A Fisheries Inventory and Assessment of Allens Creek and the Brazos River, Austin County, Texas

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INTRODUCTION

Allens Creek Reservoir is a proposed 8,250 acre reservoir located on Allens Creek, a small tributary of the Brazos River in Austin County, Texas. The project would impound water from the Allens Creek watershed as well as water diverted and pumped from the Brazos River (HDR Engineering, Inc. *et al.* 1994). Originally, Allens Creek Reservoir was proposed by the Houston Lighting and Power Company (HL&P) as a cooling lake for a nuclear power plant (URS/Forrest and Cotton, Inc. 1977). HL&P eventually abandoned plans for the power plant and subsequently the Brazos River Authority obtained an option to purchase the reservoir site from HL&P. The reservoir, if built, could serve as a water storage facility for the Trans-Texas Water Program (HDR Engineering, Inc. *et al.* 1994).

To assist in future environmental impact evaluations, the Texas Parks and Wildlife Department conducted a pre-impoundment survey of the fish community at the proposed Allens Creek Reservoir site and nearby Brazos River.

STUDY AREA

Allens Creek originates southeast of Sealy, Texas (Austin County), and flows south for about 16 km before making a strong turn to the east, emptying into the Brazos River after another 6 km. The proposed reservoir is located about 3 km north of Wallis, Texas (Figure 1).

Six sampling stations were selected within the study area (Table 1). One station was located upstream, two within, and three downstream of the proposed reservoir.

