lake Weatherford and TRWD) | Supplemental wells, Additional Weatherford supplies |
| Mining | 1,720 | Trinity Aquifer, Local supplies, Brazos River Authority | Supplemental wells |
| Steam Electric Power | 102 | Weatherford (Lake Weatherford) | Additional Lake Weatherford |

[a] WUG is in multiple counties

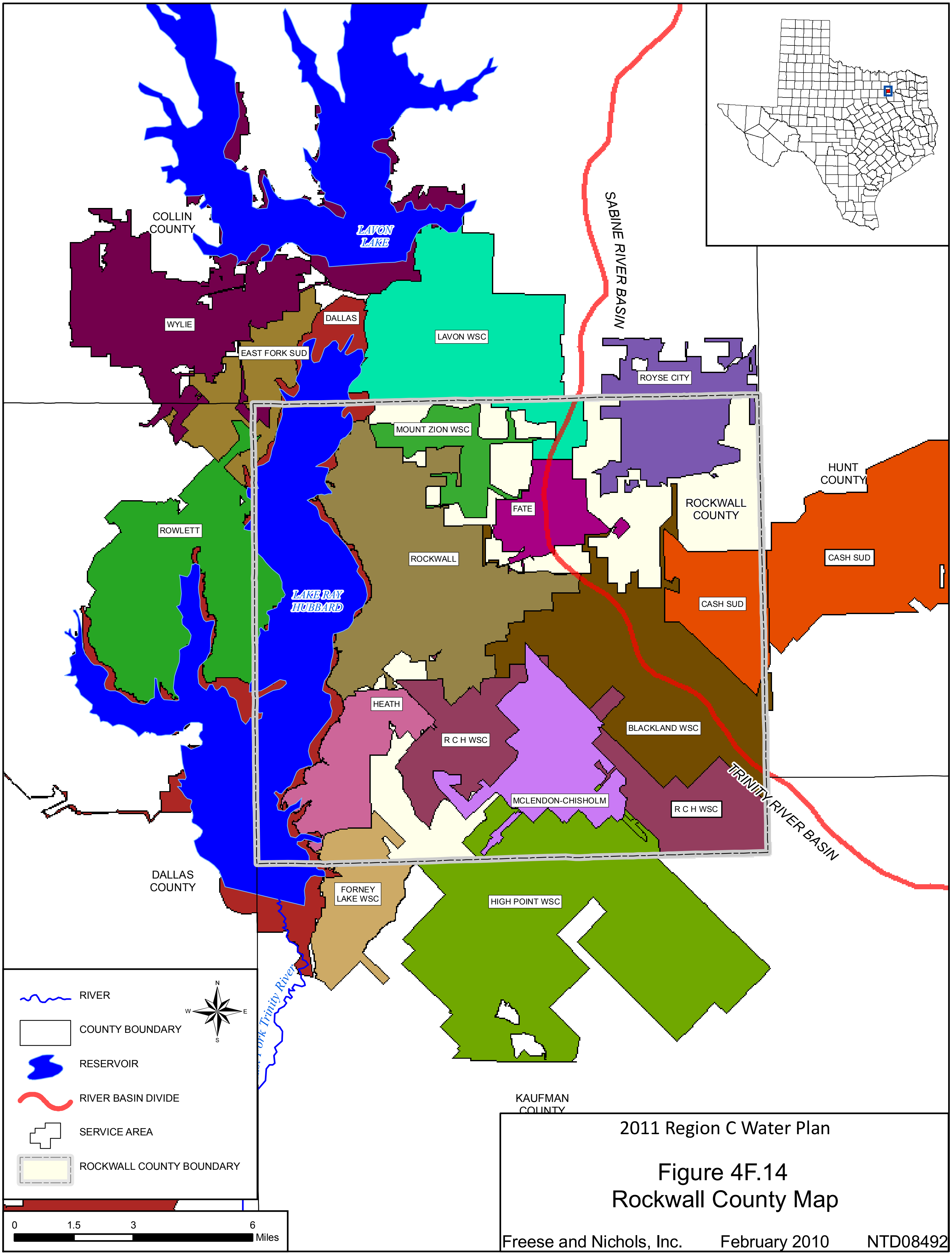
[b] Water conservation is a strategy for every municipal user group.

## 4F.14 Rockwall County

Figure 4F.14 is a map of Rockwall County. Rockwall County has limited groundwater supplies. The North Texas Municipal Water District (NTMWD) supplies most of the water used in Rockwall County and will continue to do so in the future. Water user groups that currently get water from NTMWD will purchase additional water from NTMWD to meet future demands. Water user groups that will obtain additional water from sources other than NTMWD include the following:

- The small portion of Dallas located in Rockwall County will continue to be supplied by Dallas Water Utilities.
- Cash SUD is partially supplied by the Sabine River Authority (Region D), as well as by the NTMWD. Cash SUD plans to purchase additional water supplies from the Sabine River Authority in the future.

Water management strategies for Rockwall County water user groups are discussed on the following pages. Table 4F.303 on page 4F.381 shows the estimated capital costs for the Rockwall County water management strategies not associated with the wholesale water providers, and Table 4F.304 on page 4F.383 is a summary of the costs by category. Table 4F.304 is followed by a Rockwall County summary.




2011 Region C Water Plan

Figure 4F.14
Rockwall County Map

Freese and Nichols, Inc. February 2010 NTD08492

## Blackland Water Supply Corporation

Blackland WSC is located in eastern Rockwall County, with a small area in Hunt County, and serves about 4,300 people. The WSC gets its water supply from the North Texas Municipal Water District (NTMWD) through Rockwall. Water management strategies for Blackland WSC include conservation, establishing a direct connection with NTMWD, and additional water from NTMWD. Table 4F.290 shows the projected population and demand, the current supplies, and the water management strategies for Blackland WSC.

**Table 4F.290**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Blackland WSC (Regions C & D)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,316** | **5,831** | **7,150** | **8,578** | **10,284** | **12,302** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 483 | 699 | 842 | 999 | 1,197 | 1,433 |
| ***Total Projected Water Demand*** | ***483*** | ***699*** | ***842*** | ***999*** | ***1,197*** | ***1,433*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 476 | 569 | 595 | 634 | 687 | 765 |
| ***Total Current Supplies*** | ***476*** | ***569*** | ***595*** | ***634*** | ***687*** | ***765*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***7*** | ***130*** | ***247*** | ***365*** | ***510*** | ***668*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 28 | 43 | 55 | 69 | 87 |
| Direct Connection and Additional Water from NTMWD | 0 | 102 | 204 | 310 | 441 | 581 |
| ***Total Water Management Strategies*** | ***7*** | ***130*** | ***247*** | ***365*** | ***510*** | ***668*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Cash Special Utility District

Cash SUD provides water supply in eastern Rockwall County and in Hopkins, Hunt and Rains Counties in the Northeast Texas Region (Region D). Most of the SUD’s customers are in the Northeast Texas Region. Table 4F.291 shows the projected population and demand, the current supplies, and the water management strategies for the part of Cash SUD in Region C. Cash SUD gets enough water from NTMWD to meet all of its Region C demands and is able to send some NTMWD water to the Northeast Texas Region. Water management strategies in Region C include conservation and additional water from NTMWD. Cash SUD also purchases water from the Sabine River Authority (Lake Tawakoni) and operates its own water treatment plant in the Northeast Texas Region. Water management strategies for the Northeast Texas Region are discussed in that regional water plan.

**Table 4F.291**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Cash Special Utility District (Region C Only)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Region C Population** | **638** | **860** | **1,053** | **1,260** | **1,505** | **1,792** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 82 | 111 | 136 | 162 | 194 | 231 |
| ***Total Projected Region C Demand*** | ***82*** | ***111*** | ***136*** | ***162*** | ***194*** | ***231*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 644 | 651 | 714 | 855 | 1,029 | 957 |
| ***Total Current Supplies*** | ***644*** | ***651*** | ***714*** | ***855*** | ***1,029*** | ***957*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 5 | 8 | 10 | 12 | 15 |
| Additional Water from NTMWD | 2 | 149 | 296 | 491 | 763 | 835 |
| ***Total Water Management Strategies*** | ***4*** | ***154*** | ***304*** | ***501*** | ***775*** | ***850*** |
| **Available to Send to Region D** | **566** | **694** | **882** | **1,194** | **1,610** | **1,576** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Dallas

Dallas Water Utilities (DWU) is the water utility of the City of Dallas, which has a population of about 1,300,000. DWU is a wholesale water provider. The City of Dallas is primarily in Dallas County but extends into Collin, Denton, Kaufman, and Rockwall

Counties. There is a detailed discussion of water supply plans for DWU beginning on page 4E.4 in Section 4E.

### East Fork Special Utility District

East Fork SUD is located in southern Collin County and extends into Dallas and Rockwall Counties. The water management strategies for East Fork SUD are described under Collin County on page 4F.14.

### Fate

Fate is a city of about 6,200 people located in northern Rockwall County. The city gets its water supply from the North Texas Municipal Water District (NTMWD), and water management strategies include conservation and additional water from NTMWD. Table 4F.292 shows the projected population and demand, the current supplies, and the water management strategies for Fate.

**Table 4F.292**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Fate**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **6,222** | **12,007** | **15,062** | **17,923** | **19,997** | **21,379** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,091 | 3,968 | 4,943 | 5,842 | 6,496 | 6,945 |
| ***Total Projected Demand*** | ***2,091*** | ***3,968*** | ***4,943*** | ***5,842*** | ***6,496*** | ***6,945*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 2,070 | 3,230 | 3,494 | 3,710 | 3,731 | 3,707 |
| ***Total Current Supplies*** | ***2,070*** | ***3,230*** | ***3,494*** | ***3,710*** | ***3,731*** | ***3,707*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***21*** | ***738*** | ***1,449*** | ***2,132*** | ***2,765*** | ***3,238*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 21 | 164 | 253 | 349 | 443 | 531 |
| Additional Water from NTMWD | 0 | 574 | 1,196 | 1,783 | 2,322 | 2,707 |
| ***Total Water Management Strategies*** | ***21*** | ***738*** | ***1,449*** | ***2,132*** | ***2,765*** | ***3,238*** |

## Forney Lake Water Supply Corporation

Forney Lake WSC supplies water to about 6,300 people in northwestern Kaufman County and southwestern Rockwall County. Water management strategies for Forney Lake WSC are discussed on page 4F.300 under Kaufman County.

## Heath

Heath has a population of about 7,000 and is located in southwestern Rockwall County. The city gets its water supply from North Texas Municipal Water District (NTMWD). The water management strategies for Heath are conservation and additional water from NTMWD. Table 4F.293 shows the projected population and demand, the current supplies, and the water management strategies for Heath.

**Table 4F.293**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Heath**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **6,971** | **9,857** | **12,362** | **15,058** | **18,238** | **21,968** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,952 | 2,727 | 3,393 | 4,116 | 4,964 | 5,980 |
| ***Total Projected Demand*** | ***1,952*** | ***2,727*** | ***3,393*** | ***4,116*** | ***4,964*** | ***5,980*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 1,936 | 2,220 | 2,399 | 2,614 | 2,851 | 3,192 |
| ***Total Current Supplies*** | ***1,936*** | ***2,220*** | ***2,399*** | ***2,614*** | ***2,851*** | ***3,192*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***16*** | ***507*** | ***994*** | ***1,502*** | ***2,113*** | ***2,788*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 16 | 114 | 181 | 255 | 350 | 471 |
| Additional Water from NTMWD | 0 | 393 | 813 | 1,247 | 1,763 | 2,317 |
| ***Total Water Management Strategies*** | ***16*** | ***507*** | ***994*** | ***1,502*** | ***2,113*** | ***2,788*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## High Point Water Supply Corporation

High Point WSC supplies water to about 3,400 people in northwestern Kaufman County and southern Rockwall County. Water management strategies for High Point WSC are discussed on page 4F.301 under Kaufman County.

## Lavon Water Supply Corporation

Lavon WSC has a population of about 5,200, split almost evenly between Collin and Rockwall Counties. Water management strategies for Lavon WSC are discussed on page 4F.18 under Collin County.

## McLendon-Chisholm

McLendon-Chisholm is located in southern Rockwall County and has a population of about 1,800. Residents of the city get retail water service from High Point WSC and R-C-H WSC, both of which get their water from NTMWD. The water management strategies for McLendon-Chisholm are conservation and additional water from NTMWD. Table 4F.294 shows the projected population and demand, the current supplies, and the water management strategies for McLendon-Chisholm.

**Table 4F.294**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of McLendon-Chisholm**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,800** | **2,000** | **2,200** | **2,400** | **2,765** | **3,255** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 272 | 296 | 320 | 347 | 396 | 467 |
| ***Total Projected Demand*** | ***272*** | ***296*** | ***320*** | ***347*** | ***396*** | ***467*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District (through High Point WSC and RCH WSC) | 268 | 241 | 226 | 220 | 227 | 249 |
| ***Total Current Supplies*** | ***268*** | ***241*** | ***226*** | ***220*** | ***227*** | ***249*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***4*** | ***55*** | ***94*** | ***127*** | ***169*** | ***218*** |
| | | | | | | |

**(Table 4F.294, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 11 | 15 | 18 | 22 | 27 |
| Additional Water from NTMWD | 0 | 44 | 79 | 109 | 147 | 191 |
| ***Total Water Management Strategies*** | ***4*** | ***55*** | ***94*** | ***127*** | ***169*** | ***218*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Mount Zion Water Supply Corporation

Mount Zion WSC serves about 1,700 people in northern Rockwall County. The WSC gets its water supply from NTMWD. Water management strategies for Mount Zion WSC include conservation and additional water from NTMWD. Table 4F.295 shows the projected population and demand, the current supplies, and the water management strategies for Mount Zion WSC.

**Table 4F.295**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Mount Zion Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,700** | **1,700** | **1,700** | **1,700** | **1,700** | **1,700** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 442 | 436 | 430 | 425 | 421 | 421 |
| ***Total Projected Demand*** | ***442*** | ***436*** | ***430*** | ***425*** | ***421*** | ***421*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 439 | 355 | 304 | 270 | 242 | 225 |
| ***Total Current Supplies*** | ***439*** | ***355*** | ***304*** | ***270*** | ***242*** | ***225*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***3*** | ***81*** | ***126*** | ***155*** | ***179*** | ***196*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 20 | 25 | 29 | 32 | 36 |
| Additional Water from NTMWD | 0 | 61 | 101 | 126 | 147 | 160 |
| ***Total Water Management Strategies*** | ***3*** | ***81*** | ***126*** | ***155*** | ***179*** | ***196*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## R-C-H Water Supply Corporation

R-C-H WSC supplies water to about 3,600 people in southeastern Rockwall County. The WSC gets its water supply from North Texas Municipal Water District (NTMWD) through Rockwall. Water management strategies for R-C-H WSC include conservation, establishing a direct connection with NTMWD, and additional water from NTMWD. Table 4F.296 shows the projected population and demand, the current supplies, and the water management strategies for R-C-H WSC.

**Table 4F.296**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the R-C-H Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,630** | **5,280** | **5,400** | **5,500** | **5,500** | **5,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 642 | 911 | 919 | 918 | 912 | 912 |
| ***Total Projected Demand*** | ***642*** | ***911*** | ***919*** | ***918*** | ***912*** | ***912*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 635 | 741 | 650 | 583 | 524 | 487 |
| ***Total Current Supplies*** | ***635*** | ***741*** | ***650*** | ***583*** | ***524*** | ***487*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***7*** | ***170*** | ***269*** | ***335*** | ***388*** | ***425*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 50 | 63 | 71 | 78 | 86 |
| Direct Connection and Additional Water from NTMWD | 0 | 120 | 206 | 264 | 310 | 339 |
| ***Total Water Management Strategies*** | ***7*** | ***170*** | ***269*** | ***335*** | ***388*** | ***425*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Rockwall

Rockwall is located in central Rockwall County and has a population of about 36,000 people. Rockwall is a wholesale water provider, and the discussion of water supply plans for Rockwall is on page 4E.97 in Section 4E.

## Rockwall County Irrigation

Table 4F.297 shows the projected demand, the current supplies, and the water management strategies for Rockwall County Irrigation. The current supplies are NTMWD, Dallas Water Utilities (DWU), and direct reuse. The water management strategies are conservation and additional water from DWU.

**Table 4F.297**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for the Rockwall County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,125** | **1,125** | **1,125** | **1,125** | **1,125** | **1,125** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 62 | 27 | 0 | 0 | 0 | 0 |
| Dallas Water Utilities | 255 | 208 | 199 | 187 | 172 | 151 |
| Direct Reuse | 784 | 784 | 784 | 784 | 784 | 784 |
| ***Total Current Supplies*** | ***1,101*** | ***1,019*** | ***983*** | ***971*** | ***956*** | ***935*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***24*** | ***106*** | ***142*** | ***154*** | ***169*** | ***190*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 37 | 71 | 89 | 106 | 123 |
| Additional Water from DWU | 22 | 69 | 71 | 65 | 63 | 67 |
| ***Total Water Management Strategies*** | ***24*** | ***106*** | ***142*** | ***154*** | ***169*** | ***190*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Rockwall County Livestock

Table 4F.298 shows the projected demand, current supplies, and water management strategies for Rockwall County Livestock. The current supplies are local surface water supplies and groundwater (other aquifer). These sources are sufficient to meet projected demands, and supplemental wells are the only water management strategy for this water user group.

**Table 4F.298**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for the Rockwall County Livestock**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **131** | **131** | **131** | **131** | **131** | **131** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Other Aquifer | 21 | 21 | 21 | 21 | 21 | 21 |
| Local Supplies | 168 | 168 | 168 | 168 | 168 | 168 |
| ***Total Current Supplies*** | ***189*** | ***189*** | ***189*** | ***189*** | ***189*** | ***189*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **58** | **58** | **58** | **58** | **58** | **58** |

## Rockwall County Manufacturing

Table 4F.299 shows the projected demand and current supplies for Rockwall County Manufacturing. Current supplies are from Rockwall and Royse City, both of which are supplied by NTMWD. The water management strategies for this water user group are conservation and additional water from NTMWD.

**Table 4F.299**
**Projected Demand, Current Supplies, and Water**
**Management Strategies for the Rockwall County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **20** | **23** | **26** | **29** | **32** | **35** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District (through Rockwall and Royse City) | 20 | 18 | 18 | 19 | 18 | 18 |
| ***Total Current Supplies*** | ***20*** | ***18*** | ***18*** | ***19*** | ***18*** | ***18*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***5*** | ***8*** | ***10*** | ***14*** | ***17*** |
| | | | | | | |

(Table 4F.299, Continued)

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 0 | 1 | 1 | 1 | 1 |
| Additional water from NTMWD | 0 | 5 | 7 | 9 | 13 | 16 |
| ***Total Water Management Strategies*** | ***0*** | ***5*** | ***8*** | ***10*** | ***14*** | ***17*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Rockwall County Mining

Table 4F.300 shows the projected demand, the current supplies, and the water management strategies for Rockwall County Mining. Rockwall County Mining is supplied from local supplies. The supply is sufficient to meet projected demands, and there are no water management strategies for this water user group.

**Table 4F.300**
**Projected Demand, Current Supplies, and Water Management Strategies for the Rockwall County Mining**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **33** | **33** | **33** | **33** | **33** | **33** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local supplies | 33 | 33 | 33 | 33 | 33 | 33 |
| ***Total Current Supplies*** | ***33*** | ***33*** | ***33*** | ***33*** | ***33*** | ***33*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Rockwall County Other

Rockwall County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Rockwall County Other supply about 1,800 people and receive their water supply from NTMWD and groundwater (other aquifer). Water management strategies for these entities include conservation, additional water from NTMWD, and supplemental wells to replace existing water wells. Table 4F.301 shows the projected population and demand, the current supplies, and the water management strategies for Rockwall County Other.

**Table 4F.301**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Rockwall County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,816** | **1,816** | **1,816** | **1,816** | **1,816** | **1,816** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 385 | 385 | 385 | 383 | 383 | 383 |
| ***Total Projected Water Demand*** | ***385*** | ***385*** | ***385*** | ***383*** | ***383*** | ***383*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Other Aquifer | 187 | 187 | 187 | 187 | 187 | 187 |
| North Texas Municipal Water District | 381 | 313 | 273 | 243 | 220 | 204 |
| ***Total Current Supplies*** | ***568*** | ***500*** | ***460*** | ***430*** | ***407*** | ***391*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 9 | 13 | 14 | 15 | 17 |
| Additional Water from NTMWD | 0 | 63 | 99 | 126 | 148 | 162 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***72*** | ***112*** | ***140*** | ***163*** | ***179*** |
| **Reserve (Shortage)** | **187** | **187** | **187** | **187** | **187** | **187** |

### Rowlett

Rowlett is a city of about 59,000 located in northeastern Dallas County and Rockwall County. Water management strategies for Rowlett are discussed on page 4F.85 under Dallas County.

### Royse City

Royse City is a city of about 12,000 people located in northeast Rockwall County and southeast Collin County. The city gets its water supply from NTMWD. The water management strategies for Royse City are conservation and additional water from NTMWD. Table 4F.302 shows the projected population and demand, the current supplies, and the water management strategies for Royse City.

**Table 4F.302**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Royse City**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **12,000** | **21,000** | **28,446** | **37,184** | **45,646** | **55,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,501 | 4,422 | 5,959 | 7,789 | 9,561 | 11,521 |
| ***Total Projected Demand*** | ***2,501*** | ***4,422*** | ***5,959*** | ***7,789*** | ***9,561*** | ***11,521*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Texas Municipal Water District | 2,470 | 3,599 | 4,212 | 4,947 | 5,491 | 6,150 |
| ***Total Current Supplies*** | ***2,470*** | ***3,599*** | ***4,212*** | ***4,947*** | ***5,491*** | ***6,150*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***31*** | ***823*** | ***1,747*** | ***2,842*** | ***4,070*** | ***5,371*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 31 | 230 | 381 | 567 | 776 | 1,031 |
| Additional Water from NTMWD | 0 | 593 | 1,366 | 2,275 | 3,294 | 4,340 |
| ***Total Water Management Strategies*** | ***31*** | ***823*** | ***1,747*** | ***2,842*** | ***4,070*** | ***5,371*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Wylie

Wylie has a population of about 40,000 and is located in southern Collin County, with some area in Dallas and Rockwall Counties. Wylie's water supply plans are discussed under Collin County on page 4F.33.

## Costs for Rockwall County Water User Groups

Table 4F.303 shows the estimated capital costs for Rockwall County water management strategies not covered under the wholesale water providers. Table 4F.304 summarizes the costs by category and is followed by a summary for Rockwall County.

**Table 4F.303**
**Costs for Recommended Water Management Strategies for Rockwall County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Blackland WSC* | Conservation | 2010 | 87 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Direct Connection to NTMWD | 2020 | 581 | $3,067,000 | $2.38 | $1.40 | Q-218 |
| | Additional NTMWD | 2010 | 581 | $0 | $1.30 | $1.30 | None |
| Cash SUD* | Conservation | See Region D plan for costs. | | | | | |
| | Additional SRA | See Region D plan for costs. | | | | | |
| | Additional NTMWD | 2010 | 835 | $0 | $1.30 | $1.30 | None |
| | Water Treatment Plant Expansions | See Region D plan for costs. | | | | | |
| Dallas* | Conservation | 2010 | 52,987*** | See DWU in Section 4E. | | | |
| | See DWU Information in Section 4E. | See DWU in Section 4E. | | | | | |
| East Fork SUD* | Conservation | See Collin County. | | | | | |
| | Additional NTMWD | See Collin County. | | | | | |
| Fate | Conservation | 2010 | 531 | $0 | $0.31 | $0.31 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 2,707 | $0 | $1.30 | $1.30 | None |
| Forney Lake WSC* | Conservation | See Kaufman County. | | | | | |
| | Additional NTMWD | See Kaufman County. | | | | | |
| Heath | Conservation | 2010 | 471 | $0 | $0.36 | $0.36 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 2,317 | $0 | $1.30 | $1.30 | None |
| High Point WSC* | Conservation | See Kaufman County. | | | | | |
| | Additional NTMWD | See Kaufman County. | | | | | |

(Table 4F.303, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Lavon WSC | Conservation | See Collin County. | | | | | |
| | Additional NTMWD | See Collin County. | | | | | |
| McLendon-Chisholm | Conservation | 2010 | 27 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 191 | $0 | $1.30 | $1.30 | None |
| Mount Zion WSC | Conservation | 2010 | 36 | $0 | $0.48 | $0.48 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 160 | $0 | $1.30 | $1.30 | None |
| RCH WSC | Conservation | 2010 | 86 | $0 | $0.62 | $0.62 | Q-10 & Q-11 |
| | Direct Connection to NTMWD and additional NTMMD supplies | 2020 | 339 | $2,416,000 | $2.48 | $1.40 | Q-219 |
| Rockwall | Conservation | 2010 | 2,163 | See Rockwall in Section 4E. | | | |
| | Additional NTMWD | 2020 | 9,877 | See Rockwall in Section 4E. | | | |
| Rockwall County Other | Conservation | 2010 | 17 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $331,000 | N/A | N/A | Q-13 |
| | Additional NTMWD | 2020 | 162 | $0 | $1.30 | $1.30 | None |
| Rowlett* | Conservation | See Dallas County. | | | | | |
| | Additional NTMWD | See Dallas County. | | | | | |
| Royse City* | Conservation | 2010 | 1,031 | $0 | $0.41 | $0.41 | Q-10 & Q-11 |
| | Additional NTMWD | 2020 | 4,340 | $0 | $1.30 | $1.30 | None |
| Wylie* | Conservation | See Collin County. | | | | | |
| | Additional NTMWD | See Collin County. | | | | | |
| Rockwall County Irrigation | Conservation | 2010 | 123 | $0 | $0.85 | $0.85 | Q-12 |
| | Additional DWU (Raw) | 2010 | 71 | $0 | $0.49 | $0.49 | None |
| Rockwall County Livestock | Supplemental wells | 2010 | 0 | $28,000 | N/A | N/A | Q-13 |
| Rockwall County Manufacturing | Conservation | 2030 | 1 | $0 | $0.85 | $0.85 | Q-12 |
| | Additional NTMWD | 2020 | 16 | $0 | $1.25 | $1.25 | None |

(Table 4F.303, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Rockwall County Mining | None | N/A | N/A | N/A | N/A | N/A | N/A |
| Rockwall County Steam Electric | None | N/A | N/A | N/A | N/A | N/A | N/A |

Notes: Water User Groups marked with an * extend into more than one county.

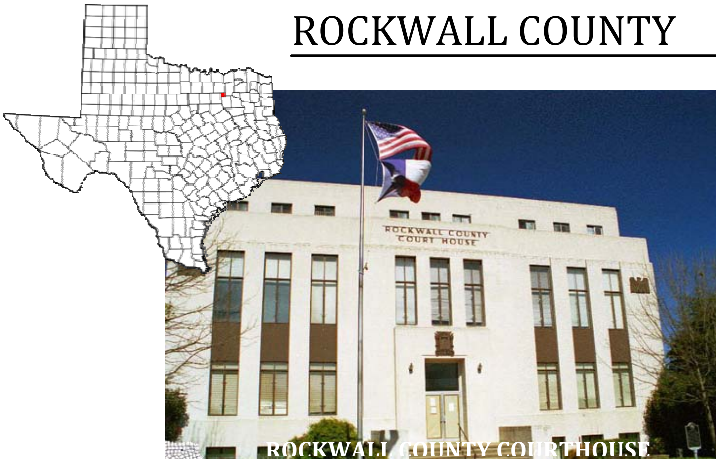
**Quantities listed are for the WUG only. They do not include the WUG's customers.

***Retail conservation

**Table 4F.304**
**Summary of Recommended Water Management Strategies for Rockwall County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 4,678 | $0 |
| Purchase from WWP | 21,257 | $0 |
| Supplemental wells | 0 | $359,000 |
| Connection to WWP | 920 | $5,483,000 |
| **Total** | | **$5,842,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.




***2000 Population:*** *43,080*

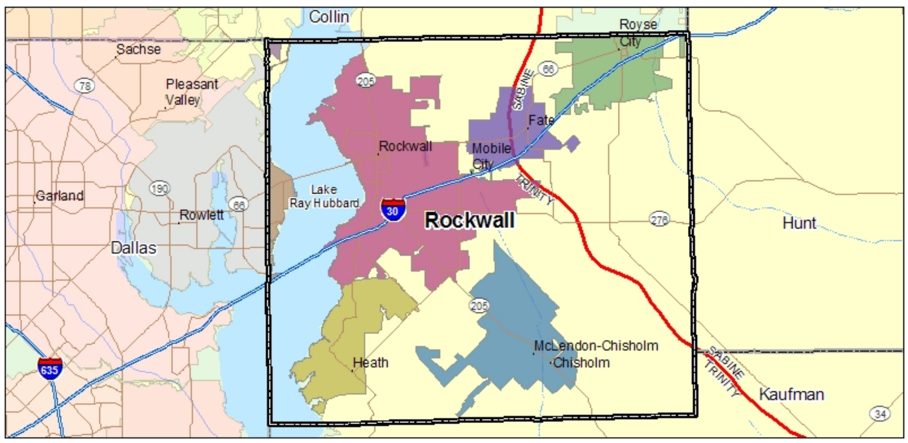
***Projected 2060 Population:*** *232,186*

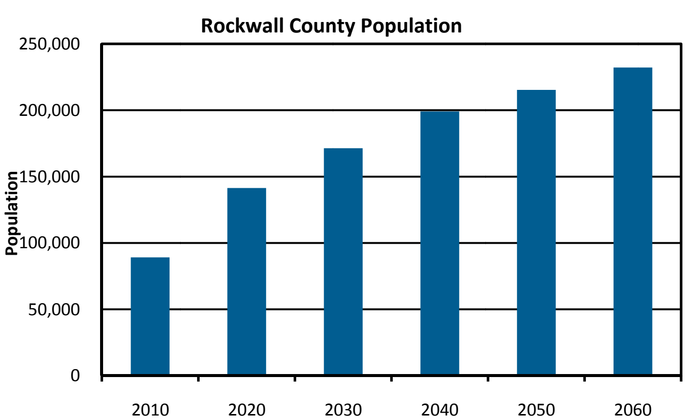
***County Seat: Rockwall***

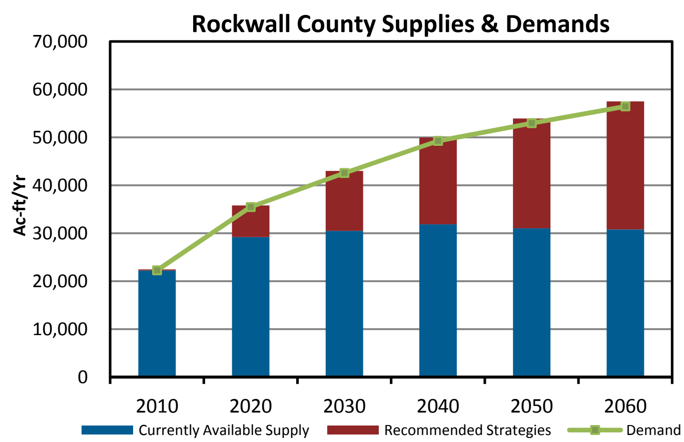
***Economy: Industry***

***River Basin(s):***

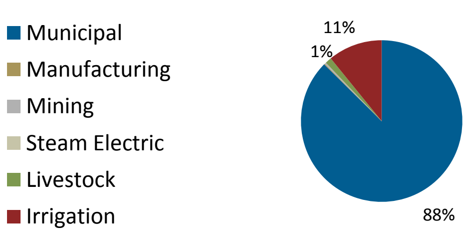
– Trinity (76%), Sabine (24%)



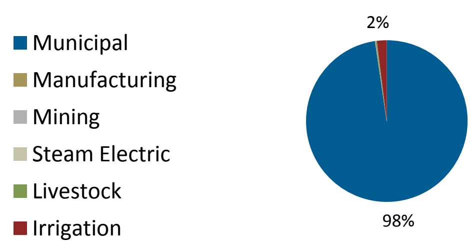




**2000 Rockwall County Demand**
**(% of total)**




**Total=10,350 acre-feet**

**2060 Rockwall County Demand**
**(% of total)**




**Total= 56,463 acre-feet**

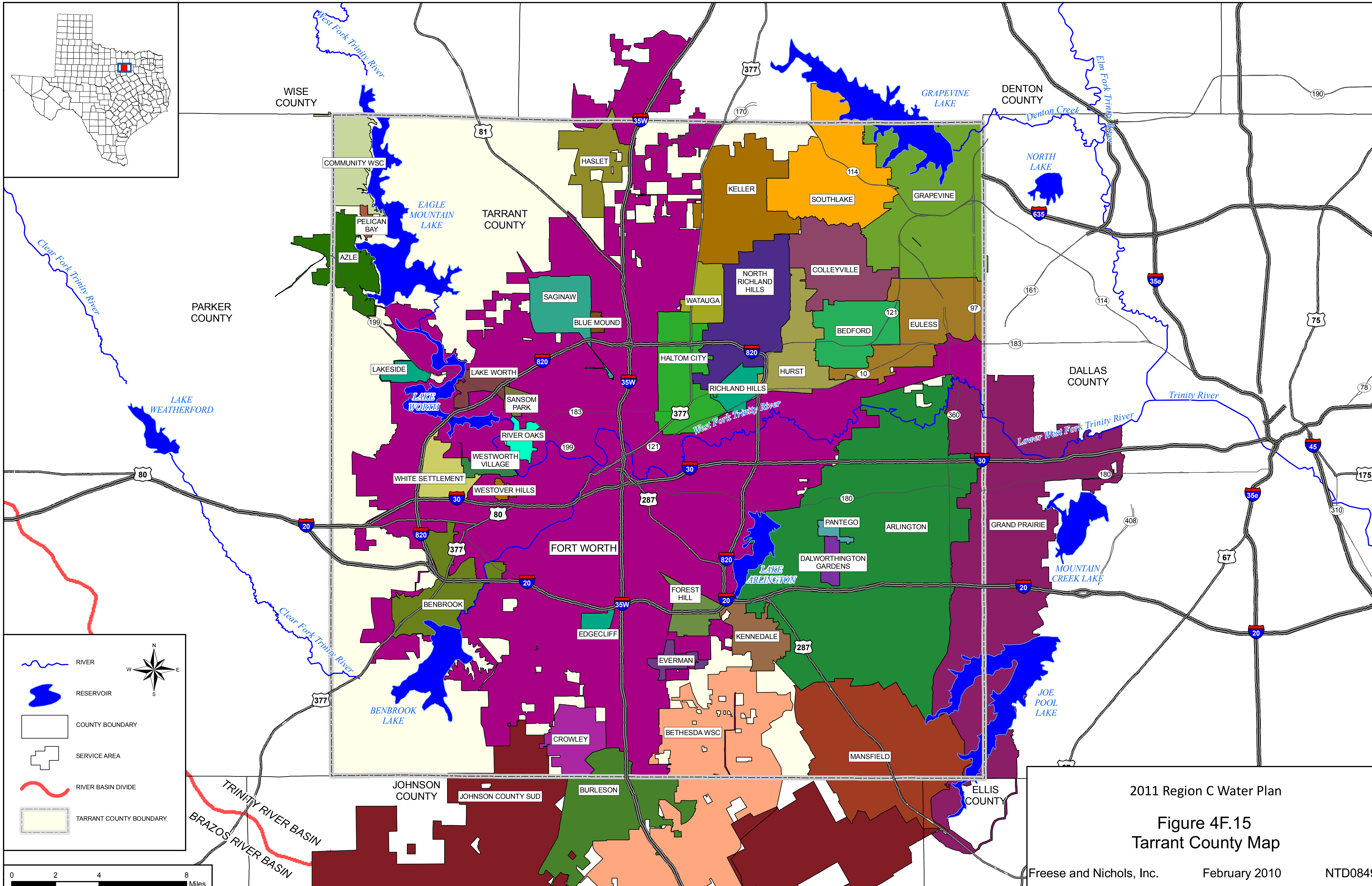
| WATER USER GROUP | 2060 ROCKWALL CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Blackland WSC [a] | 1,410 | NTMWD | Direct connection to NTMWD, Additional NTMWD supplies |
| Cash SUD [a] | 231 | NTMWD | Additional NTMWD supplies, |
| Dallas [a] | 6 | Elm Fork Lakes, Lake Grapevine, Lake Ray Hubbard, Lake Tawakoni, Lake Fork, Reuse, White Rock Lake (irrigation), Return flows | Additional reuse, Connect Lake Palestine, Additional Lake Tawakoni, Connect Lake Wright Patman, Additional Ray Hubbard, Integrated Pipeline, Fastrill Replacement, WTP expansions |
| East Fork SUD [a] | 8 | NTMWD | Additional NTMWD supplies |
| Fate | 6,945 | NTMWD | Additional NTMWD supplies |
| Forney Lake WSC [a] | 2,014 | NTMWD | Additional NTMWD supplies |
| Heath | 5,980 | NTMWD | Additional NTMWD supplies |
| High Point WSC [a] | 105 | NTMWD (through Forney and Terrell) | Additional NTMWD supplies (through Forney and Terrell) |
| Lavon WSC | 1,419 | NTMWD | Additional NTMWD supplies |
| McLendon-Chisholm | 467 | NTMWD (through High Point WSC & RCH WSC) | Additional NTMWD supplies |
| Mount Zion WSC | 421 | NTMWD | Additional NTMWD supplies |
| RCH WSC | 912 | NTMWD | Additional NTMWD supplies, Direct connection to NTMWD |
| Rockwall | 25,826 | NTMWD | Additional NTMWD supplies |
| Rowlett [a] | 1,458 | NTMWD | Additional NTMWD supplies |
| Royse City [a] | 7,214 | NTMWD | Additional NTMWD supplies |
| Wylie [a] | 340 | NTMWD | Additional NTMWD supplies |
| County-Other | 383 | Other Aquifer, NTMWD | Supplemental wells, Additional NTMWD supplies |
| Irrigation | 1,125 | NTMWD, Direct Reuse, DWU | Additional DWU supplies |
| Livestock | 131 | Other Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 35 | NTMWD (through Rockwall and Royse City) | Additional NTMWD supplies |
| Mining | 33 | Local supplies | None |
| Steam Electric Power | 0 | None | None |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

## *4F.15 Tarrant County*

Figure 4F.15 is a map of Tarrant County. Most Tarrant County water supplies come from raw water provided by the Tarrant Regional Water District (TRWD). Fort Worth, Arlington, Mansfield, and the Trinity River Authority have major water treatment plants, and a number of smaller water user groups purchase water from these major suppliers. Azle, Benbrook Water and Sewer Authority (supplying Benbrook), Community Water Supply Corporation, Grapevine and River Oaks operate smaller water treatment plants. A number of Tarrant County suppliers use groundwater for all or part of their supply. The demands in Tarrant County are projected to increase significantly, which will require additional water treatment plant capacity (new plants and expansions) and increased supplies from TRWD.

Water management strategies for Tarrant County water user groups are discussed on the following pages. Table 4F.344 on page 4F.423 shows the estimated capital costs for the Tarrant County water management strategies not associated with the wholesale water providers, and Table 4F.345 on page 4F.430 is a summary of the costs by category. Table 4F.345 is followed by a Tarrant County summary.




2011 Region C Water Plan

Figure 4F.15
Tarrant County Map

Freese and Nichols, Inc. February 2010 NTD08492

## Arlington

Arlington is a city of about 380,000 people located in eastern Tarrant County. Arlington is a wholesale water provider, and the discussion of water supply plans for Arlington is on page 4E.62 in Section 4E.

## Azle

Azle has a population of about 12,000 and is located in northwestern Tarrant and northeastern Parker Counties. Azle purchases and treats raw water from TRWD. Water management strategies for the city are conservation, water treatment plant expansions, and more water from TRWD. Table 4F.305 shows the projected population and demand, the current supplies, and the water management strategies for Azle.

**Table 4F.305**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Azle**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **12,108** | **16,795** | **23,473** | **31,060** | **38,682** | **45,362** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,953 | 2,633 | 3,602 | 4,697 | 5,849 | 6,860 |
| ***Total Projected Demand*** | ***1,953*** | ***2,633*** | ***3,602*** | ***4,697*** | ***5,849*** | ***6,860*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District (limited by treatment plant capacity) | 1,837 | 1,837 | 1,837 | 1,837 | 1,837 | 1,837 |
| ***Total Current Supplies*** | ***1,837*** | ***1,837*** | ***1,837*** | ***1,837*** | ***1,837*** | ***1,837*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***116*** | ***796*** | ***1,765*** | ***2,860*** | ***4,012*** | ***5,023*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 116 | 105 | 174 | 246 | 326 | 405 |
| 3 MGD WTP Expansion (TRWD) | 0 | 691 | 1,591 | 1,680 | 1,680 | 1,680 |
| 3 MGD WTP Expansion (TRWD) | 0 | 0 | 0 | 934 | 1,680 | 1,680 |
| 3 MGD WTP Expansion (TRWD) | 0 | 0 | 0 | 0 | 326 | 1,258 |
| ***Total Water Management Strategies*** | ***116*** | ***796*** | ***1,765*** | ***2,860*** | ***4,012*** | ***5,023*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Bedford

Bedford is located in northeastern Tarrant County and has a population of about 50,000. The city's water supply is groundwater (Trinity aquifer) and treated water from the Trinity River Authority (TRA), which gets raw water from TRWD. Water management strategies include conservation, additional water from TRA, and supplemental wells to replace existing wells. Table 4F.306 shows the projected population and demand, the current supplies, and the water management strategies for Bedford.

**Table 4F.306**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Bedford**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **50,001** | **52,395** | **54,407** | **56,098** | **57,519** | **58,713** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 10,138 | 10,447 | 10,665 | 10,808 | 11,017 | 11,246 |
| ***Total Projected Demand*** | ***10,138*** | ***10,447*** | ***10,665*** | ***10,808*** | ***11,017*** | ***11,246*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,109 | 1,109 | 1,109 | 1,109 | 1,109 | 1,109 |
| Trinity River Authority (TRWD) | 8,755 | 8,567 | 7,450 | 6,543 | 5,853 | 5,222 |
| ***Total Current Supplies*** | ***9,864*** | ***9,676*** | ***8,559*** | ***7,652*** | ***6,962*** | ***6,331*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***274*** | ***771*** | ***2,106*** | ***3,156*** | ***4,055*** | ***4,915*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 274 | 529 | 700 | 807 | 915 | 1,028 |
| Additional Water from TRA (TRWD) | 0 | 242 | 1,406 | 2,349 | 3,140 | 3,887 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***274*** | ***771*** | ***2,106*** | ***3,156*** | ***4,055*** | ***4,915*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Benbrook

Benbrook is a city of about 24,000 people located in southwestern Tarrant County. The city's water supply is raw water from TRWD (treated at Benbrook's own water treatment plant) and groundwater (Trinity aquifer). Water management strategies are conservation, water treatment plant expansions, additional water from TRWD, and supplemental wells to replace existing wells. Table 4F.307 shows the projected population and demand, the current supplies, and the water management strategies for Benbrook.

**Table 4F.307**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Benbrook**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **24,000** | **27,000** | **30,000** | **36,000** | **43,000** | **51,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 5,592 | 6,140 | 6,721 | 7,984 | 9,489 | 11,254 |
| ***Total Projected Demand*** | ***5,592*** | ***6,140*** | ***6,721*** | ***7,984*** | ***9,489*** | ***11,254*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 |
| Tarrant Regional Water District (limited by treatment plant capacity) | 4,176 | 5,055 | 5,055 | 5,055 | 5,055 | 5,055 |
| ***Total Current Supplies*** | ***5,359*** | ***6,238*** | ***6,238*** | ***6,238*** | ***6,238*** | ***6,238*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***233*** | ***0*** | ***483*** | ***1,746*** | ***3,251*** | ***5,016*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 233 | 422 | 548 | 725 | 945 | 1,218 |
| 3 MGD Plant Expansion (TRWD) | | 663 | 1,118 | 1,682 | 1,682 | 1,682 |
| 3 MGD Plant Expansion (TRWD) | | | | 522 | 1,682 | 1,682 |
| 3 MGD Plant Expansion (TRWD) | | | | | 125 | 1,617 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***233*** | ***1,085*** | ***1,666*** | ***2,929*** | ***4,434*** | ***6,199*** |
| **Reserve (Shortage)** | **0** | **1,183** | **1,183** | **1,183** | **1,183** | **1,183** |

## Bethesda Water Supply Corporation

Bethesda WSC serves about 30,000 people in southern Tarrant County and northern Johnson County. (Johnson County is in the Brazos G water planning region.) The WSC's water supplies are treated water from Fort Worth (which gets its raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for Bethesda WSC include conservation, additional water from Fort Worth (with an additional pipeline for delivery), water from Arlington (which gets raw water from TRWD), and supplemental wells to replace existing wells. Table 4F.308 shows the projected population and demand, the current supplies, and the water management strategies for Bethesda WSC.

**Table 4F.308**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Bethesda Water Supply Corporation (Regions C and G)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **29,620** | **37,309** | **45,332** | **53,999** | **64,640** | **77,546** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 4,281 | 5,265 | 6,297 | 7,440 | 8,833 | 10,597 |
| ***Total Projected Water Demand*** | ***4,281*** | ***5,265*** | ***6,297*** | ***7,440*** | ***8,833*** | ***10,597*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer (Region C) | 405 | 405 | 405 | 405 | 405 | 405 |
| Trinity Aquifer (Region G) | 2,035 | 2,035 | 2,035 | 2,035 | 1,858 | 1,858 |
| Fort Worth (TRWD) | 2,690 | 2,690 | 2,690 | 2,690 | 2,690 | 2,690 |
| ***Total Current Supplies*** | ***5,130*** | ***5,130*** | ***5,130*** | ***5,130*** | ***4,953*** | ***4,953*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***135*** | ***1,167*** | ***2,310*** | ***3,880*** | ***5,644*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 30 | 95 | 120 | 150 | 186 | 231 |
| Additional Water from Fort Worth with Additional Pipeline | 0 | 288 | 976 | 1,738 | 2,667 | 3,843 |
| Water from Arlington (TRWD) | 0 | 1,489 | 1,833 | 2,214 | 2,678 | 3,266 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***30*** | ***1,872*** | ***2,929*** | ***4,102*** | ***5,531*** | ***7,340*** |
| **Reserve (Shortage)** | **879** | **1,737** | **1,762** | **1,792** | **1,651** | **1,696** |

### Blue Mound

Blue Mound has a population of about 2,500 and is located in northern Tarrant County. The city is served by a private water company that uses groundwater from the Trinity aquifer. Water management strategies for Blue Mound are conservation and supplemental wells to replace existing wells. Table 4F.309 shows the projected population and demand, the current supplies, and the water management strategies for Blue Mound.

**Table 4F.309**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Blue Mound**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **2,500** | **2,500** | **2,500** | **2,500** | **2,500** | **2,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 297 | 300 | 294 | 286 | 283 | 283 |
| ***Total Projected Water Demand*** | ***297*** | ***300*** | ***294*** | ***286*** | ***283*** | ***283*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 327 | 327 | 327 | 327 | 327 | 327 |
| ***Total Current Supplies*** | ***327*** | ***327*** | ***327*** | ***327*** | ***327*** | ***327*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 12 | 16 | 17 | 18 | 19 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***12*** | ***16*** | ***17*** | ***18*** | ***19*** |
| **Reserve (Shortage)** | **34** | **39** | **49** | **58** | **62** | **63** |

## Burleson

Burleson is a city of about 32,000 people located in southern Tarrant County and northern Johnson County. The city's water supply is treated water from Fort Worth, which gets its raw water from TRWD. Water management strategies for Burleson are conservation, additional water from Fort Worth, and an additional connection to Fort Worth. Table 4F.310 shows the projected population and demand, the current supplies, and the water management strategies for Burleson.

**Table 4F.310**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Burleson (Regions C and G)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **32,091** | **48,255** | **60,336** | **61,782** | **63,517** | **65,567** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 5,248 | 7,676 | 9,462 | 9,550 | 9,749 | 10,062 |

**(Table 4F.310, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Projected Water Demand*** | ***5,248*** | ***7,676*** | ***9,462*** | ***9,550*** | ***9,749*** | ***10,062*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 5,235 | 7,042 | 7,377 | 6,443 | 5,759 | 5,183 |
| ***Total Current Supplies*** | ***5,235*** | ***7,042*** | ***7,377*** | ***6,443*** | ***5,759*** | ***5,183*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***13*** | ***634*** | ***2,085*** | ***3,107*** | ***3,990*** | ***4,879*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 13 | 34 | 50 | 64 | 82 | 104 |
| Additional Water from Fort Worth | 0 | 600 | 2,035 | 3,043 | 3,908 | 4,775 |
| ***Total Water Management Strategies*** | ***13*** | ***634*** | ***2,085*** | ***3,107*** | ***3,990*** | ***4,879*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Colleyville

Colleyville has a population of about 24,500 and is located in northeastern Tarrant County. The city's water supply is groundwater (Trinity aquifer) and treated water from the Trinity River Authority (TRA), which gets raw water from TRWD. Colleyville's water management strategies are conservation, additional water from TRA, and supplemental wells to replace existing wells. Table 4F.311 shows the projected population and demand, the current supplies, and the water management strategies for Colleyville.

