

MEDINA RIVER FISH KILL

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INTRODUCTION

A Southern Pacific train consisting of 112 cars derailed at 10:40 p.m. on September 14, 1985. The wreck occurred at the Medina River bridge near the town of Macdona in southwestern Bexar County (Figure 1.) The train was transporting 112 tank cars including 21 cars that were carrying approximately 286,000 gallons of 95 percent sulfuric acid. When the tank cars ruptured, an estimated 264,000 gallons of sulfuric acid were released. Approximately 42,000 gallons flowed from the spill site down Nelson Road and entered the Medina River in the vicinity of a bridge known as the low water crossing. Approximately 50,000 gallons of acid were retained by emergency berms, dikes and natural depressions and were collected and transported off site. Approximately 22,000 gallons of acid remained in the tank cars and were removed for disposal or reclamation. The balance of material either soaked into the soil or flowed into an abandoned gravel quarry immediately adjacent to the spill site.

Sulfuric acid disassociates almost completely in water to release sulfate ions and hydrogen ions. An increase in hydrogen ion concentration would lower the pH. A pH range of 6.5 to 9.0 has been established to provide adequate protection for freshwater fish and invertebrate fish food organisms. Outside of this range, fish suffer adverse physiological effects increasing in severity as the degree of deviation from this range increases until lethal levels are reached (EPA, 1976). According to the American Fisheries Society (1979), a pH range of 6.5 to 8.5 with no change greater than 0.5 units outside estimated natural seasonal maxima and minima provides nearly a maximum level of protection for freshwater aquatic life.

The toxicity of sulfuric acid to aquatic life is a function of the resulting pH (Doudoroff and Katz, 1950). Ellis (1943) confirmed this observation by stating that sulfuric acid must be diluted to give a pH of 4.5 or higher in order for fish to survive, and to pH 5.5 for other aquatic organisms to thrive and provide food for fish. Sunfish, bass and carp exhibit gill irritation and/or death below pH 4.0 (Lewis 1956). When sulfuric acid in streams depresses the pH below 5.0, atypical aquatic ecosystems develop (Harrison 1958). Also, species diversity declines and only a few resistant species remain which dominate the system (Boesch 1977).

Due to the large quantity of sulfuric acid that reached the river, Texas Parks and Wildlife Department (TPWD) made an investigation of the spill to assess damage to aquatic life in the Medina River. Law Enforcement personnel were on the scene within two hours after the spill occurred. Restricted access to the site and concern for public safety delayed fish kill investigation activities until the evening of September 15, 1985.

MATERIALS AND METHODS

Five 150 foot segment counts were made on September 16 by Law Enforcement and Resource Protection personnel between the spill site at FM 1604 and IH-35, a distance of 7.2 miles (Figure 1). Sampling sites were selected

on the basis of their accessibility. Due to the harmful acidic condition of the river, only shoreline counts were made. All of the fish counted were identified and measured by inch class.

Seven 150 foot segment counts were made on September 18 by Inland Fisheries personnel between the spill site and Applewhite Road, a distance of 17 miles. These segments were also selected according to accessibility. Two boats were launched at IH-35 and motored upstream and downstream to select count segments based on bottom type and river flow; i.e., deep holes, riffle areas, fast flowing water and low flowing water. Segment lengths were determined by anchoring a 150-foot rope at the lead end with a float attached at the trail end. All fish along the shoreline and in the river within this 150 foot distance were identified, counted and measured.

On September 20, ten 150 foot segments were counted by Inland Fisheries and Resource Protection personnel from Applewhite Road downstream to FM 1937, a distance of 12 miles. Two boats were launched at the U.S. 281 bridge. One crew made three segment counts. The first sampling segment was established by the sampling crew by motoring upstream for 25 minutes. The second and third segments were selected by floating downstream at four minute intervals. The second crew made seven segment counts, spacing the distance between segments at four minute intervals. Each segment distance was measured with a 150 foot rope anchored at the lead end and a float attached at the trail end. All species were counted, measured and identified by inch class.