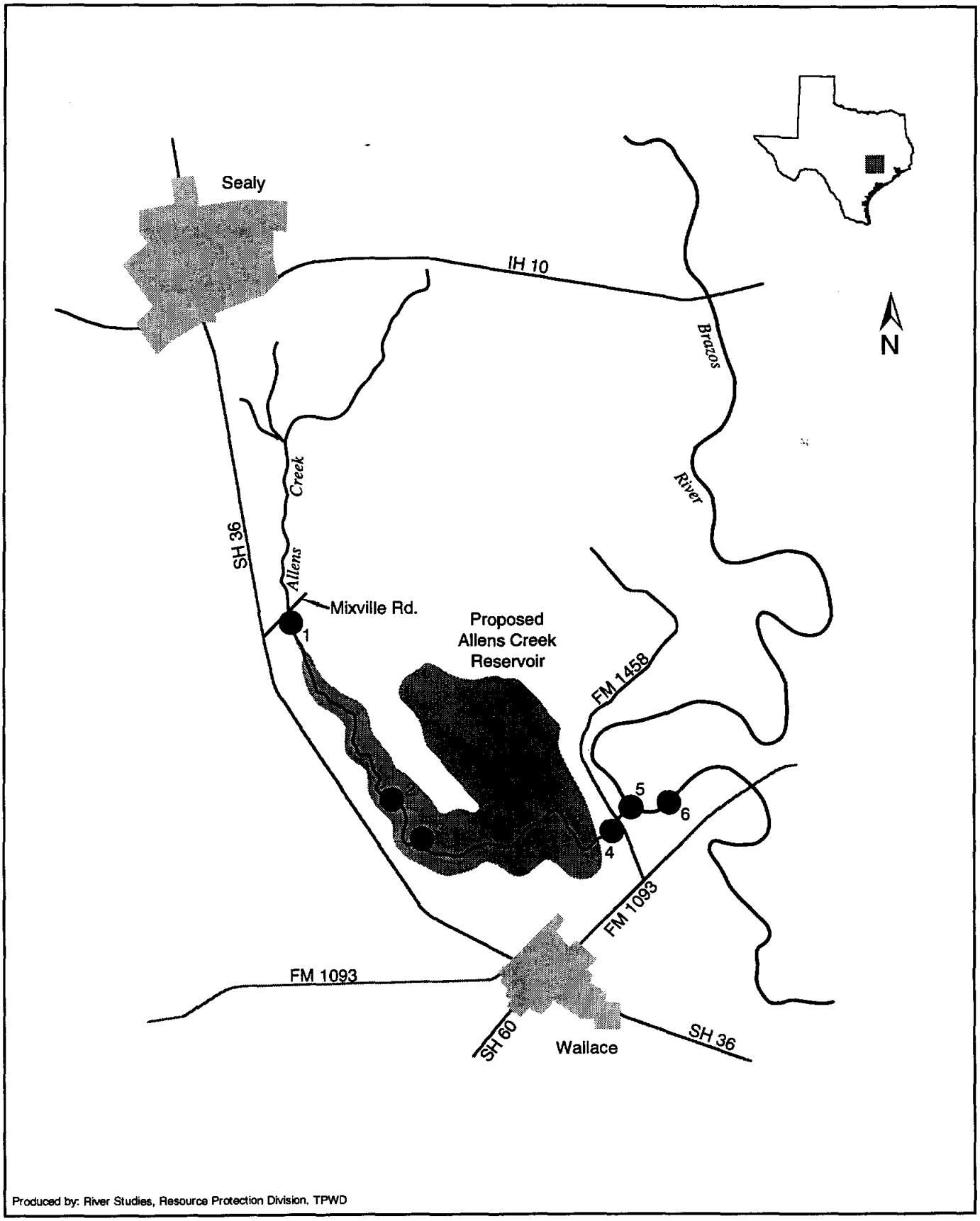

Figure 1. Sample stations on Allens Creek and Brazos River (Austin County, Texas). See Table 1 for station descriptions.

Table 1. Sample station descriptions for Allens Creek and the Brazos River, Texas (Austin County).

Station 1: Allens Creek at Mixville Road. GPS: 29°42'15"N 96°07'45"W
Station 2: Allens Creek at private road off from SH 36 on Houston Power and Light property. GPS: 29°40'2"N 96°06'19"W
Station 3: Allens Creek at private road off from SH 36 on Houston Power and Light property. The private road is located across from the Christ Our Redeemer Church Academy. GPS: 29°39'20"N 96°06'00"W
Station 4: Allens Creek at FM 1458. GPS: 29°39'56"N 96°02'49"W
Station 5: Allens Creek at mouth. GPS: 29°39'56"N 96°02'49"W
Station 6: Brazos River between Allens Creek and FM 1093.

The upstream station (Station 1) was established at Mixville Road, about 8 km south of Sealy. This site consisted of turbid, shallow pools (typically less than 0.3 m deep) and riffles. Substrate was sand and clay. Much of the stream bank had been recently cleared for pastureland. Woody debris, undercut banks, and root wads were prevalent and provided abundant fish habitat.

The two stations within the proposed reservoir, Stations 2 and 3, are located on HL&P property. Both stations are accessed by private roads off of SH 36. Entrance to Station 2 is through a gate located about 5 km south of Mixville Road. A large, white, abandoned two-story house on the east side of SH 36 identifies the gate leading into the station. The gate into Station 3 is about 2 km south of the gate for Station 2, and is located just across from the Christ Our Redeemer Church Academy. These stations were characterized by sand and clay substrate and very heavy canopy cover from mixed hardwood trees and willows. The stream was clear and shallow. In September, many of the pools at Station 3 were widely separated by long stretches of dry stream bed. Mean depth of most pools was about 0.3 m or less and maximum depth was about 1 m. The predominant land use within this portion of the watershed was cattle grazing.

Stations 4-6 are located downstream of the proposed reservoir. Station 4 was located at FM 1458. Station 5 was the most downstream station on Allens Creek and consisted of the first and second pools upstream from its confluence with the Brazos River. The downstream reach of Allens Creek was turbid and had very soft sand/silt substrate. Willows dominated the stream bank cover. Very little instream cover was

noted. The major land uses in the immediate vincinity of these stations were cattle grazing and hay production. Station 6 was located in the Brazos River just downstream from the mouth of Allens Creek. Sand was the dominant substrate in this area; however, gravel bars were also present. Snag habitat was scattered throughout the river but was not very abundant.