**Table 4F.311**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Colleyville**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **24,500** | **28,000** | **28,000** | **28,000** | **28,000** | **28,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 8,123 | 9,190 | 9,127 | 9,096 | 9,064 | 9,064 |
| ***Total Projected Water Demand*** | ***8,123*** | ***9,190*** | ***9,127*** | ***9,096*** | ***9,064*** | ***9,064*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 799 | 799 | 799 | 799 | 799 | 799 |
| Trinity River Authority (TRWD) | 7,104 | 7,702 | 6,495 | 5,600 | 4,884 | 4,259 |

(Table 4F.311, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Current Supplies*** | ***7,903*** | ***8,501*** | ***7,294*** | ***6,399*** | ***5,683*** | ***5,058*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***220*** | ***689*** | ***1,833*** | ***2,697*** | ***3,381*** | ***4,006*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 220 | 479 | 650 | 727 | 800 | 876 |
| Additional Water from TRA | 0 | 210 | 1,183 | 1,970 | 2,581 | 3,130 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***220*** | ***689*** | ***1,833*** | ***2,697*** | ***3,381*** | ***4,006*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Community Water Supply Corporation

Community WSC serves about 3,500 people in northwestern Tarrant County and southern Wise County. The WSC gets raw water from TRWD and operates its own water treatment plant. Water management strategies for Community WSC include conservation and additional water from TRWD. Table 4F.312 shows the projected population and demand, the current supplies, and the water management strategies for Community WSC.

**Table 4F.312**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the Community Water Supply Corporation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,536** | **3,588** | **3,642** | **3,699** | **3,767** | **3,847** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 444 | 438 | 433 | 422 | 426 | 435 |
| ***Total Projected Water Demand*** | ***444*** | ***438*** | ***433*** | ***422*** | ***426*** | ***435*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District | 437 | 402 | 338 | 285 | 252 | 224 |
| ***Total Current Supplies*** | ***437*** | ***402*** | ***338*** | ***285*** | ***252*** | ***224*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***7*** | ***36*** | ***95*** | ***137*** | ***174*** | ***211*** |

(Table 4F.312, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 7 | 25 | 27 | 29 | 31 | 33 |
| Additional Water from TRWD | 0 | 11 | 68 | 108 | 143 | 178 |
| ***Total Water Management Strategies*** | ***7*** | ***36*** | ***95*** | ***137*** | ***174*** | ***211*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Crowley

Crowley is a city of about 11,000 people located in southern Tarrant County. The city's water supply is treated water from Fort Worth (which gets its raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for Crowley are conservation, additional water from Fort Worth, an additional connection to Fort Worth, and supplemental wells to replace existing wells. Table 4F.313 shows the projected population and demand, the current supplies, and the water management strategies for Crowley.

**Table 4F.313**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Crowley**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **11,023** | **13,473** | **17,147** | **23,271** | **28,170** | **30,620** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,667 | 1,977 | 2,478 | 3,310 | 3,976 | 4,322 |
| ***Total Projected Water Demand*** | ***1,667*** | ***1,977*** | ***2,478*** | ***3,310*** | ***3,976*** | ***4,322*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 429 | 429 | 429 | 429 | 429 | 429 |
| Fort Worth (TRWD) | 1,218 | 1,420 | 1,597 | 1,944 | 2,095 | 2,005 |
| ***Total Current Supplies*** | ***1,647*** | ***1,849*** | ***2,026*** | ***2,373*** | ***2,524*** | ***2,434*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***20*** | ***128*** | ***452*** | ***937*** | ***1,452*** | ***1,888*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 20 | 67 | 109 | 160 | 207 | 239 |
| Additional Water from TRWD | 0 | 61 | 343 | 777 | 1,245 | 1,649 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |

(**Table 4F.313, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Water Management Strategies*** | ***20*** | ***128*** | ***452*** | ***937*** | ***1,452*** | ***1,888*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Dalworthington Gardens

Dalworthington Gardens has a population of about 2,500 and is located in eastern Tarrant County. The city's water supply is treated water from Fort Worth (which gets its raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for Dalworthington Gardens are conservation, additional water from Fort Worth, and supplemental wells to replace existing wells. Table 4F.314 shows the projected population and demand, the current supplies, and the water management strategies for Dalworthington Gardens.

**Table 4F.314**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Dalworthington Gardens**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,467** | **2,650** | **2,771** | **2,850** | **2,902** | **2,935** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 771 | 816 | 847 | 862 | 874 | 884 |
| ***Total Projected Water Demand*** | ***771*** | ***816*** | ***847*** | ***862*** | ***874*** | ***884*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 266 | 266 | 266 | 266 | 266 | 266 |
| Fort Worth (TRWD) | 500 | 505 | 453 | 402 | 359 | 318 |
| ***Total Current Supplies*** | ***766*** | ***771*** | ***719*** | ***668*** | ***625*** | ***584*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***5*** | ***45*** | ***128*** | ***194*** | ***249*** | ***300*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 5 | 36 | 49 | 58 | 66 | 74 |
| Additional Water from Fort Worth | 0 | 9 | 79 | 136 | 183 | 226 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***5*** | ***45*** | ***128*** | ***194*** | ***249*** | ***300*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Edgecliff

Edgecliff is located in southern Tarrant County and has a population of about 2,500. The city's water supply is treated water from Fort Worth, which gets raw water from TRWD. Water management strategies for Edgecliff include conservation and additional water Fort Worth. Table 4F.315 shows the projected population and demand, the current supplies, and the water management strategies for Edgecliff.

**Table 4F.315**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Edgecliff**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **2,550** | **2,550** | **2,550** | **2,550** | **2,550** | **2,550** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 460 | 451 | 443 | 434 | 428 | 428 |
| ***Total Projected Demand*** | ***460*** | ***451*** | ***443*** | ***434*** | ***428*** | ***428*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 456 | 414 | 345 | 293 | 253 | 220 |
| ***Total Current Supplies*** | ***456*** | ***414*** | ***346*** | ***293*** | ***253*** | ***221*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***4*** | ***37*** | ***97*** | ***141*** | ***175*** | ***207*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 24 | 31 | 35 | 38 | 42 |
| Additional Water from Fort Worth | 0 | 13 | 66 | 106 | 137 | 165 |
| ***Total Water Management Strategies*** | ***4*** | ***37*** | ***97*** | ***141*** | ***175*** | ***207*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Euless

Euless has a population of about 53,000 and is located in northeastern Tarrant County. The city's water supply is groundwater (Trinity aquifer) and treated water from the Trinity River Authority (TRA), which gets raw water from TRWD. Euless' water management strategies are conservation, additional water from TRA, direct reuse from Fort Worth, and supplemental wells to replace existing wells. Table 4F.316 shows the projected population and demand, the current supplies, and the water management strategies for Euless.

**Table 4F.316**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Euless**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **53,446** | **60,416** | **63,854** | **65,550** | **66,386** | **66,798** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 9,698 | 10,760 | 11,158 | 11,308 | 11,377 | 11,448 |
| ***Total Projected Demand*** | ***9,698*** | ***10,760*** | ***11,158*** | ***11,308*** | ***11,377*** | ***11,448*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,016 | 1,016 | 1,016 | 1,016 | 1,016 | 1,016 |
| Trinity River Authority (TRWD) | 8,050 | 8,607 | 7,623 | 6,698 | 5,905 | 5,186 |
| ***Total Current Supplies*** | ***9,066*** | ***9,623*** | ***8,639*** | ***7,714*** | ***6,921*** | ***6,202*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***632*** | ***1,137*** | ***2,519*** | ***3,594*** | ***4,456*** | ***5,246*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 264 | 640 | 943 | 1,063 | 1,167 | 1,270 |
| Additional Water from TRA (TRWD) | 0 | 129 | 1,208 | 2,163 | 2,921 | 3,608 |
| Fort Worth Direct Reuse | 368 | 368 | 368 | 368 | 368 | 368 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***632*** | ***1,137*** | ***2,519*** | ***3,594*** | ***4,456*** | ***5,246*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Everman

Everman is located in southern Tarrant County and has a population of about 6,000. The city's water supply is treated water from Fort Worth (which gets raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for Everman include conservation, additional water from Fort Worth, and supplemental wells to replace existing wells. Table 4F.317 shows the projected population and demand, the current supplies, and the water management strategies for Everman.

**Table 4F.317**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Everman**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **6,200** | **6,600** | **6,600** | **6,600** | **6,600** | **6,600** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 771 | 798 | 776 | 754 | 747 | 747 |
| ***Total Projected Demand*** | ***771*** | ***798*** | ***776*** | ***754*** | ***747*** | ***747*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 532 | 532 | 532 | 532 | 532 | 532 |
| Fort Worth (TRWD) | 230 | 244 | 190 | 150 | 127 | 111 |
| ***Total Current Supplies*** | ***762*** | ***776*** | ***722*** | ***682*** | ***659*** | ***643*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***9*** | ***22*** | ***54*** | ***72*** | ***88*** | ***104*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 9 | 30 | 40 | 42 | 45 | 47 |
| Additional Water from Fort Worth | 0 | 0 | 14 | 30 | 43 | 57 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***9*** | ***30*** | ***54*** | ***72*** | ***88*** | ***104*** |
| **Reserve (Shortage)** | **0** | **8** | **0** | **0** | **0** | **0** |

## Forest Hill

Forest Hill is a city of about 12,000 people located in southern Tarrant County. The city's water supply is treated water from Fort Worth, which gets its raw water from TRWD. Water management strategies for Forest Hill are conservation and additional water from Fort Worth. Table 4F.318 shows the projected population and demand, the current supplies, and the water management strategies for Forest Hill.

**Table 4F.318**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Forest Hill**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **12,000** | **13,090** | **14,210** | **15,392** | **16,738** | **17,574** |
| **Projected Water Demand** | | | | | | |

**(Table 4F.318, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal Demand | 1,492 | 1,584 | 1,671 | 1,776 | 1,912 | 2,008 |
| ***Total Projected Demand*** | ***1,492*** | ***1,584*** | ***1,671*** | ***1,776*** | ***1,912*** | ***2,008*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 1,478 | 1,454 | 1,303 | 1,199 | 1,130 | 1,035 |
| ***Total Current Supplies*** | ***1,478*** | ***1,454*** | ***1,303*** | ***1,199*** | ***1,130*** | ***1,035*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***14*** | ***130*** | ***368*** | ***577*** | ***782*** | ***973*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 14 | 56 | 81 | 94 | 109 | 121 |
| Additional Water from Fort Worth | 0 | 74 | 287 | 483 | 673 | 852 |
| ***Total Water Management Strategies*** | ***14*** | ***130*** | ***368*** | ***577*** | ***782*** | ***973*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Fort Worth

Fort Worth is a city of about 743,000 located primarily in Tarrant County, with some population in Denton, Parker, and Wise Counties. Fort Worth is a wholesale water provider, and the city's water supply plans are discussed beginning on page 4E.30 in Section 4E.

## Grand Prairie

Grand Prairie is a city of about 170,000 in western Dallas County, eastern Tarrant County, and northwestern Ellis County. The city is a wholesale water provider, and there is a discussion of Grand Prairie's water supply plans on page 4E.84 in Section 4E.

## Grapevine

Grapevine is located in northeastern Tarrant County and has a population of about 51,000. The city gets its water supply from multiple sources – treated water from TRA (which gets raw water from TRWD), raw water from Lake Grapevine, Dallas, and indirect reuse. Water management strategies for Grapevine include conservation and additional water from TRA. Table 4F.319 shows the projected population and demand, the current supplies, and the water management strategies for Grapevine.

**Table 4F.319**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Grapevine**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **51,352** | **55,000** | **60,000** | **60,000** | **60,000** | **60,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 17,256 | 18,298 | 19,827 | 19,692 | 19,625 | 19,625 |
| Golf Course (Tarrant County Irrigation) | 1,121 | 1,121 | 1,121 | 1,121 | 1,121 | 1,121 |
| ***Total Projected Demand*** | ***18,377*** | ***19,419*** | ***20,948*** | ***20,813*** | ***20,746*** | ***20,746*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Dallas Water Utilities | 3,553 | 2,677 | 2,532 | 2,123 | 1,794 | 1,473 |
| Indirect Reuse | 3,317 | 3,696 | 3,964 | 4,142 | 4,276 | 4,386 |
| Trinity River Authority (TRWD) | 9,551 | 9,838 | 9,490 | 8,331 | 7,388 | 6,526 |
| Lake Grapevine | 2,017 | 1,983 | 1,950 | 1,917 | 1,883 | 1,850 |
| ***Total Current Supplies*** | ***18,438*** | ***18,194*** | ***17,936*** | ***16,513*** | ***15,341*** | ***14,235*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***1,225*** | ***3,012*** | ***4,300*** | ***5,405*** | ***6,511*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 633 | 1,193 | 1,753 | 1,930 | 2,089 | 2,252 |
| Additional Water from TRA | 0 | 32 | 1,259 | 2,370 | 3,316 | 4,259 |
| ***Total Water Management Strategies*** | ***633*** | ***1,225*** | ***3,012*** | ***4,300*** | ***5,405*** | ***6,511*** |
| **Reserve (Shortage)** | **694** | **0** | **0** | **0** | **0** | **0** |

## Haltom City

Haltom City has a population of about 41,000 and is located in central Tarrant County. The city purchases treated water from Fort Worth, which gets raw water from TRWD. Haltom City's water management strategies are conservation and additional water from Fort Worth. Table 4F.320 shows the projected population and demand, the current supplies, and the water management strategies for Haltom City.

**Table 4F.320**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Haltom City**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population (In City Only)** | **41,000** | **50,322** | **53,058** | **54,428** | **55,113** | **55,456** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 6,521 | 7,835 | 8,142 | 8,231 | 8,272 | 8,324 |
| ***Total Projected Demand*** | ***6,521*** | ***7,835*** | ***8,142*** | ***8,231*** | ***8,272*** | ***8,324*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 6,465 | 7,192 | 6,350 | 5,555 | 4,888 | 4,289 |
| ***Total Current Supplies*** | ***6,465*** | ***7,192*** | ***6,350*** | ***5,555*** | ***4,888*** | ***4,289*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***56*** | ***643*** | ***1,792*** | ***2,676*** | ***3,384*** | ***4,035*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 56 | 221 | 303 | 340 | 371 | 401 |
| Additional Water from Fort Worth | 0 | 422 | 1,489 | 2,336 | 3,013 | 3,634 |
| ***Total Water Management Strategies*** | ***56*** | ***643*** | ***1,792*** | ***2,676*** | ***3,384*** | ***4,035*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Haslet

Haslet is a city of about 2,000 people located in northern Tarrant County. The city's water supply is treated water from Fort Worth (which gets its raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for Haslet are conservation, additional water from Fort Worth, and supplemental wells to replace existing wells. Table 4F.321 shows the projected population and demand, the current supplies, and the water management strategies for Haslet.

**Table 4F.321**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Haslet**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population (In City Only)** | **2,000** | **4,000** | **7,000** | **7,000** | **7,000** | **7,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 784 | 1,555 | 2,697 | 2,689 | 2,682 | 2,682 |
| ***Total Projected Demand*** | ***784*** | ***1,555*** | ***2,697*** | ***2,689*** | ***2,682*** | ***2,682*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 657 | 1,316 | 2,009 | 1,733 | 1,513 | 1,320 |
| Trinity Aquifer | 121 | 121 | 121 | 121 | 121 | 121 |
| ***Total Current Supplies*** | ***778*** | ***1,437*** | ***2,130*** | ***1,854*** | ***1,634*** | ***1,441*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***6*** | ***118*** | ***567*** | ***835*** | ***1,048*** | ***1,241*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 60 | 131 | 154 | 176 | 198 |
| Additional Water from Fort Worth | 0 | 58 | 436 | 681 | 872 | 1,043 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***6*** | ***118*** | ***567*** | ***835*** | ***1,048*** | ***1,241*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Hurst

Hurst has a population of about 39,000 and is located in northeast Tarrant County. The city gets its water supply from Fort Worth (which gets raw water from TRWD) and groundwater from the Trinity aquifer. Hurst's water management strategies are conservation, additional water from Fort Worth, and supplemental wells to replace existing wells. Table 4F.322 shows the projected population and demand, the current supplies, and the water management strategies for Hurst.

**Table 4F.322**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Hurst**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **38,829** | **41,000** | **41,000** | **41,000** | **41,000** | **41,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 7,524 | 7,807 | 7,670 | 7,532 | 7,486 | 7,486 |
| ***Total Projected Demand*** | ***7,524*** | ***7,807*** | ***7,670*** | ***7,532*** | ***7,486*** | ***7,486*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 816 | 816 | 816 | 816 | 816 | 816 |
| Fort Worth (TRWD) | 6,652 | 6,417 | 5,346 | 4,533 | 3,941 | 3,437 |
| ***Total Current Supplies*** | ***7,468*** | ***7,233*** | ***6,162*** | ***5,349*** | ***4,757*** | ***4,253*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***56*** | ***574*** | ***1,508*** | ***2,183*** | ***2,729*** | ***3,233*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 56 | 426 | 603 | 670 | 729 | 792 |
| Additional Water from Fort Worth | 0 | 148 | 905 | 1,513 | 2,000 | 2,441 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***56*** | ***574*** | ***1,508*** | ***2,183*** | ***2,729*** | ***3,233*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Johnson County Special Utility District

The Johnson County Special Utility District has a large service area in Johnson and Hill Counties in the Brazos G region and Tarrant and Ellis Counties in Region C. The majority of the population served by the SUD is in Johnson County, and the Brazos G Regional Water Plan deals with the SUD's overall water supply strategies. Johnson County SUD's water supply plans for Region C are discussed under Ellis County on page 4F.165.

## Keller

Keller is a city of about 40,000 people located in northern Tarrant County. The city's water supply is treated water from Fort Worth (which gets its raw water from TRWD) and a very small amount of groundwater from the Trinity aquifer. Water management strategies for Keller are conservation, additional water from Fort Worth, and supplemental wells to replace existing wells. Table 4F.323 shows the projected population and demand, the current supplies, and the water management strategies for Keller.

**Table 4F.323**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Keller**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **40,127** | **45,026** | **51,310** | **51,310** | **51,310** | **51,310** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 9,124 | 10,138 | 11,495 | 11,380 | 11,380 | 11,380 |
| ***Total Projected Demand*** | ***9,124*** | ***10,138*** | ***11,495*** | ***11,380*** | ***11,380*** | ***11,380*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 8,856 | 9,301 | 8,965 | 7,680 | 6,725 | 5,864 |
| Trinity Aquifer | 10 | 10 | 10 | 10 | 10 | 10 |
| ***Total Current Supplies*** | ***8,866*** | ***9,311*** | ***8,975*** | ***7,690*** | ***6,735*** | ***5,874*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***258*** | ***827*** | ***2,520*** | ***3,690*** | ***4,645*** | ***5,506*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 268 | 635 | 1,070 | 1,167 | 1,262 | 1,357 |
| Additional Water from Fort Worth | 0 | 192 | 1,450 | 2,523 | 3,383 | 4,149 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***268*** | ***827*** | ***2,520*** | ***3,690*** | ***4,645*** | ***5,506*** |
| **Reserve (Shortage)** | **10** | **0** | **0** | **0** | **0** | **0** |

## Kennedale

Kennedale is located in southern Tarrant County and has a population of about 7,000. The city's water supply is from groundwater (Trinity aquifer) and treated water from Fort Worth (which gets its raw water from TRWD). Water management strategies for Kennedale include conservation, additional water from Fort Worth, additional water from the Trinity aquifer (new wells), and supplemental wells to replace existing wells. Table 4F.324 shows the projected population and demand, the current supplies, and the water management strategies for Kennedale.

**Table 4F.324**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Kennedale**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **7,000** | **9,064** | **10,114** | **10,824** | **11,303** | **11,626** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,255 | 1,594 | 1,756 | 1,867 | 1,937 | 1,992 |
| ***Total Projected Demand*** | ***1,255*** | ***1,594*** | ***1,756*** | ***1,867*** | ***1,937*** | ***1,992*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 953 | 953 | 953 | 953 | 953 | 953 |
| Fort Worth (TRWD) | 48 | 390 | 458 | 471 | 454 | 424 |
| ***Total Current Supplies*** | ***1,001*** | ***1,343*** | ***1,411*** | ***1,424*** | ***1,407*** | ***1,377*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***254*** | ***251*** | ***345*** | ***443*** | ***530*** | ***615*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 38 | 94 | 131 | 158 | 182 | 203 |
| Additional Trinity Aquifer (new wells) | 216 | 216 | 216 | 216 | 216 | 216 |
| Additional Water from Fort Worth | 0 | 0 | 0 | 69 | 132 | 196 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***254*** | ***310*** | ***347*** | ***443*** | ***530*** | ***615*** |
| **Reserve (Shortage)** | **0** | **59** | **2** | **0** | **0** | **0** |

## Lake Worth

Lake Worth has a population of about 4,900 and is located in western Tarrant County. The city gets its water supply from Fort Worth (which gets raw water from TRWD) and groundwater from the Trinity aquifer. Lake Worth's water management strategies are conservation, additional water from Fort Worth, additional water from the Trinity aquifer from new wells, and supplemental wells to replace existing wells. Table 4F.325 shows the projected population and demand, the current supplies, and the water management strategies for Lake Worth.

**Table 4F.325**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Lake Worth**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,854** | **5,400** | **6,000** | **6,600** | **7,200** | **7,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 930 | 1,010 | 1,102 | 1,190 | 1,290 | 1,344 |
| ***Total Projected Demand*** | ***930*** | ***1,010*** | ***1,102*** | ***1,190*** | ***1,290*** | ***1,344*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 240 | 240 | 240 | 240 | 240 | 240 |
| Fort Worth (TRWD) | 555 | 610 | 590 | 570 | 558 | 515 |
| ***Total Current Supplies*** | ***795*** | ***850*** | ***830*** | ***810*** | ***798*** | ***755*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***135*** | ***160*** | ***272*** | ***380*** | ***492*** | ***589*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 30 | 66 | 89 | 108 | 128 | 145 |
| Additional Water from Fort Worth | 0 | 0 | 78 | 167 | 259 | 339 |
| New Wells | 105 | 105 | 105 | 105 | 105 | 105 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***135*** | ***171*** | ***272*** | ***380*** | ***492*** | ***589*** |
| **Reserve (Shortage)** | **0** | **11** | **0** | **0** | **0** | **0** |

## Lakeside

Lakeside is a city of about 1,200 people located in western Tarrant County. The city's water supply is groundwater from the Trinity aquifer. Water management strategies for Lakeside are conservation, additional water from the Trinity aquifer (new wells), and supplemental wells to replace existing wells. Table 4F.326 shows the projected population and demand, the current supplies, and the water management strategies for Lakeside.

**Table 4F.326**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Lakeside**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,252** | **1,451** | **1,655** | **1,871** | **2,130** | **2,436** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 447 | 512 | 580 | 652 | 740 | 846 |
| ***Total Projected Demand*** | ***447*** | ***512*** | ***580*** | ***652*** | ***740*** | ***846*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 582 | 582 | 582 | 582 | 582 | 582 |
| ***Total Current Supplies*** | ***582*** | ***582*** | ***582*** | ***582*** | ***582*** | ***582*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***70*** | ***158*** | ***264*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 8 | 15 | 21 | 59 | 107 | 130 |
| Additional Trinity Aquifer (new wells) | 0 | 0 | 264 | 264 | 264 | 264 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***8*** | ***15*** | ***285*** | ***323*** | ***371*** | ***394*** |
| **Reserve (Shortage)** | **143** | **85** | **287** | **253** | **213** | **130** |

## Mansfield

The City of Mansfield has a population of about 57,000 people in Ellis, Johnson and Tarrant Counties. Mansfield is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.87 in Section 4E.

## North Richland Hills

North Richland Hills is located in northern Tarrant County and has a population of about 65,000. North Richland Hills is a wholesale water provider, and there is a discussion of the city's water supply plans on page 4E.93 in Section 4E.

## Pantego

Pantego is a city of about 2,300 people located in eastern Tarrant County. The city's water supply is groundwater from the Trinity aquifer. Water management strategies for Pantego are conservation, purchasing treated water from Fort Worth and Arlington (both of which get raw water from TRWD), and supplemental wells to replace existing wells. Table 4F.327 shows the projected population and demand, the current supplies, and the water management strategies for Pantego.

**Table 4F.327**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Pantego**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **2,318** | **2,318** | **2,318** | **2,318** | **2,318** | **2,318** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 701 | 693 | 685 | 685 | 672 | 672 |
| ***Total Projected Demand*** | ***701*** | ***693*** | ***685*** | ***685*** | ***672*** | ***672*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 771 | 771 | 771 | 771 | 771 | 771 |
| ***Total Current Supplies*** | ***771*** | ***771*** | ***771*** | ***771*** | ***771*** | ***771*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 11 | 20 | 25 | 27 | 29 | 31 |
| Fort Worth (TRWD) | 0 | 100 | 100 | 100 | 100 | 100 |
| Arlington (TRWD) | 0 | 100 | 100 | 100 | 100 | 100 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***11*** | ***220*** | ***225*** | ***227*** | ***229*** | ***231*** |
| **Reserve (Shortage)** | **81** | **298** | **311** | **313** | **328** | **330** |

## Pelican Bay

Pelican Bay is located in northwestern Tarrant County and has a population of about 1,800. The city's water supply is groundwater from the Trinity aquifer. Water management strategies for Pelican Bay include conservation, water from Azle (which gets its raw water from TRWD), and supplemental wells to replace existing wells. Table 4F.328 shows the projected population and demand, the current supplies, and the water management strategies for Pelican Bay.

**Table 4F.328**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Pelican Bay**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,830** | **2,050** | **2,277** | **2,515** | **2,801** | **3,139** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 166 | 214 | 268 | 290 | 320 | 359 |
| ***Total Projected Demand*** | ***166*** | ***214*** | ***268*** | ***290*** | ***320*** | ***359*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 178 | 178 | 178 | 178 | 178 | 178 |
| ***Total Current Supplies*** | ***178*** | ***178*** | ***178*** | ***178*** | ***178*** | ***178*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***36*** | ***90*** | ***112*** | ***142*** | ***181*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 10 | 14 | 17 | 20 | 24 |
| Azle (TRWD) | 0 | 26 | 76 | 95 | 122 | 157 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***36*** | ***90*** | ***112*** | ***142*** | ***181*** |
| **Reserve (Shortage)** | **15** | **0** | **0** | **0** | **0** | **0** |

## Richland Hills

Richland Hills has a population of about 8,400 and is located in central Tarrant County. The city gets its water supply from Fort Worth (which gets raw water from TRWD) and groundwater from the Trinity aquifer. Richland Hills' water management strategies are conservation, additional water from Fort Worth, and supplemental wells to replace existing wells. Table 4F.329 shows the projected population and demand, the current supplies, and the water management strategies for Richland Hills.

**Table 4F.329**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Richland Hills**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **8,400** | **9,000** | **9,600** | **10,300** | **10,700** | **10,850** |
| **Projected Water Demand** | | | | | | |

**(Table 4F.329, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal Demand | 1,327 | 1,381 | 1,441 | 1,511 | 1,558 | 1,580 |
| ***Total Projected Demand*** | ***1,327*** | ***1,381*** | ***1,441*** | ***1,511*** | ***1,558*** | ***1,580*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 462 | 462 | 462 | 462 | 462 | 462 |
| Fort Worth (TRWD) | 854 | 844 | 764 | 708 | 648 | 576 |
| ***Total Current Supplies*** | ***1,316*** | ***1,306*** | ***1,226*** | ***1,170*** | ***1,110*** | ***1,038*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***11*** | ***75*** | ***215*** | ***341*** | ***448*** | ***542*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 11 | 39 | 56 | 65 | 73 | 79 |
| Additional Water from Fort Worth | 0 | 36 | 159 | 276 | 375 | 463 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***11*** | ***75*** | ***215*** | ***341*** | ***448*** | ***542*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## River Oaks

River Oaks is a city of about 7,100 people located in western Tarrant County. The city operates its own water treatment plant and gets raw water from TRWD. Water management strategies for River Oaks are conservation and purchasing additional water from TRWD. Table 4F.330 shows the projected population and demand, the current supplies, and the water management strategies for River Oaks.

**Table 4F.330**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of River Oaks**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **7,100** | **7,100** | **7,100** | **7,100** | **7,100** | **7,100** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,010 | 986 | 954 | 931 | 923 | 923 |
| ***Total Projected Demand*** | ***1,010*** | ***986*** | ***954*** | ***931*** | ***923*** | ***923*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |

(Table 4F.330, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Tarrant Regional Water District | 1,000 | 905 | 744 | 628 | 545 | 475 |
| ***Total Current Supplies*** | ***1,000*** | ***905*** | ***744*** | ***628*** | ***545*** | ***475*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***10*** | ***81*** | ***210*** | ***303*** | ***378*** | ***448*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 10 | 34 | 45 | 49 | 52 | 55 |
| Additional Water from TRWD | 0 | 47 | 165 | 254 | 326 | 393 |
| ***Total Water Management Strategies*** | ***10*** | ***81*** | ***210*** | ***303*** | ***378*** | ***448*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Saginaw

Saginaw is located in northern Tarrant County and has a population of about 19,000. The city's water supply is treated water from Fort Worth, which gets raw water from TRWD. Water management strategies for Saginaw include conservation and additional treated water from Fort Worth. Table 4F.331 shows the projected population and demand, the current supplies, and the water management strategies for Saginaw.

**Table 4F.331**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Saginaw**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **18,813** | **22,803** | **25,711** | **27,829** | **29,373** | **30,499** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 3,161 | 3,755 | 4,176 | 4,489 | 4,705 | 4,885 |
| ***Total Projected Demand*** | ***3,161*** | ***3,755*** | ***4,176*** | ***4,489*** | ***4,705*** | ***4,885*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 3,126 | 3,447 | 3,257 | 3,030 | 2,780 | 2,517 |
| ***Total Current Supplies*** | ***3,126*** | ***3,447*** | ***3,257*** | ***3,030*** | ***2,780*** | ***2,517*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***35*** | ***308*** | ***919*** | ***1,459*** | ***1,925*** | ***2,368*** |
| | | | | | | |

(Table 4F.331, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 35 | 205 | 292 | 355 | 412 | 469 |
| Additional Water from Fort Worth | 0 | 103 | 627 | 1,104 | 1,513 | 1,899 |
| ***Total Water Management Strategies*** | ***35*** | ***308*** | ***919*** | ***1,459*** | ***1,925*** | ***2,368*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Sansom Park Village

Sansom Park Village has a population of about 4,400 and is located in western Tarrant County. The city gets its water supply from groundwater from the Trinity aquifer and treated water from Fort Worth (which gets raw water from TRWD). Sansom Park Village's water management strategies are conservation and supplemental wells to replace existing wells. Table 4F.332 shows the projected population and demand, the current supplies, and the water management strategies for Sansom Park Village.

**Table 4F.332**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for Sansom Park Village**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **4,376** | **4,527** | **4,644** | **4,734** | **4,804** | **4,857** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 603 | 609 | 609 | 605 | 608 | 615 |
| ***Total Projected Demand*** | ***603*** | ***609*** | ***609*** | ***605*** | ***608*** | ***615*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 552 | 552 | 552 | 552 | 552 | 552 |
| Fort Worth (TRWD) | 45 | 52 | 44 | 36 | 33 | 32 |
| ***Total Current Supplies*** | ***597*** | ***604*** | ***596*** | ***588*** | ***585*** | ***584*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***6*** | ***5*** | ***13*** | ***17*** | ***23*** | ***31*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 22 | 30 | 33 | 35 | 38 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***6*** | ***22*** | ***30*** | ***33*** | ***35*** | ***38*** |
| **Reserve (Shortage)** | **0** | **17** | **17** | **16** | **12** | **7** |

## Southlake

Southlake is a city of about 28,000 in northwestern Tarrant County, with some area in southern Denton County. The city's water supply is treated water from Fort Worth, which gets raw water from TRWD. Water management strategies for Southlake include conservation, additional treated water from Fort Worth, and an additional connection to Fort Worth. Table 4F.333 shows the projected population and demand, the current supplies, and the water management strategies for Southlake.

**Table 4F.333**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Southlake**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **28,019** | **29,636** | **30,107** | **31,924** | **34,188** | **36,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 9,321 | 9,826 | 9,949 | 10,514 | 11,259 | 11,855 |
| ***Total Projected Demand*** | ***9,321*** | ***9,826*** | ***9,949*** | ***10,514*** | ***11,259*** | ***11,855*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 9,068 | 9,015 | 7,756 | 7,093 | 6,651 | 6,107 |
| ***Total Current Supplies*** | ***9,068*** | ***9,015*** | ***7,756*** | ***7,093*** | ***6,651*** | ***6,107*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***253*** | ***811*** | ***2,193*** | ***3,421*** | ***4,608*** | ***5,748*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 253 | 435 | 558 | 681 | 823 | 965 |
| Additional Water from Fort Worth | 0 | 376 | 1,635 | 2,740 | 3,785 | 4,783 |
| ***Total Water Management Strategies*** | ***253*** | ***811*** | ***2,193*** | ***3,421*** | ***4,608*** | ***5,748*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Tarrant County Irrigation

Table 4F.334 shows the projected demand, the current supplies, and the water management strategies for Tarrant County Irrigation. The vast majority of irrigation use in Tarrant County is for golf course irrigation. (The Texas Water Development Board classifies the use of potable water for golf course irrigation as a part of municipal use. The use of raw water or reuse of treated wastewater effluent for golf course irrigation is classified as irrigation use.) The current supplies are local surface water supplies, direct reuse from Azle and Fort Worth, indirect reuse, raw water from TRWD, and groundwater from the Trinity aquifer. Water management strategies for Tarrant County Irrigation include conservation, additional water from TRWD, additional water from reuse, and supplemental wells to replace existing wells.

**Table 4F.334**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Tarrant County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **8,417** | **8,417** | **8,417** | **8,417** | **8,417** | **8,417** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 549 | 549 | 549 | 549 | 549 | 549 |
| Trinity Aquifer | 15 | 15 | 15 | 15 | 15 | 15 |
| Indirect Reuse (DCPCMUD through Grapevine) | 1,121 | 1,121 | 1,121 | 1,121 | 1,121 | 1,121 |
| Direct Reuse (Azle) | 300 | 300 | 300 | 300 | 300 | 300 |
| Tarrant Regional Water District | 5,518 | 3,863 | 3,282 | 2,840 | 2,487 | 2,168 |
| Direct Reuse (Fort Worth) | 897 | 897 | 897 | 897 | 897 | 897 |
| ***Total Current Supplies*** | ***8,400*** | ***6,745*** | ***6,164*** | ***5,722*** | ***5,369*** | ***5,050*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***17*** | ***1,672*** | ***2,253*** | ***2,695*** | ***3,048*** | ***3,367*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 17 | 274 | 527 | 660 | 785 | 910 |
| Additional Water from TRWD | 0 | 71 | 399 | 708 | 936 | 1,130 |
| Additional Water from Reuse | 0 | 1,327 | 1,327 | 1,327 | 1,327 | 1,327 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***17*** | ***1,672*** | ***2,253*** | ***2,695*** | ***3,048*** | ***3,367*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Tarrant County Livestock

Table 4F.335 shows the projected demand, current supplies, and water management strategies for Tarrant County Livestock. The current supplies are local surface water supplies and groundwater from the Trinity aquifer. These sources are sufficient to meet projected demands, and supplemental wells are the only water management strategy for this water user group.

**Table 4F.335**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Tarrant County Livestock**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **803** | **803** | **803** | **803** | **803** | **803** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 361 | 361 | 361 | 361 | 361 | 361 |
| Local Supplies | 442 | 442 | 442 | 442 | 442 | 442 |
| ***Total Current Supplies*** | ***803*** | ***803*** | ***803*** | ***803*** | ***803*** | ***803*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Tarrant County Manufacturing

Table 4F.336 shows the projected demand and current supplies for Tarrant County Manufacturing. Current supplies are water from the TRWD through numerous water suppliers in the county. The water management strategies for this water user group are conservation and additional water from TRWD.

**Table 4F.336**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Tarrant County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **17,258** | **20,444** | **23,630** | **26,924** | **29,919** | **32,457** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District (through multiple suppliers) | 17,258 | 18,766 | 18,430 | 18,171 | 17,680 | 16,724 |
| ***Total Current Supplies*** | ***17,258*** | ***18,766*** | ***18,430*** | ***18,171*** | ***17,680*** | ***16,724*** |

(Table 4F.336, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***1,678*** | ***5,200*** | ***8,753*** | ***12,239*** | ***15,733*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 35 | 413 | 630 | 711 | 784 |
| Additional water from TRWD | 0 | 1,643 | 4,787 | 8,123 | 11,528 | 14,949 |
| ***Total Water Management Strategies*** | ***0*** | ***1,678*** | ***5,200*** | ***8,753*** | ***12,239*** | ***15,733*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Tarrant County Mining

Table 4F.337 shows the projected demand, the current supplies, and the water management strategies for Tarrant County Mining. Tarrant County Mining is supplied from local supplies, raw water from TRWD (through numerous water suppliers), and the Trinity aquifer. The supply is sufficient to meet projected demands, and supplemental wells are the only water management strategy for this water user group.

**Table 4F.337**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Tarrant County Mining**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,073** | **904** | **939** | **974** | **1,009** | **1,036** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local supplies | 342 | 342 | 342 | 342 | 342 | 342 |
| Tarrant Regional Water District | 536 | 415 | 366 | 329 | 298 | 267 |
| Trinity Aquifer | 1,073 | 1,073 | 1,073 | 1,073 | 1,073 | 1,073 |
| ***Total Current Supplies*** | ***1,951*** | ***1,830*** | ***1,781*** | ***1,744*** | ***1,713*** | ***1,682*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **878** | **926** | **842** | **770** | **704** | **646** |

## Tarrant County Other

Tarrant County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups. The entities included under Tarrant County Other supply about 24,000 people and receive their water supply from the TRWD (through various water suppliers) and groundwater (Trinity aquifer). Water management strategies for these entities include conservation, additional water from TRWD, and supplemental wells to replace existing water wells. Table 4F.338 shows the projected population and demand, the current supplies, and the water management strategies for Tarrant County Other.

**Table 4F.338**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Tarrant County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **23,911** | **23,911** | **23,911** | **23,911** | **23,911** | **23,911** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 3,482 | 3,402 | 3,348 | 3,268 | 3,241 | 3,241 |
| ***Total Projected Water Demand*** | ***3,482*** | ***3,402*** | ***3,348*** | ***3,268*** | ***3,241*** | ***3,241*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,597 | 1,597 | 1,597 | 1,597 | 1,597 | 1,597 |
| Tarrant Regional Water District (through various suppliers) | 1,832 | 1,657 | 1,366 | 1,128 | 971 | 847 |
| ***Total Current Supplies*** | ***3,429*** | ***3,254*** | ***2,963*** | ***2,725*** | ***2,568*** | ***2,444*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***53*** | ***148*** | ***385*** | ***543*** | ***673*** | ***797*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 53 | 173 | 183 | 194 | 204 | 215 |
| Additional Water from TRWD | 0 | 0 | 202 | 349 | 469 | 582 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***53*** | ***173*** | ***385*** | ***543*** | ***673*** | ***797*** |
| **Reserve (Shortage)** | **0** | **25** | **0** | **0** | **0** | **0** |

### Tarrant County Steam Electric Power

Table 4F.339 shows the projected demand, the current supplies, and the water management strategies for Tarrant County Steam Electric Power. Tarrant County Steam Electric Power is supplied from run-of-the-river supplies and raw water from TRWD. Water management strategies for Tarrant County Steam Electric Power are additional water from TRWD and reuse.

**Table 4F.339**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Tarrant County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **2,640** | **2,448** | **4,168** | **5,000** | **5,000** | **5,000** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Run-of-River supplies | 235 | 187 | 219 | 257 | 304 | 362 |
| Tarrant Regional Water District | 2,640 | 2,247 | 2,059 | 1,782 | 1,560 | 1,360 |
| ***Total Current Supplies*** | ***2,875*** | ***2,434*** | ***2,278*** | ***2,039*** | ***1,864*** | ***1,722*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***14*** | ***1,890*** | ***2,961*** | ***3,136*** | ***3,278*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from TRWD | 0 | 202 | 582 | 859 | 1,080 | 1,280 |
| Reuse | 0 | 0 | 1,528 | 2,360 | 2,360 | 2,360 |
| ***Total Water Management Strategies*** | ***0*** | ***202*** | ***2,110*** | ***3,219*** | ***3,440*** | ***3,640*** |
| **Reserve (Shortage)** | **235** | **188** | **220** | **258** | **304** | **362** |

### Watauga

Watauga is a city of about 23,000 in northern Tarrant County. The city's water supply is treated water from North Richland Hills (which in turn buys treated water from Fort Worth, which gets raw water from TRWD). Water management strategies for Watauga include conservation and additional treated water from North Richland Hills. Table 4F.340 shows the projected population and demand, the current supplies, and the water management strategies for Watauga.

**Table 4F.340**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Watauga**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **23,423** | **24,632** | **25,000** | **25,000** | **25,000** | **25,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 3,437 | 3,532 | 3,500 | 3,416 | 3,388 | 3,388 |
| ***Total Projected Demand*** | ***3,437*** | ***3,532*** | ***3,500*** | ***3,416*** | ***3,388*** | ***3,388*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| North Richland Hills (from Fort Worth from TRWD) | 3,401 | 3,242 | 2,730 | 2,305 | 2,002 | 1,746 |
| ***Total Current Supplies*** | ***3,401*** | ***3,242*** | ***2,730*** | ***2,305*** | ***2,002*** | ***1,746*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***36*** | ***290*** | ***770*** | ***1,111*** | ***1,386*** | ***1,642*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 36 | 122 | 165 | 178 | 189 | 200 |
| Additional Water from North Richland Hills | 0 | 168 | 605 | 933 | 1,197 | 1,442 |
| ***Total Water Management Strategies*** | ***36*** | ***290*** | ***770*** | ***1,111*** | ***1,386*** | ***1,642*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Westover Hills

Westover Hills has a population of about 650 and is located in western Tarrant County. The city purchases treated water from Fort Worth (which gets raw water from TRWD). Westover Hills' water management strategies are conservation and additional water from Fort Worth. Table 4F.341 shows the projected population and demand, the current supplies, and the water management strategies for Westover Hills.

**Table 4F.341**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Westover Hills**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **658** | **658** | **658** | **658** | **658** | **658** |
| **Projected Water Demand** | | | | | | |

**(Table 4F.341, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Municipal Demand | 276 | 274 | 272 | 270 | 268 | 268 |
| ***Total Projected Demand*** | ***276*** | ***274*** | ***272*** | ***270*** | ***268*** | ***268*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 274 | 252 | 212 | 182 | 158 | 138 |
| ***Total Current Supplies*** | ***274*** | ***252*** | ***212*** | ***182*** | ***158*** | ***138*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***22*** | ***60*** | ***88*** | ***110*** | ***130*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 12 | 17 | 19 | 21 | 24 |
| Additional Water from Fort Worth | 0 | 10 | 43 | 69 | 89 | 106 |
| ***Total Water Management Strategies*** | ***2*** | ***22*** | ***60*** | ***88*** | ***110*** | ***130*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Westworth Village

Westworth Village is located in western Tarrant County and has a population of about 3,200. The city's water supply is treated water from Fort Worth, which gets raw water from TRWD. Water management strategies for Westworth Village include conservation and additional treated water from Fort Worth. Table 4F.342 shows the projected population and demand, the current supplies, and the water management strategies for Westworth Village.

**Table 4F.342**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Westworth Village**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,224** | **3,403** | **3,618** | **3,869** | **4,156** | **4,586** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 350 | 412 | 426 | 442 | 470 | 519 |
| ***Total Projected Demand*** | ***350*** | ***412*** | ***426*** | ***442*** | ***470*** | ***519*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Fort Worth (TRWD) | 344 | 378 | 332 | 298 | 278 | 267 |
| ***Total Current Supplies*** | ***344*** | ***378*** | ***332*** | ***298*** | ***278*** | ***267*** |

**(Table 4F.342, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***6*** | ***34*** | ***94*** | ***144*** | ***192*** | ***252*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 6 | 17 | 23 | 27 | 30 | 35 |
| Additional Water from Fort Worth | 0 | 17 | 71 | 117 | 162 | 217 |
| ***Total Water Management Strategies*** | ***6*** | ***34*** | ***94*** | ***144*** | ***192*** | ***252*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### White Settlement

White Settlement is a city of about 16,000 in western Tarrant County. The city's water supply is treated water from treated water from Fort Worth (which gets raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for White Settlement include conservation, additional treated water from Fort Worth, and supplemental wells to replace existing wells. Table 4F.343 shows the projected population and demand, the current supplies, and the water management strategies for White Settlement.

**Table 4F.343**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of White Settlement**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **15,800** | **17,000** | **18,000** | **19,000** | **20,500** | **22,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 2,531 | 2,647 | 2,742 | 2,831 | 3,031 | 3,253 |
| ***Total Projected Demand*** | ***2,531*** | ***2,647*** | ***2,742*** | ***2,831*** | ***3,031*** | ***3,253*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 1,007 | 1,007 | 1,007 | 1,007 | 1,007 | 1,007 |
| Fort Worth (TRWD) | 1,173 | 1,505 | 1,353 | 1,231 | 1,196 | 1,157 |
| ***Total Current Supplies*** | ***2,180*** | ***2,512*** | ***2,360*** | ***2,238*** | ***2,203*** | ***2,164*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***351*** | ***135*** | ***382*** | ***593*** | ***828*** | ***1,089*** |

**(Table 4F.343, Continued)**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 351 | 72 | 99 | 115 | 134 | 154 |
| Additional Water from Fort Worth | | 63 | 283 | 478 | 694 | 935 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***351*** | ***135*** | ***382*** | ***593*** | ***828*** | ***1,089*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Costs for Tarrant County Water User Groups

Table 4F.344 shows the estimated capital costs for Tarrant County water management strategies not covered under the wholesale water providers. Table 4F.345 summarizes the costs by category and is followed by a summary for Tarrant County.