The number of fish in each inch class for each species were summed and multiplied by an expansion factor to obtain an estimate of the total number of dead fish in the river. Expansion factors were calculated according to the following general equation:

$$EF = \frac{\text{total stream miles affected}}{\text{summed lengths of segments counted}}$$

Expansion factors were calculated for each day counts were made. These expansion factors are:

$$\begin{array}{l} \text{September 16, 1985} \\ \text{(Spill site to IH-35)} \end{array} \quad EF = \frac{(5,280 \text{ ft/mile}) (7.2 \text{ miles})}{5 (150 \text{ ft.})}$$

$$EF = 50.7$$

$$\begin{array}{l} \text{September 18, 1985} \\ \text{(Spill site to} \\ \text{Applewhite Rd.)} \end{array} \quad EF = \frac{(5,280 \text{ ft/mile}) (17 \text{ miles})}{7 (150 \text{ ft.})}$$

$$EF = 85.5$$

$$\begin{array}{l} \text{September 20, 1985} \\ \text{(Applewhite Rd.} \\ \text{to FM 1937)} \end{array} \quad EF = \frac{(5,280 \text{ ft/mile}) (12 \text{ miles})}{10 (150 \text{ ft.})}$$

$$EF = 42.2$$

TPWD personnel made pH measurements with a portable Hach meter. Qualitative observations of water color and turbidity were made at all river crossings from the spill site to its confluence with the San Antonio River. Additional pH data were obtained from the Texas Water Commission and San Antonio River Authority (Table 4). In addition, containment and cleanup efforts were monitored throughout the spill by Resource Protection personnel.

RESULTS

On September 16, 253 fish were counted in five, 150 foot segments from the spill site to IH-35 (Table 1). The first segment count was made approximately one mile below the spill site where the depth of water ranged from 3 to 10 feet. There were 29 fish representing four species counted within the segment. The count included sunfish (Lepomis sp.), carp (Cyprinus carpio), gizzard shad (Dorosoma cepedianum), and white crappie (Pomoxis annularis). Organic material in the river was decomposed by the acid which resulted in an increase in water clarity compared to ambient conditions. (Many large fish were observed on the bottom of deep pools. The pH was 1.0 (Table 4) and the fish that were counted were soft and deteriorated.

The second count was made in a shallow, riffle area approximately 500 yards downstream from the first segment. Most of the fish were caught in debris along the banks with some observed in shallow areas. One hundred five fish were counted that included sunfish, largemouth bass (Micropterus salmoides), channel catfish (Ictalurus punctatus), alligator gar (Lepisosteus spatula), gizzard shad, and Rio Grande cichlids (Cichlasoma cyanoguttatum). The pH in this segment was 1.0 and the water was clear.

The third count was made below Pearsall Road. This segment of the river was approximately 3 to 6 feet deep. There were 42 organisms counted representing five species that included alligator gar, American eel (Anguilla rostrata), gizzard shad, sunfish and Rio Grande cichlids. The color of the water was greenish-white as a result of lime added at Pearsall Road. The pH had increased to 5.8 as a result of the lime.

The count at segment four, made one mile upstream from IH-35, included 31 organisms representing six species such as alligator gar, gizzard shad, channel catfish, sunfish and American eel. The water was clear and a large number of dead fish were observed on the bottom. The pH of the river in this segment was 1.0.

The last segment count was made at the IH-35 crossing. The count totaled 46 organisms representing three species that included sunfish, gizzard shad and American eel. Large numbers of fish were observed on the bottom. The fish were deteriorated as a result of a pH of 1.8.

In summary, nine species of fish were counted in the river between the spill site and IH-35, a distance of 7.2 miles (Table 1). These species included sunfish, common carp, channel catfish, largemouth bass, gizzard shad, white crappie, alligator gar, Rio Grande cichlid and the American eel. The total count of 253 fish was then expanded to 12,829 by

multiplying the actual count of all inch classes by an expansion factor of 50.7. The pH ranged from 1.0 to 7.0 while dead fish were counted in this segment.