MATERIALS AND METHODS

Fish and physicochemical measurements were collected at five sampling stations in Allens Creek and one station in the Brazos River. Sampling was conducted on September 7-8, 1993, and again on November 16-17, 1993. Fish were collected at each station in Allens Creek with straight seines and a backpack electrofisher. Boat electrofishing was also employed at Station 5 during the November effort. Brazos River fish samples were collected with straight seines and a boat-mounted electrofisher. Habitats were sampled in proportion to their occurrence.

Physicochemical parameters were measured at each station with a Hydrolab Scout and included: dissolved oxygen, pH, conductivity, and temperature. General physical features such as substrate, turbidity, water depth, and riparian attributes were noted while sampling.

The Index of Biotic Integrity (IBI) was used to evaluate the fish community (Karr *et al.* 1986), though the metrics and scoring criteria were modified to rate the Allens Creek and Brazos River fish community. Metrics and scoring criteria were developed from a study of minimally disturbed Texas streams (Bayer *et al.* 1992). Trophic and tolerance designations follow that developed by Linam and Kleinsasser (unpublished

manuscript).

All sample stations but Station 1 are within the Western Gulf Coastal Plain Region. Station 1 lies just within the boundary of the South Central and Southern Humid, Mixed Land Use Region (Omernik and Gallant 1989). Since regional boundaries were coarsely established and the stream characteristics and fish community at Station 1 were very similar to the other stations downstream, the same IBI metrics and scoring criteria were used for all stations (Table 2).

Eight of the original IBI metrics developed by Karr *et al.* (1986) were employed in this study. The number of darter species and the number of sucker species were eliminated because only one darter species and no suckers were collected from the minimally disturbed streams sampled in the Western Gulf Coastal Plain Region (Bayer *et al.* 1992). Number of cyprinid species excluding common carp (*Cyprinus carpio*) and number of catfish species were used in their place. These modifications were previously employed in Texas during a study of the Trinity River (Kleinsasser and Linam 1989). Catfish were used based upon suggested modifications by Karr *et al.* (1986) and because they were well represented in collections from the minimally disturbed streams in this region. Cyprinid species was selected because cyprinids were fairly common in the minimally disturbed streams from this region and because this family is considered to have many species which serve as good indicators of water quality (Ramsey 1968). Also, Hughes and Gammon (1987) used cyprinids as a target group in an IBI study of the Willamette River, citing their responsiveness to deterioration of habitat structure (Minckley 1973; Moyle 1976).

Table 2. Metrics, scoring criteria, and integrity classes used to evaluate the fish community in Allens Creek and the Brazos River.

	Scoring criteria		
METRIC	5	3	1
1. Total number of fish species	>10	5-10	<5
2. Number of cyprinid species (excluding common carp)	>2	2	<2
3. Number of catfish species	>2	2	<2
4. Number of sunfish species	>3	2-3	<2
5. Number of intolerant species	≥1	-	0
6. Proportion of individuals as tolerant species (excluding western mosquitofish)	<26%	26-50%	>50%
7. Proportion of individuals as omnivores	<9%	9-16%	>16%
8. Proportion of individuals as invertebrate feeders	>64%	34-64%	<34%
9. Proportion of individuals as piscivores	>2%	1-2%	0%
10. Number of individuals in sample*			
a. Individuals/seine haul	>174	88-174	<88
b. Individuals/minute shocked	>6	4-6	<4
11. Proportion of individuals as introduced species	<2%	2%	>2%
12. Proportion of individuals with disease or other anomaly	<0.6%	0.6-1%	>1%

IBI Score	Integrity Class
58-60	Excellent
48-52	Good
40-44	Fair
28-34	Poor
12-22	Very Poor
	No Fish