**Table 4F.344**
**Costs for Recommended Water Management Strategies for Tarrant County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Arlington | Conservation | 2010 | 8,426 | See Arlington in Section 4E. | | | |
| | Water treatment plant expansions | 2040 | 0 | See Arlington in Section 4E. | | | |
| | Additional TRWD | 2020 | 31,471 | See Arlington in Section 4E. | | | |
| | Direct reuse (Fort Worth) | 2010 | 602 | See Fort Worth in Section 4E. | | | |
| Azle* | Conservation | 2010 | 405 | $10,000 | $0.59 | $0.59 | Q-10 & Q-11 |
| | New water treatment plant | 2040 | 0 | $14,964,000 | $2.68 | $0.70 | Q-14 |
| | Water treatment plant expansions | 2020 | 0 | $20,892,000 | $1.84 | $1.27 | Q-15 |
| | Additional TRWD | 2020 | 4,618 | $0 | $0.69 | $0.69 | None |

(Table 4F.344, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Bedford | Conservation | 2010 | 1,028 | $0 | $0.32 | $0.32 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,062,000 | N/A | N/A | Q-13 |
| | Additional TRA (TRWD) | 2020 | 3,887 | $0 | $2.27 | $2.27 | None |
| Benbrook | Conservation | 2010 | 1,218 | $10,000 | $0.39 | $0.39 | Q-10 & Q-11 |
| | Water treatment plant expansions | 2020 | 2,520 | $17,046,000 | $1.95 | $1.53 | Q-15 |
| | Additional TRWD | 2010 | 4,237 | $0 | $0.69 | $0.69 | None |
| | Supplemental wells | 2010 | 0 | $4,886,000 | N/A | N/A | Q-13 |
| Bethesda WSC* | Conservation | 2010 | 231 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $10,476,000 | N/A | N/A | Q-13 |
| | Additional Pipeline from Fort Worth (TRWD) | 2020 | 3,843 | $16,341,000 | $3.71 | $2.74 | Q-220 |
| | Arlington (TRWD) | 2020 | 3,266 | $0 | $2.50 | $2.50 | None |
| Blue Mound | Conservation | 2010 | 19 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,528,000 | N/A | N/A | Q-13 |
| Burleson* | Conservation | 2010 | 104 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 4,775 | $0 | $1.79 | $1.79 | None |
| | Additional connection to Fort Worth | 2020 | 0 | $2,592,000 | $0.14 | $0.02 | Q-221 |
| Colleyville | Conservation | 2010 | 876 | $25,000 | $0.24 | $0.24 | Q-10 & Q-11 |
| | Additional TRA (TRWD) | 2020 | 3,130 | $0 | $2.27 | $2.27 | None |
| Community WSC* | Conservation | 2010 | 33 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional TRWD | 2020 | 178 | $0 | $0.69 | $0.69 | None |

(Table 4F.344, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Crowley | Conservation | 2010 | 239 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 1,649 | $0 | $1.79 | $1.79 | None |
| | Upsize connection to Fort Worth | 2020 | 0 | $621,000 | $0.09 | $0.01 | Q-222 |
| | Supplemental wells | 2010 | 0 | $4,014,000 | N/A | N/A | Q-13 |
| Dalworthington Gardens | Conservation | 2010 | 74 | $0 | $0.41 | $0.41 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 226 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $1,165,000 | N/A | N/A | Q-13 |
| Edgecliff | Conservation | 2010 | 42 | $0 | $0.62 | $0.62 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 165 | $0 | $1.79 | $1.79 | None |
| Euless | Conservation | 2010 | 1,270 | $49,000 | $0.43 | $0.43 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,250,000 | N/A | N/A | Q-13 |
| | Additional TRA (TRWD) | 2020 | 3,608 | $0 | $2.27 | $2.27 | None |
| | Direct reuse (Fort Worth) | See Fort Worth in Section 4E. | | | | | |
| Everman | Conservation | 2010 | 47 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2030 | 57 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $3,524,000 | N/A | N/A | Q-13 |
| Forest Hill | Conservation | 2010 | 121 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 852 | $0 | $1.79 | $1.79 | None |
| Fort Worth* | Conservation | 2010 | 43,549 | See Fort Worth in Section 4E. | | | |
| | Water treatment plants - new and expansions | See Fort Worth in Section 4E. | | | | | |
| | Additional TRWD | See Fort Worth in Section 4E. | | | | | |
| | Direct reuse (Fort Worth) | See Fort Worth in Section 4E. | | | | | |

(Table 4F.344, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Grand Prairie* | Conservation | 2010 | 6,366 | See Grand Prairie in Section 4E. | | | |
| | Additional DWU supplies | See Grand Prairie in Section 4E. | | | | | |
| | Additional Fort Worth supplies | See Grand Prairie in Section 4E. | | | | | |
| | Supplemental wells | See Grand Prairie in Section 4E. | | | | | |
| | Midlothian (from TRWD) | See Grand Prairie in Section 4E. | | | | | |
| | Mansfield (from TRWD) | See Grand Prairie in Section 4E. | | | | | |
| | Arlington (from TRWD) | See Grand Prairie in Section 4E. | | | | | |
| Grapevine | Conservation | 2010 | 2,252 | $54,000 | $0.25 | $0.25 | Q-10 & Q-11 |
| | Additional TRA (TRWD) | 2020 | 4,264 | $0 | $2.27 | $2.27 | None |
| Haltom City | Conservation | 2010 | 401 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 3,634 | $0 | $1.79 | $1.79 | None |
| Haslet | Conservation | 2010 | 198 | $5,000 | $0.33 | $0.33 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 1,043 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $1,873,000 | N/A | N/A | Q-13 |
| Hurst | Conservation | 2010 | 792 | $34,000 | $0.46 | $0.46 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 2,441 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $5,958,000 | N/A | N/A | Q-13 |
| Johnson County SUD* | Conservation | See Ellis County. | | | | | |
| | Additional BRA SWATS | See Brazos G Regional Water Plan. | | | | | |
| | Additional Mansfield (TRWD) | See Ellis County. | | | | | |
| | Grand Prairie | See Ellis County. | | | | | |

(Table 4F.344, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | Unit Cost ($/1000 gal) After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Keller | Conservation | 2010 | 1,357 | $0 | $0.56 | $0.56 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 4,149 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2020 | 0 | $711,000 | N/A | N/A | Q-13 |
| Kennedale | Conservation | 2010 | 203 | $0 | $0.61 | $0.61 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2040 | 196 | $0 | $1.79 | $1.79 | None |
| | Additional wells | 2010 | 216 | $717,000 | $1.42 | $0.68 | Q-223 |
| | Supplemental wells | 2010 | 0 | $4,732,000 | N/A | N/A | Q-13 |
| Lake Worth | Conservation | 2010 | 145 | $0 | $1.22 | $1.22 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2030 | 339 | $0 | $1.79 | $1.79 | None |
| | New Wells | 2010 | 105 | $416,000 | $1.50 | $0.62 | Q-257 |
| | Supplemental wells | 2010 | 0 | $1,951,000 | N/A | N/A | Q-13 |
| Lakeside | Conservation | 2010 | 130 | $24,000 | $0.81 | $0.81 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,065,000 | N/A | N/A | Q-13 |
| | Additional wells | 2030 | 264 | $662,000 | $1.20 | $0.64 | Q-285 |
| Mansfield* | Conservation | 2010 | 3,984 | See Mansfield in Section 4E. | | | |
| | Additional TRWD | 2020 | 22,823 | See Mansfield in Section 4E. | | | |
| | Treatment plant expansions and new plant | 2020 | 0 | See Mansfield in Section 4E. | | | |
| North Richland Hills | Conservation | 2010 | 1,762 | See North Richland Hills in Section 4E. | | | |
| | Additional Fort Worth (TRWD) | 2010 | 1,714 | See North Richland Hills in Section 4E. | | | |
| | Additional TRA (TRWD) | 2020 | 4,177 | See North Richland Hills in Section 4E. | | | |
| | Supplemental wells | 2020 | 0 | See North Richland Hills in Section 4E. | | | |
| Pantego | Conservation | 2010 | 31 | $5,000 | $0.10 | $0.10 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,510,000 | N/A | N/A | Q-13 |
| | Connect to Arlington | 2020 | 100 | $1,072,000 | $4.71 | $2.31 | Q-230 |
| | Connect to Fort Worth | 2020 | 100 | $1,072,000 | $4.72 | $2.33 | Q-229 |

(Table 4F.344, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Pelican Bay | Conservation | 2010 | 24 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,940,000 | N/A | N/A | Q-13 |
| | Azle (TRWD) | 2020 | 157 | $1,430,000 | $4.48 | $2.44 | Q-231 |
| Richland Hills | Conservation | 2010 | 79 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 463 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $3,381,000 | N/A | N/A | Q-13 |
| River Oaks | Conservation | 2010 | 55 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional TRWD | 2020 | 393 | $0 | $0.69 | $0.69 | None |
| Saginaw | Conservation | 2010 | 469 | $0 | $0.57 | $0.57 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 1,899 | $0 | $1.79 | $1.79 | None |
| Sansom Park Village | Conservation | 2010 | 38 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $3,456,000 | N/A | N/A | Q-13 |
| Southlake* | Conservation | 2010 | 965 | $0 | $0.25 | $0.25 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 4,783 | $0 | $1.79 | $1.79 | None |
| | Additional connection to Fort Worth (TRWD) | 2020 | 0 | $9,427,000 | $0.48 | $0.04 | Q-151 |
| Tarrant County Other | Conservation | 2010 | 215 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2030 | 582 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $463,000 | N/A | N/A | Q-13 |
| Watauga | Conservation | 2010 | 200 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional North Richland Hills | 2020 | 1,442 | $11,803,000 | $2.94 | $2.15 | Q-228 |
| Westover Hills | Conservation | 2010 | 24 | $19,000 | $0.49 | $0.49 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 106 | $0 | $1.79 | $1.79 | None |

(Table 4F.344, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) With Debt Service | After Debt Service | Table for Details |
|---|---|---|---|---|---|---|---|
| Westworth Village | Conservation | 2010 | 35 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 217 | $0 | $1.79 | $1.79 | None |
| White Settlement | Conservation | 2010 | 351 | $27,000 | $0.83 | $0.83 | Q-10 & Q-11 |
| | Additional Fort Worth (TRWD) | 2020 | 935 | $0 | $1.79 | $1.79 | None |
| | Supplemental wells | 2010 | 0 | $3,969,000 | N/A | N/A | Q-13 |
| Tarrant County Irrigation | Conservation | 2010 | 910 | $0 | $0.85 | $0.85 | Q-12 |
| | Additional TRWD | 2020 | 1,130 | $0 | $0.69 | $0.69 | None |
| | Additional direct reuse | 2020 | 1,327 | $4,587,000 | $1.23 | $0.46 | Q-233 |
| | Supplemental wells | 2010 | 0 | $75,000 | N/A | N/A | Q-13 |
| Tarrant County Livestock | Supplemental wells | 2010 | 0 | $75,000 | N/A | N/A | Q-13 |
| Tarrant County Manufacturing | Conservation | 2020 | 784 | $0 | $0.85 | $0.85 | Q-12 |
| | Additional TRWD | 2020 | 14,949 | $0 | $0.69 | $0.69 | None |
| Tarrant County Mining | Supplemental wells | 2020 | 0 | $156,000 | N/A | N/A | Q-13 |
| Tarrant County Steam Electric | Additional TRWD | 2020 | 1,280 | $0 | $0.69 | $0.69 | None |
| | Direct reuse | 2030 | 2,360 | $10,315,000 | $1.31 | $0.43 | Q-232 |

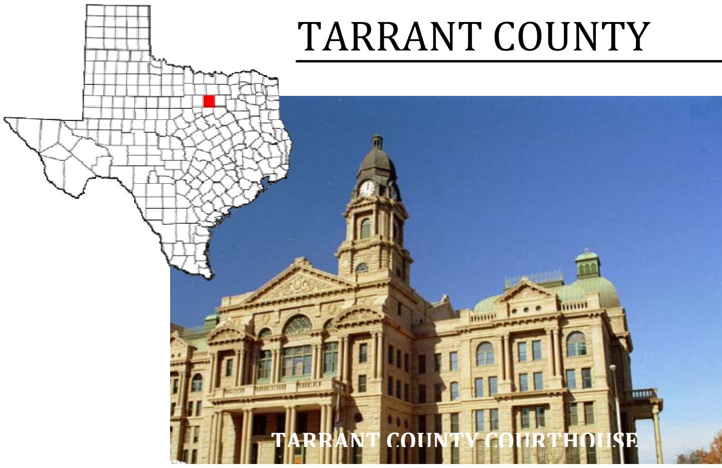
Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.345**
**Summary of Recommended Water Management Strategies for Tarrant County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation | 67,146 | $262,000 |
| Purchase from WWP or WUG | 135,235 | $13,233,000 |
| Supplemental wells | 0 | $66,220,000 |
| New water treatment plant and expansions | 2,520 | $52,902,000 |
| Transmission facilities | 4,043 | $31,125,000 |
| Additional Groundwater | 585 | $1,795,000 |
| Reuse (including transmission facilities) | 4,289 | $14,902,000 |
| **Total** | | **$180,439,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.




***2000 Population:*** *1,446,219*

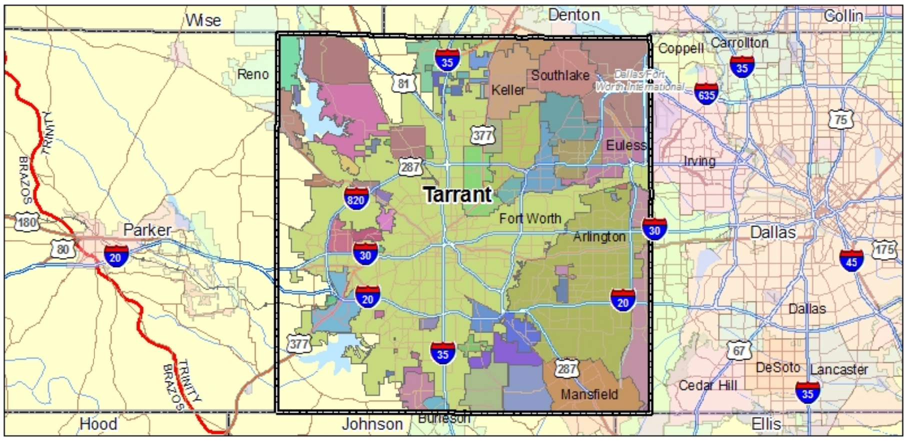
***Projected 2060 Population:*** *3,353,509*

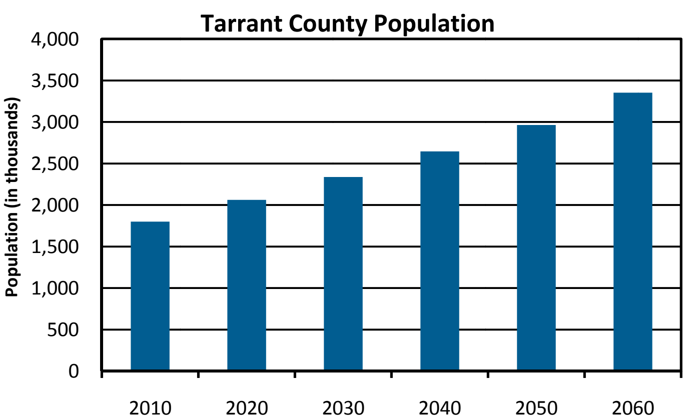
***County Seat:*** *Fort Worth*

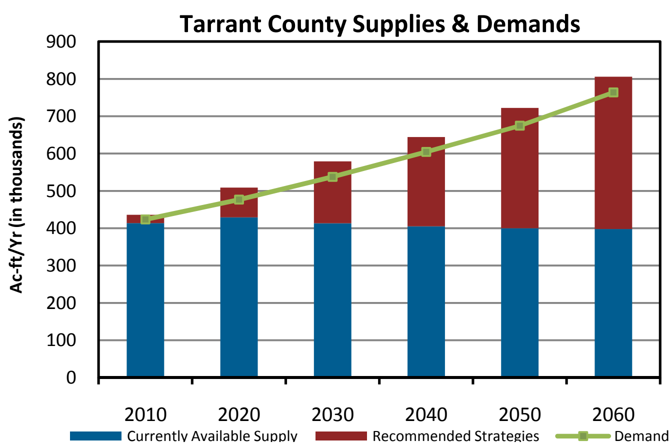
***Economy:*** *Tourism; manufacturing*

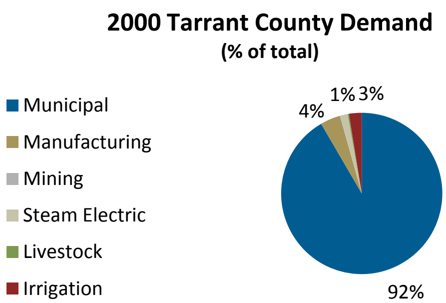
***River Basin(s):***

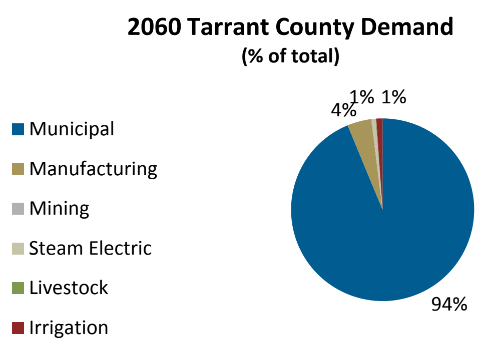
- Trinity (100%)




**Total=331,066 acre-feet**

**Total= 763,750 acre-feet**

| WATER USER GROUP | 2060 TARRANT CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Arlington | 92,008 | TRWD, Lake Arlington | WTP expansions, Additional TRWD supplies, Direct reuse (Fort Worth) |
| Azle [a] | 6,049 | TRWD | WTP expansions |
| Bedford | 11,246 | TRA (TRWD), Trinity Aquifer | Supplemental wells, Additional TRA (TRWD) supplies |
| Benbrook | 11,254 | TRWD, Trinity Aquifer | WTP expansions, Additional TRWD supplies, Supplemental wells |
| Bethesda WSC [a] | 3,501 | Fort Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Arlington (TRWD), Supplemental wells |
| Blue Mound | 283 | Trinity Aquifer | Supplemental wells |
| Burleson [a] | 1,967 | Fort Worth (TRWD) | Additional Fort Worth supplies |
| Colleyville | 9,064 | Trinity Aquifer, TRA (TRWD) | Supplemental wells, Additional TRA |
| Community WSC [a] | 419 | TRWD | Additional TRWD supplies |
| Crowley | 4,322 | Fort Worth (TRWD), Trinity Aquifer | Additional TRWD supplies, Supplemental wells |
| Dalworthington Gardens | 884 | Fort Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Edgecliff | 428 | Fort Worth (TRWD) | Additional Fort Worth supplies |
| Euless | 11,448 | TRA (TRWD), Trinity Aquifer | Supplemental wells, Additional TRA supplies, Direct reuse (Fort Worth) |
| Everman | 747 | Fort Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Forest Hill | 2,008 | Fort Worth (TRWD) | Additional Fort Worth supplies |
| Forth Worth [a] | 417,660 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| Grand Prairie [a] | 7,969 | DWU, Fort Worth (TRWD), Trinity Aquifer, Joe Pool Lake (for irrigation) | Additional DWU supplies, Supple-mental wells, Additional Fort Worth supplies, Midlothian (TRWD), Mansfield (TRWD), Arlington (TRWD) |
| Grapevine | 19,625 | DWU, Indirect reuse, TRA (TRWD), Lake Grapevine | Additional TRA supplies |
| Haltom City | 8,324 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Haslet | 2,682 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Hurst | 7,486 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Johnson County SUD [a] | 1,154 | Mansfield (TRWD), Other supplies in Region G | Additional Mansfield, Grand Prairie |
| Keller | 11,380 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| Kennedale | 1,992 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells, Additional Trinity Aquifer |
| Lake Worth | 1,344 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells, new wells |

| WATER USER GROUP | 2060 TARRANT CO. DEMAND (AC-FT/YR) | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Lakeside | 846 | Trinity Aquifer | Supplemental wells, Additional Trinity Aquifer |
| Mansfield [a] | 33,673 | TRWD | Additional TRWD supplies, WTP expansions, New WTP |
| North Richland Hills | 16,022 | Fort Worth (TRWD), TRA (TRWD), Trinity Aquifer | Supplemental wells, Additional Fort Worth supplies, Additional TRA supplies |
| Pantego | 672 | Trinity Aquifer | Supplemental wells, Arlington (TRWD) supplies, Fort Worth (TRWD) supplies |
| Pelican Bay | 359 | Trinity Aquifer | Supplemental wells, Azle (TRWD) |
| Richland Hills | 1,580 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| River Oaks | 923 | TRWD | Additional TRWD supplies |
| Saginaw | 4,885 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Sansom Park Village | 615 | Forth Worth (TRWD), Trinity Aquifer | Supplemental wells |
| Southlake [a] | 10,549 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Watauga | 3,388 | North Richland Hills (Fort Worth from TRWD) | Additional North Richland Hills supplies |
| Westover Hills | 268 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| Westworth Village | 519 | Forth Worth (TRWD) | Additional Fort Worth supplies |
| White Settlement | 3,253 | Forth Worth (TRWD), Trinity Aquifer | Additional Fort Worth supplies, Supplemental wells |
| County-Other | 3,241 | TRWD, Trinity Aquifer | Additional TRWD supplies, Supplemental wells |
| Irrigation | 8,417 | Local supplies, Trinity Aquifer, Indirect reuse, Direct reuse, TRWD | Additional reuse, Additional TRWD supplies, Supplemental wells |
| Livestock | 803 | Local supplies, Trinity Aquifer | Supplemental wells |
| Manufacturing | 32,457 | TRWD | Additional TRWD supplies |
| Mining | 1,036 | Local supplies, TRWD, Trinity Aquifer | Supplemental wells |
| Steam Electric Power | 5,000 | Run-of-River supplies, TRWD | Additional TRWD supplies, Reuse |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

### *4F.16 Wise County*

Figure 4F.16 is a map of Wise County. Many water user groups in Wise County use groundwater supplies. The Tarrant Regional Water District (TRWD) supplies most of the remaining demand in Wise County through Walnut Creek SUD, West Wise SUD, and Wise County Water Supply District (Decatur). Water user groups that currently get water from TRWD will purchase additional water from TRWD to meet future demands. Additional supplies from sources other than groundwater and TRWD include the following:

- Bolivar Water Supply Corporation will begin purchasing water from UTRWD.
- Bolivar Water Supply Corporation will also begin purchasing water from GTUA through the Cooke County Water Supply Project.

Water management strategies for Wise County water user groups are discussed on the following pages. Table 4F.364 on page 4F.453 shows the estimated capital costs for the Wise County water management strategies not associated with the wholesale water providers, and Table 4F.365 on page 4F.456 is a summary of the costs by category. Table 4F.365 is followed by a Wise County summary.

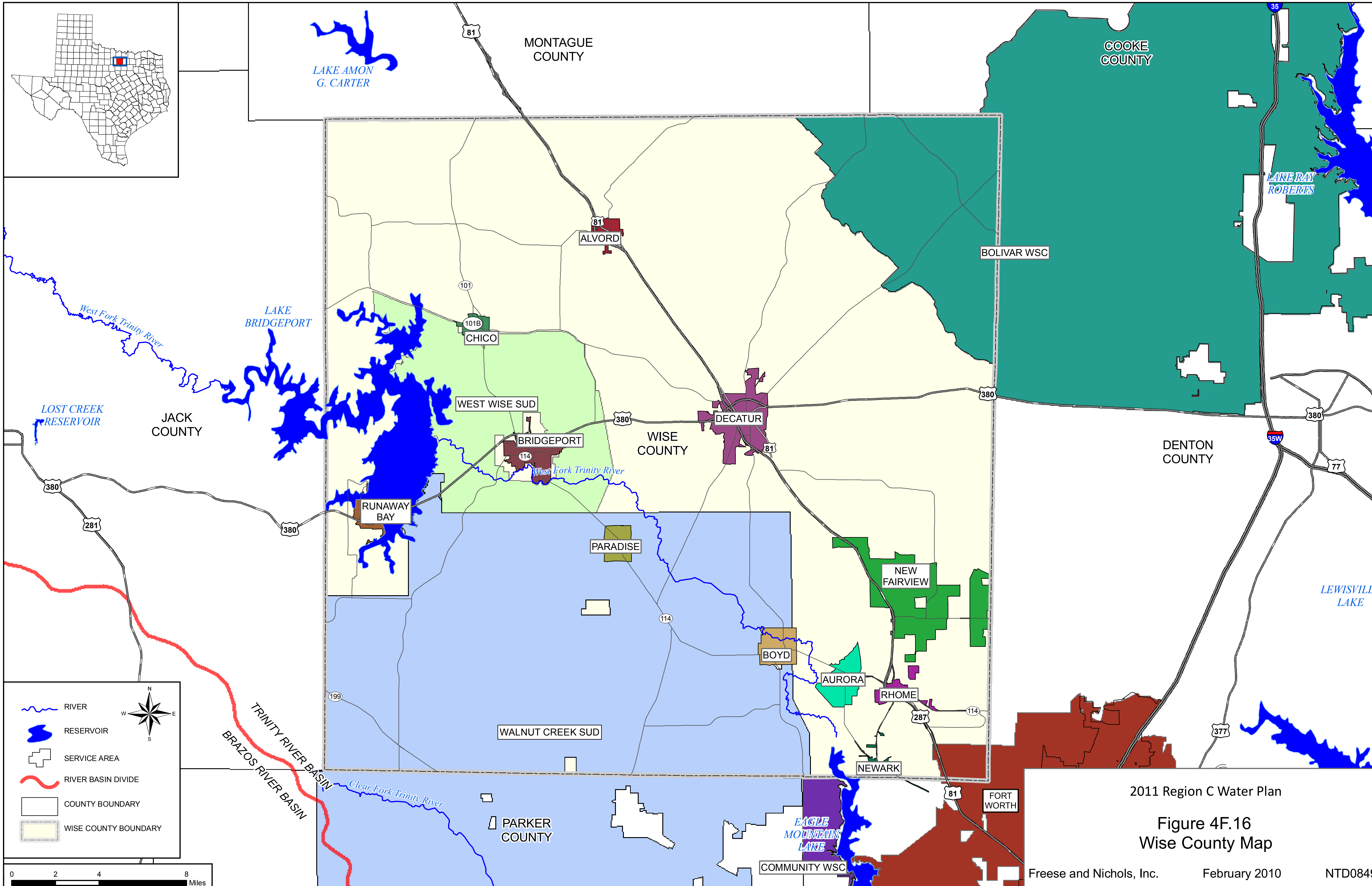



Figure 4F.16
Wise County Map

## Alvord

Alvord is a city of about 1,300 in northern Wise County. The city's water supply is groundwater from the Trinity aquifer. Water management strategies for Alvord include conservation, treated water from the West Wise SUD (which gets raw water from TRWD and treated water from Walnut Creek SUD), and supplemental wells to replace existing wells. Table 4F.346 shows the projected population and demand, the current supplies, and the water management strategies for Alvord.

**Table 4F.346**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Alvord**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,336** | **1,478** | **1,615** | **1,751** | **1,906** | **2,085** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 199 | 214 | 228 | 243 | 263 | 287 |
| ***Total Projected Water Demand*** | ***199*** | ***214*** | ***228*** | ***243*** | ***263*** | ***287*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 316 | 316 | 316 | 316 | 316 | 316 |
| ***Total Current Supplies*** | ***316*** | ***316*** | ***316*** | ***316*** | ***316*** | ***316*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 7 | 10 | 12 | 14 | 17 |
| West Wise SUD (TRWD) | 0 | 150 | 150 | 150 | 150 | 150 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***2*** | ***157*** | ***160*** | ***162*** | ***164*** | ***167*** |
| **Reserve (Shortage)** | **119** | **259** | **248** | **235** | **217** | **196** |

## Aurora

Aurora has a population of about 1,500 and is located in southeastern Wise County. The city's water supply is groundwater from the Trinity aquifer. Water management strategies for Aurora include conservation, treated water from the Rhome (from treated water from Walnut Creek SUD, which gets raw water from TRWD), and supplemental wells to replace existing wells. Table 4F.347 shows the projected population and demand, the current supplies, and the water management strategies for Aurora.

**Table 4F.347**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Aurora**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,500** | **1,800** | **2,000** | **2,149** | **2,507** | **2,905** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 187 | 218 | 237 | 253 | 292 | 338 |
| ***Total Projected Demand*** | ***187*** | ***218*** | ***237*** | ***253*** | ***292*** | ***338*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 252 | 252 | 252 | 252 | 252 | 252 |
| ***Total Current Supplies*** | ***252*** | ***252*** | ***252*** | ***252*** | ***252*** | ***252*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***1*** | ***40*** | ***86*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 9 | 13 | 15 | 18 | 22 |
| Rhome (from Walnut Ck. SUD and TRWD) | 0 | 50 | 50 | 50 | 50 | 86 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***59*** | ***63*** | ***65*** | ***68*** | ***108*** |
| **Reserve (Shortage)** | **68** | **93** | **78** | **64** | **28** | **22** |

## Bolivar Water Supply Corporation

Bolivar WSC serves wholesale and retail customers in northeastern Wise County and in Denton and Cooke Counties. Bolivar WSC is a wholesale water provider, and there is a detailed discussion of water supply plans for the WSC beginning on page 4E.68 in Section 4E.

## Boyd

Boyd is located in southeastern Wise County and has a population of about 1,500. The city's water supply is treated water from Walnut Creek SUD (which gets its raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for Boyd include conservation, additional treated water from Walnut Creek SUD (which gets raw water from TRWD), and supplemental wells to replace existing wells. Table 4F.348 shows the projected population and demand, the current supplies, and the water management strategies for Boyd.

**Table 4F.348**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Boyd**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Population** | **1,500** | **2,000** | **2,500** | **3,000** | **3,500** | **3,500** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 215 | 278 | 339 | 397 | 459 | 459 |
| ***Total Projected Demand*** | ***215*** | ***278*** | ***339*** | ***397*** | ***459*** | ***459*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 150 | 150 | 150 | 150 | 150 | 150 |
| Walnut Creek SUD (TRWD) | 62 | 117 | 147 | 167 | 183 | 159 |
| ***Total Current Supplies*** | ***212*** | ***267*** | ***297*** | ***317*** | ***333*** | ***309*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***3*** | ***11*** | ***42*** | ***80*** | ***126*** | ***150*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 10 | 16 | 20 | 25 | 27 |
| Additional Water from Walnut Ck. SUD | | 1 | 26 | 60 | 101 | 123 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***11*** | ***42*** | ***80*** | ***126*** | ***150*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

### Bridgeport

Bridgeport is a city of about 5,900 in western Wise County. The city buys raw water from TRWD (Lake Bridgeport) and operates its own water treatment plant. Water management strategies for Bridgeport include conservation, water treatment plant expansions, and additional raw water from TRWD. Table 4F.349 shows the projected population and demand, the current supplies, and the water management strategies for Bridgeport.

**Table 4F.349**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Bridgeport**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **5,900** | **8,352** | **12,001** | **14,296** | **16,657** | **19,936** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,361 | 1,899 | 2,702 | 3,187 | 3,713 | 4,444 |
| ***Total Projected Demand*** | ***1,361*** | ***1,899*** | ***2,702*** | ***3,187*** | ***3,713*** | ***4,444*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District (limited by treatment plant capacity) | 1,337 | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| ***Total Current Supplies*** | ***1,337*** | ***1,700*** | ***1,700*** | ***1,700*** | ***1,700*** | ***1,700*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***24*** | ***199*** | ***1,002*** | ***1,487*** | ***2,013*** | ***2,744*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 24 | 107 | 188 | 252 | 324 | 425 |
| Water Plant Expansions and more TRWD | 0 | 92 | 814 | 1,235 | 1,689 | 2,319 |
| ***Total Water Management Strategies*** | ***24*** | ***199*** | ***1,002*** | ***1,487*** | ***2,013*** | ***2,744*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Chico

Chico has a population of about 1,300 and is located in western Wise County. The city's water supply is groundwater from the Trinity aquifer and treated water from West Wise SUD (which gets raw water from TRWD and treated water from Walnut Creek SUD). Water management strategies for Chico include conservation, additional treated water from West Wise SUD, and supplemental wells to replace existing wells. Table 4F.350 shows the projected population and demand, the current supplies, and the water management strategies for Chico.

**Table 4F.350**
**Projected Population and Demand, Current Supplies, and Water Management Strategies for the City of Chico**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,300** | **1,500** | **1,800** | **2,200** | **2,700** | **3,300** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 208 | 235 | 276 | 333 | 405 | 495 |
| ***Total Projected Demand*** | ***208*** | ***235*** | ***276*** | ***333*** | ***405*** | ***495*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 124 | 124 | 124 | 124 | 124 | 124 |
| West Wise SUD (TRWD) | 81 | 102 | 111 | 111 | 111 | 111 |
| ***Total Current Supplies*** | ***205*** | ***226*** | ***235*** | ***235*** | ***235*** | ***235*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***3*** | ***9*** | ***41*** | ***98*** | ***170*** | ***260*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 9 | 14 | 18 | 23 | 30 |
| Additional Water from West Wise SUD | | | 27 | 80 | 147 | 230 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***9*** | ***41*** | ***98*** | ***170*** | ***260*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Community Water Supply Corporation

Community WSC serves about 3,500 people in northwestern Tarrant County and southern Wise County. Water management strategies for Community WSC are discussed under Tarrant County on page 4F.394.

## Decatur

Decatur is located in central Wise County and has a population of about 6,800. The city's water supply is treated water from the Wise County WSD (which gets its raw water from TRWD). Water management strategies for Decatur include conservation and additional treated water from Wise County WSD. Table 4F.351 shows the projected population and demand, the current supplies, and the water management strategies for Decatur.

**Table 4F.351**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Decatur**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **6,804** | **8,508** | **11,738** | **15,253** | **19,751** | **23,225** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 1,639 | 2,011 | 2,748 | 3,537 | 4,580 | 5,385 |
| ***Total Projected Water Demand*** | ***1,639*** | ***2,011*** | ***2,748*** | ***3,537*** | ***4,580*** | ***5,385*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Wise Co. Water Supply District (TRWD) | 1,614 | 1,754 | 1,754 | 1,754 | 1,754 | 1,754 |
| ***Total Current Supplies*** | ***1,614*** | ***1,754*** | ***1,754*** | ***1,754*** | ***1,754*** | ***1,754*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***25*** | ***257*** | ***994*** | ***1,783*** | ***2,826*** | ***3,631*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 25 | 108 | 189 | 278 | 398 | 514 |
| Additional Water from Wise Co. WSD | | 149 | 805 | 1,505 | 2,428 | 3,117 |
| ***Total Water Management Strategies*** | ***25*** | ***257*** | ***994*** | ***1,783*** | ***2,826*** | ***3,631*** |

## Fort Worth

Fort Worth is a city of about 743,000 located primarily in Tarrant County, with some population in Denton, Parker, and Wise Counties. Fort Worth is a wholesale water provider, and the city's water supply plans are discussed beginning on page 4E.30 in Section 4E.

## New Fairview

New Fairview is a city of about 1,600 in southeastern Wise County. The city gets its water supply from the Trinity aquifer. Water management strategies for New Fairview include conservation, the purchase of treated water from Rhome (which gets treated water from Walnut Creek SUD which in turn uses TRWD raw water), and supplemental wells to replace existing wells. Table 4F.352 shows the projected population and demand, the current supplies, and the water management strategies for New Fairview.

**Table 4F.352**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of New Fairview**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,587** | **2,167** | **2,732** | **3,290** | **3,921** | **4,654** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 201 | 272 | 340 | 409 | 488 | 579 |
| ***Total Projected Demand*** | ***201*** | ***272*** | ***340*** | ***409*** | ***488*** | ***579*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 221 | 221 | 221 | 221 | 221 | 221 |
| ***Total Current Supplies*** | ***221*** | ***221*** | ***221*** | ***221*** | ***221*** | ***221*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***51*** | ***119*** | ***188*** | ***267*** | ***358*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 4 | 13 | 20 | 26 | 32 | 40 |
| Rhome (from Walnut Ck. SUD from TRWD) | 0 | 47 | 99 | 162 | 235 | 318 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***4*** | ***60*** | ***119*** | ***188*** | ***267*** | ***358*** |
| **Reserve (Shortage)** | **24** | **9** | **0** | **0** | **0** | **0** |

## Newark

Newark has a population of about 1,100 and is located in southeastern Wise County. The city gets its water supply from the Trinity aquifer. Water management strategies for Newark include conservation, the purchase of treated water from Rhome (which gets treated water from Walnut Creek SUD which in turn uses TRWD raw water), and supplemental wells to replace existing wells. Table 4F.353 shows the projected population and demand, the current supplies, and the water management strategies for Newark.

**Table 4F.353**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Newark**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,137** | **1,772** | **2,339** | **3,302** | **4,458** | **6,216** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 154 | 232 | 301 | 418 | 564 | 787 |
| ***Total Projected Demand*** | ***154*** | ***232*** | ***301*** | ***418*** | ***564*** | ***787*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 169 | 169 | 169 | 169 | 169 | 169 |
| ***Total Current Supplies*** | ***169*** | ***169*** | ***169*** | ***169*** | ***169*** | ***169*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***63*** | ***132*** | ***249*** | ***395*** | ***618*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 11 | 17 | 26 | 37 | 54 |
| Rhome (from Walnut Ck. SUD from TRWD) | 0 | 52 | 115 | 223 | 358 | 564 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***3*** | ***63*** | ***132*** | ***249*** | ***395*** | ***618*** |
| **Reserve (Shortage)** | **18** | **0** | **0** | **0** | **0** | **0** |

## Paradise

Paradise is located in central Wise County and has a population of about 550. The city's residents are provided retail service by Walnut Creek SUD (which gets raw water from TRWD). Water management strategies for Paradise include conservation and additional treated water from Walnut Creek SUD. Table 4F.354 shows the projected population and demand, the current supplies, and the water management strategies for Paradise.

**Table 4F.354**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Paradise**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **563** | **691** | **848** | **1,041** | **1,278** | **1,568** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 73 | 89 | 109 | 134 | 165 | 202 |

(Table 4F.354, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Projected Demand*** | ***73*** | ***89*** | ***109*** | ***134*** | ***165*** | ***202*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Walnut Creek SUD (TRWD) | 71 | 82 | 85 | 90 | 98 | 104 |
| ***Total Current Supplies*** | ***71*** | ***82*** | ***85*** | ***90*** | ***98*** | ***104*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***2*** | ***7*** | ***24*** | ***44*** | ***67*** | ***98*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 2 | 4 | 6 | 7 | 10 | 12 |
| Additional Walnut Creek SUD | 0 | 3 | 18 | 37 | 57 | 86 |
| ***Total Water Management Strategies*** | ***2*** | ***7*** | ***24*** | ***44*** | ***67*** | ***98*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Rhome

Rhome is a city of about 1,600 in southeastern Wise County. The city's water supply is treated water from Walnut Creek SUD (which gets its raw water from TRWD) and groundwater from the Trinity aquifer. Water management strategies for Rhome include conservation, additional treated water from Walnut Creek SUD (which gets raw water from TRWD), and supplemental wells to replace existing wells. Table 4F.355 shows the projected population and demand, the current supplies, and the water management strategies for Rhome.

**Table 4F.355**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Rhome**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,621** | **2,640** | **4,300** | **6,000** | **7,700** | **9,400** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 590 | 955 | 1,541 | 2,151 | 2,760 | 3,369 |
| ***Total Projected Demand*** | ***590*** | ***955*** | ***1,541*** | ***2,151*** | ***2,760*** | ***3,369*** |
| | | | | | | |

(Table 4F.355, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 243 | 243 | 243 | 243 | 243 | 243 |
| Walnut Creek SUD (TRWD) | 330 | 653 | 1,012 | 1,130 | 1,130 | 1,130 |
| ***Total Current Supplies*** | ***573*** | ***896*** | ***1,255*** | ***1,373*** | ***1,373*** | ***1,373*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***17*** | ***59*** | ***286*** | ***778*** | ***1,387*** | ***1,996*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 17 | 43 | 85 | 137 | 199 | 270 |
| Additional Water from Walnut Ck. SUD | 0 | 16 | 201 | 641 | 1,188 | 1,726 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***17*** | ***59*** | ***286*** | ***778*** | ***1,387*** | ***1,996*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Runaway Bay

Runaway Bay is located in western Wise County and has a population of about 1,400. The city buys raw water from TRWD and operates its own water treatment plant. Water management strategies for Runaway Bay include conservation, additional raw water from TRWD, and water treatment plant expansions. Table 4F.356 shows the projected population and demand, the current supplies, and the water management strategies for Runaway Bay.

**Table 4F.356**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the City of Runaway Bay**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **1,411** | **1,720** | **2,097** | **2,400** | **2,700** | **3,000** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 296 | 356 | 430 | 489 | 547 | 608 |
| ***Total Projected Demand*** | ***296*** | ***356*** | ***430*** | ***489*** | ***547*** | ***608*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District | 293 | 327 | 335 | 330 | 323 | 313 |
| ***Total Current Supplies*** | ***293*** | ***327*** | ***335*** | ***330*** | ***323*** | ***313*** |

(Table 4F.356, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***3*** | ***29*** | ***95*** | ***159*** | ***224*** | ***295*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 3 | 16 | 25 | 32 | 41 | 51 |
| Additional Water from TRWD and Water Treatment Plant Expansion | 0 | 13 | 70 | 127 | 183 | 244 |
| ***Total Water Management Strategies*** | ***3*** | ***29*** | ***95*** | ***159*** | ***224*** | ***295*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Walnut Creek Special Utility District

Walnut Creek SUD provides retail and wholesale supplies in northern Parker County and southern Wise County. The SUD is a wholesale water provider, and its water supply plans are discussed beginning on page 4E.103 in Section 4E.

## West Wise Special Utility District

West Wise SUD serves about 3,500 people in western Wise County and provides water to Chico. The SUD buys raw water from TRWD and operates its own water treatment plant and buys treated water from Walnut Creek SUD (which also gets its raw water from TRWD). Water management strategies for West Wise SUD include conservation, additional raw water from TRWD, and additional treatment capacity. Table 4F.357 shows the projected population and demand, the current supplies, and the water management strategies for West Wise SUD.

**Table 4F.357**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for West Wise Special Utility District**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **3,474** | **3,864** | **4,287** | **4,758** | **5,283** | **5,865** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 483 | 524 | 567 | 618 | 681 | 756 |
| Demand for Chico | 96 | 102 | 138 | 191 | 258 | 341 |

(Table 4F.357, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Total Projected Demand*** | ***579*** | ***626*** | ***705*** | ***809*** | ***939*** | ***1,097*** |
| **Currently Available Water Supplies** | | | | | | |
| Tarrant Regional Water District (direct and through Walnut Creek SUD) | 574 | 583 | 560 | 558 | 568 | 580 |
| ***Total Current Supplies*** | ***574*** | ***583*** | ***560*** | ***558*** | ***568*** | ***580*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***5*** | ***43*** | ***145*** | ***251*** | ***371*** | ***517*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation (West Wise SUD and Chico) | 14 | 28 | 41 | 51 | 62 | 76 |
| Additional Water from TRWD and New or Expanded Water Treatment Plant | 0 | 15 | 104 | 200 | 309 | 441 |
| ***Total Water Management Strategies*** | ***14*** | ***43*** | ***145*** | ***251*** | ***371*** | ***517*** |
| **Reserve (Shortage)** | **9** | **0** | **0** | **0** | **0** | **0** |

## Wise County Irrigation

Table 4F.358 shows the projected demand, the current supplies, and the water management strategies for Wise County Irrigation. The current supplies are local surface water supplies, and groundwater from the Trinity aquifer. Water management strategies for Wise County Irrigation include conservation and supplemental wells to replace existing wells.

**Table 4F.358**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for the Wise County Irrigation**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **502** | **502** | **502** | **502** | **502** | **502** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Local Supplies | 139 | 139 | 139 | 139 | 139 | 139 |
| Trinity Aquifer | 290 | 290 | 290 | 290 | 290 | 290 |
| Tarrant Regional Water District | 212 | 195 | 165 | 143 | 125 | 109 |
| ***Total Current Supplies*** | ***641*** | ***624*** | ***594*** | ***572*** | ***554*** | ***538*** |

(Table 4F.358, Continued)

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 5 | 10 | 13 | 15 | 18 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***5*** | ***10*** | ***13*** | ***15*** | ***18*** |
| **Reserve (Shortage)** | **139** | **127** | **102** | **83** | **67** | **54** |

## Wise County Livestock

Table 4F.359 shows the projected demand, current supplies, and water management strategies for Wise County Livestock. The current supplies are local surface water supplies and groundwater from the Trinity aquifer. These sources are sufficient to meet projected demands, and supplemental wells are the only water management strategy for this water user group.

**Table 4F.359**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Wise County Livestock**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,714** | **1,714** | **1,714** | **1,714** | **1,714** | **1,714** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 807 | 807 | 807 | 807 | 807 | 807 |
| Local Supplies | 1,117 | 1,117 | 1,117 | 1,117 | 1,117 | 1,117 |
| ***Total Current Supplies*** | ***1,924*** | ***1,924*** | ***1,924*** | ***1,924*** | ***1,924*** | ***1,924*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| **Reserve (Shortage)** | **210** | **210** | **210** | **210** | **210** | **210** |

## Wise County Manufacturing

Table 4F.360 shows the projected demand and current supplies for Wise County Manufacturing. Current supplies are water from the TRWD through numerous water suppliers in the county and groundwater (other aquifer). The water management strategies for this water user group are conservation, additional water from TRWD, and supplemental wells to replace existing wells.

**Table 4F.360**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Wise County Manufacturing**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Projected Water Demand** | **2,313** | **2,660** | **2,979** | **3,277** | **3,539** | **3,858** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Other Aquifer | 14 | 14 | 14 | 14 | 14 | 14 |
| Tarrant Regional Water District (through multiple suppliers) | 2,299 | 2,429 | 2,313 | 2,202 | 2,083 | 1,981 |
| ***Total Current Supplies*** | ***2,313*** | ***2,443*** | ***2,327*** | ***2,216*** | ***2,097*** | ***1,995*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***217*** | ***652*** | ***1,061*** | ***1,442*** | ***1,863*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 0 | 1 | 12 | 18 | 19 | 21 |
| Additional water from TRWD | 0 | 216 | 640 | 1,043 | 1,423 | 1,842 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***217*** | ***652*** | ***1,061*** | ***1,442*** | ***1,863*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Wise County Mining

Table 4F.361 shows the projected demand, the current supplies, and the water management strategies for Wise County Mining. Wise County Mining is supplied from reuse, run-of-river water from the Trinity River, raw water from TRWD, and the Trinity aquifer. The water management strategies for this water user group are additional water from TRWD, additional reuse, and supplemental wells to replace existing wells.

**Table 4F.361**
**Projected Demand, Current Supplies,**
**and Water Management Strategies for Wise County Mining**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **26,477** | **28,924** | **31,620** | **34,393** | **37,258** | **39,956** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Reuse | 15,930 | 14,074 | 12,152 | 10,643 | 9,236 | 8,061 |
| Run-of-river - Trinity | 51 | 51 | 51 | 51 | 51 | 51 |
| Trinity Aquifer | 2,553 | 2,553 | 2,553 | 2,553 | 2,553 | 2,553 |
| Tarrant Regional Water District | 7,943 | 7,961 | 7,395 | 6,961 | 6,603 | 6,175 |
| ***Total Current Supplies*** | ***26,477*** | ***24,639*** | ***22,151*** | ***20,208*** | ***18,443*** | ***16,840*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***4,285*** | ***9,469*** | ***14,185*** | ***18,815*** | ***23,116*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from TRWD | 0 | 716 | 2,091 | 3,357 | 4,574 | 5,812 |
| Reuse - Recycled water | 0 | 3,569 | 7,378 | 10,828 | 14,241 | 17,304 |
| Supplemental wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***0*** | ***4,285*** | ***9,469*** | ***14,185*** | ***18,815*** | ***23,116*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Wise County Other

Wise County Other includes individual domestic supplies and other water suppliers too small to be classified as water user groups.  The entities included under Wise County Other supply about 32,000 people and receive their water supply from the TRWD and groundwater (Trinity aquifer).  Water management strategies for these entities include conservation and supplemental wells to replace existing water wells.  Table 4F.362 shows the projected population and demand, the current supplies, and the water management strategies for Wise County Other.

**Table 4F.362**
**Projected Population and Demand, Current Supplies,**
**and Water Management Strategies for Wise County Other**

| (Values in Ac-Ft/Yr) | Projected Population and Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Population** | **31,801** | **35,218** | **35,218** | **35,218** | **35,218** | **35,218** |
| **Projected Water Demand** | | | | | | |
| Municipal Demand | 3,776 | 4,261 | 4,221 | 4,142 | 4,103 | 4,103 |
| ***Total Projected Water Demand*** | ***3,776*** | ***4,261*** | ***4,221*** | ***4,142*** | ***4,103*** | ***4,103*** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |
| Trinity Aquifer | 2,984 | 2,984 | 2,984 | 2,984 | 2,984 | 2,984 |
| Tarrant Regional Water District | 1,863 | 1,955 | 1,646 | 1,398 | 1,212 | 1,057 |
| ***Total Current Supplies*** | ***4,847*** | ***4,939*** | ***4,630*** | ***4,382*** | ***4,196*** | ***4,041*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***62*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Water Conservation | 49 | 166 | 216 | 232 | 245 | 259 |
| Supplemental Wells | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Total Water Management Strategies*** | ***49*** | ***166*** | ***216*** | ***232*** | ***245*** | ***259*** |
| **Reserve (Shortage)** | **1,120** | **844** | **625** | **472** | **338** | **197** |

## Wise County Steam Electric Power

Table 4F.363 shows the projected demand, the current supplies, and the water management strategies for Wise County Steam Electric Power. Wise County Steam Electric Power is supplied by raw water from TRWD. The water management strategy for Wise County Steam Electric Power is additional water from TRWD.

**Table 4F.363**
**Projected Demand, Current Supplies, and Water**
**Management Strategies for Wise County Steam Electric Power**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Projected Water Demand** | **1,751** | **1,245** | **1,216** | **1,878** | **2,042** | **2,748** |
| | | | | | | |
| **Currently Available Water Supplies** | | | | | | |

**(Table 4F.363, Continued)**

| (Values in Ac-Ft/Yr) | Projected Demand | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Tarrant Regional Water District | 1,751 | 1,143 | 948 | 1,267 | 1,207 | 1,416 |
| ***Total Current Supplies*** | ***1,751*** | ***1,143*** | ***948*** | ***1,267*** | ***1,207*** | ***1,416*** |
| | | | | | | |
| ***Need (Demand - Current Supply)*** | ***0*** | ***102*** | ***268*** | ***611*** | ***835*** | ***1,332*** |
| | | | | | | |
| **Water Management Strategies** | | | | | | |
| Additional Water from TRWD | 0 | 102 | 268 | 611 | 835 | 1,332 |
| ***Total Water Management Strategies*** | ***0*** | ***102*** | ***268*** | ***611*** | ***835*** | ***1,332*** |
| **Reserve (Shortage)** | **0** | **0** | **0** | **0** | **0** | **0** |

## Costs for Wise County Water User Groups

Table 4F.364 shows the estimated capital costs for Wise County water management strategies not covered under the wholesale water providers. Table 4F.365 summarizes the costs by category and is followed by a summary for Wise County.