On September 18, large numbers of dead fish were observed in the river from the spill site to Applewhite Road, a distance of 17 miles (Table 2). The pH ranged from 7.8 at the IH-35 bridge to 11.8 at Applewhite Road. ~~The fish were not soft and deteriorated as the ones counted on the 16th. Also, there were no dead fish observed on the bottom~~ and most of the fish were floating midstream or were caught in debris along the bank. The total count within the seven segments included and 976 fish representing 15 species. The species killed were sunfish, channel catfish, largemouth bass, gizzard shad, gray redhorse (*Moxostoma congestum*), common carp, smallmouth buffalo (*Ictiobus bubalus*), Rio Grande cichlid, *Tilapia* sp., alligator gar, inland silverside (*Menidia beryllina*), white crappie, sailfin molly (*Poecilia latipinna*), log perch (*Percina caprodes*) and the American eel. The total estimated number of fish killed within this section of the river was 83,449. This number was derived by expanding the total counted in all segments by the expansion factor of 85.5.

Many dead fish were observed in the river within the 12 mile segment from Applewhite Road to FM 1937. On September 20, one thousand nine hundred eighty one (1,981) dead fish were counted in this segment (Table 3). The 1,981 fish counted were multiplied by an expansion factor of 42.2 resulting in an estimated number of 83,591 fish killed in this segment. The 12 species killed included the Rio Grande cichlid, channel catfish, sunfish, common carp, inland silverside, sailfin molly, gizzard shad, mosquitofish (*Gambusia affinis*), alligator gar, largemouth bass, gray redhorse, and American eel. On September 19, pH readings of 11.5 and 10.3 were measured within this segment at Applewhite Road and U.S. 281, respectively (Table 4).

The September 16 fish kill counts from the spill site to IH-35 were not included when determining the total number of dead fish within the 29 miles of river affected. The ratio of the number of dead fish on the bottom versus those counted within this 7.2 miles was approximately 5:1. The acid deteriorated most of the fish preventing them from floating to the surface and from being counted and measured accurately. Therefore, the estimate of 12,829 dead fish in this segment was considered to be low and underestimated the full impact of the spill in this segment. The September 18 counts were expanded over this section to provide more accurate counts than those made on September 16.

The counts made on September 18, between the spill site and Applewhite Road and the counts made on September 20, between Applewhite Road and FM 1937 were considered separately when determining the total number of fish killed. Since species diversity between these two sections differed, the two sections were expanded separately so that a more accurate estimate of the total number of fish killed could be determined. Several species including tilapia, Rio Grande cichlid, American eel, sunfish and smallmouth buffalo were found exclusively or in much higher numbers at either the September 18 or September 20 sections (Tables 2 and 3). Therefore, after summing the estimated totals from both sections, the

total kill in the 29 mile stretch of the river affected by the acid or lime was 167,040 fish.

DISCUSSION

When the sulfuric acid entered the river on September 14, the pH dropped from ambient levels of 7.7 to 8.1, to 1.0 at the spill site (Table 4). The acid reacted with organic matter in the river forming a black, foam-like scum. In addition, the river was dark brown in color and a slight odor of sulfuric acid was prevalent. To prevent further downstream contamination by the foam, a skim boom was placed on the upstream side of the low water crossing bridge.

Monitoring of pH was started immediately by Parks and Wildlife and Water Commission personnel to locate the acid plume downstream from the spill site. The leading edge of the acid plume (pH 1.0) was located at 0230 on September 15, approximately one mile downstream from the spill site. In contrast, the pH at Pearsall Road, 2.8 miles from the spill site, was 7-8 at 0300. Discussions were held by Southern Pacific and Water Commission personnel to determine methods to stop the downstream flow of acid. Southern Pacific then attempted to construct a man-made dam across the river at the leading edge of the acid plume to divert the flow of the acid contaminated river into a gravel pit adjacent to the river. The river flow was too great to safely divert, so construction was stopped. Southern Pacific with Water Commission concurrence then made a decision to neutralize the acid with hydrated lime ($\text{Ca}(\text{OH})_2$). Lime was pumped into the river at approximately 0300 on September 15 at the spill site and the low water crossing bridge.