* Rating calculated as a mean of a and b

The scoring criteria for number of intolerant species was adjusted such that this metric can either receive a score of five or one, since only one intolerant species was collected from the minimally disturbed streams in this region. The proportion of individuals as tolerant species (excluding western mosquitofish, *Gambusia affinis*) was substituted for proportion of individuals as green sunfish (*Lepomis cyanellus*). Karr *et al.* (1986) selected green sunfish as a species that tends to overpopulate disturbed areas, but offered proportion of tolerant individuals as an alternate metric. Western mosquitofish are tolerant, but were excluded since there does not appear to be a relationship between water quality and their abundance. They are common in both perturbed and unperturbed systems, and were often the most abundant species in the minimally disturbed streams sampled. Their inclusion would have reduced the sensitivity of this metric.

In other modifications, the proportion of individuals as invertebrate feeders was substituted for proportion of insectivorous cyprinids, following the guidance of Karr *et al.* (1986). The proportion of individuals as hybrids was replaced with the proportion of individuals as introduced species. Introduced species may impact the native species present, and their presence is often an indication of deteriorating stream conditions.

RESULTS AND DISCUSSION

Physicochemical measurements are reported in Table 3. All measured parameters were within ranges capable of supporting a diverse fish community. Conductivity in Allens Creek increased substantially between Stations 3 and 4

Table 3. Physicochemical measurements recorded in Allens Creek and the Brazos River during September and November, 1993.

	SEPTEMBER					
	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Date	9/8/93	9/8/93	9/8/93	9/7/93	9/7/93	9/7/93
Time	0902	1204	1454	1813	1107	1430
Temperature (°C)	23.07	25.22	25.85	26.23	26.43	30.03
Dissolved Oxygen (mg/L)	3.63	5.81	5.74	9.74	5.09	8.60
Conductivity (*u*mhos/cm)	573	512	576	750	755	1160
pH	7.65	8.04	8.13	7.66	7.90	8.21

	NOVEMBER					
	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Date	11/16/93	11/16/93	11/16/93	11/16/93	11/17/93	11/17/93
Time	0937	1050	1220	1441	1134	1301
Temperature (°C)	17.63	17.84	17.14	16.72	14.52	17.21
Dissolved Oxygen (mg/L)	7.58	8.43	8.82	7.25	8.50	8.02
Conductivity (*u*mhos/cm)	226	299	190	268	132	637
pH	7.66	7.97	8.12	8.16	8.35	8.19

(possibly due to the City of Wallis sewage treatment plant), but was even higher in the Brazos River (nearly twice the highest values recorded in Allens Creek during September, and more than twice the values recorded in November). Temperature was also slightly higher in the Brazos River (during September), likely due in part to the dense canopy cover over Allens Creek.

November 1993 physicochemical measurements were recorded during a major thunderstorm associated with a cold front moving through the area. Runoff caused the creek to rise and deposition of sediment was observed at the mouths of channels entering the creek. Measurements reported for the sample period reflect those conditions. Water temperature was considerably cooler and conductivity was up to six times lower than in September.

Forty-four fish species were collected from Allens Creek and the Brazos River (Tables 4 and 5). Western mosquitofish was the most abundant fish species at all but two sampling stations in Allens Creek. Pirate perch (*Aphredoderus sayanus*) slightly outnumbered it at Station 2 in September, whereas longear sunfish (*Lepomis megalotis*) outnumbered it there in November. Red shiner (*Cyprinella lutrensis*) was the most abundant species at Station 5 in November, and dominated both collections in the Brazos River.

Red shiner was the dominant cyprinid at Stations 4, 5, and 6 during September and at Stations 5 and 6 in November; however, bullhead minnow (*Pimephales vigilax*) displaced it as the most numerous cyprinid at Station 4 in November. No one cyprinid species dominated the three upstream stations, but blacktail shiner was the most

Table 4. Fishes collected with seines and electrofishing gear from Allens Creek and the Brazos River during September 1993.