**Table 4F.364**
**Costs for Recommended Water Management Strategies for Wise County Not Covered Under Wholesale Water Providers**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Alvord | Conservation | 2010 | 17 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Alvord | Supplemental wells | 2010 | 0 | $1,508,000 | N/A | N/A | Q-13 |
| Alvord | West Wise Rural SUD (TRWD) | 2020 | 150 | $0 | $2.50 | $2.50 | None |
| Aurora | Conservation | 2010 | 22 | $0 | 0 | 0 | Q-10 & Q-11 |
| Aurora | Supplemental wells | 2010 | 0 | $1,512,000 | N/A | N/A | Q-13 |
| Aurora | Rhome (TRWD through Walnut Creek SUD) | 2020 | 86 | $0 | $2.50 | $2.50 | None |
| Bolivar WSC* | Conservation | See Denton County. | | | | | |
| Bolivar WSC* | Supplemental wells | See Denton County. | | | | | |
| Bolivar WSC* | UTRWD supplies | See Denton County. | | | | | |
| Bolivar WSC* | Cooke County Water Supply Project | See Cooke County. | | | | | |
| Boyd | Conservation | 2010 | 27 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| Boyd | Supplemental wells | 2010 | 0 | $760,000 | N/A | N/A | Q-13 |
| Boyd | Additional Walnut Creek SUD | 2020 | 123 | $0 | $2.50 | $2.50 | None |
| Bridgeport | Conservation | 2010 | 425 | $5,000 | $0.51 | $0.51 | Q-10 & Q-11 |
| Bridgeport | Water treatment plant expansions | 2040 | 2,242 | $14,540,000 | $1.90 | $0.70 | Q-15 |
| Bridgeport | Additional TRWD | 2010 | 1,729 | $0 | $0.69 | $0.69 | None |
| Chico | Conservation | 2010 | 30 | $5,000 | $0.13 | $0.13 | Q-10 & Q-11 |
| Chico | Supplemental wells | 2010 | 0 | $2,239,000 | N/A | N/A | Q-13 |
| Chico | Additional West Wise Rural SUD | 2030 | 230 | $0 | $2.50 | $2.50 | None |

(Table 4F.364, Continued)

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Community WSC* | Conservation | See Tarrant County. | | | | | |
| | Additional TRWD | See Tarrant County. | | | | | |
| Decatur | Conservation | 2010 | 514 | $10,000 | $0.54 | $0.54 | Q-10 & Q-11 |
| | WTP Expansions | See Wise County WSD in Section 4E. | | | | | |
| | Additional Wise County WSD | 2020 | 3,117 | $0 | $2.50 | $2.50 | None |
| Fort Worth* | Conservation | See Fort Worth in Section 4E. | | | | | |
| | Water treatment plants - new and expansions | See Fort Worth in Section 4E. | | | | | |
| | Additional TRWD | See Fort Worth in Section 4E. | | | | | |
| | Direct reuse (Fort Worth) | See Fort Worth in Section 4E. | | | | | |
| New Fairview | Conservation | 2010 | 40 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,340,000 | N/A | N/A | Q-13 |
| | Rhome (TRWD through Walnut Creek SUD) | 2020 | 318 | $0 | $2.50 | $2.50 | None |
| Newark | Conservation | 2010 | 54 | $5,000 | $0.11 | $0.11 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $2,382,000 | N/A | N/A | Q-13 |
| | Rhome (TRWD through Walnut Creek SUD) | 2020 | 564 | $0 | $2.50 | $2.50 | None |
| Paradise | Conservation | 2010 | 12 | $0 | 0 | 0 | Q-10 & Q-11 |
| | Additional Walnut Creek SUD | 2020 | 86 | $0 | $2.50 | $2.50 | None |
| Rhome | Conservation | 2010 | 270 | $0 | $0.29 | $0.29 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $1,182,000 | N/A | N/A | Q-13 |
| | Additional Walnut Creek SUD | 2020 | 1,726 | $0 | $2.50 | $2.50 | None |

**(Table 4F.364, Continued)**

| Water User Group | Strategy | Imple-mented by: | Quantity** (Ac-Ft/Yr) | Capital Costs | Unit Cost ($/1000 gal) | | Table for Details |
|---|---|---|---|---|---|---|---|
| | | | | | With Debt Service | After Debt Service | |
| Runaway Bay | Conservation | 2010 | 50 | $0 | $0.51 | $0.51 | Q-10 & Q-11 |
| | Water treatment plant expansion | 2020 | 280 | $2,735,000 | $2.50 | $0.70 | Q-15 |
| | Additional TRWD | 2020 | 244 | $0 | $0.69 | $0.69 | None |
| Walnut Creek SUD* | Conservation | See Walnut Creek SUD in Section 4E. | | | | | |
| | New water treatment plant and expansions | See Walnut Creek SUD in Section 4E. | | | | | |
| | Transmission system improvements | See Walnut Creek SUD in Section 4E. | | | | | |
| | Additional TRWD | See Walnut Creek SUD in Section 4E. | | | | | |
| West Wise Rural WSC | Conservation | 2010 | 45 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Water treatment plant expansion | 2020 | 0 | $21,810,000 | $1.90 | $0.70 | Q-15 |
| | Additional TRWD | 2020 | 321 | $0 | $0.69 | $0.69 | None |
| Wise County Other | Conservation | 2010 | 259 | $0 | $0.00 | $0.00 | Q-10 & Q-11 |
| | Supplemental wells | 2010 | 0 | $348,000 | N/A | N/A | Q-13 |
| Wise County Irrigation | Supplemental wells | 2010 | 0 | $35,000 | N/A | N/A | Q-13 |
| | Conservation | 2020 | 18 | $0 | $0.85 | $0.85 | Q-12 |
| Wise County Livestock | Supplemental wells | 2010 | 0 | $35,000 | N/A | N/A | Q-13 |
| Wise County Manufacturing | Conservation | 2020 | 21 | $0 | $0.85 | $0.85 | Q-12 |
| | Supplemental wells | 2010 | 0 | $259,000 | N/A | N/A | Q-13 |
| | Additional TRWD | 2020 | 1,842 | $0 | $0.69 | $0.69 | None |
| Wise County Mining | Supplemental wells | 2010 | 0 | $49,000 | N/A | N/A | Q-13 |
| | Additional reuse | 2010 | 2,010 | $0 | $0.25 | $0.25 | None |
| | Additional TRWD | 2020 | 5,812 | $0 | $0.69 | $0.69 | None |
| Wise County Steam Electric | Additional TRWD | 2020 | 1,332 | $0 | $0.69 | $0.69 | None |

Notes: Water User Groups marked with an * extend into more than one county.

**Quantities listed are for the WUG only. They do not include the WUG's customers.

**Table 4F.365**
**Summary of Recommended Water Management Strategies for Wise County**
**Not Covered Under Wholesale Water Providers**

| Type of Strategy | Quantity (Ac-Ft/Yr) | Capital Costs |
|---|---|---|
| Conservation* | 2,641 | $25,000 |
| Purchase from WWP or WUG | 17,680 | $0 |
| Supplemental wells | 0 | $11,649,000 |
| New water treatment plant and expansions | 2,522 | $39,085,000 |
| Transmission facilities | 0 | $0 |
| Reuse (including transmission facilities) | 2,010 | $0 |
| **Total** | | **$50,759,000** |

* The conservation quantities represent conservation in the county, not the sum of the individual water user groups.


***2000 Population:*** *48,793*

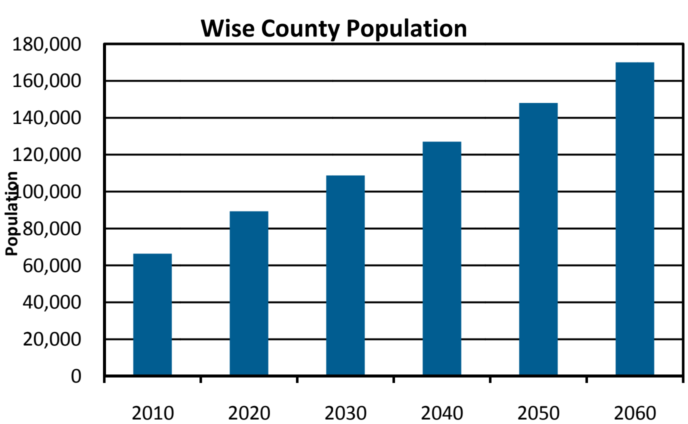
***Projected 2060 Population:*** *170,071*

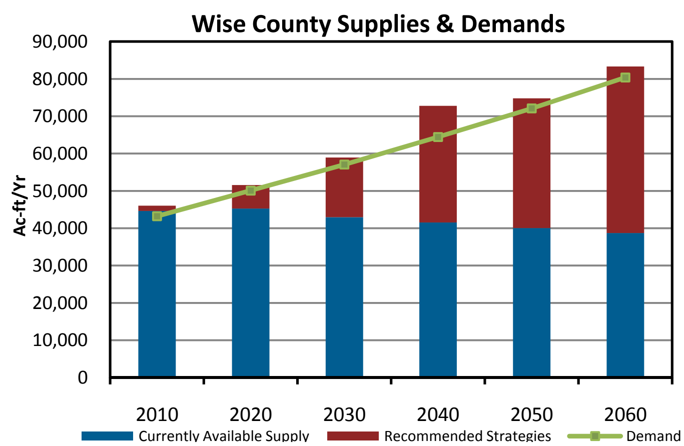
***County Seat:*** *Decatur*

***Economy:*** *Petroleum; sand and gravel; agribusiness*

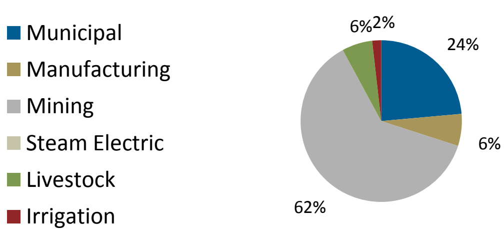
***River Basin(s):***

– Trinity (100%)

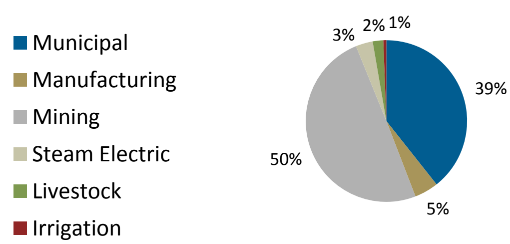




**2000 Wise County Demand**
**(% of total)**




**Total=28,067 acre-feet**

**2060 Wise County Demand**
**(% of total)**




**Total= 80,392 acre-feet**

| WATER USER GROUP | 2060 WISE CO. DEMAND (AC-FT/YR0 | CURRENT SUPPLIES | RECOMMENDED STRATEGIES [b] |
|---|---|---|---|
| Alvord | 287 | Trinity Aquifer | Supplemental wells, TRWD supplies |
| Aurora | 338 | Trinity Aquifer | Supplemental wells, TRWD sources (from Walnut Creek SUD through Rhome) |
| Bolivar WSC [a] | 918 | Trinity Aquifer | Supplemental wells, Cooke County Water Supply Project, UTRWD supplies |
| Boyd | 459 | Trinity Aquifer, Walnut Creek SUD (TRWD) | Supplemental wells, Additional Walnut Creek SUD supplies |
| Bridgeport | 4,444 | TRWD | Additional TRWD supplies, WTP expansions |
| Chico | 495 | Trinity Aquifer, West Wise SUD (TRWD) | Supplemental wells, Additional West Wise SUD supplies |
| Community WSC [a] | 16 | TRWD | Additional TRWD supplies |
| Decatur | 5,385 | Wise County WSD (TRWD) | Additional Wise County WSD, New WTP, WTP expansions |
| Fort Worth [a] | 7,936 | TRWD, Direct reuse | Additional TRWD supplies, Additional direct reuse, Additional treatment capacity |
| New Fairview | 579 | Trinity Aquifer | Supplemental wells, TRWD (from Walnut Creek SUD through Rhome) |
| Newark | 787 | Trinity Aquifer | Supplemental wells, TRWD (from Walnut Creek SUD through Rhome) |
| Paradise | 202 | Walnut Creek SUD (TRWD) | Additional Walnut Creek SUD |
| Rhome | 3,369 | Trinity Aquifer, Walnut Creek SUD (TRWD) | Supplemental wells, Additional Walnut Creek SUD supplies |
| Runaway Bay | 608 | TRWD | Additional TRWD supplies, WTP expansion |
| Walnut Creek SUD [a] | 932 | TRWD | Additional TRWD supplies, New WTP, WTP expansions, transmission expansions |
| West Wise SUD | 756 | TRWD, Walnut Creek SUD (TRWD) | Additional TRWD supplies, New or expanded WTP |
| County-Other | 4,103 | TRWD supplies, Trinity Aquifer | Supplemental wells |
| Irrigation | 502 | Trinity Aquifer, Local supplies, TRWD sources | Supplemental wells |
| Livestock | 1,714 | Trinity Aquifer, Local supplies | Supplemental wells |
| Manufacturing | 3,858 | Other Aquifer, TRWD | Supplemental wells, Additional TRWD supplies |
| Mining | 39,656 | Trinity Aquifer, Reuse, Run-of-River, TRWD | Supplemental wells, Additional reuse, Additional TRWD supplies |
| Steam Electric Power | 2,748 | TRWD | Additional TRWD supplies |

[a] WUG is in multiple counties
[b] Water conservation is a strategy for every municipal user group.

## SECTION 4F
## LIST OF REFERENCES


(1) R.W. Harden and Associates, Inc., HDR Engineering, Inc., LBG-Guyton Associates, Freese and Nichols, Inc., United States Geological Survey, and Dr. Joe Yelderman: *Northern Trinity/Woodbine Aquifer Groundwater Availability Model*, prepared for the Texas Water Development Board, Austin, August 31, 2004.

(2) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

(3) Mid-East Texas Groundwater Conservation District created by the Texas Legislature, Chapter 1507, Art. 4 (HB 1784) and Ch. 966, Art. 3, Part 15, (SB 1), 77th Leg., September 2001, confirmed November 2002.

(4) Lesikar, B., R. Kaiser, V. Silvy, *Questions about Groundwater Conservation Districts in Texas*, published by the Texas Cooperative Extension, College Station, June 2002.

(5) Neches and Trinity Valleys Groundwater Conservation District created by the Texas Legislature, Ch. 1387, 77th Leg., September 2001 (SB 1821), confirmed November 2001.

## 4G. Texas Water Development Board Required Tables

The Texas Water Development Board requires summary tables showing specific information on all water management strategies. Those tables can be found in Appendix Z of this report. The tables are based on information from the Texas Water Development Board online planning database (DB12) and reflect the most current information in the database at the time of the printing of this report. Subsequent adjustments may be made to the database and an update to these tables may be made through an errata to this report. There may be slight numerical differences between the TWDB online planning database and this printed regional water plan due to rounding associated with the regional water plan preparation and online data entry. In any and all instances where numbers in the regional water plan and the online planning database do not match, the data in the online planning database (DB12) shall take precedence over the associated number in the regional water plan for the purpose of development of the State Water Plan.

# 4H. Summary of Special Studies

## *4H.1 Biennium Studies*

In 2007, the Texas Water Development Board (TWDB) authorized the Region C Water Planning Group (RCWPG) to conduct several biennium studies to further evaluate water supply strategies in Region C. Of the nine projects proposed by the RCWPG, the TWDB approved funding for four projects as part of the biennium studies. Additional funding for these four projects was provided by the Tarrant Regional Water District, Athens Municipal Water Authority, and City of Fort Worth. The studies looked at issues of particular importance to North Central Texas, including water conservation and reuse practices, the availability of water from the Toledo Bend Reservoir in East Texas, direct and indirect water reuse case studies and potential water management strategies to address rapid population growth and other changing conditions in localized areas of the region. The results of these biennium studies were presented to TWDB as separate documents. The results of the studies were incorporated into development of the *2011 Region C Water Plan*.

### Water Conservation and Reuse Study

Conservation and reuse are major recommended strategies in the *2006 Region C Water Plan*, and it is important that the projected water savings can be reasonably achieved within the timeframe specified in the Region C plan. The *Region C Water Conservation and Reuse Study* (1) was conducted to provide additional information on the performance of water conservation and reuse in the region and consider recommendations for the *2011 Region C Water Plan*. The major components of the study included a survey of all water user groups and wholesale water providers, telephone interviews with selected providers, case studies of conservation practices for different size municipalities, and detailed updates of selected reuse projects. The study also examined the potential impacts of increased conservation and reuse on return flows, which may impact instream flows, and the potential impacts of future development patterns on conservation.

Approximately half of the water users surveyed provided information on their water conservation practices. The data provided through the surveys and other sources were used to assess quantities of water saved. While the data did not allow calculations of water saved by Best Management Practices (BMPs), the analysis did indicate that water conservation programs are reducing the water use that would have occurred without such measures.

Compared to the recommendation in the *2006 Region C Water Plan,* the water providers in Region C are on-target or ahead of schedule for implementing the recommended conservation strategies. Seasonal outdoor water use continues to be a factor in water use in Region C and it is often targeted for conservation savings. The conservation practices with the highest implementation rates include practices that are directly implemented by the provider and address system-wide savings, such as education programs, water pricing, water audits and enacting ordinances. These strategies were also consistently rated as the more effective conservation measures. Rebate programs are a strategy that is currently not being implemented by very many Region C providers.

When evaluated at the individual city level, the selection and implementation of conservation practices appear to vary by size and location of the city. This is partly due to different budget levels and customer types. For small towns, budgets are limited and the Best Management Practices implemented are those that coincide with standard water system operation and maintenance (price increases, conservation pricing and leak detection and repair). These strategies have been shown to be effective for small towns. As the size of the city increases, the larger budgets and staff may allow increased focus on implementing additional conservation measures. Both the mid-size and large cities evaluated as part of the case studies employ (or plan to employ) education programs, water waste prohibition, residential customer audits, Industrial/Commercial/Institutional (ICI) audits and/or specific ICI conservation programs. These measures are in addition to those conservation measures implemented as part of standard operations. The large cities also target outdoor water use through time of day watering restrictions and requiring rain/freeze sensors on automatic sprinkler systems.

Reuse continues to be a major component of the region's water conservation plan. The *2006 Region C Water Plan* reported existing year 2010 reuse of almost 100,000 acre-feet per year, with future reuse strategies totaling 771,000 acre-feet per year by 2060. Many of these reuse strategies have been implemented bringing the existing reuse in Region C in 2010 to just under 204,000 acre-feet per year increasing to 330,695 acre-feet per year in 2060. Considering the current and planned future projects, Region C has the largest reuse program in the state.

Based on these data, it is clear that conservation and reuse continue to be a major focus for water providers in Region C. The strategies currently being implemented reflect the recommended strategies in the 2006 water plan, and it is recommended that the strategies included in the municipal water user groups' basic and expanded packages continue to serve as the primary means for achieving water conservation savings in the region. Below are the recommendations from the *Region C Water Conservation and Reuse Study*. The first three have been implemented in the 2011 regional plan and the remaining ones continue to be recommendations for future implementation.

1. The "Water Conservation Pricing" and "Water Waste Prohibition" strategies have been moved from the Expanded Package to the Basic Package. Both of these BMPs have minimal costs and are relatively easy to implement.
2. The "ICI general rebate" strategy has been eliminated from the Expanded Conservation Package due to low implementation rates and institutional challenges of administering these programs.
3. A new "Landscape Watering Restriction" strategy has been added to the Expanded Conservation Package. In particular, the time-of-day lawn watering has become widely implemented in Region C and could be used as a model for implementation.
4. Contact North Central Texas Council of Governments (NCTCOG) to determine their interest in and feasibility to coordinate Region-wide public education/conservation efforts for entities who are not already involved in such programs.
5. Consider other strategies currently being used in the region for possible inclusion in the Expanded Conservation Package.
6. Encourage regional coordination of public education efforts.
7. Develop, in cooperation with other regions and the TWDB, a program to gather information and data about water savings and costs, and perform a quantitative assessment of water savings and cost per implemented water conservation strategy.
8. Monitor water conservation technology developments and review new strategies for possible inclusion in subsequent updates of the Region C Water Supply Plan.

### Toledo Bend Study

This study was led by the Region I Water Planning Group. The Region C consultant team reviewed the study, titled *East Texas Region Special Study No. 1: Inter-Regional Coordination* *on the Toledo Bend Project* [2], and provided input. To meet projected water demands in Region C, the *2007 State Water Plan* recommended moving water from the Toledo Bend Reservoir in East Texas to water providers in North Texas via a pipeline project. This project, as currently proposed, involves transporting up to 400,000 acre-feet per year of water to water providers in Region C, with the potential to increase this amount to 600,000 acre-feet per year. The project also recommends transporting 100,000 acre-feet per year to customers of the Sabine River Authority in Region D.

Since the development of this strategy for the 2006 regional water plans, there has been on-going development of water supplies by the Region C providers and the East Texas Region. This study was conducted to better understand these changes and the impacts to the proposed Toledo Bend Pipeline Project.

The Toledo Bend Pipeline Project is considered viable, but it is not expected to be developed until 2060. Due to this extended timeframe, additional analysis will likely be needed, which may have significant implications on the project's preliminary design and cost. The study indicates that the major participants are currently pursuing other water supply projects and recommends that the East Texas region should continue to monitor the demand for water from sources in its region and coordinate with adjoining regions to best utilize its resources.

The Toledo Bend Pipeline Project continues to be a recommended water management strategy for two Region C water providers (North Texas Municipal Water District and Tarrant Regional Water District), and an alternative strategy for two others (Dallas Water Utilities and Upper Trinity Regional Water District), in the *2011 Region C Water Plan*.

### Reuse Pilot Project Studies

This study examined direct and indirect reuse in Region C, in order to develop guidance documents for future reuse projects. Reuse is increasingly important statewide and in Region C. In the *2006 Region C Water Plan* the year 2060 available reuse supply was listed as 103,429 acre-feet per year. In the *2011 Region C Water Plan* the year 2060 available reuse supply has increased to 330,695 acre-feet per year, more than triple the amount from the 2006 Plan.

Direct reuse occurs when treated wastewater is delivered from a wastewater treatment plan to an end user, with no intervening discharge to waters of the state. Direct reuse requires a notification to the Texas Commission on Environmental Quality (TCEQ), which is routinely accepted so long as requirements to protect public health are met. Direct reuse is most commonly used to supply water for landscape irrigation (especially golf courses) and industrial uses (especially cooling for steam electric power plants).

The *Direct, Non-Potable Reuse Guidance Document* (3) developed as part of the study is designed to provide guidance for implementation of future direct water reuse projects, including the identification of technical and regulatory issues that must be addressed in the planning and design of such projects.

As a case study for the guidance document, the RCWPG refined the implementation plans for two city of Fort Worth direct reuse projects: a Central System to serve potential customers between the Village Creek Wastewater Treatment Plant and the Central Business District, and a Southern System to serve potential customers in the industrial area near the intersection of I-20 and I-35W. The direct reuse guidance document provides general guidance for water suppliers regarding regulations for reuse water, types of reclaimed water, reclaimed water quality requirements, identification of potential reclaimed water users, site selection, conceptual design of a reclaimed water production facility and conveyance systems, analysis of costs and benefits, and permitting issues.

The RCWPG also developed an *Indirect Reuse Guidance Document* (4), which provides general guidance and a case study implementation plan for the Athens Municipal Water Authority and City of Athens to transport reclaimed water from the Athens wastewater treatment plants to Lake Athens to augment its raw water supply. Indirect reuse occurs when treated wastewater is discharged to a stream or reservoir and is then diverted for reuse. The discharged water mixes with ambient water in the stream or reservoir as it travels to the point of diversion. Indirect reuse can provide water supplies for municipal use, as well as irrigation and industrial supplies.

The guidance document identifies technical and regulatory issues to be addressed in the planning and design of the augmentation of surface water supplies with reclaimed water. The state does not have specific regulations for indirect use, since planned augmentation of raw water supplies with reclaimed water is relatively new in Texas.  Rather, indirect reuse is regulated by other state permits and standards.

The document's recommendations for indirect reuse in Texas include a multi-barrier approach to manage the uncertainties associated with augmentation of raw water supplies with reclaimed water including advanced wastewater treatment, limits on the blend of reclaimed and natural water, requirements on the detention time in the receiving water, and advanced water treatment.  The indirect reuse guidance document provides general guidance for water suppliers regarding regulations and guidelines for indirect reuse, a multiple-barrier approach to indirect reuse, water quality evaluations, allowable reclaimed water augmentation rates, opportunities for indirect reuse, conceptual design of a conveyance system, cost analysis, and permitting issues.

## Regional System Implementation Plans

The remaining special studies conducted by the RCWPG during the 2007-2008 period looked at changing conditions in localized areas.  The first of these, the *Water Supply Study for Ellis, Johnson, Southern Dallas and Southern Tarrant Counties* (5)**,** was commissioned to review recent population growth in the four-county area, make adjustments to projections as a result of the growth and update the current and future water plans of the water user groups and wholesale water providers in the study area based on revised projections.

This study was needed because the TWDB-approved population projections for Ellis and Johnson Counties that were used by the RCWPG in developing the *2006 Region C Water Plan* did not take into account subsequent population projections developed by the North Central Texas Council of Governments (NCTCOG), which were significantly higher than those of the TWDB.  More recent population estimates have indicated that future growth in the area may fall between the two sets of projections.

The study provided the opportunity to revise water management strategies to reflect new demand projections and current planning by area water suppliers.  The study concluded that the significant changes in water supply should be expected in the coming decade, including:

- Increased reliance on surface water supplies, rather than groundwater.

- Substantial additional supplies from the Sokoll water treatment plant currently under construction in Ellis County.
- Additional supplies from Midlothian's proposed water treatment plant.
- More treated water supplies from Tarrant Regional Water District (TRWD) customers.
- Cleburne's development of additional reuse supplies for manufacturing and mining use and development of a desalination plant for Lake Whitney water.
- Increased supply from Dallas with the growth of current customers and the completion of the Red Oak connection.

The study also recommended a variety of additional water management strategies to ensure an adequate future supply in the rapidly growing area.

Another localized study, the *Water Supply Study for Parker and Wise Counties* (6), focused on the years 2010 through 2030, detailing revisions and updates to the *2006 Region C Water Plan* that will be needed to account for steadily increasing population growth projections. The resulting report concluded that, for most water user groups in the area, increasing the amount of supply from TRWD sources was the only change necessary to meet higher projected demands.

Most of the recommendations for revisions to the population and demand projections and water management strategies from these two localized county studies have been incorporated into the *2011 Region C Water Plan*.

### 4H.2 Summary of 2011 Special Studies

The scope of work for the *2011 Region C Water Plan* includes six special studies. One of the studies is related to the use of saline water to meet future demands in Region C. The other five studies are aimed at analyzing approaches to developing countywide water management strategies as well as approaches for implementation of the water management strategies. Countywide water systems are comprised of separate projects that are completed over a period of time by various WUGs, and these separate projects were coordinated whenever practical. The county studies cover the following counties: Cooke and Grayson Counties (one report), Fannin, Freestone, Navarro, and Kaufman. These studies have been produced as stand-alone documents. The complete texts of these reports are also located in Appendices R through W of the *2011 Region C Water Plan*. The appendices of these reports are not included in Appendices R through W as the information is found in other portions of the *2011 Region C Water Plan*.

### Saline Water Study

The complete text of the Draft *Saline Water Special Study* (7) is located in Appendix R. This section summarizes the findings of that report. The Region C Regional Water Planning Group is committed to the exploration and promotion of viable water sources and water management strategies to meet the region's water needs. Region C's water conservation strategies, including reuse, have emerged as key water management strategies. An additional emerging strategy that is being considered by Region C as a potential source is the utilization of brackish surface and groundwater. There are a number of issues associated with the viability of brackish water such as water quality considerations (desalination and inland concentrate disposal), regulatory considerations, and costs.

The 2001 and 2006 Region C Water Plans included brackish water from several sources including the Red River, Possum Kingdom Lake, Lake Texoma, and the Brazos River. In order to evaluate the potential to utilize additional water from these and other sources, a "Study on the Use of Saline Water and Refinement of Costs" was included as Task 4.d in the scope for the 2011 Region C Water Plan. The purpose of this study is to further define the sources available to Region C, review the regulatory requirements, review and evaluate strategies for concentrate disposal, and evaluate the potential applicability of brackish sources to Region C.

With continued advancements in desalination and the potential for blending with fresh water supplies, there is value in considering additional brackish supplies as potential future sources to Region C. In Texas, brackish water sources have not historically been sought out and researched with the same intensity as fresh water sources. Accordingly, research associated with the feasibility, potential quantities, and quality of brackish water supplies has not been as extensive as that for fresh water supplies.

Historical analysis of brackish groundwater and surface water near Region C has been limited. Further coordination with other regional water planning groups should occur to identify brackish surface water supplies that may be utilized by Region C. Unallocated water has been identified in the Brazos and Red Rivers, although storage and water quality concerns would need to be addressed to utilize this water. Additional supplies of surface water in Lake Texoma (in addition to the planned projects by NTMWD and GTUA) are not available at this time. Executing agreements with the state of Oklahoma for a share of their Texoma water and/or Congressional action to reallocate additional water for municipal supply may provide an opportunity for identifying additional supplies. Coordination with power interests on Lake Texoma may also provide an opportunity for identifying additional supplies. There are a number of challenges associated with these actions and storage and allocation issues would have to be addressed for this to represent a viable additional source.

Volumes of brackish groundwater have been identified, but groundwater availability models to determine yield information have not been developed. Preliminary analysis by the TWDB indicates that approximately 85,000,000 acre-feet of brackish groundwater supplies may be present within the Region C area, although this estimate is based on generalized aquifer characteristics, and is not intended to represent precise availability values. Further study is needed to determine the specific location of significant brackish groundwater sources within Region C, as well as their location in relationship to areas of need. Additionally, before considering a brackish groundwater water supply project, extensive pilot studies, including monitoring of test wells, would need to be conducted. As area GCDs continue to develop rules and regulations, coordination might aid in providing additional information on regional brackish water supplies.

Prior to the utilization of any brackish water supply, a detailed water quality evaluation of the source water should be conducted to aid during the design phase of a project. In addition to dissolved solids, potential distribution system water quality issues associated with the use of brackish supplies include: taste and odor (algae), staining (Magnesium), discolored water, elevated coliform or heterotrophic plate counts (HPC), pathogens, disinfection byproducts (DBPs), bromated DBPs, elevated total organic carbon, and contaminants listed on the Contaminate Candidate List 3. These considerations may be associated with brackish supplies themselves, or when mixing two dissimilar waters in a distribution system.

The issue of brine concentrate disposal represents a major consideration for inland use of brackish water. Concentrate disposal techniques utilized by local inland desalination plants include surface water discharge (Robinson – 1.80 MGD facility and the Brazos River Authority – 6 MGD facility), sanitary sewer disposal (Sherman – 7.50 MGD facility), and deep well injection (El Paso – 27.5 MGD facility). The identification of potential feasible concentrate disposal techniques is site specific and should be investigated prior to the implementation of any project. Water suppliers in Region C may benefit from the development of additional data (i.e. subsurface information for deep well injection) that would aid in the evaluation of appropriate project specific concentrate disposal techniques. Additionally, studies should be conducted to determine whether disposal of concentrate could be achieved in concert with brackish source water management projects.

With the exception of the concentrate disposal requirements, many regulatory requirements for a desalination facility are the same or identical to those for a conventional treatment facility. Regulatory requirements have traditionally played an important role in project feasibility, schedule, and cost, and should be considered a priority during the planning stages of a project. Items such as site selection, raw water sources, and concentrate disposal options will affect the type of permits required, the magnitude of environmental investigations, and the time allotted for permitting.

This study does address the potential costs associated with facility construction, concentrate disposal, and operation and maintenance costs associated with desalination. However, in order to utilize additional brackish water sources in Region C, extensive pilot testing, yield analysis, and regulatory/permitting evaluations will need to be conducted at an additional cost to determine feasibility. In addition to desalination related studies, studies associated with blending of brackish and fresh water sources may provide further opportunities for utilizing brackish water within the region.

### Cooke and Grayson County Water Supply Study

The complete text of the Draft *Cooke-Grayson County Water Supply Study* [8] is located in Appendix S. This section summarizes the findings of that report.

**Cooke County**

Cooke County is projecting lower population in the *2011 Region C Water Plan* through each planning period than was projected in the *2006 Region C Water Plan*. Cooke County is projecting higher demand in the *2011 Region C Water Plan* than was projected in the *2006 Region C Water Plan* for 2020 through 2060, but lower demand in 2010. There are a total of 13 WUGs in Cooke County. Population projections were decreased for two municipal WUGs. Demand projections were increased for two municipal WUGs and were decreased for one municipal WUG. Cooke County demands for non-municipal WUGs were not changed. Water management strategies (WMSs) have been revised to meet the higher municipal demands. WMSs were updated based on information obtained from meetings with various water user groups in Cooke County as well as from surveys mailed to every WUG in Region C. Gainesville utilizes the only significant existing surface water supply in Cooke County (Moss Lake).

Proposed surface water supplies listed as WMSs include expansion of treatment and transmission capacity of Moss Lake to meet a part of the demands for all of the municipal WUGs in Cooke County except Muenster. Muenster will develop treatment capacity for Lake Muenster as a WMS. The plans for Cooke County, as determined by this special study, are discussed in greater detail in Section 4F.2.

**Grayson County**

Grayson County is projecting lower population in the *2011 Region C Water Plan* than was projected in the *2006 Region C Water Plan* for 2010 through 2050, but the same population in 2060. Grayson County is projecting lower demand in the *2011 Region C Water Plan* than was projected in the *2006 Region C Water Plan* for every decade in the planning period. There are a total of 25 WUGs in Grayson County. Population projections were decreased for ten municipal WUGs. Demand projections were increased for one municipal WUG (Southmayd in 2060 only) and were decreased for eleven municipal WUGs. Demands were increased for one non-municipal WUG (steam electric power). Additional water from Lake Texoma will be used to meet the additional steam electric power demands. WMSs were updated based on information obtained from meetings with various water user groups in Grayson County as well as from surveys mailed to every WUG in Region C. There are two current Wholesale Water Providers providing water in Grayson County (Sherman and Greater Texoma Utility Authority (GTUA)). Sherman operates a WTP treating Lake Texoma water and purchases raw water from GTUA (Lake Texoma).

Proposed surface water supplies listed as water management strategies include expansion of the treatment and transmission capacity for Lake Texoma water. The treatment and transmission capacity of Sherman will be increased to meet a part of the future demands of 11 WUGs. New WTPs are proposed in north and northwest Grayson County (operated by GTUA) to meet a part of the future demands of 7 WUGs. Howe and Van Alstyne are currently supplied through the Collin-Grayson Municipal Alliance (CGMA) pipeline (NTMWD and GTUA). The capacity of the pipeline will be expanded to meet most of the future demands of these WUGs. The plans for Grayson County, as determined by this special study, are discussed in greater detail in Section 4F.8.

### Fannin County Water Supply Study

The complete text of the Draft *Fannin County Water Supply Study* [9] is located in Appendix T. This section summarizes the findings of that report. Fannin County is projecting higher population and lower demands in the *2011 Region C Water Plan* through each planning period than was projected in the *2006 Region C Water Plan*. There are a total of 17 WUGs in Fannin County. Population projections were increased for two municipal WUGs and were decreased for one municipal WUG. Demand projections were increased for two municipal WUGs and were decreased for three municipal WUGs. Demands were increased for one non-municipal WUG (steam electric power). Additional water from Lake Texoma will be used to meet the additional steam electric power demands. Water management strategies (WMSs) have been revised to meet the lower municipal demands. WMSs were updated based on information obtained from meetings with various water user groups in Fannin County as well as from surveys mailed to every WUG in Region C. There is no current major water supplier in Fannin County. The only existing surface water supply in Fannin County (Lake Bonham) is used to supply the City of Bonham (after treatment by NTMWD).

Proposed surface water supplies listed as WMSs include the new Lower Bois d'Arc Creek Reservoir (through NTWMD) and Lake Ralph Hall (through UTRWD). In most cases, for WUGs that need future supply, the water management strategy was to obtain supply from NTMWD. One WUG in Fannin County (Ladonia) has a water management strategy to obtain water from UTRWD (Lake Ralph Hall). The plans for Fannin County, as determined by this special study, are discussed in greater detail in Section 4F.6.

### Freestone County Water Supply Study

The complete text of the Draft *Freestone County Water Supply Study* [10] is located in Appendix U. This section summarizes the findings of that report. Freestone County is projecting lower growth in the near term than was previously projected. Growth from 2010 to 2030, as projected in the 2011 Region C Water Plan, is less than the projections in the 2006 Region C Water Plan [2]. Ten WUGs are located in Freestone County. Population and demand projections were increased for one municipal WUG and decreased for one municipal WUG. Steam electric power demand projections were also decreased based on new information. Water management strategies (WMSs) have been revised to meet the projected higher long term demands.

The majority of WUGs in Freestone County rely on groundwater from the Carrizo-Wilcox Aquifer. Final Managed Available Groundwater values for the aquifers located within the Mid-East Texas Groundwater Conservation District (METGCD) are not yet available. When looking at the groundwater supplies allocated within the METGCD's boundaries (Leon, Madison, and Freestone Counties) the total pumping through 2060 is well below the pumping used to calculate the drawdowns in the DFCs. The largest water user in the county is steam electric power which uses mostly surface water. Surface water sources including Lake Fairfield, Lake Livingston, and Tarrant Regional Water District (TRWD) sources are used to meet the steam electric power demands for Freestone County. The plans for Freestone County, as determined by this special study, are discussed in greater detail in Section 4F.7.

## Navarro County Water Supply Study

The complete text of the Draft *Navarro County Water Supply Study* (11) is located in Appendix V. This section summarizes the findings of that report. Navarro County is projecting higher growth in the near term than was previously projected. Growth from 2010 to 2040, as projected in the *2011 Region C Water Plan*, is greater than the projections in the *2006 Region C Water Plan*. There are a total of 18 WUGs in Navarro County. Population and demand projections were increased for three municipal WUGs and were decreased for three municipal WUGs. Demands were increased for one non-municipal WUG (steam electric power). There were no steam electric power demands in the *2006 Region C Water Plan*, but new power plants have recently been planned for development in Navarro County. Corsicana has agreed to supply raw water to the new power plants. Water management strategies (WMSs) have been revised to meet the higher near term demands. WMSs were updated based on information obtained from meetings with various water user groups in Navarro County as well as from surveys mailed to every WUG in Region C. Corsicana is the major water supplier in Navarro County. In most cases, for WUGs that needed future supply, the water management strategy was to increase the supply from Corsicana.

The current surface water sources for WUGs in the study area include Lake Halbert, Navarro Mills Reservoir (through TRA), Richland-Chambers Reservoir (through TRWD), and Lake Bardwell (through Ennis). Surface water supplies listed as WMSs include Tarrant Regional Water District (TRWD) sources through TRA. Several WUGs are considering groundwater as a future supply and new wells were listed as WMSs for these WUGs. The plans for Navarro County, as determined by this special study, are discussed in greater detail in Section 4F.12.

## Kaufman County Water Supply Study

The complete text of the Draft *Kaufman County Water Supply Study* (12) is located in Appendix W. This section summarizes the findings of that report. Kaufman County is projecting lower demand throughout the planning period than was previously projected. This is mainly due to the decrease in steam electric power demand projections. Considering only municipal demand projections, demand projections decreased in 2010 from the 2006 Plan and increased from 2020 to 2060. Kaufman County's designation as a non-attainment county for air quality has led to a decrease in projected demands. There are 28 WUGs in Kaufman County. Changes in population or demand projections from the *2006 Region C Water Plan* (2) were made to 14 municipal WUGs and one non-municipal WUG.

Water management strategies (WMSs) have been revised to meet the higher long term demands. Many of the WUGs plan on continuing to use their current supply source and increasing the amount supplied to them. A few of the WUGs plan on pursuing alternative or additional water sources. The majority of WUGs in Kaufman County rely solely on surface water provided by North Texas Municipal Water District (NTMWD), Tarrant Regional Water District (TRWD), and Dallas Water Utilities (DWU). Additional sources in the county include Lake Tawakoni and reuse. Lake Terrell is owned by the City of Terrell and was once used as a supply source for the City of Terrell. Terrell has recently increased their supply from NTMWD and has discontinued the use of Lake Terrell as a municipal water supply. Terrell is considering building a pipeline from Lake Terrell to Lake Tawakoni and selling the water to SRA or NTMWD, selling water for local irrigation purposes, or leaving the lake as is. Terrell has applied for TWDB planning funds to look into other alternative uses of Lake Terrell. The plans for Kaufman County, as determined by this special study, are discussed in greater detail in Section 4F.11.

**CHAPTER 4H**
**LIST OF REFERENCES**


(1) Freese and Nichols, Inc., Alan Plummer Associates, Inc., and Chiang, Patel and Yerby, Inc.: *Region C Water Conservation and Reuse Study*, prepared for the Region C Water Planning Group, Fort Worth, April 2009.

(2) Schaumburg and Polk, Inc., Freese and Nichols, Inc., and Alan Plummer Associates, Inc.: *East Texas Region Special Study No. 1: Inter-Regional Coordination on the Toledo Bend Project,* prepared for the East Texas Regional Water Planning Group, March 2009.

(3) Freese and Nichols, Inc., and Alan Plummer Associates, Inc.: *Direct, Non-Potable Reuse Guidance Document,* prepared for the Region C Water Planning Group, Fort Worth, April 2009.

(4) Freese and Nichols, Inc., and Alan Plummer Associates, Inc.: *Indirect Reuse Guidance Document*, prepared for the Region C Water Planning Group, Fort Worth, April 2009.

(5) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel and Yerby, Inc., and HDR, Inc.: *Water Supply Study for Ellis, Johnson, Southern Dallas and Southern Tarrant Counties,* prepared for the Region C Water Planning Group and the Tarrant Regional Water District in Cooperation with the Brazos G Water Planning Group, Fort Worth, April 2009.

(6) Freese and Nichols, Inc.: *Water Supply Study for Parker and Wise Counties,* prepared for the Region C Water Planning Group, Fort Worth, April 2009.

(7) Alan Plummer Associates, Inc. and Freese and Nichols, Inc.: *Draft Saline Water Special Study*, prepared for the Region C Water Planning Group, Fort Worth, April 2010.

(8) Alan Plummer Associates, Inc., Freese and Nichols, Inc., and CP&Y, Inc.: *Draft Cooke-Grayson County Water Supply Study,* prepared for the Region C Water Planning Group, Fort Worth, April 2010.

(9) Alan Plummer Associates, Inc., Freese and Nichols, Inc., and CP&Y, Inc.: *Draft Fannin County Water Supply Study,* prepared for the Region C Water Planning Group, Fort Worth, April 2010.

(10) Freese and Nichols, Inc., Alan Plummer Associates, Inc., and CP&Y, Inc.: *Draft Freestone County Water Supply Study,* prepared for the Region C Water Planning Group, Fort Worth, April 2010.

(11) Freese and Nichols, Inc., Alan Plummer Associates, Inc., and CP&Y, Inc.: *Draft Navarro County Water Supply Study,* prepared for the Region C Water Planning Group, Fort Worth, April 2010.

(12) Freese and Nichols, Inc., Alan Plummer Associates, Inc., and CP&Y, Inc.: *Draft Kaufman County Water Supply Study,* prepared for the Region C Water Planning Group, Fort Worth, April 2010.

# 5. Impacts of Recommended Water Management Strategies

The previous section presented a set of recommended water management strategies for Region C wholesale water providers and water user groups.  This section discusses the impacts of the recommended water management strategies on key parameters of water quality, the impacts of moving water from rural and agricultural areas, and impacts to third parties.

## *5.1 Impacts of Recommended Water Management Strategies on Key Water Quality Parameters*

For a given water resource, the impact of water management strategies on key water quality parameters is evaluated by comparing current water quality conditions with anticipated water quality conditions when water management strategies are in place. Many of the recommended water management strategies involve diverting water from one water body and discharging this water to another water body. For these strategies, the difference in the quality of the two waters, the quantity of water discharged, and the effectiveness of any mitigation is used to project the impact on the receiving water.  Selection of the key water quality parameters used for this comparison is based on the importance of these parameters to the use of the water resource.

The recommended water management strategies can be grouped into the following strategy types:

- Existing surface water sources
- New surface water sources
- Existing groundwater sources
- New groundwater sources
- Direct reuse
- Indirect reuse
- Conservation
- Other

In general, each strategy within a strategy type is anticipated to have a similar qualitative impact on key water quality parameters in the receiving water. Exceptions to this generalization are addressed where appropriate. The strategy type defined as "other" includes strategies that do not involve discharge of one source to another and, therefore, have no impact on water quality in the receiving water. Examples of strategies in this category include increased pipeline capacity to a particular water user group or connection of a water user group to a wholesale provider.

The following sections define the parameters selected as key water quality parameters and present the evaluation of impacts of recommended water management strategies on these key parameters.

### Selection of Key Water Quality Parameters

Selection of key water quality parameters involved a two-stage approach. First, a list of candidate water quality parameters was compiled from several sources. Then, key water quality parameters were selected from the list of potential parameters based on the general guidelines described below.

Candidate water quality parameters were identified using the following sources:

- Parameters regulated by the Texas Commission on Environmental Quality (TCEQ) in the Texas Surface Water Quality Standards (TSWQS) [(1)]
- Parameters considered for the TCEQ Water Quality Inventory in evaluation of whether water body uses are supported, not supported, or have water quality concerns. The designated water body uses included in the Water Quality Inventory are:
    - Aquatic life use
    - Contact recreation use
    - General use
    - Fish consumption use
    - Public water supply use
- Parameters that may impact suitability of water for irrigation
- Parameters that may impact treatability of water for municipal or industrial supply.

The first two categories above represent environmental water quality parameters, and the last two categories represent water quality as related to water uses.

To develop a manageable and meaningful list of key water quality parameters, the following general guidelines were established for parameter selection:

- Selected parameters should be representative of water quality conditions that may be impacted on a regional scale and that are likely to be impacted by multiple water management strategies within the region. Water quality issues associated with localized conditions (such as elevated levels of a toxic material within one water body) will be addressed as necessary within the environmental impact evaluations of the individual water management strategies for each water user group.
- Sufficient data must be available for a parameter in order to include it as a key water quality parameter. If meaningful statistical summaries cannot be carried out on the parameter, it should not be designated as a key water quality parameter.

For the *2011 Region C Water Plan*, the Region C RWPG has selected the same key water quality parameters for consideration as were used in the 2006 Plan. Since the *2006 Region C Water Plan* [2] was developed, the TSWQS have not been modified and parameters that may impact the treatability or suitability of water for agricultural, municipal or industrial supply have not changed. Due to unchanged guidance, the first stage of the process that lists candidate parameters for the *2011 Region C Water Plan* yielded the same results as the *2006 Region C Water Plan* [2]. In addition, baseline water quality conditions have not changed substantially since the last round of planning and key water quality parameters were retained.

Revisions to the TSWQS [1] are expected to be implemented after the *2011 Region C Water Plan* has been adopted. New guidance and rules will be considered in the next round of planning when selecting key water quality parameters. A detailed discussion of the selection of key water quality parameters and definition of baseline conditions for these parameters are included in Appendix M. Table 5.1 summarizes the key water quality parameters selected by the Region C Water Planning Group.

**Table 5.1**
**Region C Key Water Quality Parameters**

| Surface Water | Groundwater |
|---|---|
| Ammonia Nitrogen | Total Dissolved Solids (TDS) |
| Nitrate Nitrogen | |
| Total Phosphorus | |
| Chlorophyll-a | |
| Total Dissolved Solids (TDS) | |

## Evaluation of Water Quality Impacts

Impacts of recommended water management strategies on key water quality parameters were assessed by comparing the water quality of the source water for a given strategy with that of the receiving water. This comparison included an evaluation of historical median concentrations of key parameters, together with consideration of data quality, relative quantities of water, and planned mitigation measures (e.g., treatment, blending, or other operational strategies that serve to mitigate water quality impacts). Each recommended strategy was assigned one of the following five anticipated impact ratings: low, medium low, medium, medium high, and high. No recommended or alternative water management strategy is anticipated to have more than a "medium" impact on key water quality parameters. A "medium" impact is considered to be an impact that results in some changes in water quality, but does not result in impairment of the designated uses of the water body.

The following sections present a discussion of the anticipated water quality impacts for each strategy type. Table 5.2 summarizes the range of anticipated water quality impacts within these strategy types.

**Table 5.2**
**Range of Anticipated Impacts on Key Water Quality Parameters by Strategy Type**

| Strategy Type | Range of Anticipated Impacts on Key Water Quality Parameters | Comments |
|---|---|---|
| Existing Surface Water Sources | Low to Medium | Lake Texoma strategies assumed to include mitigation for TDS. |
| Existing Groundwater Sources | Low to Medium-Low | |
| New Surface Water Sources | Low to Medium | Water quality in new sources difficult to predict. |
| New Groundwater Sources | Medium | |
| Direct Reuse | Low/Positive | Potential positive impact resulting from reduced nutrient and TDS loadings to surface waters. |
| Indirect Reuse | Medium | Assumes mitigation to control impacts on nutrients and TDS, if necessary. |
| Conservation | Low | |
| Other | Low | Includes strategies not involving blending of 2 water sources (e.g. direct pipeline to a treatment plant). |

### Existing Surface Water Sources

For strategies utilizing existing surface water sources, impacts on key water quality parameters vary depending on a number of factors, including the location of the source and the intended destination of the water transfer.  For strategies that involve pumping existing surface water directly to a water treatment plant, no impact on water quality is anticipated (resulting in a rating of “low”). However, when water is pumped from one source to another, the impacts will depend on the existing water quality of the two sources, as well as the quantities to be transferred and any mitigation that may be applied.

Many of the recommended and alternative strategies call for increased use of water from East Texas reservoirs. In general, reservoirs in East Texas have higher concentrations of nutrients (i.e., nitrogen and phosphorus) than many of the Region C reservoirs.  The ultimate impact of importing water with higher nutrient concentrations to Region C reservoirs is difficult to predict due to the complex kinetic relationships between nutrients and chlorophyll-a. Strategies that involve importing water from East Texas reservoirs to Region C reservoirs may result in increases in ammonia, nitrate, total phosphorus, and/or chlorophyll-a, but are not likely to lead to impacts that would impair the designated uses of the Region C water bodies.  In general, the total dissolved solids (TDS) concentrations in East Texas reservoirs are lower than in Region C reservoirs.  Therefore, in nearly all cases, transfer of East Texas water to Region C reservoirs will have a positive impact on TDS concentrations in the receiving water bodies.  All of the recommended water management strategies involving importation of East Texas water to Region C reservoirs are anticipated to have a “low” or “medium-low” impact on key water quality parameters.

In addition to strategies that include transfers from East Texas reservoirs to Region C reservoirs, several recommended and alternative strategies include intermediate transfers between reservoirs outside of Region C.  These include transfers from Wright Patman Lake to Lake Fork Reservoir and Chapman Lake and from Toledo Bend Reservoir to Lake Fork Reservoir, Lake Tawakoni, and Chapman Lake. Although there are some minor variations in water quality among these reservoirs, these strategies are all anticipated to have no more than a “medium-low” impact on the key water quality parameters.