At 0630 on September 15, Law Enforcement personnel observed dead fish near the man-made dam where the pH was <1.0, much less than the 6.5 to 9.0 optimal range for fish survival. At 0930, the pH at Pearsall Road, 2.8 miles from the spill site, was also <1.0. This appeared to be the leading edge of the acid plume since the pH downstream at IH-35 was 7-8. Additional lime trucks were called in to begin liming efforts at Pearsall Road.

On September 16, at 0700, the pH at IH-35 was 6.0 to 7.0 indicating slight acid contamination. At 1015, the pH measured 1.0 to 2.0 and remained less than 1.0 from the spill site to IH-35 for 48 hours. This low pH resulted in the mortality of 12,829 fish in this section.

Southern Pacific moved the liming operations to the downstream side of IH-35 on the morning of September 16. Lime trucks began adding lime at a tremendous rate and the pH immediately increased to 12 to 13 within 10 minutes. The addition of lime at IH-35 was stopped at approximately midnight on September 16. The excessive liming at IH-35 reversed the condition of the river from acidic to basic. The pH of the river was then greater than the 6.5 to 9.0 optimal range and presented a hazard to aquatic organisms. The pH above IH-35 had returned to 7.8 to 8.2 by September 17. Monitoring of pH continued downstream to follow the route of the high pH plume that existed as a result of liming at IH-35.

On September 17, at 0730, a pH of 13.1 was measured at Somerset Road, a distance of 2.4 miles from IH-35. On September 18, at 0900 the pH at Applewhite Road was 11.8. This high pH plume, ranging from 11.8 to 13.1, covered the section of the river from IH-35 to Applewhite Road, a distance of 10 miles for 48 hours. Because the pH was greater than the optimal range of 6.5 to 9.0, a fish kill occurred.

Heavy rains on September 18 in the Medina River watershed increased the flow of Leon Creek to 45 cfs. This addition of water to the Medina River helped dilute the lime below U.S. 281. The pH at U.S. 281 and FM 1937 on September 20, was 9.0 and 9.1, respectively. The section of river between Applewhite Road and FM 1937 had a high pH plume ranging from 10.7 to 11.8 from 0900 on September 18 to 1420 on September 19. A high pH plume within this 12 mile stretch of the river was responsible for killing 83,591 fish. The pH below FM 1937 was <9.0, so FM 1937 was considered to be the end point of the fish kill.

A total of 1,078 tons of lime were used for neutralization with 525 tons placed in the river. Due to the method used to add the lime, the river became supersaturated with respect to $\text{Ca}(\text{OH})_2$. This resulted in a residue of unreacted lime that precipitated to the bottom. When the $\text{Ca}(\text{OH})_2$ reacted with the sulfuric acid, a calcium sulfate crust formed over the unreacted lime. Large deposits of unreacted lime remained in the river and would remain a continued threat to aquatic life if not removed.

International Technology, Inc. (IT), a consulting firm for Southern Pacific, was hired to remove the unreacted lime residue from the river. The areas of concern were the spill site, low water crossing bridge and Pearsall Road. Approximately 25 tons of lime had been added at the spill site, 50 tons at the low water bridge and 250 tons at Pearsall Road. It was estimated that 200 tons of lime remained in the river.

Removal operations began on September 24. A high capacity vacuum dredge was used to remove the lime. The dredge had an 80 foot extension boom which allowed access to most parts of the river, with minimal impact on the river bottom. The lime removed was transported to the acid contaminated gravel pits for neutralization.

When the unreacted lime was disturbed, the pH immediately increased from ambient pH levels of 7 to 8, to 14. To prevent further downstream contamination, a weir was constructed below the lower limit of lime contamination at the IH-35 site. The purpose of the weir was to act as a final barrier for lime flushed downstream by the dredging activities. A pH monitoring system was installed at the weir location to monitor any increase in pH caused by removal. If the pH of the water crossing the weir exceeded 9.5, a neutralization agent (H_2SO_4) was available to bring the pH of the river to an acceptable level. The pH monitored at 100 yard intervals downstream during removal operations did not exceed 8.2. Removal operations were completed by December 4, 1985.