Species	Common Name	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Lepisosteus oculatus	Spotted gar			1		16	3
Lepisosteus osseus	Longnose gar						1
Amia calva	Bowfin			1			
Dorosoma cepedianum	Gizzard shad		4	1	1		39
Dorosoma petenense	Threadfin shad					5	1
Cyprinella lutrensis	Red shiner	2	1	2	212	128	1120
Cyprinella venusta	Blacktail shiner	8	8	10	66	34	
Cyprinus carpio	Common carp	1	3	5	5	2	3
Hybognathus nuchalis	Mississippi silvery minnow			1			
Lythrurus fumeus	Ribbon shiner	5				5	
Macrhybopsis aestivalis	Speckled chub						1
Macrhybopsis storeriana	Silver chub						1
Notemigonus crysoleucas	Golden shiner	3			1	1	
Notropis buchanani	Ghost shiner						
Notropis shumardi	Silverband shiner					5	363
Opsopoedus emiliae	Pugnose minnow					1	
Pimephales vigilax	Bullhead minnow	8	1	4	48	7	266
Carpiodes carpio	River carpsucker	1	3	5	18		47
Ictiobus bubalus	Smallmouth buffalo				1		
Minytrema melanops	Spotted sucker		1				
Ameiurus melas	Black bullhead				1		
Ameiurus natalis	Yellow bullhead	3	38	24	2		
Ictalurus furcatus	Blue catfish						20
Ictalurus punctatus	Channel catfish	3	1	11	9		47
Noturus gyrinus	Tadpole madtom	1		1			
Pylodictis olivaris	Flathead catfish			1			22
Aphredoderus sayanus	Pirate perch	7	37	28	5	6	
Gambusia affinis	Western mosquitofish	215	35	508	3861	463	551
Menidia beryllina	Inland silverside					2	
Elassoma zonatum	Banded pygmy sunfish						
Lepomis cyanellus	Green sunfish	2	21	21	50	13	16
Lepomis gulosus	Warmouth	7	9	3	24	42	
Lepomis humilis	Orangespotted sunfish				1		
Lepomis hybrid	Sunfish hybrid				2		
Lepomis macrochirus	Bluegill	29	13	20	53	50	2
Lepomis megalotis	Longear sunfish	19	20	13	8	2	
Lepomis microlophus	Redear sunfish				2		
Lepomis sp. (juvenile)	Juvenile sunfish						
Micropterus punctulatus	Spotted bass						
Micropterus salmoides	Largemouth bass	1	1	4	1		
Pomoxis annularis	White crappie			1	4	18	1
Pomoxis nigromaculatus	Black crappie					2	
Etheostoma gracile	Slough darter	9			6	1	
Aplodinotus grunniens	Freshwater drum						
Mugil cephalus	Striped mullet						5
Mugil curema	White mullet						2

Table 5. Fishes collected with seines and electrofishing gear from Allens Creek and the Brazos River during November 1993.