Lake Texoma is included in the recommended and alternative strategies for multiple entities. Currently, typical TDS concentrations in Lake Texoma are in the 800-1,200 milligram per liter (mg/L) range. Most Trinity River basin reservoirs in Region C have TDS standards (from the TSWQS) in the 400-500 mg/L range. Therefore, to import a significant quantity of Lake Texoma water into a Trinity River Basin reservoir, mitigation will likely be needed in the form of desalination or blending with another lower TDS water (such as an East Texas source) to prevent significant increases in TDS concentrations in the receiving body and to prevent violation of the Texas Surface Water Quality Standard for TDS. To project the impact of strategies involving use of Lake Texoma water, it has been assumed that mitigation measures will be used to maintain TDS concentrations in the receiving water body at levels that do not violate the Texas Surface Water Quality Standard for TDS. In addition, for strategies that use desalination treatment as mitigation, disposal of the highly saline reject stream can result in increased TDS concentrations, depending on the method and location of disposal. Based on these issues, each of the recommended strategies involving importation of Lake Texoma water to another reservoir is anticipated to have no more than a “medium” impact on key water quality parameters.

### New Surface Water Sources

In general, the impact of the development of new surface water sources on key water quality parameters will be similar to that of existing reservoir sources. All of the proposed reservoir sites identified as potential Region C sources are located in the Red, Trinity, Sulphur, or Neches River Basins. As such, the impacts on key water quality parameters from these reservoirs are likely to be similar to the impacts of importing existing East Texas sources to the Trinity River Basin. (The proposed reservoir in the Red River Basin, Lower Bois d’Arc Creek Reservoir, is on a low-TDS tributary of the Red River.) All strategies involving the importation of water from new reservoirs to Trinity River Basin reservoirs are anticipated to have no more than a “medium” impact on key water quality parameters. Water management strategies calling for the pumping of new surface water sources directly to a water treatment plant are anticipated to have a “low” impact on key water quality parameters.

One new surface water source alternative strategy involves the transfer of water between reservoirs that are both outside of Region C. That is an alternative strategy for Dallas Water Utilities involving transfer of Lake Columbia water to Lake Palestine. This strategy is anticipated to have no more than a “medium” impact on water quality parameters.

### Existing Groundwater Sources

Since all recommended strategies involving existing groundwater sources do not involve blending of groundwater within a supply reservoir, no significant impacts on key surface water quality parameters are expected. For those strategies involving the temporary overdrafting of an aquifer, groundwater TDS concentrations could increase in the presence of underlying brackish waters.  However, no strategies call for long-term overdrafting of groundwater supplies and, therefore, this potential impact is anticipated to be temporary.  Potential impacts on key water quality parameters resulting from alternative and recommended strategies in this category are anticipated to be “low” or “medium low”.

### New Groundwater Sources

There are no new major groundwater sources included in the recommended water management strategies for Region C.  However, several alternative strategies propose obtaining water from groundwater sources that are new to the region, Roberts County groundwater and Brazos County groundwater.  Potential receiving water bodies for groundwater from Roberts County include Ray Roberts Lake (Dallas Water Utilities), Lake Lavon (North Texas Municipal Water District), and Lake Bridgeport (Tarrant Regional Water District).  Roberts County groundwater, which is drawn from the Ogallala aquifer, has a median TDS concentration that is only slightly higher than that in the potential receiving water bodies. However, the median nitrate concentration is high in comparison to baseline nitrate concentrations in each of the potential receiving water bodies.  As a result of the high nitrate concentration in this groundwater source, this group of strategies is anticipated to have a “medium” impact on key water quality parameters.

Lake Lavon (North Texas Municipal Water District) is the potential receiving water body for Brazos County groundwater. Brazos County groundwater, drawn from the Carrizo-Wilcox aquifer, has a median TDS concentration that is greater than that in Lake Lavon and greater than the stream standard for Lake Lavon. The TDS concentration in Brazos County groundwater relative to the stream standard may limit the use of this resource in Region C. As a result this strategy is anticipated to have a “medium” impact on key water quality parameters.

### Direct Reuse

By definition, direct reuse involves the transfer of treated wastewater effluent directly to a point of use and not into another water body. As such, the impact on key water quality parameters for all direct reuse strategies is anticipated to be “low.” In some cases there may be a positive impact. By reducing the quantity of effluent discharged into a stream or reservoir segment, the nutrient and TDS loads to that segment will also be reduced, thereby potentially improving downstream water quality.

### Indirect Reuse

Indirect reuse is a recommended strategy for multiple entities within Region C. This strategy involves the discharge of treated wastewater effluent into a body of water used for water supply. Treated wastewater can contain nutrient and TDS concentrations that are high in comparison to the receiving water. However, for most of the recommended strategies that include indirect reuse, some form of mitigation (e.g., advanced wastewater treatment, constructed wetlands, blending, etc.) is planned to address potential water quality impacts associated with nutrients and TDS. For the purposes of this evaluation, it is assumed that some form of mitigation for potential water quality impacts associated with the key parameters will be implemented, if necessary, such that the designated uses of the water body will not be impaired. For this reason, recommended indirect reuse strategies are anticipated to have no more than a “medium” impact on key water quality parameters.

### Conservation

Conservation is a recommended strategy for all municipal water user groups in Region C, including those without shortages. Water conservation is the development of water resources and practices to reduce the consumption or loss of water, increase the recycling and reuse of water, and improve the efficiency in the use of water. Water conservation plans are designed to implement practices to conserve water and quantitatively project water savings. The water conservation measures recommended in Region C are not expected to affect water quality adversely. The results should generally be beneficial because the demand on surface and groundwater resources will be decreased. Quantifying such positive impacts could be very difficult. Chapter 6 contains additional discussion of water conservation.

## *5.2 Impacts of Recommended Water Management Strategies on Moving Water from Rural and Agricultural Areas and Impacts to Third Parties*

This section discusses the potential impacts of the *2011 Region C Water Plan* on rural and agricultural activities and possible impacts to third party entities, and specifically focuses on the impacts associated with moving water from rural and agricultural areas. This section also discusses the considerations given during the development of the plan to protect rural and agricultural activities.

The *2011 Region C Water Plan* includes several strategies that move water from rural areas to urban centers. These strategies fall into two general categories:

- New connections to existing water sources: Toledo Bend Reservoir to TRWD and NTMWD, Wright Patman Lake to DWU, Lake Fork Reservoir to DWU, Lake Palestine to DWU, Texoma to NTMWD and GTUA, Oklahoma water to NTMWD, TRWD and UTRWD, etc.
- New reservoirs: Marvin Nichols, Ralph Hall, and Lower Bois d'Arc Creek.

Large groundwater projects also may move large quantities of water from rural to urban areas, but these are not recommended strategies. Both the Roberts County Project and the Carrizo-Wilcox project in Brazos County, located outside of the Region C planning area, are identified as alternate strategies.

The impacts from the recommended water management strategies will vary depending on the location of the project, current use of the water and the quantity of water that is being transferred. The types of impacts that may occur include:

- Transfer of water rights from agricultural use to other uses.
- Removal of agriculture through inundation from new reservoirs.

- Changes in stream flow immediately downstream of a new reservoir.
- Increased water level fluctuations at existing lakes as more water is used.

The recommended water plan considered many different factors as strategies were developed and recommended for inclusion. One consideration is the development of a plan that minimizes the potential impacts to rural and agricultural areas through utilization of existing sources with a strong emphasis on conservation and reuse. Over 25 percent of the water available to Region C in 2060 under this plan is from conservation and reuse – over 35 percent of the new supplies to the region. The emphasis on conservation and reuse reduces the number of strategies and amount of water needed from other sources, including transfers of water from rural and agricultural areas.

Other protections for agricultural and rural uses were incorporated in the process of evaluating and allocating water supplies. Specifically, these include:

- Existing and proposed surface water supplies were evaluated under the prior appropriation doctrine that governs surface water rights and protects senior water rights. In the final *2011 Region C Water Plan*, there are no transfers of irrigation water rights to urban uses.
- The amount of available supplies from existing sources was limited to firm yield. Existing uses from these sources were protected through the allocation process and only the amount of water that is currently permitted (up to the firm yield) was considered for transfer to Region C. Three existing reservoirs (Texoma, Wright Patman and Toledo Bend) are currently seeking or are recommended to seek additional water rights. This additional water would not impact agricultural or rural activities.
- Supplies from new reservoirs considered instream flow releases in accordance with the planning guidelines set forth by the TWDB. These releases protect recreational and non-consumptive water needs downstream of the proposed reservoir sites.

In Region C there is little irrigated agriculture, with irrigated cropland making up less than 2 percent of harvested cropland [3]. Most of the irrigation water demand is associated with golf course irrigation in and near urban areas, and much of this water need will be met through reuse. There are no recommended transfers of needed irrigation to other uses and all irrigation and livestock water needs are met through the recommended plan. The potential impacts to agricultural and rural areas are limited to the loss of land from inundation of new reservoirs. The total rural acreage that would be flooded under the *2011 Region C Water Plan* is 116,300 acres. Of this amount, many acres are bottomlands that are not currently used for agriculture. Impacts from new reservoirs will be mitigated as part of the permitting process. New reservoirs also can stimulate the rural economy through new recreational business and local improvements. The new reservoirs will provide a new water source for rural activities. Each of the proposed reservoir sites includes water set aside for local water supplies.

Possible third party impacts include loss of land and timber, impacts to existing recreational business on existing lakes due to lower lake levels, and impacts to recreational stream activities. Economic studies have been conducted for two of the reservoirs proposed for Region C, and in each case they indicate a significant net economic benefit to the region of origin [4, 5].

The impacts to recreational activities and recreational businesses at existing lakes are expected to be low. While water levels at local and rural lakes may fluctuate more under the recommended plan, these water level changes are within the design constraints of the reservoirs. Four of the major water transmission strategies have water sources that are located in highly prolific rainfall areas. Significant changes in water levels at these sources would be limited to extreme drought.

Impacts to recreational stream activities are mitigated through the permitting process and requirements for instream flow releases. New reservoirs offer new recreational opportunities and recreational business growth that could spur the local economies of rural areas.

### *5.3 Invasive and Harmful Species*

The appearance of several invasive and/or harmful species (including zebra mussels, giant salvinia, and golden algae) poses a potential threat to water supplies throughout the state of Texas. Continued monitoring and management by water suppliers in Region C will be necessary in the coming decades. Invasive species will likely be an ongoing area of interest to Region C, as the appearance of additional invasive species in the future remains a possibility. The issue of invasive and harmful species should be considered as plans for interbasin transfers of water supplies are implemented. A more extensive discussion of these invasive species is found in Section 1.8 of this report.

**CHAPTER 5**
**LIST OF REFERENCES**


(1) Texas Administrative Code, Title 30, Chapter 307, [Online], Available URL: http://www.tceq.state.tx.us/assets/public/legal/rules/rules/pdflib/307%60.pdf, January 2010.

(2) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel and Yerby, Inc., and Cooksey Communications, Inc: 2006 Region C Water Plan, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

(3) U.S. Department of Agriculture: 2007 Census of Agricultural, Volume 1, Chapter 2: Texas County Level Data, Table 1, [Online], Available URL: http://www.agcensus.usda.gov/Publications/2007/Full_Report/index.asp, February 2010.

(4) Weinstein, B. L. and T. L. Clower: *The Economic, Fiscal, and Developmental Impacts of the Proposed Marvin Nichols Reservoir Project*, prepared for the Sulphur River Basin Authority, Denton, March 2003.

(5) Clower, T. L. and B. L. Weinstein: *The Economic, Fiscal, and Developmental Impacts of the Proposed Lower Bois d'Arc Reservoir Project*, prepared for the North Texas Municipal Water District, Denton, September 2004.

# 6. Water Conservation and Drought Management Recommendations

This chapter consolidates the water conservation and drought management recommendations in the *2011 Region C Water Plan*, presenting an introduction (Section 6.1); a summary of Region C Water Planning Group decisions regarding water conservation, reuse, and drought management (Section 6.2); a discussion of trends in per capita water use in different regions of the state (Section 6.3), a discussion of current water conservation practices, current reuse projects, and recommended water conservation and reuse strategies for Region C (Section 6.4); a review of the projected per capita use in Region C with the recommended strategies (Section 6.5), a discussion of water conservation policy recommendations (Section 6.6); a discussion of model water conservation plans (Section 6.7); and a discussion of drought management planning (Section 6.8). An evaluation of consistency of the *2011 Region C Water Plan* with the water conservation and drought management planning requirements is presented in Section 6.9.

## *6.1 Introduction*

In the *2006 Region C Water Plan* (1), the projected total water demands for Region C included water conservation savings of 11 percent of total water demand for the region by 2060. The Region C Water Planning Group adopted the following strategies in the 2006 Plan to pursue water conservation:

- Take active measures to achieve the 11 percent water conservation savings included in the supply projections. Municipal measures were categorized based on potential for water savings, opinions of probable cost, and likelihood of implementation. The basic package, recommended for every water user group (WUG) in Region C, includes the following measures:
    - Low flow plumbing fixtures (included in water demand projections)
    - Public and school education
    - Water use reduction due to increasing water prices
    - Water system audit, leak detection and repair, and pressure control
    - Federal residential clothes washer standards

  The expanded package, recommended for 129 of the 271 WUGs in the 2006 Region C Plan, includes the following measures:

- Water conservation pricing structure
- Water waste prohibition
- Coin-operated clothes washer rebate
- Residential water audit
- Industrial, commercial, and institutional (ICI) general rebate
- ICI water audit, water waste reduction, and site-specific conservation program

- Non-municipal measures include estimated conservation savings from efficient new steam electric power plant savings and manufacturing and irrigation rebates.
- Assess the effectiveness and applicability of specific water conservation measures in Region C during the next five years.
- Encourage state funding for research on the effectiveness of water conservation programs and for support of education programs.

Since the Region C Water Planning Group made these recommendations, new water conservation studies have been produced, and the Texas Water Development Board (TWDB) has updated the regional water planning rules. Relevant water conservation legislation passed since 2006 will also have an effect on recommended water conservation strategies. New information is discussed below, following a review of the definitions of conservation and drought management measures.

### Definitions

The Texas Water Code §11.002(8) defines *conservation* as "the development of water resources; and those practices, techniques, and technologies that will reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses." By this definition, it is clear that reuse of treated wastewater effluent is a water conservation measure.

Although water conservation measures and drought or emergency water management measures both save water, water conservation measures are fundamentally different from drought or emergency management measures. *Drought/emergency management measures* are temporary measures that are implemented when certain criteria are met and are terminated when these criteria are no longer met, while water conservation measures are designed to provide permanent or long-term water savings.

## Information Developed Since 2006 *Region C Water Plan*

The 80th Regular Session of the Texas Legislature (2007), via the passage of Senate Bill 3 and House Bill 4, directed the TWDB to appoint members to the newly created Water Conservation Advisory Council. The Water Conservation Advisory Council replaced the Water Conservation Implementation Task Force, which was created in 2003 and abolished on January 1, 2005. Duties of the Council include: monitoring trends in water conservation implementation and new technologies for possible inclusion as best management practices; monitoring the effectiveness of the statewide water conservation public awareness program; developing and implementing a state water management resource library; developing and implementing a public recognition program for water conservation; monitoring the implementation of water conservation strategies by water users included in regional water plans; monitoring target and goal guidelines for water conservation to be considered by the TWDB and TCEQ; and conducting a study to evaluate the desirability of requiring the TWDB to designate entities and programs that provide assistance to retail public utilities in developing water conservation plans as certified water conservation training facilities and to give preference to certified water conservation training facilities in making loans or grants for water conservation training and education activities.

In December 2008, the Advisory Council published *A Report on Progress of Water Conservation in Texas* (2). The report included a number of recommendations regarding water conservation and regional water planning. These recommendations include the following:

- Develop methodology, metrics, and standards for water conservation implementation measurement and reporting.
- Develop specific guidelines for how gallons per capita per day should be determined and how it should be applied to population-dependent water use only.
- Develop reporting guidelines for improved data collection.
- Expand data collection efforts to include all water providers and water use categories.
- Develop a pilot project for water use data reporting.
- Develop a pilot project for determining population figures appropriate for certain water use metrics.

- Provide the Council with the necessary resources to sufficiently develop and implement tools to monitor implementation of water conservation strategies recommended in the regional water plans.
- Expand public awareness of water conservation statewide and coordinate campaigns at the state, regional, and local levels.
- Establish a statewide water conservation recognition program.
- Collaborate with national efforts to develop a clearinghouse of resources, tools, and best management practices.
- Direct the TWDB to develop a certification process for conservation training programs and provide preference for technical and financial assistance to these certified programs.

### New Regional Planning Requirements

The TWDB has revised its planning guidelines since the last round of regional water planning. Based on updated legislation, TWDB now requires that:

- Retail public utilities with populations greater than 20,000 implement a landscape irrigation permitting, inspection and enforcement program under HB 1656
- Retail public utilities with more than 3,300 connections submit a water conservation plan under Texas Water Code §13.146
- The TWDB review each water conservation plan and annual report to determine compliance with minimum requirements and submission deadlines under Texas Water Code §16.402.

In addition, new legislation (House Bill 2667) enacted in 2009 will require toilets purchased after January 1, 2014 to have a maximum flush volume of 1.28 gallons per flush. This will supplant the existing 1.6 gallons per flush maximum rate defined in the Water Saving Performance Standards for Plumbing Act (Chapter 372 of Texas Health and Safety Code, effective January 1992) and should be used as appropriate to estimate water savings. Further discussion of this Bill and estimated savings are included in Section 6.4.

## 6.2 Summary of Region C Water Planning Group Decisions

TWDB planning rules call for “evaluation of all water management strategies that the regional water planning group determines to be potentially feasible,” including water conservation practices, reuse of treated wastewater effluent, and drought management measures. This section summarizes the decision of the Region C Water Planning Group for each of these water management strategies.

### Water Conservation

As discussed above, the legislature, the Water Conservation Advisory Council, and the TWDB have been active in the area of water conservation since the development of the 2006 *Region C Water Plan* (1). New information about the potential for water conservation in Region C has been developed in the interim period, and the revised planning rules require incorporation of water conservation strategies for certain water user groups.

*Summary of Decision: Incorporate water management strategies involving water conservation as a major component of the long-term water supply for Region C. Encourage planning and implementation of water conservation projects. Monitor legislation and regulatory actions related to water conservation.*

### Reuse of Treated Wastewater Effluent

Reuse of treated wastewater effluent is becoming an increasingly important source of water in Region C and across the state of Texas. The *2006 Region C Water Plan* (1) projected that the reuse of reclaimed water would provide supply equal to approximately 16 percent of the 2060 Region C water supply. There are a number of water reuse projects in operation in Region C, and many others are currently in the planning and permitting process. Reuse will serve a major role in meeting future water supply requirements for the region.

Direct reuse and indirect reuse have significantly different permitting requirements and potential applications. Direct reuse occurs when treated wastewater is delivered from a wastewater treatment plant to a water user, with no intervening discharge to waters of the state. Direct reuse requires a notification to the Texas Commission on Environmental Quality (TCEQ), which is routinely accepted so long as requirements of the agency's regulations regarding direct reuse, designed to protect public health, are met. Direct reuse is most commonly used to supply water for landscape irrigation (especially golf courses) and industrial uses (especially cooling for steam electric power plants).

In 2008, the TCEQ adopted rule language (§30 TAC Chapter 321) that applies specifically to permitted wastewater treatment facility owners who plan to produce reclaimed water at a site other than an existing permitted domestic wastewater treatment facility. The new rule, which streamlines the permitting of offsite or remote reclaimed water production facilities that do not discharge to waters of the state, could potentially reduce costs associated with the transportation of raw wastewater to an existing facility and from the existing facility to reclaimed water users.

Indirect reuse occurs when treated wastewater is discharged to a stream or reservoir and is diverted downstream or out of a reservoir for reuse. The discharged water mixes with ambient water in the stream or reservoir as it travels to the point of diversion. Many of the water supplies within Region C have historically included return flows from treated wastewater as well as natural runoff. New indirect reuse projects may require a water right permit from the TCEQ and may also require a wastewater discharge permit from the TCEQ if the discharge location is changed as part of the reuse project. Many Region C reservoirs have water right permits in excess of firm yield, and are currently using return flows in their watersheds to provide a supplement to supply. These return flows may not be a long-term reliable supply if they are diverted for future direct reuse projects or redirected to other water bodies for future indirect reuse projects.

Potential applications for water reuse in Region C include:

- Landscape irrigation (parks, school grounds, freeway medians, golf courses, cemeteries, residential)
- Agricultural irrigation (crops, commercial nurseries)
- Industrial and power generation reuse (cooling, boiler feed, process water, heavy construction, mining)
- Recreational/environmental uses (lakes and ponds, wetlands, stream flow augmentation)
- Supplementing potable water supplies (surface and groundwater supplies).

There are a number of benefits associated with water reuse as a water management strategy, including:

- Water reuse represents an effective water conservation measure.

- Water reuse provides a reliable source that remains available in a drought.
- Water reuse quantities typically increase as population increases.
- Water demands that can be met by reuse are often near reuse sources.
- Water reuse is a viable way to defer and avoid construction of new surface water impoundments.

Available reuse quantities are dependent on water use, and as such are subject to reduced supplies from ongoing conservation strategies. It should also be noted that reliable reuse quantities should be based on dry-weather flows, which are likely to occur during periods of drought.

*Summary of Decision: Incorporate water management strategies involving reuse as a major component of the long-term water supply for Region C. Encourage planning and implementation of additional reuse projects. Monitor legislation and regulatory actions related to reuse.*

### Drought Management

Drought management and emergency response planning are intended to preserve water resources for the most essential uses when water supplies are threatened by an extraordinary condition such as a multi-year drought, an unexpected increase in demand, or a water supply system component failure.

Regional water supply plans are required to include potential trigger conditions for drought and emergency response measures and potential measures to be taken for each water source in the region. Appendix L includes a summary of current drought contingency and emergency management plans in Region C and potential triggers and response measures. Drought management measures are also discussed in Section 6.8.

Drought management and emergency response measures are important planning tools for all water suppliers. They provide protection in the event of water supply shortages, but they are not a reliable source of additional supplies to meet growing demands. They provide a backup plan in case a supplier experiences a drought worse than the drought of record or if a water management strategy is not fully implemented when it is needed.

Therefore, drought management measures are not recommended as a water management strategy to provide additional supplies for Region C.

*Summary of Decision: Continue efforts to implement drought management and emergency response planning, but do not treat these as water management strategies to provide additional long-term supplies.*

### 6.3 Trends in Per Capita Water Use in Various Regions

Due to the many variables involved in determining the total volume of water used in municipal water systems, total gallons per capita per day values are not ideally suited for comparisons between different utilities. Many categories of water use (such as agriculture and industry) are not directly related to population data and would benefit from specific water use and conservation metrics that are appropriate for their specific uses The Water Conservation Advisory Council [(2)] has recommended that a clearly-defined population-specific metric be developed to better allow for comparisons between utilities. The following discussion on trends throughout planning regions is based on TWDB per capita calculations, as defined later in this section, and does not currently define per capita demands based solely on population-specific metrics. The value of the current comparisons is found more appropriate for making individual regional comparisons over time. The usefulness of the planning region comparisons will be increased when a uniform metric is developed.

Figures 6.1 and 6.2 show the 2006 per capita water use, determined using data from TWDB [(4)], for Region C in a statewide context. All referenced TWDB data from water use surveys from water users and as such the accuracy is limited to the response rate to each survey. 2006 was selected for comparison because it was a relatively dry year for the region, and more comparable to year 2000 data used in the previous plan [(1)]. As shown in Figure 6.1, the year 2006 municipal per capita water use varies among the planning regions from 197 gallons per person per day (gpcd) to 122 gpcd. As shown in Figure 6.2, the year 2006 total per capita water use in Region C is by far the lowest of any region in the state at 206 gpcd, and was much lower than the statewide average of 549 gpcd.

There are several reasons for differences in per capita water use across the state. Some of the differences lie in the accounting of water use and the ability of some municipalities to accurately separate municipal water use from other uses that are supplied through the municipal retail provider. In some regions, most of the major users receive water from municipal providers. In other regions, there are significant self-supplied users. (Large users tend to develop their own supplies in areas where major groundwater wells can easily be developed and in areas where substantial surface water supplies are available.) Significantly, some regions have a much greater commercial and industrial base, and thereby experience greater commercial and institutional water usage than others. Other factors that may impact water use include climate, local economy, water prices, availability of water supplies, and active conservation programs.

**Figure 6.1**
**2006 Municipal Per Capita Water Use by Region**

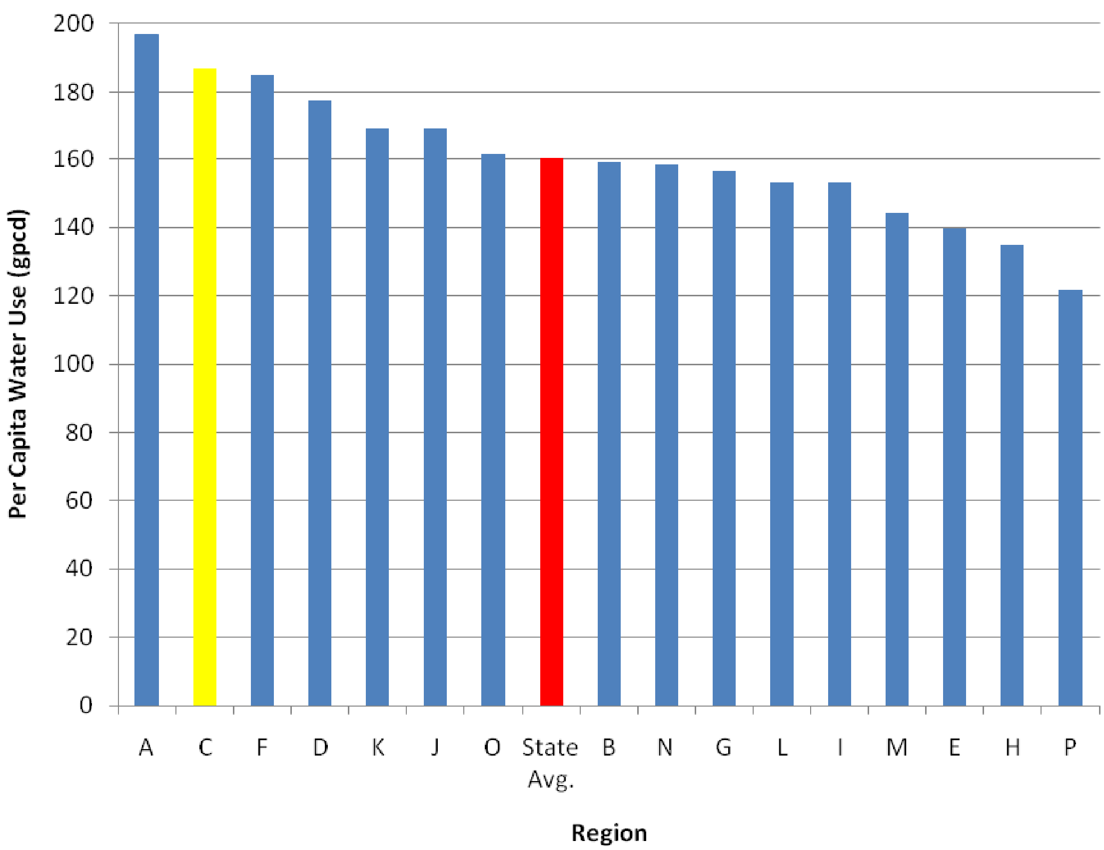
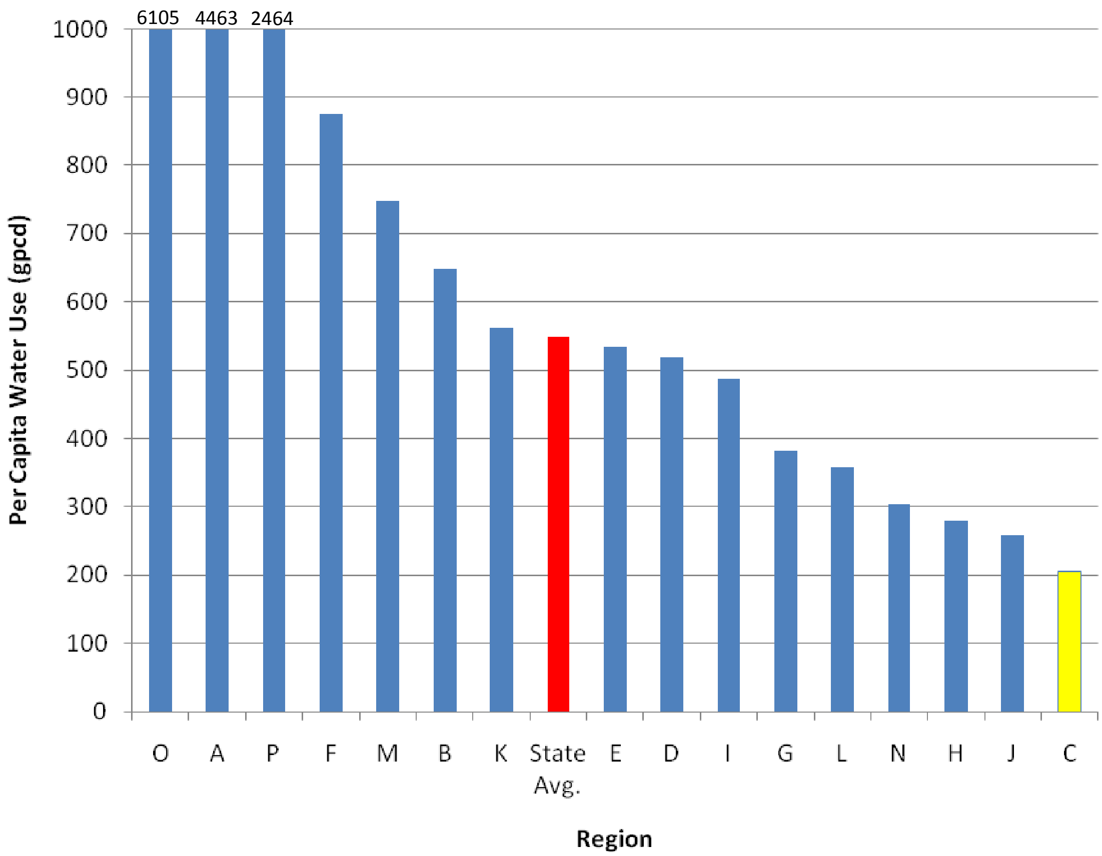


**Figure 6.2**
**2006 Total Per Capita Water Use by Region**




Comparison of Historical Per Capita Municipal Water Use in Various Parts of the State

**Municipal Per Capita Water Use.** Gallons per capita per day (gpcd) is a measurement of water use, and it is often used as a tool to assess changes in water use. However, as discussed above, depending on how gpcd is defined, its usefulness as a measuring tool can be limited. There are several different approaches proposed to define municipal gpcd. The TWDB has historically calculated a municipal gpcd indicator by this formula:

$$GPCD = \frac{\text{(water diverted and/or purchased)} - \text{(wholesale sales +industrial sales + power sales)}}{\text{Population of service area}}$$

This formula provides an estimate of municipal per capita water use that includes commercial, residential, some light industrial, and institutional water users and in some cases, municipal golf course irrigation. This definition provides a historical context for water use by a single water provider and may be a reasonable tool to assess water conservation trends over time for that provider. However, it is not a good tool for comparing water usage between regions of the state or between different providers because of different concentrations and types of non-residential water users (commercial and industrial water users, for example) in different areas. Even for a single provider, if there are significant shifts in development patterns or in the percentages of commercial/institutional water use to residential use, this measurement may not accurately reflect changes in water use due to conservation practices.

In 2004, the Water Conservation Implementation Task Force defined gpcd as:

$$\text{GPCD} = \frac{\text{(total water diverted and/or purchased)} - \text{(wholesale sales + indirect reuse)}}{\text{Population of service area}}$$

This definition takes into account reuse as a conservation strategy; however there are still potential inaccuracies in the formula. In particular, this approach includes industrial use in per capita figures, which shifts the formula toward total per capita, since industrial use is not necessarily related to population. The Task Force further stated that the purpose of gpcd data was not for comparison between entities, but for use by each entity to track its progress towards meeting its water conservation goals. Simple comparison of per-capita water use among Texas municipal water-supply providers that may have significant differences in climate and geography, as well as in their service and population profiles may, without additional data and analysis, lead to inaccurate conclusions about comparative water use efficiencies among those providers.

The Water Conservation Advisory Council has undertaken the challenge of identifying a measurement that can be used to accurately normalize water use by an entity. In its draft report to the Texas Legislature, the Council recommends defining per capita usage by use type, such as residential, industrial, etc. This methodology would provide additional detail from which comparisons could be made. However, very clear, consistent definitions of each use type are required to ensure that data are comparable between each reporting entity. In addition, usage categories that are not dependent on population may still not normalize consistently on a per capita basis and there are still potential inconsistencies with this method. For example, different utilities report multi-family usage as either residential or commercial usage, making even residential comparisons difficult. Furthermore, there is little historical data to date at this level of detail.

**Municipal and Residential Per Capita Water Use by Category.** Water usage data from TWDB [4] were used to compare per capita usage for several cities in Texas. For 2007, TWDB included estimates of residential per capita use in addition to municipal per capita use. Twelve major cities in Texas were selected for a comparison of historical per capita municipal water use in various parts of the state: Amarillo, Austin, Beaumont, Brownsville, Corpus Christi, Dallas (DWU), El Paso, Fort Worth, Houston, Laredo, Lubbock, and San Antonio (SAWS). In general, cities do not report water volumes for other categories (such as unbilled authorized consumption or water losses) to the TWDB, so to some extent, other categories are included in the estimates for most of the cities in Table 6.1. The five-year trailing average was selected to dampen annual changes in water use that occur due to external factors, such as variations in weather. Some utilities are currently performing special water conservation studies that will, once completed, provide more extensive water accounting estimates. In the absence of these studies TWDB data was used for comparison purposes.

Several cities have 2007 total per capita water use greater than 200 gpcd: Amarillo, Dallas, and Beaumont: each of these cities showed a decrease in per capita water usage from 2004 to 2007. San Antonio currently has the lowest municipal per capita water use (146 gpcd) based on 2007 five year trailing averages. All data presented in Table 6.1 originated from TWDB data sources [4].

Although the data presented in Table 6.1 is based on 5 year trailing averages, it should be reiterated that gpcd comparisons can be misleading when comparing between cities. With this consideration a general trend of reduced per capita demand can still be seen in cities throughout different regions in Texas. Potential variations due to temperature and precipitation are discussed in more detail for the North Texas area specifically in the section below. In 2007, residential per capita estimates were added to TWDB data. These estimates attempt to remove industrial, commercial, institutional and other uses from population-dependent demands. The cities in this data set range from a low of 38% of municipal demand as residential demand (Dallas) to a high of 67% (Beaumont), with an average of 54%.

**Table 6.1**
**Per Capita Water Use in Selected Cities [4]**
- Values in Gallons per Capita per Day (gpcd) –

| City | Municipal 5yr Trailing Averages | | | Residential Single Year |
|---|---|---|---|---|
| | 1999 | 2004 | 2007 | 2007 [b] |
| Amarillo | 226 | 225 | 223 | 92 |
| Austin | 163 | 164 | 171 | 87 |
| Beaumont | 190 | 217 | 207 | 133 |
| Brownsville | 179 | 222 | 183 | 65 |
| Corpus Christi | 166 | 162 | 153 [a] | 68 |
| DWU (Dallas) | 222 | 247 | 237 | 92 |
| El Paso | 163 | 169 | 157 | [c] |
| Fort Worth | 199 | 186 | 180 | [c] |
| Houston | 150 | 162 | 155 | 67 |
| Laredo | 181 | 181 | 172 [a] | 79 |
| Lubbock | 188 | 184 | 170 | 81 |
| San Antonio (SAWS) | 148 | 143 | 146 | 86 |

(a) Data not available in 2006
(b) Residential gpcd is the estimated water use for single family and multi-family residences, expressed on a per capita (population) basis. These estimates, based on responses to the TWDB annual water use survey, are being published for the first time. Different systems may categorize and report residential water use differently.
(c) Residential gpcd data not available.

## Seasonal Assessment

Seasonal analyses of water use were conducted, as part of the *Region C Water Conservation and Reuse Study* [5], in an effort to determine the impacts of water conservation measures implemented in Region C. In order to conduct these analyses, a study group of five WWPs and five WUGs was selected. The entities in the study group consisted of nine municipalities in or near the Dallas-Fort Worth Metroplex and one regional water district. In order to differentiate water saved through conservation rather than drought restrictions, none of these entities were under drought restrictions for the period of time covered by this analysis.

The total monthly water use data for the entities included in the study group were obtained for the years 2000 and 2006. These years were selected because both years were dry and had similar weather patterns. Winter water use, defined as the period January through March, was compared with summer water use, defined as the period May through September, to estimate the indoor water use and outdoor water use for each year.

For the entities in the study group, total water usage increased by 19.7% between 2000 and 2006. Water usage in the winter months increased by 25.6% between 2000 and 2006, and water usage in the summer months increased by 16.0% between 2000 and 2006. The population during this seven-year period increased 26% for the study group. For the entities in the study group, the total populations for 2000, the estimated total populations for 2006, and the relative population changes for each entity from 2000 to 2006 are listed in Table 6.2. The population estimates are from the Texas State Data Center [6]. Based on reported water demands and populations, the municipal gallons per capita usage for almost every entity decreased over the study period. The decrease may be attributable to changes in usage patterns, conservation, water rationing by some entities in 2006, weather patterns or other causes.

To assess the portion of water usage attributable to outdoor irrigation and cooling water demands, the winter months of January through March were used as a baseline, and an assumption was made that the increase in the summer period of May through September over the baseline was attributable to outdoor irrigation. Therefore, it was assumed that there was no outdoor water use in the winter months, although there is some irrigation and cooling water use in the winter. Using these assumptions, the portion of water usage attributable to outdoor irrigation has declined from 39.2% in 2000 to 36.6% in 2006 for the entities in the study group.

To assess the impact of climate on the decline in outdoor water usage from year 2000 to 2006, the historical average temperatures and rainfall data from 1971 to 2000 were compared with actual monthly temperatures and rainfall data for 2006. As obtained from the Dallas-Fort Worth International Airport climate station, the average daily temperatures from May through September of 2006 were only slightly lower than the average temperatures in 2000 [7]. Thus, it does not appear that the decline in outdoor water usage can be attributed to cooler temperatures in 2006. The total precipitation from May through September of 2006 was 7.1 inches, versus 9.3 inches in 2000 [7]. Thus, it does not appear that the decline in outdoor water usage can be attributed to higher precipitation in 2006. More detailed climatology information can be found in the 2009 *Region C Water Conservation and Reuse Study* [5].

**Table 6.2**
**Population Growth for Entities in Seasonal Analysis**

| Study Group Entity | Total Population 2000 | Estimated Total Population 2006 | Net Change Over Period |
|---|---|---|---|
| City of Fort Worth | 534,694 | 650,344 | 22% |
| City of Mansfield | 28,031 | 40,819 | 46% |
| City of North Richland Hills | 55,635 | 61,784 | 11% |
| City of Weatherford | 19,000 | 23,118 | 22% |
| City of Allen [a] | 43,554 | 68,001 | 56% |
| City of Azle | 9,600 | 10,606 | 11% |
| City of Frisco [a] | 33,714 | 76,168 | 126% |
| City of Lewisville | 77,737 | 97,771 | 26% |
| City of Plano [a] | 222,030 | 262,722 | 18% |

(a) Water rationing initiated during 2006: once per week watering.

The Water Conservation and Reuse Study concluded that the decrease in outdoor water usage in 2006 likely relates to the implementation of water conservation best management practices (BMPs) by the entities in the study group [5]. Other factors may also drive water use such as economic conditions and adding large customers.

### *6.4 Water Conservation and Reuse in Region C*

This section discusses historical water use, current water conservation, current reuse projects, conservation assumptions in the water demand projections, and recommended water conservation and reuse strategies.

## Historical Water Use in Region C

Water use data obtained from the TWDB [4] were used to analyze historical water use in Region C. Table 6.3 shows the summary of water use in Region C for year 2006. According to these data, 90.7 percent of the water use in Region C in the year 2006 was for municipal purposes.

**Table 6.3**
**TWDB Region C Summary of Water Use for Year 2006**

| Category | Reported Water Use (acre-feet) | Percentage of Regional Water Use |
|---|---:|---:|
| Irrigation | 31,067 | 2.2% |
| Livestock | 20,063 | 1.4% |
| Manufacturing | 53,027 | 3.8% |
| Mining | 10,367 | 0.7% |
| Municipal | 1,274,014 | 90.7% |
| Steam Electric Power | 15,997 | 1.1% |
| **TOTAL** | **1,404,535** | **100.0%** |

## Recommended Conservation Strategies for Region C

Water conservation has been a major component of the Region C Water Plans, including the first plan published in 2001 and the 2006 plan. The Region C Water Planning Group continues to place strong emphasis on water conservation and reuse as a means of meeting projected water needs in the region. Region C is projected to have 29% of the state population in 2060 and 47% of the municipal water conservation based on the *2007 State Water Plan* [8].

As part of the development of the recommended water conservation strategies for the *2011 Region C Water Plan*, the region conducted a survey of conservation practices [5]. That survey identified numerous strategies that were currently being used, with the most widely implemented strategies being water system audits, leak detection and repair, education programs and water conservation pricing. Specifics of that survey are described in the next section of this report.

In addition to the survey, Region C conducted an analysis of each of the Best Management Practices (BMPs) identified by the *2006 Region C Water Plan* [1], considering cost, potential water savings and opportunities for implementation. Based on the findings from the conservation survey and the analysis of the conservation practices, the region updated the two previously created water conservation packages: Basic Water Conservation Package and Expanded Water Conservation Package.

The Basic Package reflects practices that are most likely to be implemented in the region and were cost effective for small and large water user groups. This package (in whole or in part) was recommended to be implemented by each municipal water user group in the region that demonstrated:

- A projected demand greater than existing supply
- A projected total gallons per capita per day greater than 140 gpcd. The 140 gpcd goal was introduced as a recommended total gpcd utility goal by the WCTF [9] and utilized in the *2006 Region C Water Plan* [1] as a threshold to determine selected conservation strategies. This threshold was utilized as a starting point for recommendation of conservation strategies in the 2011 Region C Plan: it is a suggested goal and not a planning or regulatory requirement.
- The strategy is not already implemented (if fully implemented savings should be inherent in demand projections) and if the strategy is applicable to the WUG.

The Basic Water Conservation Package includes:

- Low flow plumbing fixture rules (required by state and federal law)
- Public and school education
- Water use reduction due to increasing water prices
- Water system audit, leak detection and repair, and pressure control
- New efficient residential clothes washer standards
- Water conservation pricing structure (in Expanded Package in 2006 Water Plan)
- Water waste prohibition (in Expanded Package in 2006 Water Plan).

Two of the water conservation practices included in the Basic Package are federally-mandated initiatives that will reduce water use over time simply through the natural replacement of high water use fixtures. These initiatives are discussed below.

The Water Saving Performance Standards for Plumbing Act, implemented by Texas in 1992, prohibits the sale, distribution, or importation of plumbing fixtures that do not meet certain low flow performance standards. The “low flow plumbing fixture rule” strategy assumes that all new construction will be built with water saving plumbing fixtures, and existing plumbing fixtures will be replaced over time with low flow fixtures. Estimates of the water savings from this strategy were provided by the TWDB for Region C. The total projected 2060 regional water demand is about 5 percent less than it would be without the Water Saving Performance Standards for Plumbing Act. House Bill 2667, implemented September 1, 2009, further reduces the maximum volume per flush of toilets available for sale after January 1, 2014 from 1.6 gallons per flush (high efficiency toilets, or HETs) to 1.28 gallons per flush (ultralow flow toilets, or ULFTs). The further reduction in water demands from this legislation is not included in the water demand estimates. The Region C Water Planning Group has estimated the additional savings from ULFTs and accounted for it where appropriate. The total projected 2060 regional water demand is reduced an additional 1% (6% total) from what it would be without low flow fixtures. It is assumed that the TWDB will include this new plumbing fixture requirement in subsequent demand projections.

The second federal initiative requires residential clothes washers manufactured on or after January 1, 2004, to be 22 percent more energy-efficient than pre-2004 models and clothes washers manufactured on or after January 1, 2007, to be 35 percent more energy-efficient than pre-2004 models. The new energy standards are also projected to produce significant water conservation savings. The water savings associated with the replacement of clothes washers were assumed to occur over time with little to no action by the water user group. More detailed descriptions of the other Basic Package strategies are included in Chapter 4 of the *2011 Region C Water Plan*.

The Expanded Water Conservation Package includes strategies that are slightly more costly to implement and demonstrate greater applicability to larger water user groups. The Expanded Package includes strategies for industrial, commercial, and institutional facilities as well as wastewater reuse. All or part of the expanded conservation package is recommended in the *2011 Region C Water Plan* for 145 out of 277 municipal water user groups.

The Expanded Water Conservation Package includes the Basic Water Conservation package, plus:

- Coin-operated clothes washer rebate
- Residential customer water audit
- Landscape irrigation restrictions (new in 2011 Water Plan)
- Industrial, commercial, and institutional (ICI) water audit, water waste reduction, and site-specific conservation program
- Reuse of treated wastewater effluent (if applicable).

One strategy, the ICI general rebate, was removed from the 2006 Water Plan expanded package due to low levels of implementation across the region. All of the recommended water conservation strategies were evaluated (water savings and costs) at the individual water user group (WUG) level. Water savings for wholesale water providers were estimated from the associated savings calculated for their customers. All costs for water conservation in the *2011 Region C Water Plan* were applied at the WUG level. In reality, some of the water conservation strategies, such as public and school education programs, are being implemented and financed on a regional basis by WUGs and by wholesale water providers. More detailed descriptions of the Expanded Package strategies are included in Chapter 4 of the *2011 Region C Water Plan*.

The development of the 2011 Region C recommended water conservation strategies also included several assumptions related to adoption rates and realization of full benefits over time. These assumptions varied by WUG, depending on current per capita water use (some BMPs were not recommended for entities with per capita water use at or below 140 gpcd), whether the strategy has already been implemented, and the applicability of the recommended strategy to the WUG. Generally, the strategies in the basic package were recommended for all WUGs with water use above 140 gpcd with full benefits being realized by 2020. The strategies in the expanded package were applied individually at the WUG level and were assumed to be implemented by 2020. Costs and estimated savings for each recommended strategy for each WUG are located in Appendix K.

## Current Water Conservation in Region C

Data presented in this section comes primarily from surveys of water suppliers, telephone interviews with selected water suppliers, and other sources including Water Conservation and Drought Contingency Plans from water suppliers, TWDB historical water use records, the TCEQ water right database, and historical wastewater return flow records. Detailed data results and analysis can be found in the 2009 *Region C Water Conservation and Reuse Report* (5).

**Survey.** The first task of this study was to determine what water conservation and reuse strategies are currently being practiced in Region C. This was accomplished through a survey that asked for information regarding recent history of population and water use, current and future water conservation and reuse strategies, the effectiveness of the strategies (water savings realized, public perception, etc), what customer class was targeted with each strategy (residential, industrial, or commercial), and the cost of the strategies. Additional questions were asked regarding public outreach programs, water loss, updates to water conservation and drought contingency plans, and recent water right permits. On August 31, 2007, this survey was sent to the 35 wholesale water providers (WWPs) and the 235 water user groups (WUGs) in Region C. To help participants complete the survey, a list of the water conservation strategies (BMPs) from the *2006 Region C Water Plan,* with detailed descriptions of each BMP, were provided with the survey. The detailed descriptions of the BMPs are included in Appendix K. Table 6.4 summarizes the data collected from the surveys.

Survey responses were received from 25 WWPs and 96 WUGs. An additional 17 WUGs returned the survey, but indicated that they were not involved in water supply activities and could not provide any data. Overall, the survey had a 51 percent response rate, with 71 percent of the WWPs and 48 percent of the WUGs (including the 17 WUGs who are not involved with water supply) responding. To encourage the water providers to respond to this survey, entities who had not responded by the requested due date were contacted up to two times by phone and offered assistance.

**Other Data Collection.** Along with the returned surveys, many WWPs and WUGs included their current Water Conservation and Drought Contingency Plans. Information in these plans was used to supplement the survey responses. Historical water use data was also collected from the TWDB for some entities. Water rights information and wastewater return flow information was obtained from the TCEQ.

**Telephone Interviews.** From among the 121 entities that returned completed surveys, 24 were selected to further query for more comprehensive cost and public education information related to the implementation of the water conservation BMPs. This query was accomplished through telephone interviews. In addition to the cost and public education questions, the respondents were also asked open-ended questions to identify which BMPs required the least amount of implementation effort or cost but proved the most effective. Lessons learned from the implementation of these water conservation measures were also requested. A matrix summarizing the water providers contacted for this study, the number of customers they serve, and the BMPs they have implemented is included in Appendix K.

It should be noted that even though the BMPs for "low flow plumbing fixture rules" and for "new efficient residential clothes washer standards" were included in the survey, these BMPs are in effect already implemented for all entities because they are mandated by law. Therefore, these BMPs have not been included in portions of the analyses in this report. Only data collected on the perceived effectiveness of these strategies and public reaction was included in the survey results.

Survey responses also identified nine additional BMP strategies beyond the basic and expanded packages suggested for consideration. Six of these additional BMPs were implemented by at least one entity and three were listed as under consideration.