CONCLUSION

All fish in the Medina River from the spill site at FM 1604 to FM 1937, a distance of 29 miles, were killed as a result of sulfuric acid spilled during the September 14, 1985 train derailment and from over liming of the river for neutralization. For 24 hours after the spill, the pH in the river from the spill site to IH-35 was less than 1.0 which was less than the lower optimal limit of 6.5. As a result, an estimated 12,829 fish representing nine species were killed in this segment. The fish killed included sunfish, common carp, channel catfish, largemouth bass, gizzard shad, white crappie, alligator gar, Rio Grande cichlid and American eel.

Over-liming at IH-35 caused a pH plume ranging from 10.8 to 13.1 to move downstream from 1015 on September 16, to 1650 on September 19. The pH was above the upper optimal limit of 9.0. As a result, 16 species were killed. The fish killed included Rio Grande cichlids, channel catfish, sunfish, common carp, inland silverside, sailfin molly, gizzard shad, mosquitofish, alligator gar, largemouth bass, gray redhorse, American eel, smallmouth buffalo, white crappie, log perch, and tilapia.

Heavy runoff during the week provided additional water to the river from Leon Creek. The increase in flow diluted the lime below FM 1937 and reduced the pH to 9.0. Some fish in the river were in stress from FM 1937 to its confluence with the San Antonio River. However, the pH was within the acceptable range of 6.5 to 9.0 and a kill did not occur.

As a result of the acid spill and excessive amounts of hydrated lime added to the river, 167,040 fish were killed.

LITERATURE CITED

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Table 1. Number of fish counted and expanded numbers in Medina River from spill site to IH-35, September 16, 1985.

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>
<u>Lepomis spp.</u>	1	45	2281
	2	73	3701
	3	1	51
	Subtotal	<u>119</u>	<u>6033</u>
<u>Cyprinus carpio</u> (common carp)	6	5	254
	8	1	51
	10	4	203
	12	4	203
	14	6	304
	15	1	51
		<u>21</u>	<u>1066</u>
<u>Ictalurus punctatus</u> (channel catfish)	2	1	51
	6	1	51
	8	1	51
	10	2	101
	12	2	101
	14	5	253
	16	3	152
	30	1	51
		<u>16</u>	<u>811</u>
	<u>Micropterus salmoides</u> (largemouth bass)	2	5
3		24	1217
4		1	51
		<u>30</u>	<u>1521</u>
<u>Dorosoma cepedianum</u> (gizzard shad)	6	18	913
	8	20	1014
	10	1	51
		<u>39</u>	<u>1978</u>

Table 1. (Continued)

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>
<u>Pomoxis annularis</u> (white crappie)	6	9	456
<u>Lepisosteus spatula</u> (alligator gar)	24 30	1 1 <u>2</u>	51 51 <u>102</u>
<u>Cichlasoma cyanoguttatum</u> (Rio Grande Cichlid)	6	14	710
<u>Anguilla rostrata</u> (American eel)	20 24	1 2 <u>3</u>	51 101 <u>152</u>
GRAND TOTAL		253	12,829

Table 2. Number of fish counted, expanded numbers and monetary value of fish killed in Medina River from spill site to Applewhite Road, September 18, 1985.