Species	Common Name	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Lepisosteus oculatus	Spotted gar				1		6
Lepisosteus osseus	Longnose gar						1
Amia calva	Bowfin	1				1	
Dorosoma cepedianum	Gizzard shad	1			1	5	17
Dorosoma petenense	Threadfin shad						2
Cyprinella lutrensis	Red shiner			1	22	204	1694
Cyprinella venusta	Blacktail shiner	16	8	3	3	1	1
Cyprinus carpio	Common carp	4	2			9	
Hybognathus nuchalis	Mississippi silvery minnow		3	1		1	1
Lythrurus fumeus	Ribbon shiner						
Macrhybopsis aestivalis	Speckled chub						
Macrhybopsis storeriana	Silver chub						
Notemigonus crysoleucas	Golden shiner						
Notropis buchanani	Ghost shiner					1	3
Notropis shumardi	Silverband shiner				20	16	137
Opsopoedus emiliae	Pugnose minnow					1	
Pimephales vigilax	Bullhead minnow	3	2	7	62	85	312
Carpiodes carpio	River carpsucker	2	5		5	3	11
Ictiobus bubalus	Smallmouth buffalo		1		1	1	1
Minytrema melanops	Spotted sucker						
Ameiurus melas	Black bullhead		1				
Ameiurus natalis	Yellow bullhead	2	5	1			
Ictalurus furcatus	Blue catfish						1
Ictalurus punctatus	Channel catfish	2	2		1	4	11
Noturus gyrinus	Tadpole madtom	1					
Pylodictis olivaris	Flathead catfish						1
Aphredoderus sayanus	Pirate perch	3	6	3	1		
Gambusia affinis	Western mosquitofish	55	15	147	78	124	47
Menidia beryllina	Inland silverside						
Elassoma zonatum	Banded pygmy sunfish				1		
Lepomis cyanellus	Green sunfish	3	9	5	8	7	4
Lepomis gulosus	Warmouth	13	5	1	19	1	2
Lepomis humilis	Orangespotted sunfish				1	1	2
Lepomis hybrid	Sunfish hybrid						
Lepomis macrochirus	Bluegill	23	2		26	8	4
Lepomis megalotis	Longear sunfish	32	24	22	8	5	5
Lepomis microlophus	Redear sunfish						
Lepomis sp. (juvenile)	Juvenile sunfish						1
Micropterus punctulatus	Spotted bass			1			
Micropterus salmoides	Largemouth bass	1					
Pomoxis annularis	White crappie				2	2	2
Pomoxis nigromaculatus	Black crappie						
Etheostoma gracile	Slough darter	2	1	1	3		
Aplodinotus grunniens	Freshwater drum						6
Mugil cephalus	Striped mullet						1
Mugil curema	White mullet						

numerous cyprinid in most upstream collections. This shift in cyprinid abundance between Stations 3 and 4 may be related to factors including conductivity, turbidity, and siltation. As noted previously, conductivity substantially increased between Stations 3 and 4, turbidity was greater in the downstream reach, and substrate composition changed from clay and sand to very soft sand/silt. Allens Creek was nearly dry at Station 3 in September and was reduced to enduring pools to a point just upstream of Station 4. In-channel springs and the City of Wallis sewage treatment plant contributed to flow at Station 4; however, flow was scarcely apparent at its mouth (which was almost completely silted in). Red shiners and bullhead minnows appear better suited than many freshwater fishes (including blacktail shiners) to such physicochemical conditions providing them a possible advantage over other cyprinids in the lower reach and Brazos River (Paloumpis 1958; Minckley 1973; Pflieger 1975; Matthews and Hill 1977; Robison and Buchanan 1984; Cross and Moss 1987; Rutledge and Beitinger 1989).

River carpsucker (*Carpiodes carpio*) was collected at each station and was the most abundant of the three sucker species collected. River carpsucker are one of two sucker species listed as tolerant for purposes of IBI in Texas (Linam and Kleinsasser unpublished manuscript) and seem to prefer waters that are turbid much of the time as it is replaced in clearer waters by other suckers (Pflieger 1975). Smallmouth buffalo (*Ictiobus bubalus*) were collected at most of the stations, but in much lower numbers than river carpsucker.

Six catfish species were collected during this survey. Channel catfish (*Ictalurus*

punctatus) and yellow bullhead (*Ameiurus natalis*) were the two most common catfish species. Channel catfish were documented from each station but were most abundant from Station 4 downstream (including the Brazos River); whereas, yellow bullhead was the most common catfish species in the upstream reach of Allens Creek.

Collections made during this survey also documented eleven centrarchid species including banded pygmy sunfish (*Elassoma zonatum*), six *Lepomis* species, two black basses, and two crappies. Banded pygmy sunfish, redear sunfish (*Lepomis microlophus*), spotted bass (*Micropterus punctulatus*), and black crappie (*Pomoxis nigromaculatus*) were each only collected from one station (all in Allens Creek); whereas, orangespotted sunfish (*Lepomis humilis*) were only collected from Station 4 downstream (including the Brazos River). The others were fairly evenly distributed.