### Case Studies

Case studies were performed for three cities to analyze the procedures and processes a city undertakes to implement a BMP or a set of BMPs. These case studies were performed to determine the ease or difficulty certain sizes of cities face when implementing various BMPs. This information is intended to inform other cities that desire to implement BMPs in the future. These studies were performed for three categories: small town, mid-sized city, and large city. The criteria for selecting the cities were as follows:

## Table 6.4
## Water Conservation Response Data from Water Retailers

| | Basic Package | | | | | | | Expanded Package | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low flow plumbing fixture rules | Public and school education | Water use reduction due to Increasing water prices | Water system audit, leak detection and repair, and pressure control | New efficient residential clothes washer standards | Water conservation pricing structure | Water waste prohibition | Coin-operated clothes washer rebate | Residential customer water audit | ICI water audit, water waste reduction, and site-specific conservation program | Reuse of treated wastewater effluent |
| **BMP Implementation** | | | | | | | | | | | |
| **Implemented** | | 49% | 62% | 58% | | 46% | 29% | 0% | 13% | 4% | 10% |
| **Target Res.** [(a)] | | 78% | 84% | 68% | | 71% | 73% | 0% | 47% | 0% | 18% |
| **Target Ind.** [(b)] | | 13% | 43% | 34% | | 37% | 52% | 0% | 0% | 40% | 27% |
| **Target Comm.** [(c)] | | 29% | 61% | 48% | | 49% | 64% | 0% | 0% | 40% | 45% |
| **Target Inst.** [(d)] | | 31% | 48% | 38% | | 43% | 61% | 0% | 0% | 60% | 27% |
| **Level of BMP Effectiveness** | | | | | | | | | | | |
| **Very Effective** | 20% | 9% | 25% | 31% | 10% | 33% | 27% | 0% | 20% | 0% | 45% |
| **Somewhat Effective** | 61% | 64% | 45% | 46% | 60% | 25% | 45% | 0% | 60% | 20% | 36% |
| **Not Effective** | 2% | 9% | 13% | 3% | 20% | 10% | 9% | 0% | 7% | 0% | 0% |
| **No Response** | 16% | 18% | 16% | 20% | 10% | 31% | 18% | 0% | 13% | 80% | 18% |
| **Plans to Maintain BMP** | | | | | | | | | | | |
| **Yes** | | 87% | 86% | 80% | | 71% | 94% | 0% | 67% | 80% | 73% |
| **No** | | 2% | 0% | 0% | | 0% | 0% | 0% | 0% | 0% | 0% |
| **No Response** | | 11% | 14% | 20% | | 29% | 6% | 0% | 33% | 20% | 27% |
| **Would Consider Implementing BMP** | | | | | | | | | | | |
| **Yes** | | 28% | 30% | 30% | | 33% | 18% | 17% | 23% | 25% | 20% |
| **No** | | 11% | 9% | 9% | | 7% | 15% | 23% | 15% | 14% | 20% |
| **No Response** | | 61% | 60% | 62% | | 61% | 67% | 60% | 62% | 61% | 60% |
| **Public Reaction** | | | | | | | | | | | |
| **Favorable** | 7% | 53% | 7% | 28% | 0% | 14% | 33% | 0% | 47% | 20% | 55% |
| **Unfavorable** | 2% | 0% | 28% | 0% | 0% | 18% | 15% | 0% | 0% | 0% | 0% |
| **No Reaction** | 36% | 13% | 19% | 23% | 50% | 16% | 6% | 0% | 0% | 0% | 0% |
| **No Response** | 52% | 33% | 43% | 48% | 50% | 49% | 39% | 0% | 53% | 80% | 45% |

(a) Respondents indicated that BMP was targeted to residential customers
(b) Respondents indicated that BMP was targeted to industrial customers
(c) Respondents indicated that BMP was targeted to commercial customers
(d) Respondents indicated that BMP was targeted to institutional customers

Small Town:

- Does not get water from a Wholesale Water Provider (WWP) and therefore is not subject to the conservation plans of that WWP.
- Located well away from Dallas/Fort Worth Metroplex area.
- Population less than 5,000.
- Is representative of other towns in the category.
- Implementing some, but not all BMPs that are typical of small towns.

Mid-sized City:

- Does not get water from a Wholesale Water Provider (WWP) and therefore is not subject to the conservation plans of that WWP.
- Not bordering Dallas or Fort Worth, but possibly within the surrounding counties.
- Population between 20,000 and 70,000.

Large City:

- City within Dallas/Fort Worth Metroplex area.
- Population greater than 100,000.

Based on these criteria, the cities of Muenster, Corsicana, and Arlington were selected for the case studies.

**Small Town – Muenster.** Based on the returned water conservation survey, Muenster's current BMPs include:

- Increasing water prices
- Water system audit, leak detection and repair, and pressure control
- Water conservation pricing structure

The year 2008 population for Muenster was 1,701 [6]. As with most small towns, there is no dedicated budget for water conservation. Muenster's current Water Conservation and Drought Contingency Plan was developed by city staff in November 1999 using the template and guidelines provided by the state.

The BMPs employed by Muenster are fairly typical for small towns. The Increasing Water Prices BMP is really a function of collecting adequate funds for maintaining and operating the water system with a side benefit of conservation. The Water Conservation

Pricing Structure BMP is a response to the TCEQ's requirement to eliminate decreasing block water pricing. Both of the BMPs associated with water pricing are effective in bringing about conservation results and are fairly inexpensive to implement. For a small town, the steps involved in implementing these BMPs are: city staff calculation of needed rates, presenting the new rates to the City Council at regularly scheduled meetings, notifying customers of proposed change via inserts in water bills and public notices in the newspaper, adopting the new rate structure ordinance, and adjusting the billing calculations to include the new rate structure. Much of this can be done as part of normal city staff operations and may not require additional funds to accomplish.

As with most small towns, the BMP related to water system audit and leak detection and repair in Muenster is covered by the city's water maintenance staff and is not considered explicitly for water conservation purposes. It is intended more for system maintenance purposes, was implemented when the system was created, and is conducted on a continuous basis. Currently the city replaces 10 percent of its water meters per year.

**Mid-Sized City – Corsicana.** Based on the returned water conservation survey, Corsicana's current BMPs include:

- Low flow plumbing fixture rules
- Public and school education
- Water system audit, leak detection and repair, and pressure control
- New efficient residential clothes washer standards
- Water conservation pricing structure
- Water waste prohibition
- Residential customer water audit
- Industrial, commercial, and institutional (ICI) water audit, water waste reduction, and site-specific conservation program

The year 2008 population for Corsicana was 26,602. Corsicana's annual budget for water conservation is approximately $10,000. Corsicana's original Water Conservation and Drought Contingency Plan was prepared by a consulting engineering firm in 1997 and was adopted by the city on March 18, 1997. The Plan has been updated numerous times since

1997. When the Plan was originally adopted, a number of BMPs were implemented including:

- Public and school education,
- Water system audit, leak detection and repair, and pressure control,
- Residential customer water audit, and
- Industrial, commercial, and institutional (ICI) water audit, water waste reduction, and site-specific conservation program.

The Water Conservation Plan and these BMPs were written into the city's Code of Ordinances under the Utilities and Solid Waste Planning Chapter. All elements of the conservation plan are maintained on file in the City Secretary's office and are available to the public. The Water Conservation and Drought Contingency Plan was updated and amended again in October 2008 to include specific conservation goals (per capita use) and associated timeframes. Corsicana currently sells water to 21 wholesale water customers. Any contracts with these wholesale customers include the requirement that the customers develop and implement a water conservation plan.

The basis of the city's public and school education program is pre-printed brochures from TWDB, available on the TWDB website. Cities may receive up to 500 pieces of literature per year at no charge from TWDB, and additional pieces may be purchased. During the first year of the program, brochures were distributed semi-annually via water bills in conjunction with newspaper articles. In following years, various brochures have been distributed annually in May or June (corresponding to peak summer periods) along with news releases to the local newspaper. The news releases are used to provide information on water-conserving practices, encourage water conservation and report progress on achieving the city's water conservation goal. New customers are given information on the city's conservation program at the time that they apply for service. The school education program involves presentations at schools as well as tours of the water plant at the request of the school. These requests are made to the City's Environmental Services Department, and tours are conducted by the plant superintendent. Water conservation is emphasized as part of these presentations and tours.

The city's water system audit and leak detection and repair program also began in 1997. An annual water audit is performed to identify unaccounted-for water. The city's goal is to meter all water used, including water used for city services. All customer meters were replaced in 2002 and 2003. The current average meter replacement is 8 to 10% per year. The city has a goal that meters will be maintained within 1 percent accuracy. The city staff manually audits monthly meter readings of large water customers (2-inch meters and larger) against the previous two or three months to determine if there is a significant change in water use or if there is an indication of an improperly operating meter. The city has a schedule of meter testing where larger meters are tested annually and smaller (residential) meters are tested every 7 years. Meter age is recorded for each billing account. In addition to the audits and meter replacement, city employees conduct daily leak inspections as they travel within the city. Citizens are also asked to report leaks when observed. When leaks are found or reported, a work order is issued for repair as soon as possible. Residential customers may request individual audits if leaks are suspected.

In August 2006, the city eliminated its decreasing block rate structure. With the new structure, no discounted rate is given for higher volumes of use. In addition, the new rates represent a 20 percent increase over the previous rates, which will encourage water conservation. Steps involved in this process were having a consultant perform a water rate study, proposing the new rate structure to the City Council, notifying customers of proposed change in rates and rate structure via inserts in water bills and public notices in the newspaper, holding public meetings to discuss the new rate structure, adopting the new rate structure ordinance, incorporating this change into the City ordinances, and adjusting the billing software to include the new rate structure. The city has a rate study performed about every three years and intends to move toward an increasing block rate structure.

The City also lists "low flow plumbing fixture rules" and "new efficient residential clothes washer standards" as part of their BMPs. Customers and/or owners of buildings that do not have water conserving plumbing devices are encouraged by the City to retrofit their old fixtures. The City's educational and advertising program helps inform customers of the advantages of installing water-saving devices as well as the availability of these items.

**Large City – Arlington.** Based on the returned water conservation survey, Arlington's current BMPs include:

- Public and school education
- Increasing water prices
- Water system audit, leak detection and repair, and pressure control
- Water conservation pricing structure
- 10am-6pm water restrictions; rain-freeze sensors required

Other BMPs planned or proposed for 2008 are:

- Low flow plumbing fixture rebate program
- Water waste prohibition
- Residential customer water audit
- Industrial, commercial, and institutional (ICI) water audit, water waste reduction, and site-specific conservation program
- Low-water landscape code and conversion incentives
- Irrigation ET controllers required
- High efficiency irrigation required and conversion incentives

Arlington's fiscal year 2007 budget for conservation was approximately $44,000. The budget increased to $184,000 for fiscal year 2008. The year 2008 population of Arlington was 374,943.

As with most cities, water rates for the City of Arlington have been steadily increasing through the years to maintain adequate revenue for their water system as well as to promote conservation. In 2003, the city introduced a water conservation pricing structure. The city now has an increasing block rate structure, in which the cost of water increases as water use increases. There are two tiers each for commercial and irrigation accounts and five tiers for residential accounts. Steps involved in increasing rates and implementing the new rate structure are similar to those performed for the small and medium sized cities.

In 2005, Arlington's Water Utilities prepared a Water Conservation Plan in accordance with TCEQ regulations. This plan was updated in 2008. The plan identified conservation goals and explained conservation practices that the city would implement.

Arlington's public and school education program includes regularly utilizing public service announcements on Arlington's public cable television channel, using bill inserts (at least twice per year), maintaining a conservation website, placing conservation advertising in local newspapers, and making presentations to school and community groups. Another part of Arlington's public education is its partnership with a number of agencies to promote a regional water conservation message to the public. The city's partnership with Tarrant Regional Water District involves the WaterWise Program for 5th graders, the Major Rivers Program (produced by TWDB) for 4th graders, and the Star-Telegram Newspapers in Education (NIE) program. Arlington advertises the Texas Smartscape CD and Website developed by the North Central Texas Council of Governments. Arlington also partners with the Arlington Conservation Council and the Lone Star Irrigation Association to disseminate conservation information. The city distributes and makes available materials developed by city staff as well as material obtained from the TWDB, TCEQ, and other sources.

As part of its conservation efforts, the city's goal for unaccounted water is less than 8 percent. This is well below the typical goal for a city, which is around 10 to 12 percent. The city maintains efforts to manage non-revenue water uses. These efforts include metering of all customers as well as all public and government users, following AWWA standards for meter testing and repair/replacement, and maintaining accurate metering of raw water supplies from Lake Arlington. In addition, leak detection and repair are part of the routine operations of the city staff including meter readers, field operations and meter services personnel. The city does not have an aggressive pipe replacement system because of the relatively young age of the distribution system.

A primary water conservation goal of Arlington is to decrease waste in landscape irrigation through implementation and enforcement of a landscape water management ordinance. In December of 2006, this ordinance was strengthened by making the 10 a.m. to 6 p.m. water restrictions year-round. In addition, beginning in January 2007, all new irrigation systems (commercial and residential) must be equipped with rain and freeze sensors. The city has provided customers with a list of approved rain and freeze sensor equipment. The city is imposing a $500 fine on violators of this ordinance.

Arlington currently sells water directly to some customers within the City of Grand Prairie and is considering wholesale water sales to Grand Prairie. Any future wholesale water contract would include the requirement that the customers develop and implement a water conservation plan.

### Summary of Existing Conservation Efforts in Region C

Significant efforts have been made by water providers and water users to conserve water in Region C. Regional coordination is one tool that has been utilized by wholesale water providers in the region. The North Texas Municipal Water District, Dallas Water Utilities and Tarrant Regional Water District jointly sponsor the North Texas Regional Water Conservation Symposium, now in its third year. Outdoor water conservation practices, such as time of day watering restrictions, have become part of local ordinances in Fort Worth, Dallas, and most of the larger cities in the area. Cities and water utilities have begun allocating conservation staff and budgeting dollars as part of their full time water management strategies. These individual conservation efforts are part of the ongoing Region C effort to promote conservation as a permanent, valuable water management strategy.

### Existing Reuse Projects

Water reuse has been a source of water supply in Region C for a number of years. Table 6.5 lists currently operating reuse projects in Region C and the amount that can be used with existing infrastructure and current users (for direct reuse). There are several reuse projects that are permitted, but that do not have infrastructure to utilize this water. Others are not fully utilized due to infrastructure limitations. Development of the infrastructure for these projects is considered a water management strategy. Further discussion of current reuse projects is included in Appendix I.

### Recommended Reuse Projects

Table 6.6 lists recommended reuse strategies for Region C. A total of 24 reuse projects are recommended with a cumulative 2060 supply amount of 300,574 acre-feet per year. More detailed discussions of the recommended reuse projects are included in Chapters 4B and 4E.

Table 6.7 shows a regional summary of estimated water savings from recommended water conservation and reuse strategies. It also shows the amount of conservation that is included in the approved water demands for the region. Non-municipal conservation associated with efficient new steam electric power is included in the new steam electric power demand projections. General rebates are the recommended non-municipal conservation strategies associated with irrigation and manufacturing demands. The projected 2060 Region C water demand with no conservation is 3,200,977 acre-feet per year (this amount includes the TWDB-approved 2060 demand value plus 211,201 acre-feet per year of conservation from low flow plumbing fixtures and 65,619 acre-feet per year of conservation from increases in steam electric power efficiency that is included in the TWDB demands). The existing and recommended 2060 water conservation and reuse strategies, including those that are assumed in the demands, will meet 1,204,128 acre-feet per year (or 38 percent) of the pre-conservation demand.

## 6.5 Per Capita Water Use in Region C with the Implementation of the Recommended Plan

The *Report to the 81st Legislature* [2] from the Water Conservation Advisory Committee recommends refining water conservation data collection, formatting and processing procedures. The report does not quantify specific water conservation targets or goal gpcd values. It recommends avoidance of a total municipal gpcd. The *Report to the 79th Legislature* [9] from the Water Conservation Implementation Task Force suggested that when establishing conservation targets and goals, a water supplier should consider "a minimum annual reduction of one percent in total gpcd, based upon a five-year rolling average, until such time as the entity achieves a total gpcd of 140 or less." The gpcd values used for Region C projections are dry year estimates, whereas the 140 gpcd recommendation is based on a five-year rolling average. The five-year average gpcd is typically 10-15% less than a dry year gpcd. As discussed earlier in this chapter, comparison between entities on a per capita basis can lead to erroneous conclusions regarding water use and water conservation effectiveness.

**Table 6.5**
**Existing Reuse Projects in Region C**
- Values in Acre-Feet per Year –

| Provider | Project Name | Type | County [a] | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|
| Alcatel Network Systems | Alcatel Network Systems Reuse | direct | Dallas | 20 | 20 | 20 | 20 | 20 | 20 |
| Athens | Athens Fish Hatchery Reuse | direct | Henderson | 2,872 | 0 | 0 | 0 | 0 | 0 |
| Azle | Azle Reuse | direct | Tarrant | 300 | 300 | 300 | 300 | 300 | 300 |
| Bryson | Jack County Reuse | direct | Jack | 27 | 27 | 26 | 26 | 25 | 25 |
| Country Club WSC | Country Club WSC Reuse | direct | Kaufman | 92 | 92 | 92 | 92 | 92 | 92 |
| Crandall | Crandall Reuse | direct | Kaufman | 484 | 666 | 666 | 666 | 666 | 666 |
| Dallas | Cedar Crest Golf Course Reuse | direct | Dallas | 561 | 561 | 561 | 561 | 561 | 561 |
| Dallas | Indirect Reuse | indirect | Denton | 29,961 | 42,046 | 53,147 | 60,646 | 69,861 | 85,000 |
| DCPCMUD | Sale to Grapevine | indirect | Tarrant | 3,317 | 3,696 | 3,964 | 4,142 | 4,276 | 4,386 |
| Deer Creek Waterworks/ Willow Park | Willow Park Reuse | direct | Parker | 11 | 11 | 11 | 11 | 11 | 11 |
| Denton | Denton Direct Reuse | direct | Denton | 1,233 | 2,242 | 2,690 | 3,251 | 3,924 | 4,708 |
| Denton | Denton Indirect Reuse | indirect | Denton | 1,682 | 8,861 | 11,557 | 12,927 | 12,726 | 12,545 |
| Denton County FWSD#1/ UTRWD/Lewisville | UTRWD Reuse | direct | Denton | 897 | 897 | 897 | 897 | 897 | 897 |
| Ennis | Ennis Reuse | direct | Ellis | 800 | 800 | 800 | 800 | 800 | 800 |
| Fort Worth | Village Creek Reuse | direct | Tarrant | 897 | 897 | 897 | 897 | 897 | 897 |
| Gainesville | Kenetso Park Reuse | direct | Cooke | 9 | 9 | 9 | 9 | 9 | 9 |
| Garland/Forney | Garland/Forney Reuse | direct | Kaufman | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 | 8,979 |
| Jacksboro | Jacksboro Reuse | indirect | Jack | 385 | 385 | 385 | 385 | 385 | 385 |

(a) County reflect location of reuse project.

**Table 6.5 (continued)**

| Provider | Project Name | Type | County [a] | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|
| Millsap WWTP | Millsap ISD Reuse | direct | Parker | 2 | 2 | 2 | 2 | 2 | 2 |
| NTMWD | Rowlett Creek Reuse | direct | Collin | 1,540 | 1,540 | 1,540 | 1,540 | 1,540 | 1,540 |
| NTMWD | Buffalo Creek Reuse | direct | Rockwall | 672 | 672 | 672 | 672 | 672 | 672 |
| NTMWD/Royse City | Royse City Reuse | direct | Rockwall | 112 | 112 | 112 | 112 | 112 | 112 |
| NTMWD | Wilson Creek Reuse | indirect | Collin | 50,000 | 60,941 | 71,882 | 71,882 | 71,882 | 71,882 |
| NTMWD | East Fork Reuse | indirect | Kaufman | 51,790 | 67,148 | 87,102 | 102,000 | 102,000 | 102,000 |
| NTMWD/Frisco | Stewart Creek West Reuse | direct | Collin | 307 | 307 | 307 | 307 | 307 | 307 |
| Pinnacle Club | Pinnacle Club Reuse | direct | Henderson | 32 | 32 | 32 | 32 | 32 | 32 |
| TRWD | Richland Chambers Reservoir Reuse Project | indirect | Navarro | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| The Colony | Collin County Reuse | direct | Collin | 380 | 380 | 380 | 380 | 380 | 380 |
| TRA | Ellis County Irrigation | direct | Ellis | 125 | 125 | 125 | 125 | 125 | 125 |
| TRA | Ten Mile Creek WWTP Reuse | direct | Dallas | 125 | 125 | 125 | 125 | 125 | 125 |
| TRA | TRA/Waxahachie Reuse | indirect | Ellis | 4,998 | 5,129 | 5,129 | 5,129 | 5,129 | 5,129 |
| TRA/DCURD | Las Colinas Reuse | direct/ indirect | Dallas | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Trophy Club | Denton County Golf Reuse | direct | Denton | 800 | 800 | 800 | 800 | 800 | 800 |
| UTRWD | Lake Chapman Indirect Reuse | indirect | Denton | 6,634 | 6,634 | 6,634 | 6,634 | 6,634 | 6,634 |
| Wise County | Wise County Mining Reuse | direct | Wise | 15,930 | 14,074 | 12,152 | 10,643 | 9,236 | 8,061 |
| **TOTAL** | | | | **203,974** | **246,510** | **289,995** | **312,992** | **321,405** | **336,082** |

(a) County reflect location of reuse project.

**Table 6.6**
**Recommended Reuse Projects in Region C***
- Values in Acre-Feet per Year –

| Provider | Project Name | Type | County [(a)] | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|
| Athens | Athens Fish Hatchery | direct | Henderson | 0 | 2,872 | 2,872 | 2,872 | 2,872 | 2,872 |
| Cooke County | Direct Reuse | direct | Cooke | 0 | 70 | 70 | 70 | 70 | 70 |
| Cooke County Mining | Mining Reuse | direct | Cooke | 0 | 99 | 67 | 71 | 74 | 77 |
| DWU | Direct Reuse | direct | Dallas | 0 | 20,458 | 20,458 | 20,458 | 20,458 | 20,458 |
| DWU/NTMWD | NTWMD WWTP Discharges to the Lake Ray Hubbard Watershed | indirect | Dallas/Kaufman/Collin/ Rockwall | 0 | 31,612 | 35,872 | 39,459 | 40,244 | 41,029 |
| Ennis | Indirect Reuse | indirect | Ellis | 0 | 0 | 0 | 333 | 2,521 | 3,696 |
| Fort Worth | Village Creek Direct Reuse | direct | Tarrant | 1,552 | 3,469 | 3,526 | 3,526 | 3,526 | 3,526 |
| Fort Worth/TRA | Alliance Corridor Direct Reuse | direct | Tarrant | 0 | 1,120 | 4,694 | 4,694 | 4,694 | 4,694 |
| Fort Worth | Fort Worth Future Direct Reuse | direct | Tarrant | 0 | 0 | 3,460 | 7,979 | 7,979 | 7,979 |
| Frisco | Collin/Denton County Direct Reuse | direct | Collin/Denton | 0 | 2,240 | 3,360 | 5,650 | 5,650 | 5,650 |
| Jacksboro | Indirect Reuse (Jack County mining) | indirect | Jack | 385 | 385 | 385 | 385 | 385 | 385 |
| Irving/TRA | Irving Direct Reuse | direct | Dallas | 0 | 6,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| NTMWD | Additional Supplies from Dallas for East Fork | indirect | Dallas/Kaufman/Collin/ Rockwall | 0 | 34,900 | 15,100 | 0 | 0 | 0 |
| Tarrant County SEP | Tarrant County SEP | direct | Tarrant | 0 | 0 | 1,528 | 2,360 | 2,360 | 2,360 |
| TRA | Tarrant County Indirect Reuse | indirect | Tarrant | 0 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 |
| TRA | Dallas County Direct Reuse | direct | Dallas | 0 | 0 | 6,760 | 6,760 | 6,760 | 6,760 |

***** NOTE: Lists recommended reuse strategies for Region C and does not include existing reuse projects.
(a) County reflects location of reuse project.

**Table 6.6* (continued)**

| Provider | Project Name | Type | County [a] | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|
| TRA | Joe Pool Lake Indirect Reuse (New WWTP) | indirect | Dallas | 0 | 4,368 | 4,368 | 4,368 | 4,368 | 4,368 |
| TRA | Ellis County Direct Reuse | direct | Ellis | 0 | 0 | 0 | 0 | 0 | 2,200 |
| TRA | Freestone County Direct Reuse | indirect | Freestone | 0 | 0 | 0 | 0 | 6,760 | 6,760 |
| TRA | Kaufman County Direct Reuse | indirect | Kaufman | 0 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| TRA | Las Colinas Direct Reuse | direct | Dallas | 0 | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 |
| TRA | Tarrant and Denton Counties Direct Reuse | direct | Tarrant/ Denton | 0 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 |
| TRWD | Trinity River Indirect Reuse - Richland Chambers | indirect | Navarro | 0 | 53,000 | 53,000 | 53,000 | 53,000 | 53,000 |
| TRWD | Trinity River Indirect Reuse - Cedar Creek | indirect | Henderson/ Kaufman | 0 | 52,500 | 52,500 | 52,500 | 52,500 | 52,500 |
| UTRWD | Indirect Reuse of Lake Ralph Hall Water | indirect | Fannin | 0 | 6,810 | 13,620 | 20,430 | 20,430 | 20,430 |
| UTRWD | Direct Reuse | direct | Denton | 0 | 0 | 560 | 1,121 | 2,240 | 2,240 |
| Wise County Mining Reuse | Wise County Mining Reuse | direct | Wise | 0 | 14,133 | 22,428 | 19,652 | 24,648 | 28,520 |
| **Total** | | | | **1,937** | **257,036** | **275,628** | **276,688** | **292,539** | **300,574** |

* NOTE: Lists recommended reuse strategies for Region C and does not include existing reuse projects.

(a) County reflects location of reuse project.

**Table 6.7**
**Summary of Existing and Recommended Conservation (Including Reuse) for Region C**
- Values in Acre-Feet per Year –

| Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| ***Municipal Conservation*** | | | | | | |
| Low flow plumbing fixture rules [(a)] | 22,029 | 69,122 | 86,663 | 105,067 | 151,981 | 211,201 |
| Municipal Recommended Conservation | 46,690 | 106,835 | 151,586 | 192,720 | 235,718 | 284,916 |
| | | | | | | |
| ***Non-Municipal Conservation*** | | | | | | |
| Efficient new steam electric power plants | 3,262 | 7,824 | 14,545 | 26,725 | 43,403 | 65,619 |
| Non-Municipal conservation strategies [(b)] | 57 | 1,069 | 3,334 | 4,518 | 5,147 | 5,737 |
| | | | | | | |
| ***Reuse Strategies*** | | | | | | |
| Existing Reuse | 203,974 | 246,510 | 289,995 | 312,992 | 321,405 | 336,082 |
| Proposed Reuse Strategies | 1,937 | 257,036 | 275,628 | 276,688 | 292,539 | 300,574 |
| | | | | | | |
| **Total Conservation and Reuse** | 277,949 | 688,396 | 821,750 | 918,710 | 1,050,192 | 1,204,128 |
| | | | | | | |
| Total Region C Municipal Demands | 1,546,970 | 1,833,671 | 2,087,597 | 2,344,115 | 2,612,176 | 2,924,157 |
| Total Municipal Demand without Conservation | 1,572,261 | 1,910,617 | 2,188,805 | 2,475,907 | 2,807,560 | 3,200,977 |

a. The Total Region C Demands on the line above includes projected conservation savings from low flow plumbing fixtures and efficient new steam electric power plants. These savings were added to the Region C Demands to obtain “Total Demand without Conservation”, a projection of Region C’s demands if no conservation occurred.

b. Non-municipal water conservation measures include estimated conservation savings from manufacturing and irrigation rebates.

The 140 gpcd goal has no specific regulatory basis, and may not be appropriate for all entities based on differences in climatic conditions and other water use characteristics. However, since this number has been used in previous plans and is recognized statewide, it is used to provide a baseline for comparison in the discussion below.

This section of the report compares the per capita water use that would result from implementation of the 2011 Plan to the suggested voluntary goal of 140 gpcd.

## Region C Per Capita Municipal Water Use

This plan recommends significant conservation efforts and the development of substantial new supplies from reuse. Table 6.8 summarizes the projected per capita municipal water use for Region C with the implementation of the plan. As discussed previously, the TWDB demand estimates do not take into account the recent HB 2667, which mandates lower flow toilets by January 1, 2014. The additional estimated savings realized by this legislation is shown as a line item in both Table 6.8 and Table 6.9. Figure 6.3 is a graph of the data from Table 6.8. The figure and the table show the following:

- With no conservation or reuse at all, the projected dry-year per capita municipal water use in Region C is 212 gpcd in 2060.
- Implementation of the plumbing code requiring the use of low flow plumbing fixtures had already reduced the per capita use in Region C by 6 gpcd as of the year 2007. It is expected to reduce per capita use by another 8 gpcd, to a total of 14 gpcd, by 2060.
- The recommended water conservation measures in the 2011 Plan will reduce the projected 2060 per capita municipal use by an additional 20 gpcd, to 178 gpcd.
- The existing and recommended municipal water reuse projects will reduce the projected 2060 per capita municipal use by an additional 43 gpcd, to 135 gpcd.
- The projected normal year per capita use would be 10-15 percent lower than dry-year use, well under the recommended goal of 140 gpcd.
- Many of the recommended reuse projects in this plan are proposed for implementation between now and 2030, leading to a rapid reduction in per capita use in Region C after crediting for reuse.

## Region C Per Capita Municipal and Manufacturing Water Use

The Water Conservation Implementation Task Force recommended goal of 140 gpcd is based on potable water supplied to municipal retail customers. In Region C, manufacturers also use wholesale, self-supplied, and non-potable water. Therefore, the region-wide per capita use to be compared to the recommended goal of 140 gpcd will be between the region-wide per capita municipal use and the region-wide per capita municipal and manufacturing use.

Table 6.9 summarizes the projected per capita municipal and manufacturing water use for Region C with the implementation of this plan. Figure 6.4 is a graph of the data from Table 6.9. The figure and the table show the following:

- With no conservation or reuse at all, the projected per capita municipal and manufacturing water use in Region C would be 220 gpcd in 2060.
- Implementation of the plumbing code requiring the use of low flow plumbing fixtures had already reduced the per capita use in Region C by 8 gpcd as of the year 2007. It is expected to reduce per capita use by another 7 gpcd, to a total of 205 gpcd, by 2060.
- The recommended water conservation measures in the 2011 Plan will reduce the projected 2060 per capita municipal and manufacturing use by an additional 20 gpcd, to 185 gpcd.
- The existing and recommended water reuse projects will reduce the projected 2060 dry-year per capita municipal and manufacturing use by an additional 43 gpcd, to 142 gpcd.
- The projected normal year per capita use would be 10-15 percent lower than dry-year use, well under the recommended goal of 140 gpcd.

### *6.6 Water Conservation Policy Recommendations*

The Region C Water Planning Group policy recommendations are discussed in Chapter 8 and included in Appendix Y. Recommendations specific to water conservation and reuse, once collected and provided by the Region C Water Planning Group, will be summarized below for reference.

### *6.7 Model Water Conservation Plans*

Model water conservation plans have been developed for four different water user types: municipal, irrigation, manufacturing, and steam electric power. The model water conservation plans are presented in Appendix L. The model plans are designed to show the content required by the TCEQ, optional content suggested by the TCEQ, and optional content suggested by the Region C Water Planning Group (e.g., potentially feasible water conservation strategies). The model plans are intended to be a template that Region C water user groups can use as a starting point and customize to develop their own situation-specific water conservation plans.

## Table 6.8
## Projected Municipal Per Capita Use in Region C

| | Projections | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Basic Data** | | | | | | |
| Population | 6,670,493 | 7,971,728 | 9,171,650 | 10,399,038 | 11,645,686 | 13,045,592 |
| Municipal Demand without Low Flow Plumbing (Acre-feet) | 1,568,999 | 1,898,716 | 2,162,241 | 2,428,587 | 2,735,232 | 3,098,539 |
| Municipal Demand with Low Flow Plumbing (Acre-feet) | 1,546,970 | 1,833,671 | 2,087,597 | 2,344,115 | 2,612,176 | 2,924,157 |
| 1.28 gpf plumbing savings | 0 | 4,077 | 12,019 | 20,595 | 28,925 | 36,819 |
| Recommended Municipal Water Conservation (Acre-feet) | 46,690 | 106,835 | 151,586 | 192,720 | 235,718 | 284,916 |
| Current Municipal Reuse (Acre-feet) | 203,954 | 246,490 | 289,975 | 312,972 | 321,385 | 336,062 |
| Recommended Municipal Reuse (Acre-feet) | 1,937 | 257,036 | 275,628 | 276,688 | 292,539 | 300,574 |
| | | | | | | |
| **Per Capita Use (Gallons per Capita per Day)** | | | | | | |
| No Conservation or Reuse | 210 | 213 | 210 | 208 | 210 | 212 |
| With All Plumbing Codes | 207 | 205 | 202 | 199 | 198 | 198 |
| With Plumbing Code and Recommended Conservation | 201 | 193 | 187 | 183 | 180 | 178 |
| With Recommended Conservation and Reuse | 173 | 137 | 132 | 132 | 133 | 135 |
| Normal-Year Use (Assumed 12 Percent Lower than Dry-Year) | 155 | 122 | 118 | 118 | 119 | 120 |

## Figure 6.3
## Projected Municipal Per Capita Water Use in Region C

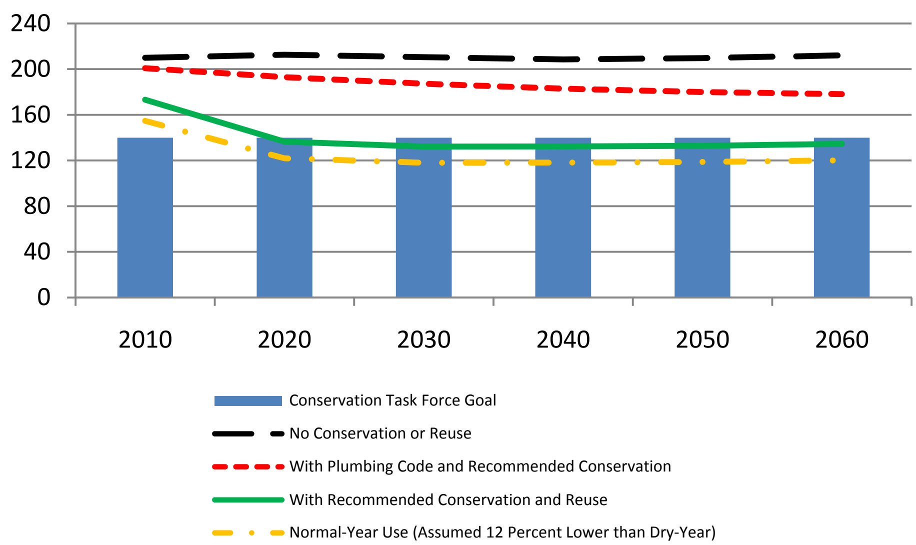
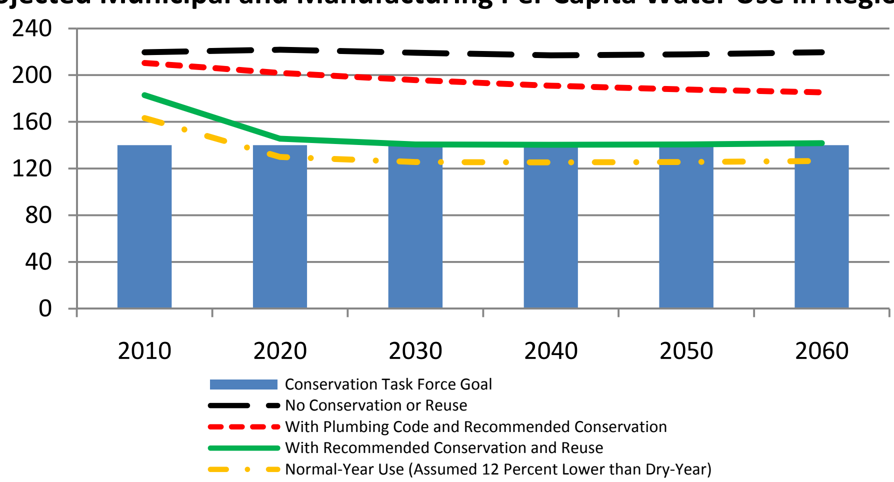


**Table 6.9**
**Projected Municipal and Manufacturing Per Capita Use in Region C**

| | Projections | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Basic Data** | | | | | | |
| Population | 6,670,493 | 7,971,728 | 9,171,650 | 10,399,038 | 11,645,686 | 13,045,592 |
| Municipal Demand without Low Flow Plumbing | 1,568,999 | 1,898,716 | 2,162,241 | 2,428,587 | 2,735,232 | 3,098,539 |
| Municipal Demand with Low Flow Plumbing | 1,546,970 | 1,833,671 | 2,087,597 | 2,344,115 | 2,612,176 | 2,924,157 |
| 1.28 gpf plumbing savings | 0 | 4,077 | 12,019 | 20,595 | 28,925 | 36,819 |
| Manufacturing Demand | 72,026 | 81,273 | 90,010 | 98,486 | 105,808 | 110,597 |
| Recommended Mun. and Man. Water Conservation | 46,747 | 107,904 | 154,920 | 197,238 | 240,865 | 290,653 |
| Current Municipal and Manufacturing Reuse | 203,974 | 246,510 | 289,995 | 312,992 | 321,405 | 336,082 |
| Recommended Municipal and Manufacturing Reuse | 1,937 | 257,036 | 275,628 | 276,688 | 292,539 | 300,574 |
| | | | | | | |
| **Per Capita Use (Gallons per Capita per Day)** | | | | | | |
| No Conservation or Reuse | 220 | 222 | 219 | 217 | 218 | 220 |
| With Plumbing Code | 217 | 214 | 211 | 208 | 206 | 205 |
| With Plumbing Code and Recommended Conservation | 210 | 202 | 196 | 191 | 188 | 185 |
| With Recommended Conservation and Reuse | 183 | 146 | 141 | 140 | 141 | 142 |
| Normal-Year Use (Assumed 12 Percent Lower than Dry-Year) | 163 | 130 | 126 | 125 | 126 | 127 |

a. Manufacturing water conservation measures include estimated conservation savings from manufacturing rebates.

**Figure 6.4**
**Projected Municipal and Manufacturing Per Capita Water Use in Region C**



## Who Must Develop a Water Conservation Plan

The TCEQ requires water conservation plans for all municipal, industrial, and mining water users with surface water rights of 1,000 acre-feet per year or more, all irrigation water users with surface water rights of 10,000 acre-feet per year or more, and all retail public utilities with 3,300 connections or more. The retail public utility requirement is an additional reporting requirement since the *2006 Region C Water Plan*. Water conservation plans are also required for all water users applying for a state water right and may also be required for entities seeking state funding for water supply projects. Water right information was collected to determine what changes have taken place since the *2006 Region C Water Plan*. A number of entities have applied for and/or secured the right to use their own return flows. Water conservation plans were required to be submitted to the Executive Director of the TCEQ by May 1, 2005 [10]. Then, water conservation plans were required to submit an updated water conservation plan to the TCEQ by May 1, 2009, and every five years after that date [10].

Table 6.10 lists estimated Region C entities that are required by TCEQ to develop a water conservation plan. The additional requirement that retail public utilities serving more than 3,300 connections submit water conservation plans adds approximately 71 new WUGs in Region C that are now required to develop water conservation plans. Connections for each WUG were estimated from proposed 2010 WUG populations and available WUG demographic (population per connection) data.

## Municipal Water Conservation Plan Requirements

The TCEQ requires the following minimum content in a municipal water conservation plan:

- Utility profile
- Specification of conservation goals
- Accurate metering
- Universal metering
- Determination and control of unaccounted-for water
- Public education and information program

**Table 6.10**
**Region C Water Users Required to Develop Water Conservation Plans**

| | | | |
|---|---|---|---|
| Addison | Allen | Arlington | Athens |
| Azle | Balch Springs | Bedford | Benbrook |
| Bethesda WSC | Bolivar WSC | Bonham | Carrollton |
| Cedar Hill | College Mound WSC | Colleyville | Coppell |
| Corinth | Corsicana | Crowley | Culleoka WSC |
| Dallas Water Utilities* | Denison* | Denton* | De Soto |
| Duncanville | East Cedar Creek FWSD | East Fork SUD | Ennis |
| Euless | Farmers Branch | Flower Mound | Forest Hill |
| Forney | Fort Worth* | Frisco | Gainesville* |
| Garland | Glenn Heights | Grand Prairie | Grapevine* |
| Haltom City | Highland Park | Highland Village | Hurst |
| Irving | Jacksboro* | Keller | Lancaster |
| Lewisville | Little Elm | Mansfield | McKinney |
| Mesquite | Midlothian | Mineral Wells* | Murphy |
| North Richland Hills | Plano | Red Oak | Richardson |
| Richland Hills | Roanoke | Rockett Sud | Rockwall |
| Rowlett | Royse City | Sachse | Saginaw |
| Sardis-Lone Elm WSC | Seagoville | Sherman | Southlake |
| Southwest Fannin County SUD | Terrell* | The Colony | University Park |
| Walnut Creek SUD | Watauga | Waxahachie | Weatherford* |
| West Cedar Creek MUD | White Settlement | Wylie | Dallas County Park Cities MUD* |
| Ellis County WCID No. 1* | Extex Laporte* | Go-Crete Inc.* | Greater Texoma Utility Authority* |
| Hanson Aggregates Central Inc.* | J-M Manufacturing Co. Inc.* | Lafarge Corporation* | North Texas MWD* |
| Red River Authority* | Tarrant Regional Water District* | Trinity River Authority* | TXU Electric Company* |
| Upper Trinity RWD | | | |

*Required in 2006 Water Plan [1]

- Non-promotional water rate structure
- Reservoir system operation plan
- Means of implementation and enforcement
- Coordination with regional water planning group.

In addition, the TCEQ requires additional minimum content for municipal entities that are projected to supply 5,000 people or more in the following 10 years:

- Leak detection, repair, and water loss accounting
- Record management system
- Requirement for water conservation plans by wholesale customers.

The TCEQ requires additional minimum content for municipal entities that currently supply 20,000 people:

- Landscape irrigation permitting, inspection and enforcement program

The TCEQ also suggests optional content for municipal water conservation plans:

- Conservation-oriented water rates
- Ordinances, plumbing codes or rules on water-conserving fixtures
- Programs for the replacement or retrofit of water-conserving plumbing fixtures in existing structures
- Reuse and recycling of wastewater
- Pressure control and/or reduction
- Landscape water management ordinance
- Monitoring methods
- Other conservation methods.

Finally, the Region C Water Planning Group suggests optional content consisting of the potentially feasible water conservation strategies that are not discussed elsewhere in the municipal water conservation plan:

- Residential customer water audit
- Water-efficient clothes washer rebate
- Landscape irrigation system rebate
- Industrial, commercial, and institutional (ICI) general rebate
- ICI water audit, water waste reduction, and site-specific water conservation program.

### Implementation of House Bill 1656

HB 1656 mandates that municipalities with populations of 20,000 or more implement a landscape irrigation permitting, inspection and enforcement program. Municipalities are required to adopt local ordinances or rules related to landscape irrigation that include minimum standards and specifications for designing, installing and operating irrigation systems, and requires a new type of license, an irrigation inspector.

North Central Texas Council of Governments (NCTCOG) formed a committee to convene local water utility staff and building code officials to develop a model ordinance template. The committee recommended that cities and water districts consider using the draft model ordinance and consider inclusion of the irrigation and conservation elements in their respective ordinances.  A copy of the model ordinance is found in Appendix L.

### Irrigation Water Conservation Plan Requirements

The TCEQ requires the following minimum content in an irrigation water conservation plan:

- Description of the irrigation production process
- Description of the irrigation method or system and equipment
- Accurate metering
- Specification of conservation goals
- Description of water-conserving irrigation equipment and application system
- Leak detection, repair, and water-loss control
- Irrigation timing and/or measuring the amount of water applied
- Land improvements for retaining or reducing runoff and increasing the infiltration of rain and irrigation water
- Tailwater recovery and reuse
- Other conservation practices, methods, or techniques.

### Manufacturing and Steam Electric Power Water Conservation Plan Requirements

The TCEQ requires the following minimum content in manufacturing or steam electric power water conservation plans:

- Water use in the production process
- Specification of conservation goals
- Accurate metering
- Leak detection, repair, and water-loss accounting
- Water use efficiency process and/or equipment upgrades

- Other conservation practices
- Review and update of plan.

### *6.8 Drought Management*

As described in Section 6.2, the Region C Water Planning Group decided not to recommend drought management measures as a water management strategy to provide additional supplies for Region C. The consensus of the planning group is that:

- Drought management and emergency response planning are intended to preserve water resources for the most essential uses when water supplies are threatened by an unexpected condition such as a multi-year drought, an unexpected increase in demands, or a water supply system component failure.
- Drought contingency and emergency response measures provide protection in the event of water supply shortages, but they are not a reliable source of additional supplies to meet growing demands. They provide a backup plan in case a supplier experiences a drought worse than the drought of record or if a water management strategy is incomplete when it is needed.

This section presents TCEQ requirements for drought contingency plans, reviews existing drought contingency plans, and summarizes model drought contingency plans.

#### Who Must Develop a Drought Contingency Plan

The TCEQ requires drought contingency plans for wholesale and retail public water suppliers and for irrigation districts. Drought contingency plans are also required for all water users applying for a state water right and may also be required for entities seeking state funding for water supply projects.

Wholesale public water suppliers, retail public water suppliers providing water service to 3,300 or more connections, and irrigation districts were required to prepare a drought contingency plan and submit it to the Executive Director of the TCEQ by May 1, 2005 [10]. These water suppliers were required to submit an updated drought contingency plan by May 1, 2009, and every five years after that date [10].

All retail public water suppliers were required to prepare and adopt a drought contingency plan and have it available for inspection by the Executive Director upon request by May 1, 2005 [10]. Thereafter, all retail public water suppliers were required to submit an updated drought contingency plan by May 1, 2009, and every five years after that date [10].

## Required Content for Drought Contingency Plans

Drought contingency plans typically identify different stages of drought and specific triggers and responses for each stage. In addition, a drought contingency plan must specify quantifiable targets for water use reductions for each stage, and a means and method for enforcement. As with the water conservation plans, drought contingency plans were to be updated and submitted to the TCEQ by May 1, 2005. Required content for different types of drought contingency plans is discussed below.

**Municipal.** The TCEQ requires the following minimum content in a municipal drought contingency plan:

- Provisions to inform the public and provide opportunity for public input
- Provisions for continuing public education and information
- Coordination with the regional water planning group
- Criteria for initiation and termination of drought stages
- Drought and emergency response stages
- Specific, quantified targets for water use reductions
- Water supply and demand management measures for each stage
- Procedures for initiation and termination of drought stages
- Procedures for granting variances
- Procedures for enforcement of mandatory restrictions
- Consultation with wholesale supplier
- Notification of implementation of mandatory measures
- Review and update of plan.

**Irrigation.** The TCEQ requires the following minimum content in an irrigation drought contingency plan:

- Provisions to inform the public and provide opportunity for public input
- Coordination with the regional water planning group
- Criteria for initiation and termination of drought stages

- Specific, quantified targets for water use reduction
- Procedures for determining the allocation of irrigation supplies to individual users
- Criteria for initiation and termination of drought stages
- Procedures for use accounting
- Procedures for the transfer of water allocations among individual users
- Procedures for enforcement of water allocation policies
- Consultation with wholesale supplier
- Protection of public water supplies
- Review and update of plan.

### Review of Existing Drought Contingency Plans

Regional water plans are required to include potential trigger conditions for drought and emergency response measures and potential measures to be taken for each water source in the region. Appendix L includes a summary of drought contingency and emergency management plans in Region C, including potential triggers and response measures.

### Model Drought Contingency Plans

Model drought contingency plans have been developed for municipal and irrigation water users. The TCEQ does not require drought contingency plans for manufacturing or steam electric power water users. The model drought contingency plans are shown as the last chapter in the municipal and irrigation water conservation plans presented in Appendix L. The model plans are designed to show the minimum content required by the TCEQ and are intended to be a template that Region C water user groups can use as a starting point and customize to develop their own situation-specific drought contingency plan. Each plan identifies four drought stages: mild, moderate, severe and emergency. The recommended responses range from notification of drought conditions and voluntary reductions in the "mild" stage to mandatory restrictions during an "emergency" stage. Individual entities will customize the trigger conditions for and the appropriate responses to the different stages.

### 6.9 Evaluation of Water Conservation and Drought Management Planning Requirements

As discussed in Section 6.1, the TWDB planning rules [11] require consideration of water conservation and drought management measures for various water user groups. Table 6.11 shows each requirement and documents that the requirements have been fulfilled.