Other fish families collected include: Lepisosteidae (two species); Amiidae (one species - only from Allens Creek); Clupeidae (two species); Aphredoderidae (one species - only from Allens Creek); Atherinidae (one species - only from Allens Creek); Percidae (one species - only from Allens Creek); Sciaenidae (one species - only from the Brazos River); and Mugilidae (two species - only from the Brazos River).

During September, Station 3 received an excellent IBI integrity class rating; Stations 1 and 4, good to excellent; Stations 5 and 6, fair to good; and Station 2, fair (Table 6). Station 1 did not receive an excellent rating because of the low number of individuals collected and the moderately high proportion of fish with disease or anomalies. Station 4 rated less than excellent because of the absence of intolerant species and the moderate proportion of piscivores collected. Station 5 did not rate

Table 6. IBI ratings for the Allens Creek and Brazos River stations sampled during September 1993.

Metric	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
1. Total number of fish species	18 (5)	16 (5)	21 (5)	22 (5)	20 (5)	20 (5)
2. Number of cyprinid species (excluding common carp)	5 (5)	3 (5)	4 (5)	4 (5)	7 (5)	5 (5)
3. Number of catfish species	3 (5)	2 (3)	4 (5)	3 (5)	0 (1)	3 (5)
4. Number of sunfish species	4 (5)	4 (5)	4 (5)	6 (5)	4 (5)	2 (3)
5. Number of intolerant species (bonus)	1 (3)	0 (-)	1 (3)	0 (-)	0 (-)	0 (-)
6. Proportion of individuals as tolerant species (excluding western mosquitofish)	15 (5)	28 (3)	11 (5)	9 (5)	31 (3)	51 (3)
7. Proportion of individuals as omnivores	3 (5)	25 (3)	7 (5)	1 (5)	1 (5)	6 (5)
8. Proportion of individuals as invertebrate feeders	94 (5)	59 (3)	88 (5)	97 (5)	88 (5)	92 (5)
9. Proportion of individuals as piscivores	3 (5)	16 (5)	5 (5)	2 (5)	11 (5)	2 (5)
10. Number of individuals in sample						
a. Individuals/seine haul	38 (1)	8 (1)	85 (3)	1052 (5)	83 (3)	374 (5)
b. Individuals/minute electrofishing	4 (3)	10 (5)	10 (5)	10 (5)	3 (3)	3 (3)
Mean	(2)	(3)	(4)	(5)	(3)	(4)
11. Proportion of individuals as introduced species	0 (5)	1.5 (3)	0.8 (5)	0.1 (5)	0.2 (5)	0.1 (5)
12. Proportion of individuals with disease or other anomaly	0.9 (3)	0.5 (3)	0.3 (5)	0 (5)	0 (5)	0 (5)
Total IBI score	53	41	57	55	47	50
Integrity class	Good	Fair/Good	Excellent	Excellent	Good	Good/Excellent

higher because of the absence of catfish and intolerant species, the moderately high proportion of tolerant species, and the low number of individuals collected. Station 6 only had a moderate number of sunfish species, no intolerant species, a high proportion of tolerant species, a moderate proportion of piscivores, and a moderate number of individuals in the collection. Station 2 only received a fair rating due to a moderate number of catfish species, absence of intolerant species, moderately high proportion of tolerant species, imbalanced trophic structure, modest number of fish collected, and moderately high proportion of introduced species.

Integrity classes declined at all stations in Allens Creek (except Station 2 which remained as fair) during November; while, the Brazos River station increased from a fair to good integrity class to good. The changes in Allens Creek were likely due to the rising stream conditions which rendered sampling less effective than in September. This is supported by the species richness data in that the disparity in the number of species collected from each station increased downstream as rising waters exhibited an increasing effect on sampling efficiency. Species richness at Station 5 did not follow this trend since the high waters provided the opportunity to boat electrofish. In November, Stations 1, 4, and 6 received good integrity class ratings, Station 3 fair to good, and Stations 2 and 5 fair (Table 7). Less than expected numbers of fish were collected at each station. Besides low collection numbers contributing to the less than excellent rating, Station 1 only yielded a moderate number of cyprinid and sunfish species, a moderately high proportion of tolerant individuals, and a moderately high proportion of introduced species. Station 4 had a low number of catfish species,

Table 7. IBI ratings for the Allens Creek and Brazos River stations sampled during November 1993.

Metric	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
1. Total number of fish species	17 (5)	16 (5)	12 (5)	19 (5)	20 (5)	24 (5)
2. Number of cyprinid species (excluding common carp)	2 (3)	3 (5)	4 (5)	4 (5)	7 (5)	6 (5)
3. Number of catfish species	3 (5)	3 (5)	1 (1)	1 (1)	1 (1)	3 (5)
4. Number of sunfish species	3 (5)	4 (5)	3 (3)	5 (5)	5 (5)	5 (5)
5. Number of intolerant species (bonus)	1 (3)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)
6. Proportion of individuals as tolerant species (excluding western mosquitofish)	30 (3)	32 (3)	4 (5)	32 (3)	51 (3)	77 (1)
7. Proportion of individuals as omnivores	7 (5)	21 (3)	1 (5)	3 (5)	5 (5)	2 (5)
8. Proportion of individuals as invertebrate feeders	82 (5)	64 (3)	95 (5)	86 (5)	93 (5)	97 (5)
9. Proportion of individuals as piscivores	11 (5)	15 (5)	4 (5)	11 (5)	2 (5)	1 (3)
10. Number of individuals in sample						
a. Individuals/seine haul	9 (1)	7 (1)	22 (1)	10 (1)	33 (1)	724 (5)
b. Individuals/minute electrofishing	7 (5)	4 (3)	5 (5)	20 (5)	14 (5)	2 (3)
Mean	(3)	(2)	(3)	(3)	(3)	(4)
11. Proportion of individuals as introduced species	2.4 (1)	2.2 (1)	0 (5)	0 (5)	1.9 (3)	0 (5)
12. Proportion of individuals with disease or other anomaly	0 (5)	0 (5)	0 (5)	0 (5)	0 (5)	0 (5)
Total IBI score	48	42	47	47	45	48
Integrity class	Good	Fair/Good	Good	Good	Good	Good

no intolerant species, and a moderately high proportion of tolerant individuals. Station 6 yielded no intolerant species, a high proportion of tolerant individuals, and a moderate proportion of piscivores. Station 3 rated fair to good because of the low number of catfish species, moderate number of sunfish species, and absence of intolerant species. Station 2 rated fair due to the absence of intolerant species, moderately high proportion of tolerant species, imbalanced trophic structure, and moderately high proportion of introduced species. Station 5 also rated fair, due to the low number of catfish species, absence of intolerant species, high proportion of tolerant individuals, moderate proportion of piscivores, and moderately high proportion of introduced species.

SUMMARY

The impoundment of streams has immediate obvious effects on the terrestrial ecosystem which is inundated, but perhaps less obvious effects on the aquatic environment. Fish species with specific habitat requirements associated with lotic systems are often replaced with species more suited for lentic environments. Allens Creek, as well as the Brazos River station, have rich fish faunas typical of streams in the Western Gulf Coastal Plain with species richnesses comparable to minimally disturbed streams sampled within this region (Bayer *et al.* 1992). Integrity classes for the fish communities at Stations 2 and 3 (which lie within the proposed impoundment) rated as fair and good to excellent, respectively, over the two sampling periods.

Stream reaches downstream of impoundments may also be affected as stream flow decreases and the overall hydrological pattern is altered. The fish community at

Stations 4 and 5 rated good and fair, respectively, over the two sampling periods; whereas, the Brazos River station rated fair to good.

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