### 6.10 Conservation Requirements for Interbasin Transfers of Water

Section 11.085 of the Texas Water Code includes permitting requirements for interbasin transfers of surface water. Section 11.085(l)(2) provides for an enhanced conservation standard for interbasin transfers, indicating that the Texas Commission on Environmental Quality (TCEQ) may grant a water right "to the extent that…the applicant for the interbasin transfer has prepared a drought contingency plan and has developed and implemented a water conservation plan that will result in the highest practicable levels of water conservation and efficiency achievable within the jurisdiction of the applicant." Section 11.1721(e) of the Water Code indicates that the Texas Water Development Board (TWDB) and the TCEQ should jointly "develop model water conservation programs for different types of water suppliers that suggest best management practices for achieving the highest practicable levels of water conservation and efficiency achievable for each specific type of water supplier." The TWDB and TCEQ have addressed this requirement by preparing TWDB Report 362, the *Water Conservation Best Management Practices Guide* [12].

For this report, the Region C Water Planning Group analyzed the applicability and appropriateness in Region C of the Best Management Practices suggested in the *Guide*. The Basic Water Conservation Package and the Enhanced Water Conservation Package recommended for Region C represent measures that can, collectively and/or individually, be implemented, provide long term water savings, provide a reasonable quantity of conservation at a reasonable coat, and be practicable for implementation in Region C.

The Basic Water Conservation Package was recommended for all suppliers with a per capita demand over 140 gallons per capita per day (gpcd) and a need for additional water supply. (Suppliers with a per capita demand of less than 140 gpcd were considered to have an effective conservation program in place.) The Basic Water Conservation Package includes:

**Table 6.11**
**Evaluation of Water Conservation and Drought Management Planning Requirements**

| Requirement | Evaluation | Fulfilled? |
|---|---|---|
| Incorporate information from first biennium study on conservation and reuse. | Information from the April 2009 *Water Conservation and Reuse Study* was used to supplement previous work from the *2006 Region C Water Plan*, the *Water Conservation Task Force Special Report* and the *Water Conservation Advisory Council Special Report* recommendations. References documenting the location and scope of additional information are included throughout the chapter as well as in the reference section. | Yes |
| Review and update model water conservation and drought contingency plans for up to four user categories. | Table 6.9 lists Region C entities that are required to develop a water conservation plan under Texas Water Code §11.1271. These entities include municipal water retailers, municipal water wholesalers, manufacturers, and steam electric power generators. Water conservation plans for municipal, irrigation, manufacturing/steam electric power and drought contingency plans for municipal and irrigation categories from the *2006 Region C Water Plan* have been reviewed and updated as necessary. Model plans have been consolidated into Appendix L. | Yes |
| Update the description of the recommended water conservation strategies for water user groups in Region C. | The basic conservation package is recommended for each municipal water user group, and the expanded conservation package is recommended for some municipal water user groups. In general water conservation practices were not recommended for water user groups that do not have a projected water need (with the exception of some municipal strategies that will occur without action from the water user group). Golf course conservation is recommended for each county that has a projected <u>irrigation</u> water need. There are no projected <u>livestock</u> water needs. The manufacturing general rebate strategy is recommended in each county with a projected <u>manufacturing</u> water need. The basic conservation package is recommended for each <u>municipal</u> water user group, and the expanded conservation package is recommended for some municipal water user groups. The projected <u>steam electric power</u> water demands include the assumption that new power plants will be more efficient than existing power plants. The recommended water conservation strategies were chosen from the potentially feasible water conservation strategies based on evaluation of quantity, cost, reliability, and other factors in comparison with other water supply alternatives. | Yes |
| Coordinate with the North Central Texas Council of Governments Water Resources subcommittee on implementation of House Bill 1656. | The North Central Texas Council of Governments has produced a model ordinance to address the requirements of HB 1656. This bill covers review and inspection of landscape irrigation systems by municipalities with populations greater than 20,000 people. A copy of the ordinance is included in Appendix L for reference. | Yes |

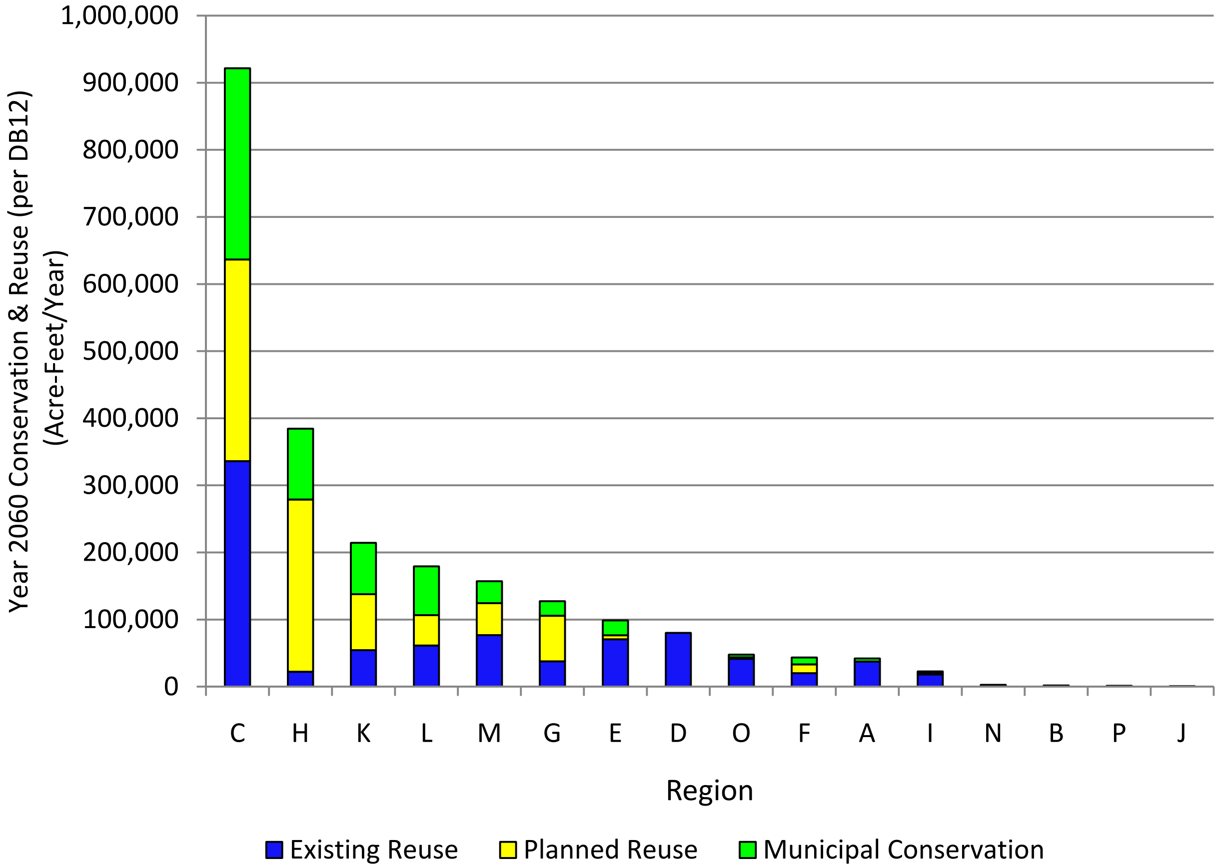
- Low flow plumbing fixture rules (required by state and federal law)
- Public and school education
- Water use reduction due to increasing water prices
- Water system audit, leak detection and repair, and pressure control
- New efficient residential clothes washer standards
- Water conservation pricing structure
- Water waste prohibition

The Expanded Water Conservation Package includes strategies that are more costly to implement and that demonstrate greater applicability for larger water user groups. The Expanded Water Conservation Package includes the Basic Water Conservation Package, plus:

- Coin-operated clothes washer rebate
- Residential customer water audit
- Landscape irrigation restrictions
- Industrial, commercial, and institutional (ICI) water audit, water waste reduction, and site-specific conservation program
- Reuse of treated wastewater effluent (if applicable for the specific supplier)

The measures in each package were studied at a regional level, and more detailed studies conducted for individual suppliers may indicate that some of these measures are not practicable for individual suppliers or that alternate strategies should be implemented. A careful review of the strategies laid out in the *Guide* (12), with emphasis on the strategies recommended for Region C, and adoption of the strategies that fit the individual supplier will provide for "the highest practicable levels of water conservation and efficiency achievable."Figure 6.5 demonstrates the size of the conservation and reuse programs already implemented by Region C water providers and recommended in the Region C Water Plan. With a quarter of the state's population, Region C has far more existing and proposed water reuse than any other region. Looking at conservation and reuse, Region C has by far the largest municipal conservation and reuse program planned in the state. The

**Figure 6.5**
**Conservation and Reuse in Regional Water Plans by Region**




conservation and reuse program outlined in this plan and being implemented by Region C water suppliers meets the requirements of Texas Water Code Section 11.085(l)(2).

### *6.11 Evaluation of Reuse Efforts in Region C*

During late 2009, a survey of Chapter 210 reuse providers and indirect reuse providers in Region C was conducted. A summary of information obtained from these surveys is included in Table 6.12.

Direct reuse systems that replace potable water result in immediate reductions in per capita potable water usage. The higher levels of reuse water usage experienced during drought periods also further aid in offsetting water supply requirements during these critical periods. The 2006 Region C Water Plan estimated that the direct reuse projects included in Table 6.12 would collectively provide 36,856 ac-ft/yr of water by the year

## Table 6.12
## Evaluation of Existing Water Reuse in Region C

| Sponsor | Project | Use | 2010 Estimate (2006 Plan) (ac-ft/yr) | 2010 Estimate (2011 Plan) (ac-ft/yr) | 2005 (ac-ft/yr) | 2006 (ac-ft/yr) | 2007 (ac-ft/yr) | 2008 (ac-ft/yr) |
|---|---|---|---|---|---|---|---|---|
| Azle | Cross Timbers | Golf Course Irrigation | 811 | 300 | 243 | 285 | 32 | 56 |
| ***Azle Direct Reuse Subtotal*** | | | ***811*** | ***300*** | ***243*** | ***285*** | ***32*** | ***56*** |
| Dallas | Cedar Crest | Golf Course Irrigation | 561 | 561 | 251 | 232 | 166 | N/A |
| ***Dallas Direct Reuse Subtotal*** | | | ***561*** | ***561*** | ***251*** | ***232*** | ***166*** | ***N/A*** |
| Denton | City of Garland | Steam Electric Power | 3,363 | 1,233 | 388 | 644 | 173 | 108 |
| Denton | Various | Irrigation | 6,165 | | 64 | 107 | 82 | 69 |
| Denton | Oakmont Country Club | Golf Course Irrigation | 800 | | 310 | 233 | 119 | 215 |
| ***Denton Direct Reuse Subtotal*** | | | ***10,328*** | ***1,233*** | ***762*** | ***984*** | ***373*** | ***393*** |
| Ennis | Tractabel | Steam Electric Power | 3,363 | 800 | 708 | 706 | 861 | N/A |
| ***Ennis Direct Reuse Subtotal*** | | | ***3,363*** | ***800*** | ***708*** | ***706*** | ***861*** | ***N/A*** |
| Frisco | Stewart Creek | Golf Course Irrigation | 307 | 307 | 320 | 357 | 258 | 108 |
| ***Frisco Direct Reuse Subtotal*** | | | ***307*** | ***307*** | ***320*** | ***357*** | ***258*** | ***108*** |
| Fort Worth | Waterchase Golf | Golf Course Irrigation | 897 | 897 | 438 | 594 | 305 | 449 |
| ***Fort Worth Direct Reuse Subtotal*** | | | ***897*** | ***897*** | ***438*** | ***594*** | ***305*** | ***449*** |
| Garland | Forney | Steam Electric Power | 8,979 | 8,979 | 6,523 | 8,016 | 7,998 | 7,910 |
| ***Garland Direct Reuse Subtotal*** | | | ***8,979*** | ***8,979*** | ***6,523*** | ***8,016*** | ***7,998*** | ***7,910*** |
| Gainesville | Keneteso Park | Irrigation | 9 | 9 | 1 | 1 | 4 | 4 |
| ***Gainesville Direct Reuse Subtotal*** | | | ***9*** | ***9*** | ***1*** | ***1*** | ***4*** | ***4*** |
| Grapevine | Peach St. WWTP | indirect reuse | 3,317 | 3,317 | 3,502 | 3,377 | 3,924 | 3,838 |
| ***Grapevine Indirect Reuse Subtotal*** | | | ***3,317*** | ***3,317*** | ***3,502*** | ***3,377*** | ***3,924*** | ***3,838*** |
| Lewisville | Castlehills Golf Course | Golf Course Irrigation | 897 | 897 | 383 | 379 | 210 | |
| ***Lewisville Direct Reuse Subtotal*** | | | ***897*** | ***897*** | ***383*** | ***379*** | ***210*** | ***0*** |
| NTMWD | Rowlett Creek | Golf Course Irrigation | 1,540 | 1,540 | 384 | 423 | 140 | 222 |
| NTMWD | Buffalo Creek | Golf Course Irrigation | 672 | 682 | 188 | 245 | 146 | 159 |
| NTMWD | Royse City | Golf Course Irrigation | 112 | 112 | 112 | 129 | 0 | 0 |
| ***NTMWD Direct Reuse Subtotal*** | | | ***2,324*** | ***2,324*** | ***684*** | ***797*** | ***286*** | ***381*** |
| NTMWD | Wilson Creek | indirect reuse | 71,882 | 50,000 | 39,856 | 43,933 | 50,104 | 42,831 |
| ***NTMWD Indirect Reuse Subtotal*** | | | ***71,882*** | ***50,000*** | ***39,856*** | ***43,933*** | ***50,104*** | ***42,831*** |
| TRA | Las Colinas | Irrigation | 8,000 | 8,000 | 1,684 | 2,192 | 227 | 1,757 |
| TRA | Ten Mile Creek | Irrigation | N/A | 250 | 42 | 46 | 13 | 36 |
| ***TRA Direct Reuse Subtotal*** | | | ***8,000*** | ***8,250*** | ***1,726*** | ***2,238*** | ***241*** | ***1,793*** |
| The Colony | Stonebriar Country Club | Golf Course Irrigation | 380 | 380 | 115 | 326 | 180 | N/A |
| ***The Colony Direct Reuse Subtotal*** | | | ***380*** | ***380*** | ***115*** | ***326*** | ***180*** | ***N/A*** |
| UTRWD | Lakeview Regional WRP | indirect reuse | 8,441 | 6,634 | 2,686 | 2,691 | 4,264 | 4,071 |
| UTRWD | Riverbend Regional WRP | indirect reuse | | | 404 | 583 | 924 | 934 |
| UTRWD | Peninsula Regional WRP | indirect reuse | | | 76 | 116 | 147 | 191 |
| UTRWD | Celina WWTP | indirect reuse | | | 330 | 305 | 513 | 418 |
| ***UTRWD Indirect Reuse Subtotal*** | | | ***8,441*** | ***6,634*** | ***3,496*** | ***3,695*** | ***5,849*** | ***5,614*** |
| **TOTAL** | | | **120,496** | **84,888** | **59,007** | **65,921** | **70,792** | **63,379** |

2010. The *2011 Region C Water Plan* estimates that the direct reuse projects included in Table 6.12 will collectively provide 24,937 ac-ft/yr of water by the year 2010. Over the course of the period evaluated here (2005-2008), these projects collectively provided anywhere from 10,000 to 14,000 acre-feet per year.

The *2006 Region C Water Plan* estimated that the indirect reuse projects included in Table 6.12 would collectively provide 83,640 acre-feet per year of water by the year 2010. The 2011 Region C Water Plan estimates that the indirect reuse projects included in Table 6.12 will collectively provide 59,951 acre-feet per year of water by the year 2010. Over the course of the period evaluated here (2005-2008), these projects collectively provided anywhere from 46,000 to 59,000 acre-feet per year.

The primary obstacles hindering the growth of direct reuse systems in Region C are the initial capital costs required to build the necessary infrastructure and securing new customers. The primary obstacles hindering the growth of indirect reuse systems in Region C are the acquisition or amendment of water rights and development of conveyance systems, particularly within very urbanized areas. In order to continue advancing reuse systems within the region, continued emphasis will need to be placed on identifying means for financing these systems.

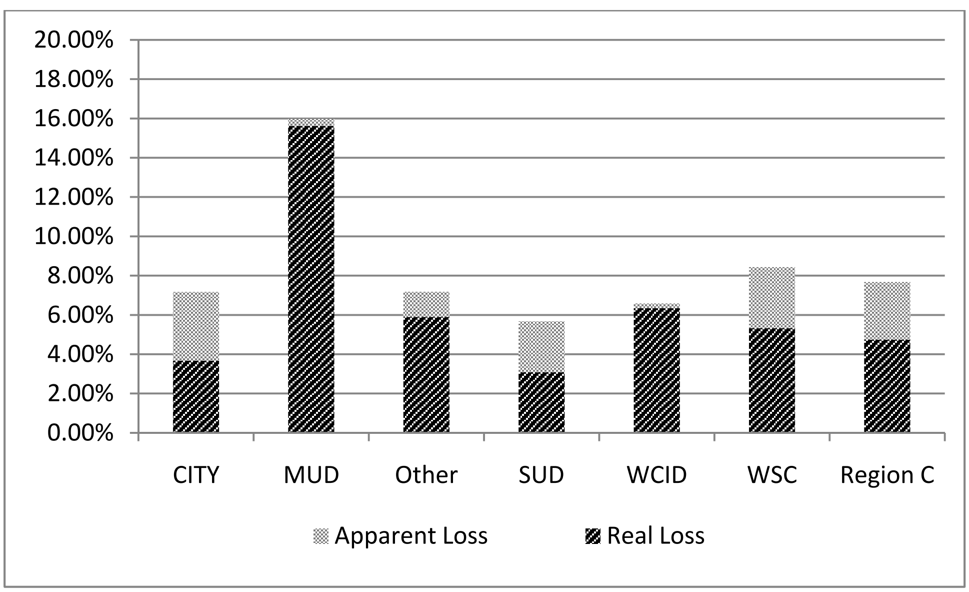
### *6.12 Water Loss and Water Audit*

Since the previous round of regional planning, retail public water utilities are now required to complete and submit a water loss audit form to the TWDB every five years. The first water loss audit reports were submitted to the TWDB by March 31, 2006. The data from these reports were compiled by Alan Plummer Associates Inc. through a research and planning fund grant from TWDB [13]. The water audit reporting requirements follow the International Water Association (IWA) and American Water Works Association (AWWA) Water Loss Control Committee methodology.

The primary purposes of a water audit loss are to account for all of the water being used and to identify potential areas where water can be saved. Water audits track multiple sources of water loss that are commonly described as apparent loss and real loss. Apparent loss is the paper loss of water. It includes losses associated with customer meters underregistering, billing adjustment and waivers, and unauthorized consumption. Real loss is the actual water loss of water from the system, and includes main breaks and leaks, customer service line breaks and leaks, and storage overflows. The sum of the apparent loss and the real loss make up the total water loss for a utility.

In Region C, 234 public water suppliers submitted a water loss audit to TWDB. The breakdown of the public water suppliers are 98 cities, 89 water supply corporations, seven special utility districts, two water control and improvement districts, two municipal utility districts and 36 other water suppliers. The total percentage water loss was calculated for each water supplier using a corrected input volume (The corrected input volume is water delivered divided by master meter accuracy, this represents the actual amount of water that was delivered to the utility.). Figure 6.6 shows the percentage of total water loss for the region, cities, water supply corporations, special utility districts, water control and improvement districts, municipal utility districts and other water suppliers.

**Figure 6.6**
**Percentage of Total Water Loss in Region C**




On a regional basis, the percentage of total water loss for Region C is 7.68 percent. The amount of total water loss for cities, water supply corporations, special utility districts, water control and improvement districts and other water suppliers is within the range of acceptable water loss (less than or equal to twelve percent). The amount of total water loss as a percent of corrected input volume for the municipal utility district suppliers is much higher. One explanation for this is the low density of service connections per mile of main line for municipal utility district suppliers. Table 6.13 shows the ratio of the number of connections per mile of main line by category.

**Table 6.13**
**Service Connections per Mile of Water Main in Region C**

| Category | Service Connections/Mile |
|---|---|
| Region C | 51.32 |
| City | 68.60 |
| MUD | 6.20 |
| Other | 39.73 |
| SUD | 11.00 |
| WCID | 10.75 |
| WSC | 9.67 |

The amount of real losses in Region C from the 227 public water suppliers totaled 10.65 billion gallons in 2005. This represents 2.7 percent of the total 2005 municipal water use for the region. Based on these findings, the region is adequately addressing municipal water loss.

# CHAPTER 6
# LIST OF REFERENCES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# 7. Description of How the Regional Water Plan is Consistent with Long-Term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources

## 7.1 Introduction

The development of viable strategies to meet the demand for water is the primary focus of regional water planning. However, another important goal of water planning is the long-term protection of resources that contribute to water availability and to the quality of life in the state. The purpose of this chapter is to describe how the *2011 Region C Water Plan* is consistent with the long-term protection of the state's water resources, agricultural resources, and natural resources. The requirement to evaluate the consistency of the regional water plan with protection of resources is found in 31 TAC Chapter 357.14(2)(C) [(1)], which states, in part:

> "The regional water plan is consistent with the guidance principles if it is developed in accordance with §358.3 of this title (relating to Guidelines), §357.5 of this title (relating to Guidelines for Development of Regional Water Plans), §357.7 of this title (relating to Regional Water Plan Development), §357.8 of this title (relating to Ecologically Unique River and Stream Segments), and §357.9 of this title (relating to Unique Sites for Reservoir Construction)."

Chapter 7 provides a general description of how the Region C plan is consistent with protection of water resources, agricultural resources, and natural resources. This chapter also specifically addresses the consistency of the *2011 Region C Water Plan* with the state's water planning requirements.

## 7.2 Consistency with the Protection of Water Resources

Five river basins provide surface water for Region C, and six aquifers provide groundwater to the region. The four major river basins within Region C boundaries are the Trinity River Basin, the Red River Basin, the Brazos River Basin, and the Sabine River Basin. Only a small portion of the Sulphur River Basin lies within the Region C boundaries, but this basin provides important surface water supplies for Region C from Chapman Lake. These river basins are depicted on Figure I.1, in Chapter 1. The region's groundwater resources include two major aquifers, the Trinity and Carrizo-Wilcox, and three minor aquifers, the Woodbine, the Nacatoch, and the Queen City. The extents of these aquifers within the region are depicted on Figures 1.7 and 1.8 in Chapter 1.

The Trinity River Basin provides the largest amount of water supply in Region C. Surface reservoirs in the Trinity Basin in Region C with conservation storage over 50,000 acre-feet include:

- Lake Bridgeport
- Eagle Mountain Lake
- Lake Worth
- Lake Weatherford
- Benbrook Lake
- Lake Arlington
- Joe Pool Lake
- Grapevine Lake
- Ray Roberts Lake
- Lewisville Lake
- Lake Lavon
- Lake Ray Hubbard
- Bardwell Lake
- Lake Waxahachie
- Terrell Lake
- Navarro Mills Lake
- Richland-Chambers Reservoir
- Cedar Creek Reservoir
- Lake Fairfield

Other major reservoirs supplying surface water to Region C include the following:

- Lake Texoma in the Red River Basin.
- Only a small portion of the Sabine River Basin lies within Region C; however, Region C receives water from two major water supply reservoirs located in Region D and the Sabine Basin (Lake Tawakoni and Lake Fork Reservoir).
- Only small portions of the Brazos River Basin lie within Region C, and no Brazos River Basin reservoirs with conservation storage over 50,000 acre-feet are located in Region C.
- Chapman Lake is located in the Sulphur River Basin in Region D and provides water supply to Region C.
- Lake Palestine is already permitted for use in Region C, but is located in the Neches River Basin in Region I.

Of the groundwater resources in Region C, the Trinity aquifer provides about 71 percent of the region's groundwater, and about 17 percent comes from the Woodbine aquifer. The remainder of the groundwater is from the Carrizo-Wilcox (9 percent), the Nacatoch (less than 1 percent), the Queen City (less than 1 percent), and undifferentiated/other aquifers (2 percent).

To be consistent with the long-term protection of water resources, the plan must recommend strategies that minimize threats to the region's sources of water over the planning period. The water management strategies identified in Chapter 4 were evaluated for threats to water resources. The state-developed surface Water Availability Models (WAMs) and Groundwater Availability Models (GAMs) were used to evaluate surface water and groundwater supplies, respectively. The results from these models were used to determine the amount of water supply that could be allocated while still protecting the sustainability of the water resources. The recommended strategies represent a comprehensive plan for meeting the needs of the region while effectively minimizing threats to water resources.

Descriptions of the major strategies and the ways in which they minimize threats include the following:

- *Water Conservation*. Strategies for water conservation have been recommended that will significantly reduce the demand for water, thereby reducing the impact on the region's groundwater and surface water sources. Not including reuse, water conservation practices are expected to reduce the water use in Region C by 567,473 acre-feet per year by 2060, reducing impacts on both groundwater and surface water resources (Table 6.7).
- *Reuse Projects*. Existing and recommended reuse projects in Region C account for a total water supply of 636,656 acre-feet per year as of 2060 (Table 6.7). The majority of the recommended reuse is for municipal use. A portion of the reuse water is for golf course and general irrigation in municipal areas and for steam electric power generation. These strategies will provide an economical and environmentally desirable source of water for Region C and delay the need for development of new water supplies.
- *Conservation and Reuse*. Conservation strategies and water reuse in Region C will account for 1,204,129 acre-feet per year in 2060, including the TWDB conservation measures. This is 37 percent of the region's total demand.
- *Full Utilization of Existing Surface Supplies Committed to Region C*. A number of recommended strategies for Region C are intended to make full use of existing supplies. Most reservoirs in Region C will be utilized at or near their firm yield capacities but not beyond, thus protecting these reservoirs and allowing the continued water supplies throughout a drought similar to the drought of record. In addition, by fully utilizing the existing water supplies, water providers will delay the need for new supplies.
- *Investigation of Existing Supplies Not Committed To Region C.* As part of this planning process, the Region C Water Planning Group investigated the cost and availability of existing water supplies that might be made available to Region C. Cost-effective existing supplies are included in the *2011 Region C Water Plan*.

- *Optimal Use of Groundwater*. This strategy is recommended for entities with limited alternative sources and sufficient groundwater supplies to meet their needs. Groundwater availability reported in the plan is the long-term sustainability of the aquifer, and is based on aquifer recharge. In a few instances, over-drafting is recommended in limited areas where no other alternatives are available until after 2010. By 2020, the recommended plan calls for groundwater use at a sustainable level, thus maintaining the long-term sustainability of the aquifers.
- *New Surface Reservoirs*. A number of new surface reservoirs have been recommended as water management strategies. They include: Lower Bois d'Arc Creek Reservoir in 2020, Lake Ralph Hall in 2020 and Marvin Nichols Reservoir in 2030. Lake Tehuacana has been under consideration as an alternate management strategy for future supply. These reservoirs will have significant impacts on the land, homes, and habitat that will be inundated and on the existing stream segments which will be altered. As part of reservoir development, the Corps of Engineers will determine the quantity of land that should be set aside to mitigate for impacts to aquatic and wildlife habitats. Landowners within the reservoir sites will be compensated for their land. These new reservoirs will make releases for environmental water needs in accordance with environmental regulations and permit conditions, which will help sustain aquatic and wildlife habitat downstream from the reservoir. Water right permits for these reservoirs will be granted based on results from the WAMs which will ensure that these new water rights do not interfere with existing prior water rights, thus protecting existing water resources of the state.

## 7.3 Consistency with Protection of Agricultural Resources

Many areas of Region C are heavily urbanized, and the region has comparatively little irrigated agriculture. In the year 2006, 3.6 percent of the Region’s total water use was for irrigation and livestock, as shown in Table 1.7. None of the recommended water management strategies involve transferring water rights from agricultural use to another use. Thus, the Region C plan protects current agricultural water use.

The proposed reservoirs in the *2011 Region C Water Plan* will inundate some agricultural areas, but agricultural use in the reservoir sites is limited. The proposed reservoirs located in Region C include Lower Bois d’Arc Creek Lake, Lake Ralph Hall and Lake Tehuacana. Very little agricultural activity exists in the area of these proposed reservoirs. During the permitting process, site specific analyses would address this topic in more detail.

The proposed Marvin Nichols Reservoir in the Region C Plan is located outside of Region C. The area of the proposed Marvin Nichol Reservoir site has some agricultural activity, including cattle raising. This area is also known to have some hunting leases for game animals.

## *7.4 Consistency with Protection of Natural Resources*

Region C contains many natural resources that must be considered in water planning. Natural resources include threatened or endangered species; local, state and federal parks and public land; and energy/mineral reserves. The Region C plan is consistent with the long-term protection of these resources. A brief discussion of consistency of the plan with protection of natural resources follows.

### Threatened/Endangered Species

A list of threatened or endangered species located within Region C is contained in two tables in Chapter 1. Table 1.29 presents the Federal Endangered or Threatened Species in Region C, and Table 1.30 lists the State Species of Special Concern in Region C. According to the Texas Parks and Wildlife Department's listing [(2)], there are 12 endangered species and 19 threatened species whose habitats are located in Region C counties. According to the Federal Listing from the U.S. Fish and Wildlife Service [(3)], there are 7 endangered species and 2 threatened species whose habitats are located in Region C counties.

All recommended strategies in Region C have been chosen with the possible effects on these threatened and endangered species in mind. For example, strategies that are likely to disturb threatened or endangered species habitat include mitigation allowances that set aside additional land for that habitat.

### Wetland Habitats

The Region C plan includes some projects that would have impacts to existing wetland habitats. The Marvin Nichols Reservoir project would inundate a portion of the state's Priority 1 bottomland hardwoods. These wetlands are considered high value to key waterfowl species and would require comparable mitigation. As discussed in Section 7.2, state and federal agencies will determine the quantity of land that should be set aside to mitigate for impacts to aquatic and wildlife habitats during reservoir development. The quantity and quality of the mitigation lands will be designed to achieve no net loss of wetlands functions and values. In addition, the development of a lake will create new wetland and aquatic habitats.

### Parks and Public Lands

The Texas Parks and Wildlife Department operates several state parks in Region C listed below: (4)

- Bonham State Park in Fannin County
- Cedar Hill State Park in Dallas County
- Eisenhower State Park in Grayson County
- Fairfield Lake State Park in Freestone County
- Lake Mineral Wells State Park in Parker County
- Fort Richardson & Lost Creek Reservoir State Park in Jack County
- Purtis Creek State Park partially in Henderson County
- Caddo National Grasslands Wildlife Management Area in Fannin County
- Ray Roberts State Park in Cooke, Denton, and Grayson Counties
- Richland Creek Wildlife Management Area in Freestone and Navarro Counties
- Ray Roberts Lake Wildlife Management Area in Cooke, Denton, and Grayson Counties
- Cedar Creek Islands Wildlife Management Area in Henderson and Kaufman Counties.

Federal government natural resource holdings in Region C include the following:

- Parks and other land around all of the Corps of Engineers lakes in the region (Texoma, Ray Roberts, Lewisville, Lavon, Grapevine, Benbrook, Joe Pool, Bardwell, and Navarro Mills)
- Hagerman National Wildlife Refuge on the shore of Lake Texoma in Grayson County
- Lyndon B. Johnson National Grasslands in Wise County.
- The Caddo National Grasslands WMA in Fannin County.

In addition, there are a number of city parks, recreational facilities, and public lands located throughout the region.

Increased utilization of some reservoirs may lower the lake levels during a severe drought. This may affect the parks and public lands surrounding these reservoirs, but the strategies recommended in the Region C plan will have no additional impact on these water resources beyond what has already been allowed for in their water right permits. None of the recommended water management strategies evaluated for the Region C plan is expected to adversely impact parks or public lands.

### Energy Reserves

Oil and natural gas fields are important natural resources in portions of Region C. Most of the oil production is in Jack, Wise, Cooke, Navarro, and Grayson Counties [5], and most of the natural gas production is in Freestone, Parker, Denton, Jack, Tarrant, and Wise Counties[6]. Gas production in the Barnett Shale has rapidly increased in the past decade due in large part to improvements in hydraulic fracture stimulation technologies [7]. This use of water in gas production has significantly increased the mining use in Region C. In addition, there are some lignite coal resources in Region C [8], the most significant of which is used to supply TXU Electric's Big Brown Steam Electric Station on Lake Fairfield. None of the recommended water management strategies are expected to impact oil, gas, or coal production in the region.

## 7.5 Consistency with Protection of Navigation

No commercial navigation activities occur in Region C at this time. For the two river segments identified by the Corps of Engineers as "navigable waters" (Trinity River downstream of Fort Worth and the Red River downstream of Warren's Bend in Cooke County), there are no known plans to initiate navigation activities. This plan has no impact to navigation in Region C.

The Region C recommended strategies also do not impact navigation activities in other regions. Analysis of the proposed reuse projects found that there are limited impacts to stream flows from reuse projects, thus protecting potential downstream navigation activities. The recommended reservoir located in adjacent regions (Marvin Nichols Reservoir) includes sufficient releases that would protect instream uses and downstream navigation activities.

## 7.6 Consistency with State Water Planning Guidelines

To be considered consistent with long-term protection of the state's water, agricultural, and natural resources, the Region C plan must be determined to be in compliance with the following regulations [1, 9]:

- 31 TAC Chapter 358.3
- 31 TAC Chapter 357.5
- 31 TAC Chapter 357.7
- 31 TAC Chapter 357.8
- 31 TAC Chapter 357.9

The information, data, evaluation, and recommendations included in Chapters 1 through 6 and Chapter 8 of the Region C plan collectively comply with these regulations.

## CHAPTER 7
## LIST OF REFERENCES

(1) Texas Water Development Board: *Chapter 357, Regional Water Planning Guidelines*, Austin, October 1999, amended February 18, 2008.

(2) Texas Parks and Wildlife Department, Wildlife Division, Diversity and Habitat Assessment Programs: *County Lists of Texas' Special Species. Region C Counties*, January 20, 2009.

(3) U.S. Fish and Wildlife Service: *Listed Species Information Center*, [Online], Available URL: http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm, January 2008.

(4) Texas Parks and Wildlife Department: State Parks and Destinations, [Online], Available URL : http://www.tpwd.state.tx.us/ , February, 2010.

(5) Texas Railroad Commission: Well Distribution by County, Oil Well Counts, Austin, [Online], Available URL : http://www.rrc.state.tx.us/data/wells/wellcount/oilwellct_0210.pdf , February 2010.

(6) Texas Railroad Commission: Well Distribution by County, Gas Well Counts, Austin, [Online], Available URL: http://www.rrc.state.tx.us/data/wells/wellcount/gaswellct_0210.pdf , February 2010.

(7) R.W. Harden & Associates, Inc, Freese & Nichols, Inc, Bureau of Economic Geology: *Northern Trinity/Woodbine GAM, Assessment of Groundwater Use in the Northern Trinity Aquifer Due to Urban Growth and Barnett Shale Development*, Austin, January 2007.

(8) Texas Railroad Commission: Maps, Coal Mining Locations, Austin, [Online], Available URL: http://www.rrc.state.tx.us/programs/mining/TxCoaLst.pdf , October 27, 2008.

(9) Texas Water Development Board: *Chapter 358, State Water Planning Guidelines*, Austin, October 1999, amended December 6, 2004.

# 8. Unique Stream Segments, Unique Reservoir Sites, and Legislative Recommendations

Regional Water Planning Guidelines, Title 31, Part 10, Chapter 357 of the Texas Administrative Code, call for regional water planning groups to make recommendations regarding ecologically unique river and stream segments; unique sites for reservoir construction; and regulatory, administrative, or legislative actions that will facilitate the orderly development, management, and conservation of water resources. Recommendations of the Region C Water Planning Group and the reasons for them are presented in this section in the following order:

- Summary of recommendations
- Recommendations for ecologically unique river and stream segments
- Recommendations for unique sites for reservoir construction
- Policy and legislative recommendations.

## *8.1 Summary of Recommendations*

### Recommendations for Ecologically Unique River and Stream Segments

- Convene a working group comprised of representatives of TWDB, TPWD, TCEQ, and the sixteen regions to bring clarity, purpose, and direction to the legislative mandate to "identify river and stream segments of unique ecological value."

### Recommendations for Unique Sites for Reservoir Construction

- Retain recommendations from the *2006 Region C Water Plan* for these reservoir sites:
  - Ralph Hall
  - Lower Bois d'Arc Creek
  - Marvin Nichols
  - Tehuacana
  - (Muenster Lake, also recommended in the 2006 plan, has been completed and is in operation.)
- Encourage affirmative votes by sponsors of these five proposed reservoirs to make expenditures necessary to construct or apply for required permits and avoid termination of unique reservoir site designations on September 1, 2015.

### Policy and Legislative Recommendations

- Senate Bill One Planning Process
  - Encourage formation of a Working Group on Stream Segments of Unique Ecological Value
  - Support Water Conservation Task Force Recommendations regarding target for water conservation
  - Allow waivers of plan amendments for entities with small strategies.
  - Coordination between TWDB and TCEQ to determine the appropriate data and tools for use in regional water planning.
- TCEQ Policy and Water Rights
  - Legislature should remove some of the unnecessary barriers to interbasin transfers.
  - Water code should be changed to exempt certain water right permits from cancellation for non-use.
- State Funding and Water Supply Programs
  - Continue and expand State Funding for TWDB loans and State Participation Program.
  - More State Funding for water conservation efforts.
  - State Funding for reservoir site acquisition.
  - Consider alternative financing for large projects.
  - Adequate funding of Groundwater Conservation Districts
  - Funding for NRCS Structures
- Water Reuse and Desalination
  - Support research to advance reuse and desalination
  - Funding assistance for desalination and reuse projects.
- State and Federal Program – Water Supply Issues
  - Continued and increased State support for efforts to develop water supplies from Oklahoma.
  - Oversight of Groundwater Conservation District rule making.
  - Revise Federal Section 361(b) regulations on power plant cooling water.

## 8.2 Recommendations for Ecologically Unique River and Stream Segments

Texas Parks and Wildlife Department (TPWD) recommendations for 10 ecologically unique river and stream segments in Region C were published in *Ecologically Significant River and Stream Segments of Region C, April 2002.* These 10 river and stream segments, along with the attributes that TPWD deemed qualifying for unique status, are listed in Table 8.1. The segments are also depicted in red in Figure 8.1. However, in the 2001 *Region C Water Plan*, and again in the *2006 Region C Water Plan*, the Region C Water Planning Group decided not to recommend any river or stream segments as ecologically unique because of unresolved concerns regarding the implications of such designation. Through passage of Senate Bill 675, the Texas Legislature has clarified that the only intended effect of the designation of a unique stream segment is to prevent the development of a reservoir on the designated segment by a political subdivision of the state. However, the Texas Water Development Board regulations governing regional water planning require analysis of the impacts of water management strategies on unique stream segments which implies a level of protection beyond the mere prevention of reservoir development.

In preparing for the *2011 Region C Water Plan*, the Region C Water Planning Group reviewed the 2006 recommendations of the other regional planning groups and directed its consultants to take the following actions with regard to ecologically unique river and stream segments:

- Develop scenarios of concern
- Meet with state agencies
- Review previously identified segments
- Consider additional segments
- Present possible candidate segments to the Region C Water Planning Group
- Receive comments
- Recommend action

The potential scenarios of concern involve the following features which could be located within, upstream, or downstream of a designated segment:

- Dams
- Pipeline crossings
- Water intakes
- New water outfalls
- Treated effluent outfalls

- Constructed wetlands
- Bed and banks transport of reservoir releases

These potential scenarios of concern were addressed by Region C consultants in a meeting with staffs of the Texas Water Development Board, Texas Parks and Wildlife Department, and Texas Commission on Environmental Quality (TCEQ) in August 2009. Ecologically unique river and stream segment legislation (Title 2, Chapter 16 of the Texas Water Code) and agency rules (Title 31, Part 10, Chapter 357 of the Texas Administrative Code) were also reviewed at the meeting. Conclusions from this meeting were as follows:

- TPWD plans no updates to its *Ecologically Significant River and Stream Segments of Region C, April 2002*. This report was summarized in Appendix W of the *2006 Region C Water Plan*.
- TPWD and TWDB staffs believe that ecologically unique river and stream segment legislation only impacts public financing of reservoirs.
- TCEQ staff position is to use all available information to regulate attributes of river and stream segments without regard to ecologically unique designation.
- Ecologically unique river and stream segment designation may influence public opinion.
- Ecologically unique river and stream segment legislation has not been tested in the courts.
- A statewide TWDB/TPWD/TCEQ/RWPG working group could help address concerns.

The Region C Water Planning Group recommends the formation of a working group comprised of representatives of TWDB, TPWD, TCEQ, and the sixteen water planning regions to bring clarity, purpose, and direction to the legislative mandate to "identify river and stream segments of unique ecological value. " Specifically, it is expected that the working group would:

- Research, verify, and publicize the intent of ecologically unique river and stream segment legislation.
- Research agency rules and recommend changes or clarifications where needed.
- Ensure common understanding of "reservoir" as used in ecologically unique river and stream segment legislation and agency rules.
- Identify the lateral extent of ecologically unique river and stream segment designation.
- Seek clarification of quantitative assessment of impacts on ecologically unique river and stream segments.

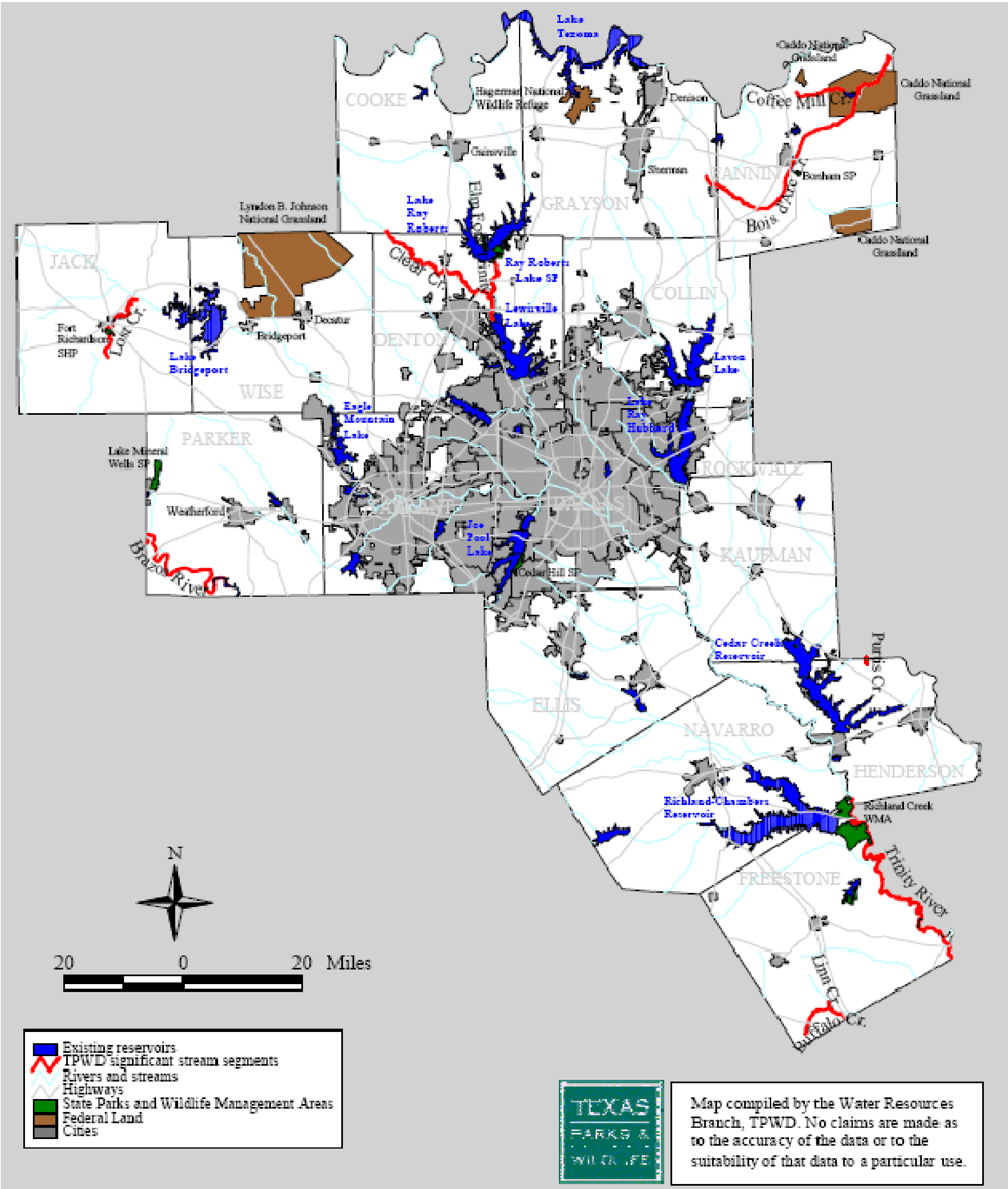
**Table 8.1**
**Texas Parks and Wildlife Department Recommendations for Designation as Ecologically Unique River and Stream Segments from *Ecologically Significant River and Stream Segments of Region C, April 2002* (2)**

| River or Stream Segment | Description | Basin | County | TPWD Reasons for Designation [a] | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Biological Function | Hydro-logic Function | Riparian Conservation Area | High Water Quality/ Aesthetic Value | Endangered Species/ Unique Communities |
| Bois d'Arc Creek | Entire length | Red | Fannin | X | X | X | | |
| Brazos River | Parker/Palo Pinto Co. line to F.M. 2580 | Brazos | Parker | X | | | X | X |
| Buffalo Creek | Alligator Ck.-S.H. 164 | Trinity | Freestone | X | X | | | |
| Clear Creek | Denton/Cooke Co. line to Elm Fork Trinity R. | Trinity | Denton | | | | X | |
| Coffee Mill Creek | Entire length | Red | Fannin | | | X | | |
| Elm Fork of Trinity River | Headwaters of Lewisville Lake to Lake Ray Roberts Dam | Trinity | Denton | | | X | | |
| Linn Creek | Buffalo Ck. – C.R. 691 | Trinity | Freestone | X | X | | | |
| Lost Creek | Entire length | Trinity | Jack | | | X | X | |
| Purtis Creek | S. Twin Ck. to Henderson Co. line | Trinity | Henderso n | | | X | | |
| Trinity River | Freestone/Leon to Henderson/Anderson Co. line | Trinity | Freestone /Anderson | X | | X | | X |

Note: a. The criteria listed are from Texas Administration Code Section 357.8. The Texas Parks and Wildlife Department feels that their recommended stream reaches meet those criteria marked with an X.

**Figure 8.1**

**Texas Parks and Wildlife Department Recommendations for Designation as Ecologically Unique River and Stream Segments from *Ecologically Significant River and Stream Segments of Region C, April 2002* (2)**



- Illustrate the value of ecologically unique river and stream segment designations.

### 8.3 Recommendations for Unique Sites for Reservoir Construction

In the *2006 Region C Water Plan*, the Region C Water Planning Group recommended designation of the following six unique sites for reservoir development:

- Muenster site on Brushy Elm Creek in Cooke County
- Ralph Hall site on the North Sulphur River in Fannin County
- Lower Bois d'Arc Creek (formerly called New Bonham) site on Bois d'Arc Creek in Fannin County
- Marvin Nichols site on the Sulphur River in Red River, Titus, and Franklin counties
- Fastrill site on the Neches River in Anderson and Cherokee counties
- Tehuacana site on Tehuacana Creek in Freestone County.

These six sites were subsequently recommended in the *2007 State Water Plan* and designated by the Legislature in Senate Bill 3 as unique reservoir sites necessary to meet water supply needs.

**Muenster Lake** was constructed on Brushy Elm Creek in Cooke County by the Muenster Water District and the USDA Natural Resources Conservation Service in 2005 and 2006, was filled in June 2007, and is now in operation. The reservoir impounds 4,700 acre-feet and is permitted for diversion of 500 acre-feet per year for municipal use. It floods 418 acres at the top of conservation storage. Water is supplied to the City of Muenster and other customers of the Muenster Water District in Cooke County.

**Lake Ralph Hall** would be located on the North Sulphur River in southeast Fannin County, north of Ladonia. The reservoir would yield 34,050 acre-feet per year and would flood 7,236 acres. Lake Ralph Hall is a recommended water management strategy for the Upper Trinity Regional Water District. The proposed lake would provide water to southeast Fannin County residents, as well as to customers of the Upper Trinity Regional Water District in the Denton County area.

**Lower Bois d'Arc Creek Reservoir** would be located on Bois d'Arc Creek in Fannin County, immediately upstream from the Caddo National Grassland. The proposed reservoir would yield 123,000 acre-feet per year and would flood 16,400 acres. The North Texas Municipal Water District would be the primary developer of lower Bois d'Arc Creek

Reservoir. The proposed reservoir would provide water to potential customers in Fannin County in addition to existing customers of the North Texas Municipal Water District.

**Marvin Nichols Reservoir** would be located on the Sulphur River upstream from its confluence with White Oak Creek. The dam would be in Titus and Red River counties and would also impound water in Franklin County. The proposed reservoir would yield 612,300 acre-feet per year (assuming Lake Ralph Hall is senior and Marvin Nichols Reservoir, site 1A, is operated as a system with Wright Patman Lake) and would flood 67,400 acres. The reservoir is a recommended water management strategy for the North Texas Municipal Water District, Tarrant Regional Water District, and Upper Trinity Regional Water District. It is also considered an alternative strategy for Dallas Water Utilities and the City of Irving. Approximately 80 percent of water supplied from Marvin Nichols Reservoir is expected to serve customers of wholesale water providers in Region C and approximately 20 percent would serve water needs in Region D.

**Lake Fastrill** would be located on the Neches River in Anderson and Cherokee counties downstream of Lake Palestine and upstream of the Weches dam site. The proposed reservoir would yield 148,780 acre-feet per year and flood 24,950 acres. The U.S. Fish and Wildlife Service has recommended development of the Neches River Wildlife Refuge along the Upper Neches River near the same area as the proposed Lake Fastrill. Recent court rulings have caused Lake Fastrill to no longer be considered a feasible strategy.

**Tehuacana Reservoir** would be located on Tehuacana Creek in Freestone County, south of the Richland-Chambers Reservoir. The proposed reservoir would yield 56,800 acre-feet per year and would flood 14,900 acres. Tarrant Regional Water District would be the developer of Tehuacana Reservoir. Water from the proposed reservoir would serve needs in Freestone County in addition to customers of Tarrant Regional Water District.

**Recommendation.** Region C encourages affirmative votes by sponsors of the proposed Lake Ralph Hall, Lower Bois d'Arc Creek Reservoir, Marvin Nichols Reservoir, Lake Fastrill, and Tehuacana Reservoir to make expenditures necessary to construct or apply for required permits for these reservoirs and avoid termination of unique reservoir site designation on September 1, 2015 (Section 16.051, Texas Water Code).

### *8.4 Policy and Legislative Recommendations*

The Region C Water Planning Group discussed legislative and policy issues that impact the planning and development of water resources. The group offers the following policy and legislative recommendations, which are divided by topic.

#### Senate Bill One Planning Process

**Encourage Formation of a Working Group on Stream Segments of Unique Ecological Value.** The Region C Water Planning Group recommends the formation of a working group comprised of representatives of TWDB, TPWD, TCEQ, and the sixteen water planning regions to bring clarity, purpose, and direction to the legislative mandate to "identify river and stream segments of unique ecological value. " Specifically, it is expected that the working group would:

- Research, verify, and publicize the intent of ecologically unique river and stream segment legislation.
- Research agency rules and recommend changes or clarifications where needed.
- Ensure common understanding of "reservoir" as used in ecologically unique river and stream segment legislation and agency rules.
- Identify the lateral extent of ecologically unique river and stream segment designations.
- Seek clarification of quantitative assessment of impacts on ecologically unique river and stream segments.
- Illustrate the value of ecologically unique river and stream segment designations.

**Support Water Conservation Task Force Recommendation Regarding Target for Water Conservation.** The Water Conservation Task Force [7] recommended targets for water conservation be considered as water suppliers as they set voluntary per capita water goals. The Task Force indicated that these voluntary targets should <u>not</u> be mandatory. Per capita water use is unique to each water supplier and each region of the State. A statewide per capita water use value is not appropriate for the State, considering its wide variation in rainfall, economic development, and other factors. The Region C Water Planning Group supports the decision of the Water Conservation Task Force that the targets included in their report should be voluntary targets rather than mandatory goals.

**Allow Waivers of Plan Amendments for Entities with Small Strategies.** Region C recommends that the Texas Water Development Board allow waivers for consistency issues for plan amendments that involve projects resulting in small amounts of additional supply.

**Coordination between TWDB and TCEQ Regarding Use of the WAMs for Planning.** The TWDB requires that the Water Availability Models (WAMs) developed under the direction of TCEQ be used in determining available surface water supplies. The models were developed for the purpose of evaluating new water rights permit applications and are not appropriate for water supply planning. The assumptions built into the WAM (full use of all existing water rights, full operation of priority calls at all times, full permitted area and capacity) do not always match the actual operations of supplies. The TWDB and TCEQ should coordinate their efforts to determine the appropriate data and tools available through the WAM program for use in regional water planning. The TWDB should allow the regional water planning groups some flexibility in applying the models made available for planning purposes.

## TCEQ Policy and Water Rights

**Requirements for Interbasin Transfers Introduced in Senate Bill One.** In 1997, Senate Bill One introduced a number of new requirements for applications for water rights permits to allow interbasin transfers. The requirements are found in Section 11.085 of the Texas Water Code (9). The code includes many provisions that are not required of any other water rights, including:

- Analysis of the impact of the transfers on user rates by class of ratepayer.
- Public meetings in the basin of origin and the receiving basin.
- Simultaneous (and dual) notices of an interbasin transfer application in newspapers published in every county located either wholly or partially in both the basin or origin and the receiving basin, without regard to the distance or physical relationship between the proposed interbasin transfer and any such county's boundaries.
- Additional notice to county judges, mayors, and groundwater districts in the basin of origin.
- Additional notice to legislators in the basin of origin and the receiving basin.
- TCEQ request for comments from each county judge in the basin of origin.
- Proposed mitigation to the basin of origin.
- Demonstration that the applicant has prepared plans that will result in the "highest practicable water conservation and efficiency achievable…".

Exceptions to these extra requirements placed on interbasin transfers were made for emergencies, small transfers (less than 3,000 acre-feet under one water right), transfers to an adjoining coastal basin, and transfers from those portions of a county, city, or city's municipal retail service area located partially in the basin of origin, to those portions of the county, city or city's municipal retail service area located in the receiving basin.

The effect of these changes is to make obtaining a permit for interbasin transfer significantly more difficult than it was under prior law and thus to discourage the use of interbasin transfers for water supply. This is undesirable for several reasons:

- Interbasin transfers have been used extensively in Texas and are an important part of the state's current water supply. For example, current permits allow interbasin transfers of over 750,000 acre-feet per year from the Red, Sulphur, Sabine, and Neches Basins to meet needs in the Trinity Basin in Region C. This represents more than one-third of the region's reliable water supply.
- Current supplies greatly exceed projected demands in some basins of origin, and the supplies already developed in those basins can only be beneficially used as a result of interbasin transfers.
- Senate Bill One water supply plans for major metropolitan areas in Texas (Dallas-Fort Worth, Houston, and San Antonio) rely on interbasin transfers as a key component of their plans.
- Texas water law has always regarded surface water as "state water" belonging to the people of the state, to be used for the benefit of the state as a whole and not merely that area or region of the state where abundant surface water supplies may exist.
- The current requirements for permitting interbasin transfers provide unnecessary barriers to the development of the best, most economical, and most environmentally acceptable source of water supplies.
- Since no contested interbasin transfer permits have been granted under these new requirements since the passage of Senate Bill One, the meaning of some of the provisions and the way in which they will be applied by TCEQ are undefined.

The legislature should revisit the current law on interbasin transfers and remove some of the unnecessary, unduly burdensome, and counterproductive barriers to such transfers that now exist.

**Cancellation of Water Rights for Non-Use.** The Texas Water Code [8] currently allows the Texas Commission on Environmental Quality to cancel any water right, in whole or in part, for ten consecutive years of non-use. This rule inhibits long-term water supply planning. Reservoirs are often constructed to fully utilize the yield available at a given site and are often constructed to meet needs far into the future. Many times, only part of the supply is used in the first ten years of the reservoir's operation, with the remainder allocated for future needs.

The water code should be changed to exempt certain projects from the cancellation for ten years of non-use rule. The exemption might include municipal water rights, water rights for steam electric power, water rights associated with major reservoirs, and water rights included as long-term supplies in an approved regional water plan.

### State Funding for Water Supply Programs

**Continued and Expanded State Funding for Texas Water Development Board Loans and the State Participation Program.** The Senate Bill One regional water planning studies show significant needs for future water supply projects. The Texas Water Development Board's loan and State Participation Programs have been important tools in the development of existing supplies. These programs should be continued and expanded with additional funding to assist in the development of the water management strategies recommended in the regional water plans to meet the future water needs in Texas.

**State Funding for Water Conservation Efforts.** In 2007, the Texas Legislature formed the Water Conservation Advisory Council to serve as an expert resource to the state government and the public on water conservation in Texas. In December 2008, the Council published a report on water conservation in Texas [15]. The report included 11 recommendations, two of which dealt with state funding for water conservation efforts:

- Provide the Council with the necessary resources to sufficiently develop and implement tools to monitor implementation of water conservation strategies recommended in the regional water plans.
- Expand public awareness of water conservation statewide and coordinate campaigns at the state, regional, and local levels (by adequately funding a statewide water conservation campaign).

We encourage adequate funding for the Water Conservation Advisory Council and for a statewide water conservation awareness campaign.

**State Funding for Reservoir Site Acquisition.** The State of Texas has designated unique sites for reservoir development. As the recent creation of a Federal wildlife refuge in the Fastrill Site demonstrates, the designation of these sites does not fully protect them for development as reservoirs. We recommend that TWDB and the Legislature consider assisting with the acquisition of these sites. Actions that could be taken include:

- The use of state funds to acquire reservoir sites.
- Changing TWDB regulations so that Water Infrastructure Fund resources can be used for the acquisition of reservoir sites before completion of the permitting process.
- Encouraging voluntary sales of land in these reservoir sites to entities planning to develop the reservoirs.

**Consider Alternative Financing Arrangements for Large Projects.** The Texas Water Development Board offers low-interest financing for development of projects from the State Water Plan through the Water Infrastructure Fund. TWDB also offers deferred financing with delayed requirements for repayment, but the terms for deferred financing are not as flexible as they might be. We encourage the Texas Water Development Board and the Legislature to consider more flexible deferred financing, modeled on the old Federal program in which debt repayment could be made as portions of the project were needed and brought on line.

**Adequate Funding of Groundwater Conservation Districts.** In recent years, the Texas Legislature has created a great number of new groundwater conservation across the state. Especially in the early years of their existence, many of these districts struggle to find adequate resources to develop and implement their rules. We recommend that the state fund a grant program to provide financial resources for the development of the initial rules of these districts.

**Funding for NRCS Structures as a Form of Watershed Protection.** One key element of water supply planning is the protection of the quality and usability of supplies already developed. Over the past 50 to 60 years, the U.S. Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) has built numerous small dams for sediment control and flood control in Texas. The NRCS reservoirs improve water quality and prevent erosion in the watershed., and they also provide water for livestock and increased streamflows during low flow periods. The design life for the majority of the NRCS watershed dams is 50 years. Most of the projects were built in the 1950s and 1960s and are nearing the end of their design life. Many NRCS structures are in need of maintenance or repair in order to extend their useful life.

The Dam Rehabilitation Act [11] funds the rehabilitation and upgrade of existing NRCS structures. Every year, the NRCS accepts applications for funding such projects and prioritizes them. The rehab program is a 65/35 split of federal funds to the sponsor's funds. Currently, in the Region C area, ten NRCS structures are being planned, designed or constructed with funding through the dam rehabilitation act.

The Small Watershed Act [12] allocates federal funds for the development of new NRCS structures. The federal government provides 100% of the construction costs and the sponsor provides the land acquisition costs. Eight projects in Region C are being planned, designed, or constructed. Several of these projects are ready to construct, but the funding is not currently available.

The State should develop a program to provide funding for the development and rehabilitation of new and existing NRCS structures, as a form of watershed protection. Elements of such a program could include:

- State grants or matching funding for studies of NRCS structures
- Seminars on watershed protection.

The Region C Water Planning Group recommends that the State seek additional federal funding to improve and maintain NRCS structures. Region C also recommends that the State provide funding to local sponsors to aid them in paying for their required 35% of the cost for the dam rehabilitation projects.

### Water Reuse and Desalination

**Support for Research to Advance Reuse and Desalination.** Water reuse and desalination are becoming increasingly important sources of water supply for Texas. We recommend that the Legislature and the TWDB support research to advance these emerging water supply strategies in the coming years.

**Funding Assistance for Desalination Projects.** In December 2002, the TWDB completed a report [13] for Governor Perry recommending a large-scale demonstration seawater desalination project. This project will result in greater information available to Texas on the challenges involved in developing large-scale desalination projects. However, many smaller communities could make use of brackish groundwater or surface water if the treatment process was more affordable.

The Red River and Lake Texoma in Region C have high concentrations of salts. The water from these sources must either be blended with a less saline supply or desalinated for direct use. The smaller communities neighboring these water supplies could potentially use this water with help in funding the necessary desalination process. These sources would be more economical for the smaller communities than building small pipeline of great lengths to purchase water from a larger supplier. Region C recommends that the TWDB provide funding assistance for desalination projects for smaller communities. Region C also recommends that federal funds be sought for desalination projects.

**Funding Assistance for Water Reuse Projects.** The Region C Water Plan includes reuse as a key water management strategy to meet the water needs of the Region between now and 2060. Water reuse projects are rapidly developing in Region C. In the *2006 Region C Water Plan*, the 2060 supply from existing reuse projects was slightly over 103,000 acre-feet per year. In the current plan, newly developed projects have more than tripled the 2060 supply from reuse, to almost 331,000 acre-feet per year. The plan also calls for development of an additional 292,000 acre-feet per year in reuse projects. In addition to Region C, the W*ater for Texas 2007* Plan 14 of the 16 regions included reuse as a water management strategy. In order to achieve implementation of the significant quantities of reuse there is a critical need to develop implementation approaches, funding support, and the technology and science associated with reuse. The Texas Water Development Board is in the process of developing a research agenda to identify specific research needs and potential projects to address these issues and develop information that will advance reuse in Texas.

Region C recommends that the State Legislature to provide funding support to perform critical research needs to be identified by the Texas Water Development Board.

## State and Federal Programs – Water Supply Issues

**Continued and Increased State Support of Efforts to Develop Water Supplies for Oklahoma.** In recent years, water suppliers in Region C have been seeking to develop unused water resources in Oklahoma. The Tarrant Regional Water District has filed a suit in Federal Court challenging an Oklahoma moratorium on the export of water from the state. The Texas Attorney General recently filed an *amicus curiae* brief supporting TRWD's suit. We encourage the State of Texas to continue and increase its support of efforts to develop unused water resources in Oklahoma.

**Oversight of Groundwater Conservation District Rule Making.** The Legislature has established groundwater conservation districts across Texas, often without regard for aquifer boundaries. These groundwater conservation districts develop rules and regulations regarding groundwater pumping within their boundaries. Often, the rules that have been developed by these districts are inconsistent from one district to the next, resulting in inconsistent regulation of the same aquifer. Although one-size-fits all regulations are inappropriate, the groundwater conservation districts need state oversight, particularly with regard to their rule-making policies. Region C recommends that the TWDB or TCEQ provide oversight for the current and future groundwater conservation districts.

**Revise Federal Section 361(b) Regulations on Power Plant Cooling Water.** Recent USEPA regulations implementing Section 316(b) of the Clean Water Act designate cooling towers for new power plants. The USEPA is also currently developing new regulations that could result in a requirement for adding cooling towers at existing power plants. Compared to once-through cooling (which was the usual approach in Texas prior to the new regulations), cooling towers reduce the amount of water diverted for a power plant but significantly increase the amount of water consumed. There is also a secondary impact; operation of cooling towers creates a high TDS (total dissolved solids) wastestream known as blowdown, that must managed and/or treated, often resulting in additional increased water consumption. This higher water consumption is not good for Texas, where water supplies are scarce. We encourage TWDB and TCEQ to work with the Federal government on Section 316(b) regulations to allow the efficient use and conservation of water supplies for power plants and the state.

# CHAPTER 8
# LIST OF REFERENCES


(1) Texas Water Development Board: *Chapter 357, Regional Water Planning Guidelines*, Austin, October 1999, amended July 11, 2001.

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(4) U.S. Fish and Wildlife Service, *Texas Bottomland Hardwood Preservation Program*, Albuquerque, 1984.

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(8) Texas Water Code, Chapter 11 Water Rights, Subchapter E, Section 11.173, Amended by Acts 2001, 77th Leg., ch. 966, § 2.12, eff. Sept. 1, 2001, Austin, [Online], Available URL: http://www.capitol.state.tx.us/statutes/wa.toc.htm, May 2005.

(9) Texas Water Code, Chapter 11 Water Rights, Subchapter C, Section 11.085 Amended by Acts 2001, 77th Leg., ch. 1234, § 2.12, eff. Sept. 1, 2001, Austin, [Online], Available URL: http://www.capitol.state.tx.us/statutes/watoc.html, February 2005.

(10) Texas Water Development Board, Water IQ – Know Your Water, Austin, [Online], Available URL: http://www.water-iq.org/, May 2005.

(11) Based on information provided by Steven Bednartz of the Natural Resources Conservation Service, regarding NRCS Structures in Region C and the Dam Rehabilitation Act, February 10, 2005.

(12) Based on information provided by Steven Bednartz of the Natural Resources Conservation Service, regarding NRCS Structures in Region C and the Small Watershed Act, February 10, 2005.

(13) Texas Water Development Board, Large-Scale Demonstration Seawater Desalination in Texas, Report of Recommendations for the Office of Governor Rick Perry, Austin, [Online], Available URL: http://www.twdb.state.tx.us/Desalination/FINAL%2012-16-02.pdf, May 2005.

# 9. Infrastructure Funding Recommendations

This plan has identified $19.1 billion in improvements needed by 2060 to meet the projected water demands in Region C. This plan also recommends that the State of Texas provide funding for water supply to assist with development of needed projects. The infrastructure financing survey is conducted as part of the regional water planning process to better assess the state's role in financing the identified water projects. For this planning cycle, the TWDB developed the infrastructure financing survey to evaluate the amount of state funding that water users are likely to request. This chapter identifies the portion of capital improvements recommended for Region C that will require TWDB financial assistance and identifies the potential TWDB financial programs that will be used. The survey developed by the TWDB included the following five financial programs:

- WIF-Deferred
- WIF-Construction
- State Participation
- Rural
- Economically Distressed Areas Program

## *9.1 Infrastructure Financing Questionnaires for Recommended Water Management Strategies*

The infrastructure financing surveys were sent, by either email or post office, in August 2010 to all municipal water user groups and wholesale water providers in Region C that had indicated a need for infrastructure capital spending to support identified water management strategies. Surveys were not sent to entities with no identified capital costs in the Region C plan. Most of these water user groups whom did not receive a survey were entities supplied by wholesale water providers and/or associated with regional projects. Surveys were also not mailed to aggregated water user groups: county-other, irrigation, livestock, manufacturing, mining, and steam electric power.

A total of 172 surveys were emailed/mailed – 141 to water user groups and 31 to wholesale water providers. Many of the proposed capital improvements recommended in this plan involve one or more of the wholesale water providers. As a result, more than 93 percent of the total Region C plan costs are borne by the wholesale water providers – and over 79 percent is borne by just five regional wholesale water providers.

### Water User Groups (WUGs)

Of the 141 water user groups surveyed, 58 submitted responses, resulting in an overall 41 percent participation rate in this survey. Although this is a lower response rate than desired, these 58 responders account for 53 percent of the total capital costs identified by all of the WUGs. Appendix X includes a sample copy of the survey, along with a summary of the survey responses. To help encourage additional input, the Region C Water Planning Group attempted up to two times to contact entities whose survey responses had not been received.

A few respondents to the survey indicated that they had changes to the recommended strategies or strategy costs. These comments were considered and the *Region C Initially Prepared Water Plan* was modified as appropriate.

Thirty-nine of the responding water user groups (67 percent) plan to finance 100 percent of the capital costs for improvements identified in the survey without TWDB assistance. The remaining respondents reported being able to pay for a portion of the estimated capital improvements, but would likely apply for one, or more, TWDB funding programs. A summary of the survey results for the water user groups is presented in Table 9.1.

**Table 9.1**
**Summary of Water User Groups Financing Needs in Region C[1]**

| | |
|---|---|
| **Total Costs of Strategies – All WUGs Surveyed** | **$1,300,954,000** |
| **Total Costs of Strategies - IFR Responses** | **$683,008,000** |
| Amount Likely to be Funded by TWDB WIF-Deferred Funding | $26,452,000 |
| Amount Likely to be Funded by TWDB WIF-Construction Funding | $239,266,000 |
| Amount Likely to be Funded by TWDB State Participation Funding | $3,976,000 |
| Amount Likely to be Funded by TWDB Rural Areas Funding | $1,644,000 |
| Amount Likely to be Funded by TWDB Economically Distressed Areas Program Funding | $5,011,000 |
| Amount from Entities Indicating "Not Applicable" to Project Costs or "Project Completed"[2] | $2,388,000 |
| Remaining Costs[3] | $307,697,000 |
| **Amount Respondents Requested from TWDB Programs** | **$276,349,000** |
| **Total Costs of Strategies – WUGs Not Responding to IFR Survey** | **$617,946,000** |

1. The summary of costs reported in this table reflect survey responses submitted to the TWDB as of September 22, 2010. These numbers could change as additional entities continue to submit responses to the TWDB survey.
2. The City of Kennedale responded that the conveyance project has already been completed.
3. The remaining costs likely would be funded either by cash reserves, bonds, loans, or other programs.

## Wholesale Water Providers (WWPs)

Twenty-nine wholesale water providers responded to the financing surveys, resulting in a 94 percent response rate. These 29 responders, though, account for 99.5 percent of the total capital costs for all WWPs. Six WWPs responded that they intend to finance 100 percent of the identified capital improvements, although some stated that they might consider using state funding in the future. The other 23 reported that it is likely they can finance a portion of the total capital improvements, but that state participation would also be required. Overall, the twenty-nine respondents indicated that they would likely request financial assistance from the TWDB for approximately 62 percent of the estimated capital costs.

Summaries of the wholesale water provider responses are included in Appendix X. Table 9.2 provides the financing needs for the wholesale water providers based on the survey results.

**Table 9.2**
**Summary of Wholesale Water Providers Financing Needs in Region C[1]**

| | |
|---|---|
| **Total Costs of Strategies – All WWPs Surveyed** | **$17,781,764,000** |
| **Total Costs of Strategies - IFR Responses** | **$17,693,494,000** |
| Amount Likely to be Funded by TWDB WIF-Deferred Funding | $964,481,000 |
| Amount Likely to be Funded by TWDB WIF-Construction Funding | $8,742,306,000 |
| Amount Likely to be Funded by TWDB State Participation Funding | $1,260,047,000 |
| Amount Likely to be Funded by TWDB Rural Areas Funding | $20,000,000 |
| Amount Likely to be Funded by TWDB Economically Distressed Areas Program Funding | $0 |
| Amount from Entities Indicating "Not Applicable" to Project Costs or "Project Completed" | $0 |
| Remaining Costs[2] | $6,794,929,000 |
| **Amount Respondents Requested from TWDB Programs** | **$10,986,835,000** |
| **Total Costs of Strategies – WWPs Not Responding to IFR Survey** | **$88,270,000** |

1. The summary of costs reported in this table reflect survey responses submitted to the TWDB as of September 22, 2010. These numbers could change as additional entities continue to submit responses to the TWDB survey.
2. The remaining costs likely would be funded either by cash reserves, bonds, loans, or other programs.

## 9.2 Wholesale Water Provider and Water User Group Funding Summary

Overall, the TWDB IFR survey received a 51 percent response rate (41 percent of WUGs and 94 percent of WWPs). However, on a monetary basis, the survey respondents accounted for 96 percent of the total capital costs in Region C (53 percent of WUG costs and 99.5 percent of WWP costs). Based on the survey responses, from both WUGs and WWPs, the water users in Region C are likely to request financial assistance from the TWDB to pay for approximately $11.3 billion (62 percent) of the capital costs identified for those entities' water supply infrastructure. The results included in this report could change as additional water suppliers continue to respond to the TWDB after the publication of this report. Additionally, several factors could still impact the amount of TWDB-funding that is actually requested, including inflation, and the political and financial climate at the time funds are needed.

## 9.3 Additional Funding Mechanisms

To help implement water management strategies, there are numerous funding programs available for municipal and non-municipal water users with local, state and/or federal sponsors (in addition to the five TWDB funding programs included in the TWDB IFR survey). Many of the programs target municipal entities through loan and grant programs. There are also several agricultural assistance programs that administer funds for rural and agricultural users. Some of the funding options require a political subdivision to take the lead and establish benefits to non-municipal water users. Other programs are not open to non-municipal users, but non-municipal users (particularly manufacturers) may benefit from these funding programs through purchasing water from eligible municipalities.

The current primary mechanisms for funding infrastructure projects in Region C are financing through local bank loans and municipal bonds that are repaid through increased fees and revenues. This funding mechanism places the burden of paying for the capital improvements on the beneficiaries of the project. It also provides for local control in the implementation and timing of the needed improvements. While local financing will continue to be an integral component for financing water projects in this region, other funding sources through state and federal sponsors have been utilized in the region and may be accessed more frequently in the future as the region looks to develop new water resources.

The following are potential funding mechanisms that may be available for infrastructure projects in Region C. These funding sources are discussed in more detail in Appendix X and summarized in Table 9.3. Table 9.4 shows the potential funding sources for non-municipal water users.

- Market financing (taxable and tax-exempt)
- Texas Water Development Board programs
- U.S. Department of Agriculture programs
- Texas Department of Agriculture programs
- U.S. Department of Commerce Economic Development Administration Public Works Program
- U.S. Small Business Administration programs
- Texas Department of Economic Development programs
- Corps of Engineers Sponsorship

- Local economic development incentives.
- Bureau of Reclamation Programs
- Texas Office of Rural Community Affairs

**Table 9.3**
**Summary of Funding Programs for Water Users in Region C**

| Program | State/ Federal/ Local | Agency [a] | Type | Eligible Water Supply Projects |
|---|---|---|---|---|
| Private Financing | N/A | N/A | All | All |
| Fees and Tax Increases | Local | N/A | All | All |
| Municipal Bonds | Local | N/A | All | All |
| Public-Private Partnerships | Local | N/A | All | All |
| Drinking Water State Revolving Fund | State | TWDB | Loans | Water supply and source water protection |
| Water Development Fund Program | State | TWDB | Loans | Planning, acquisition and construction of water related infrastructure |
| Clean Water State Revolving Fund Program | State | TWDB | Loans | Wastewater recycling and reuse facilities |
| State Participation Program | State | TWDB | Loans | Regional water, wastewater recycling and reuse facilities |
| Agriculture Water Conservation Loan | State | TWDB | Loans | Install efficient irrigation equipment on private property |
| Water Infrastructure Fund | State | TWDB | Loans | Water management strategies recommended in state or regional water plans |
| Rural Water Assistance Fund | State | TWDB | Loans | Development or regionalization of rural water supplies |
| Economically Distressed Area Program | State | TWDB | Grants, Loans | Water and sewer service to economically distressed areas |
| Regional Facility Planning Grant Program | State | TWDB | Grant | Studies and analyses of regional water supply and wastewater facility needs |
| Farm Ownership Program | Federal | USDA | Loans, loan guarantees | Water conservation |

**Table 9.3, Continued**

| Program | State/ Federal/ Local | Agency [a] | Type | Eligible Water Supply Projects |
|---|---|---|---|---|
| Rural Utilities Service Water and Waste Disposal Loans and Grants | Federal | USDA | Grants, loans, loan guarantees | Drinking water, wastewater collection and treatment facilities in rural areas |
| Watershed Protection and Flood Prevention Program | Federal | USDA / NRCS | Grants | Plan and install watershed-based projects on private land |
| Texas Capital Fund Infrastructure Development Program | State | TDA | Grants | Water and sewer infrastructure improvements |
| Interest Rate Reduction Program | State | TDA | Interest buy-down | Water conservation, stock tanks, brush control, and dam construction |
| Agricultural Loan Guaranty Program | State | TDA | Loan guarantees | Non-specific |
| Young Farmer Interest Rate Reduction Program | State | TDA | Loan guarantees | Non-specific |
| Young Farmer Grant Program | State | TDA | Grants | Non-specific |
| Public Works Program | Federal | USDC | Grants | Water and sewer systems for industrial use |
| 7a Loan Guaranty Program | Federal | SBA | Loan guarantees | Non-specific |
| Certified Development Company (504) Program | Federal | SBA | Loans | Improvements, utilities |
| Industrial Development Loan Program | State | TDED | Reserve account | Non-specific |

**Table 9.3, Continued**

| Program | State/ Federal/ Local | Agency [a] | Type | Eligible Water Supply Projects |
|---|---|---|---|---|
| Texas Industrial Bond Revenue Program | State | TDED | Bonds | Non-specific |
| Texas Leverage Fund | State | TDED | Loans | Non-specific |
| Texas Enterprise Zone Program | State | TDED | Tax refund, credits | Non-specific |
| Corps of Engineers | Federal | USACE | Cost sharing | Those that meet a federal purpose, such as multi-purpose reservoirs, ecosystem restoration |
| Local economic development incentives | Local | N/A | Tax abatement, etc. | Non-specific |
| WaterSMART | Federal | BR | Grants | Non-specific |
| Title XVI funding | Federal | BR | Grants | Reclaimed Water |
| Small Town Environment Program | State | TDRA | Grants | Non-specific |
| Renewable Energy Demonstration Pilot Program | State | TDRA | Grants | Renewable energy for water and wastewater treatment |
| Desalination Fund | State | TDRA | Grants | Renewable energy for desalination of brackish groundwater |

Note: a. BR = Bureau of Reclamation
NRCS = National Resources Conservation Service
SBA = U.S. Small Business Administration
TDA = Texas Department of Agriculture
TDED = Texas Department of Economic Development
TDRA = Texas Department of Rural Affairs
TWDB = Texas Water Development Board
USACE = United States Army Corps of Engineers
USDA = U.S. Department of Agriculture
USDC = U.S. Department of Commerce

**Table 9.4**
**Applicable Funding Programs for Non-Municipal Users**

| Program | State/ Federal / Local | Agency* | Non-Municipal Users Eligible to Apply** | Type | Eligible Water Supply Projects | Water Users with Potential to Receive Funding | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Manufact-uring | Mining | Irrigation | Livestock | Steam Electric Power |
| Private Financing | N/A | N/A | Yes | All | All | x | x | x | x | x |
| Clean Water State Revolving Fund Program | State | TWDB | No | Loans | Wastewater recycling and reuse facilities | x | x | x | | x |
| State Participation Program | State | TWDB | No | Loans | Regional wastewater recycling and reuse facilities | x | x | x | | x |
| Agriculture Water Conservation Loan | State | TWDB | Indirect | Loans | Install efficient irrigation equipment on private property | | | x | | |
| Water Infrastructure Fund | State | TWDB | No | Loans | Water management strategies recommended in state or regional water plans | x | x | x | x | x |
| Rural Water Assistance Fund | State | TWDB | No | Loans | Development or regionalization of rural water supplies | x | | x | x | x |
| Farm Ownership Program | Federal | USDA | Yes | Loans, loan guarantees | Water conservation | | | x | x | |

**Table 9.4, Continued**

| Program | State/ Federal / Local | Agency* | Non-Municipal Users Eligible to Apply** | Type | Eligible Water Supply Projects | Water Users with Potential to Receive Funding | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Manufact-uring | Mining | Irrigation | Livestock | Steam Electric Power |
| Rural Utilities Service Water and Waste Disposal Loans and Grants | Federal | USDA | No | Grants, loans, loan guarantees | Drinking water, wastewater collection and treatment facilities in rural areas | x | x | x | x | x |
| Watershed Protection and Flood Prevention Program | Federal | USDA/ NRCS | Indirect | Grants | Plan and install watershed-based projects on private land | x | x | x | x | |
| Texas Capital Fund Infrastructure Development Fund | State | TDA | No | Grants | Water and sewer infrastructure improvements | x | x | x | x | x |
| Interest Rate Reduction Program | State | TDA | Yes | Interest buy-down | Water conservation, stock tanks, brush control, and dam construction | | | x | x | |
| Agricultural Loan Guaranty Program | State | TDA | Yes | Loan guarantees | Non-specific | | | x | x | |
| Young Farmer Loan Guarantee and Grant Programs | State | TDA | Yes | Loan guarantees and Grants | Non-specific | | | x | x | |

**Table 9.4, Continued**

| Program | State/ Federal / Local | Agency* | Non-Municipal Users Eligible to Apply** | Type | Eligible Water Supply Projects | Water Users with Potential to Receive Funding | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Manufact-uring | Mining | Irrigation | Livestock | Steam Electric Power |
| 7a Loan Guaranty Program | Federal | SBA | Yes | Loan guarantees | Non-specific | x | x | x | x | |
| Certified Development Company (504) Program | Federal | SBA | Yes | Loans | Improvements, utilities | x | x | x | x | |
| Industrial Development Loan Program | State | TDED | Yes | Reserve account | Non-specific | x | x | x | x | |
| Texas Industrial Bond Revenue Program | State | TDED | Indirect | Bonds | Non-specific | x | x | | | x |

# 10. Plan Approval Process and Public Participation

This section describes the plan approval process for the Region C Water Plan and the efforts made to inform the public and encourage public participation in the planning process. Special efforts were made to inform the general public and water suppliers and others with special interest in the regional water plan and to seek their input.

## *10.1 Regional Water Planning Group*

The legislation for Senate Bill One and the Texas Water Development Board (TWDB) planning guidelines establish regional water planning groups to control the planning process [1]. The regional water planning groups were to include representatives of eleven specific interests:

- General public
- Counties
- Municipalities
- Industrial
- Agricultural
- Environmental
- Small businesses
- Electric generating utilities
- River authorities
- Water districts
- Water utilities

Table 10.1 lists the members of the Region C Water Planning Group, the interests they represent, and the counties in which they reside. For most of the third round of planning, Jim Parks was the Chair of the Region C Water Planning Group, Jody Puckett was Vice-Chair, and Russell Laughlin was Secretary. A number of planning group members did not seek reelection to the Region C Water Planning Group as their terms expired during this planning cycle. They were: Robert Johnson, Brad Barnes, Roy Eaton, Dale Fisseler, and Elaine Petrus. Members elected to fill their respective positions were: Jody Puckett, Tom Woodward, Bill Lewis, Frank Crumb, and Steve Berry. At the end of the last planning cycle, George Shannon passed away, and the planning group elected Jack Stevens to fill his position. In addition, group member Irvin (Marsh) Rice passed away during this planning cycle, and the group elected his alternate, Bill Ceverha, to fill his position.

**Table 10.1**
**Current Members of the Region C Water Planning Group**

| Member | Interest | County |
|---|---|---|
| Jim Parks, Chairman | Water Districts | Rockwall |
| Jody Puckett, Vice Chair | Municipalities | Dallas |
| Russell Laughlin, Secretary | Industry | Tarrant |
| Steve Berry | Environmental Interests | Tarrant |
| Bill Ceverha | Public | Dallas |
| Jerry Chapman | Water Districts | Grayson |
| Frank Crumb | Municipalities | Tarrant |
| Bill Lewis | Small Business | Denton |
| G.K. Maenius | Counties | Tarrant |
| Howard Martin | Municipalities | Denton |
| Jim McCarter | Water Utilities | Navarro |
| Paul Phillips | Municipalities | Parker |
| Gary Spicer | Electric Generating Utilities | Dallas |
| Bob Scott | Environmental Interests | Tarrant |
| Connie Standridge | Water Utilities | Freestone |
| Jack Stevens | Water Districts | Tarrant |
| Danny Vance | River Authorities | Tarrant |
| Mary Vogelson | Public | Dallas |
| Tom Woodward | Agricultural Interests | Wise |

## *10.2 Outreach to Water Suppliers, Water User Groups, and Regional Planning Groups*

The Region C Water Planning Group made special efforts to contact water suppliers and water user groups in the region and neighboring regional water planning groups to obtain their input in the planning process. Water suppliers and water user groups were surveyed on a number of occasions to solicit information on their current situation and their future water plans. Region C coordinated with Regions D, G, H, and I regarding shared resources and water user groups that were located in multiple regions.

Five of the largest wholesale water providers in the region (Dallas Water Utilities, Tarrant Regional Water District, North Texas Municipal Water District, Fort Worth, and Trinity River Authority) were represented on the water planning group. In addition, the planning group encouraged the Region C consultants to keep in touch with wholesale water providers and other water suppliers as planning proceeded. Water suppliers were included on the mailing list for Region C newsletters (discussed below under outreach to the public). Other specific measures to obtain input from water suppliers and from other regional water planning groups are discussed below.

### Questionnaires

A number of questionnaires have been sent to the Region C water user groups and wholesale water providers. Appendix D includes copies of the questionnaires that were mailed in early 2009 to all Region C county judges, cities with populations over 500, regional water suppliers, retail water suppliers (supplying over 0.25 mgd), and groundwater conservation districts located in Region C. The questionnaires sought information on population and demand projections, current water supplies, future water management strategies, conservation, and other water planning issues. Following the deadline for this questionnaire, the consultants spent a considerable amount of time calling each entity whose survey response had not been received. The consultants attempted to call each of these entities up to two times. The follow-up phone calls resulted in increased participation rate and additional information acquired. The overall response rate for the population and water planning issues questionnaire was 59 percent.

In the fall of 2009, another questionnaire was sent via email to water user groups for whom Region C recommended changes to population and/or demand projections. This questionnaire asked for either agreement or further input regarding the entities' revised projections.

Another questionnaire was sent to all water user groups and wholesale water providers via email shortly after the publication of Region C's Initially Prepared Plan. This questionnaire asked for either agreement or further input on the entities' recommended water management strategies.

Lastly, a questionnaire was e-mailed to water user groups and wholesale water providers in August 2010. This questionnaire was developed by TWDB and sought input regarding the financing options each entity will likely pursue to develop the strategies outlined in this plan. This questionnaire was in the form of an interactive on-line survey.

The results of this survey have been compiled and are discussed in Chapter 9 and in Appendix X of this report.

### Meetings with Wholesale Water Providers and Other Suppliers

The consultants met in person with many of the wholesale water providers and with water user groups that were interested in meeting. The consultants spoke with wholesale water providers by phone when the provider thought that an in-person meeting was not necessary.

Throughout the planning process, the consultants met with the following water suppliers on one or more occasions to discuss current water supplies, current customers, population and demand projections, recommendations in the 2006 Plan, future water supplies, water treatment plant capacity and planned expansions, and additional wholesale customers:

- Athens MWA and City of Athens
- Corsicana
- Denton
- Dallas Water Utilities
- Fort Worth
- Grand Prairie
- Greater Texoma Utility Authority
- Irving
- North Texas Municipal Water District
- Rockett SUD
- Tarrant Regional Water District
- Trinity River Authority
- Upper Trinity Regional Water District
- Walnut Creek SUD
- Waxahachie
- Weatherford.

Consultants also contacted groundwater conservation districts located in Region C and obtained pertinent information regarding those entities.

The meetings with the providers listed above provided a better understanding of the current water supplies and the manner in which they are used, the current customers, current infrastructure limitations, potential future customers, and planned water supply and infrastructure improvement projects. These meetings were useful in determining recommended strategies for the Region C Water Plan.

In addition to all of these meetings for the Region C Plan, additional meetings were held in conjunction with the individual county studies that were a part of this round of planning. These county studies covered Cooke, Grayson, Fannin, Freestone, Kaufman, and Navarro Counties. Individual meetings were held with the majority of the water suppliers in those counties at the beginning of those studies. Public meetings were held in each of those counties prior to the publication of the Initially Prepared Plan.

## *10.3 Outreach to the Public*

### Newsletters

The Region C Water Planning Group published newsletters throughout this third round of the Regional Water Planning process to keep the public informed on the progress of the planning process, as well as to educate the public about water management strategies under consideration, water conservation issues and other water-related topics. The newsletters were sent to:

- Water right holders
- County judges
- Mayors and officials of cities in the region
- Other water planning regions
- Texas Water Development Board staff
- Approximately 200 media representing more than 175 media outlets in North Central Texas
- Any person who asked to be on the mailing list.

A total of 6 newsletters have been distributed on behalf of the Region C Water Planning Group during the second round of water planning, with another newsletter scheduled for distribution in Fall 2010. Appendix Y includes copies of the Region C newsletters.

## Media Outreach

The media outreach plan for Region C called for using a number of communication vehicles to keep the media, and hence the public, informed of the progress and activities of the Region C Water Planning Group:

- **Newsletters.** Newsletters were sent to approximately 200 media representing more than 200 media outlets in North Central Texas, as well as to members of the general public on the mailing list.
- **Media-Only briefing.** Members of the media with an interest in water planning issues were invited to a media-only briefing in September 2009 at the Dallas offices of Alan Plummer Associates, Inc. During the meeting, media heard from the RCWPG chair, vice-chair, and lead consultants on key water management strategies under consideration, projected water needs and supplies, steps involved in the water planning process and other critical issues. Media were invited to participate in a question-and-answer session following the presentation. Representatives of *The Dallas Morning News*, *Star-Telegram*, *Fort Worth Business Press* and two broadcast TV stations attended the briefing, and after the briefing, a copy of the presentation was distributed to the full Region C media list and posted to the Region C website.
- **Public hearings.** The media were invited through printed public meeting notices and press releases to attend the public hearings regarding the approval of the scope of work and the Initially Prepared Plan.
- **Press materials.** Updated press kit materials on Region C's water planning effort were developed during the third round of Regional Water Planning and provided to media throughout the planning period. The updated fact sheet was also translated into Spanish and made available to Hispanic media, and all materials were also posted on the Region C Web site. The press kit includes frequently asked questions and answers, a summary of the planning process, list of key water management strategies under consideration, Regional Water Planning fact sheet, list of RCWPG members and contact information, copies of the newsletters, and a glossary of key water planning terms.
- **Press releases and media advisories.** Press releases and/or media advisories were issued prior to every meeting of the RCWPG during the third round of regional water planning. These notices alerted the media of the opportunity to attend and cover these public meetings, as well as requesting the media to include meeting notices in their public calendars to encourage public attendance and participation.
- **Ongoing media relations.** Among other key media outlets, reporters from *The Dallas Morning News*, *Star-Telegram* and *Fort Worth Business Press* have been proactive in attending the public meetings and have diligently covered the issues and activities surrounding the Region's water planning efforts. Significant coverage of Region C water planning efforts has also appeared in countless other community newspapers, magazines, websites and blogs.

- **Editorial board meetings.** Editorial board meetings were held with *The Dallas Morning News* and *Fort Worth Star-Telegram* in March and April, 2010, around the time that the Initially Prepared Plan was first made available for public review. The purpose of the editorial board meetings was to encourage the media to write editorials about the importance of regional water planning and to encourage the public to review and provide feedback on the Initially Prepared Plan. Both newspapers did publish such editorials. Additionally, both publications provided other coverage of regional water planning issues during the public comment period, and the *Star-Telegram* published an op-ed from Region C Water Planning Group Chairman Jim Parks.

The Region C Water Planning Group and its efforts have netted a significant amount of press coverage since the third round of water planning began. The following are some of the media outlets that have produced stories on the Region C planning process in the last few years:

- *Allen American*
- *Athens Daily Review*
- *Azle News*
- *Bonham Daily Favorite*
- *Bridgeport Index*
- *Carrollton Reader*
- *Celina Record*
- *Colleyville Courier*
- *Collin County Business Press*
- *Coppell Gazette*
- *Corsicana Daily Sun*
- *Country World News*
- *D Magazine*
- *Dallas Business Journal*
- *Dallas Morning News*
- *Denton Record-Chronicle*
- *Flower Mound Leader*
- *Fort Worth Business Press*
- *Fort Worth Star-Telegram*
- *Fort Worth Weekly*

- *Frisco Enterprise*
- *Gainesville Daily Register*
- *Greenville Herald Banner*
- KDFW Fox 4 TV
- KRLD News Radio 1080 AM
- KTVT CBS-11 TV
- KXAS NBC-5 TV
- *Lewisville Leader*
- *Little Elm Journal*
- *Longview News Journal*
- *Lufkin Daily News*
- *McKinney Courier-Gazette*
- *Mesquite News*
- *Nacogdoches Daily Sentinel*
- *Oak Cliff Tribune*
- *Plano Star-Courier*
- *Rowlett Lakeshore Times*
- *Sanger Courier*
- *Sherman Herald-Democrat*
- *Southlake Times*
- *Texarkana Gazette*
- *The Colony Courier Leader*
- WBAP 820 AM
- WFAA Channel 8
- *Wise County Messenger*
- *Wylie News.*

### Region C Web Site

In order to make the *Initially Prepared 2011 Region C Water Plan* more accessible to the public, the draft plan was made available on the Region C web site, www.regioncwater.org, in April 2010. The web site has been used extensively throughout the third round of regional water planning, with all key documents uploaded to the site for public review. The site has also provided updates on upcoming meetings and key dates in the water planning process, as well as contact information for RCWPG members and consultants.

Members of the public have had the opportunity to sign up for the newsletter mailing list through the web site, and to view current and past issues of the RCWPG newsletter. Members of the press have also been able to access press kit materials and submit requests for press kits or interviews via the web site.

## *10.4 Public Meetings and Public Hearings*

### Initial Public Hearing

As required by Senate Bill One rules, the Region C Water Planning Group held an initial public hearing to discuss the planning process and the scope of work for the region on June 2, 2008. The scope of work was approved by the Region C Water Planning Group. The public were notified by the notice that was published in accordance with Texas Water Development Board (TWDB) guidelines [(1)]. A public hearing was held on August 7, 2006 regarding the scope of work for the special studies that were performed in the 2007-08 Biennium.

### Regular Public Meetings

The Region C Water Planning Group held regular meetings during the development of the plan, receiving information from the region's consultants and making decisions on planning efforts. These meetings were open to the public, and proper notice was made under Senate Bill One guidelines [(1)]. All of the Region C Water Planning Group meetings were held at the Trinity River Authority (TRA) Central Wastewater Treatment Plant in Grand Prairie, a central location in the region. The water planning group met regularly, approximately every two to three months.

### Public Hearing on Initially Prepared Plan

The public hearing on the *Region C Initially Prepared Water Plan* was held on May 25, 2010, at the Bob Duncan Community Center in Arlington. Official public notice was posted in accordance with the TWDB requirements [(1)]. Approximately 60 people attended the meeting, 12 speakers provided verbal comments, four of which were in support of the plan.

One speaker expressed significant concerns regarding the IPP, two speakers wanted more conservation in the plan, and five speakers expressed concern about the location of Fort Worth reuse projects.

### Public Input

The Region C Water Planning Group encouraged the public to participate in the planning process by providing an opportunity for the public to speak to the Group. The public was allowed to address the planning group on each action item prior to the Group taking action. The public was also invited to speak on any topic prior to the conclusion of each meeting. Summaries of the public comments were posted on the Region C web site following each meeting.

The public was invited to speak to the Planning Group at all of the public hearings. Oral comments at the public hearing regarding the Initially Prepared Plan were recorded by a court stenographer and made available on the Region C web site. These comments are summarized and included in Appendix AA of the final report, along with the planning group's response to each speaker. Written comments were also accepted by the planning group. Written comments on the Initially Prepared Plan have been included in Appendix AA of this plan. Responses to the written comments are found in Appendix BB.

## *10.5 Study Commission on Region C Water Supply*

In 2008, the Study Commission on Region C Water Supply was formed as a result of Senate Bill 3 to study potential alternative strategies to the Marvin Nichols Reservoir, a large reservoir planned for Northeast Texas. The Study Commission is composed of the following members, with three members representing Region C and three representing Region D:

<u>Region C Representatives</u>

- State Representative Jodie Laubenberg
- Region C Water Planning Group Chairman Jim Parks
- State Senator Florence Shapiro

<u>Region D Representatives</u>

- Thomas Duckert, Environmental Health & Safety Manager, International Paper

- State Representative Stephen Frost
- Region D Water Planning Group Chairman Richard LeTourneau

The group was charged with several tasks, including reviewing water supply alternatives available to Region C, analyzing the socioeconomic effect of reservoir development on the area where the water supply is located and determining whether water demand in Region C may be reduced through additional conservation and reuse measures, among other items.

Phase I of the Study Commission's efforts focused on an examination of existing studies and data gaps, with respect to five alternative water sources: Lake O' the Pines, Lake Texoma, Marvin Nichols Reservoir, Toledo Bend Reservoir and Lake Wright Patman. A draft report summarizing existing data, socio-economic studies and data gaps related to the alternative water sources was presented to the Commission in September 2009 to the Commission. In November 2009, the Commission met to finalize the Phase I report and lay out its proposed scope of work for Phase II.

Phase II of the Commission's efforts, which is now underway, will continue the work of Phase I and more closely examine the potential alternative water supply strategies, with a deadline of October 2010 for approval of the Commission's final report.

In addition to the examination of various water supply alternatives, the Study Commission will also examine the following issues during Phase II:

- the impacts on various entities of using the alternative strategies;
- the possibility of reducing water demand in Region C through additional conservation and reuse measures;
- measures that would need to be taken to comply with mitigation requirements of the U.S. Army Corps of Engineers in connection with any proposed new reservoirs, including identifying potential mitigation sites;
- whether the mitigation burden may be shared by Regions C and D in proportion to the allocation to each region of water in any proposed reservoir;
- innovative methods of compensation for affected property owners, including royalties for water stored on acquired properties and annual payments to landowners for properties acquired for the construction of a reservoir to satisfy future water management strategies;
- the minimum number of surface acres required for construction of proposed reservoirs in order to develop adequate water supply; and

- identification of the location of proposed reservoir sites and proposed mitigation sites in Regions C and D, using satellite imagery with sufficient resolution to permit land ownership to be determined.

The Region C Water Planning Group has been closely monitoring the work of the Study Commission throughout the planning period, and received regular status reports on the Study Commission's progress at each of the Planning Group's public meetings.

More information about the Commission's ongoing efforts can be found at:

http://www.twdb.state.tx.us/wrpi/rwp/committee/rgc/rgc.htm.

# CHAPTER 10
# LIST OF REFERENCES

(1) Texas Water Development Board: *Chapter 357, Regional Water Planning Guidelines*, Austin, effective date of subsections, *Section 357.3* December 6, 2004; *Section 357.4* March 11, 1998; *Section 357.5* February 18, 2008; *Section 357.6* July 11, 2001; *Section 357.7* February 18, 2008; *Section 357.10* February 18, 2008; *Section 357.11* January 2, 2002; *Section 357.12* February 18, 2008; *Section 357.16* February 18, 2008.