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>	<u>Weight (lb./fish)</u>	
<u>Lepomis spp.</u> (sunfish)	2	69	5900		
	3	403	34456		
	4	104	8892		
	5	22	1881		
	6	2	171		
			<u>600</u>	<u>51,300</u>	
<u>Ictalurus punctatus</u> (channel catfish)	3	2	171		
	4	1	86		
	5	5	428		
	6	16	1368		
	7	12	1026		
	8	16	1368		
	9	10	855		
	10	20	1710		
	11	1	85		
	12	8	684		
	13	5	427		
	14	13	1112		
	15	1	86		
	16	3	256		
	18	2	171		
	20	2	171		
			<u>117</u>	<u>10,004</u>	(1.6) (2.3) (3.2)
<u>Micropterus salmoides</u> (largemouth bass)	3	1	85		
	4	3	257		
	5	3	256		
	6	3	257		
	7	1	86		
	8	1	85		
	9	1	85		
			<u>17</u>	<u>1454</u>	

Table 2. (Continued)

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>	<u>Weight (lb./fish)</u>	
<u>Dorosoma cepedianum</u> (gizzard shad)	1	1	86		
	4	2	171		
	5	7	598		
	6	4	342		
	7	17	1454		
	8	30	2565		
	9	22	1881		
	10	26	2223		
	11	4	342		
	12	9	770		
	14	2	171		
		<u>124</u>	<u>10,603</u>		(1.0)
	<u>Moxostoma congestum</u> (gray redhorse)	6	4	342	
		7	12	1026	
8		5	427		
10		4	342		
11		4	342		
12		6	513		
13		1	85		
14		2	171		
18		1	86		
		<u>39</u>	<u>3334</u>		(.9) (1.0) (2.0)
<u>Cyprinus carpio</u> (common carp)		12	1	85	(1.0)
		14	1	86	(1.2)
		15	2	171	(1.5)
		17	1	85	(2.1)
	19	1	86	(3.0)	
	20	1	85	(4.0)	
	21	1	86	(4.6)	
	24	1	85	(6.2)	
		<u>9</u>	<u>769</u>		

Table 2. (Continued)

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>	<u>Weight (lb./fish)</u>
<u>Ictiobus bubalus</u> (smallmouth buffalo)	16	1	86	(7.0)
	22	1	85	(11.0)
	24	1	86	(12.0)
		<u>3</u>	<u>257</u>	
<u>Cichlasoma cyanoguttatum</u> (Rio Grande cichlid)	4	1	85	
	5	2	171	
	7	1	86	
		<u>4</u>	<u>342</u>	
<u>Tilapia</u> sp	3	1	85	
	4	2	171	
	5	2	171	
	6	7	599	
	7	2	171	
	10	<u>10</u>	<u>855</u>	
		<u>24</u>	<u>2052</u>	
<u>Lepisosteus spatula</u> (alligator gar)	7	1	86	(.5)
	8	1	85	(1.0)
	20	3	256	(1.0)
	23	1	86	(1.1)
	24	<u>2</u>	<u>171</u>	
	<u>8</u>	<u>684</u>		
<u>Menidia beryllina</u> (inland silverside)	1	1	85	
	2	3	257	
	4	1	86	
		<u>5</u>	<u>428</u>	
<u>Pomoxis annularis</u> (white crappie)	6	1	85	

Table 2. (Continued)

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>	<u>Weight (lb./fish)</u>
<u>Anguilla rostrata</u> (American eel)	14	3	256	(0.5)
	15	1	86	(0.5)
	18	1	85	(0.75)
	19	1	86	(0.75)
	20	7	598	(0.80)
	24	8	684	(1.00)
		<u>21</u>	<u>1795</u>	
<u>Poecilia latipinna</u> (saffin molly)	3	1	85	
<u>Percina caprodes</u> (log perch)	3	1	86	
	4	2	171	
		<u>3</u>	<u>257</u>	
SUBTOTAL		976	83,449	

Table 3. Numbers of fish counted, expanded numbers and monetary value of fish killed in Medina River from Applewhite Road to FM 1937, September 20, 1985.

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>	<u>Weight (lb./fish)</u>	
<u>Cichlasoma cyanoguttatum</u> (Rio Grande cichlid)	1	16	675		
	2	520	21944		
	3	242	10212		
	4	263	11099		
	5	318	13420		
	6	84	3545		
	7	2	84		
			<u>1445</u>	<u>60,979</u>	
<u>Ictalurus punctatus</u> (channel catfish)	2	4	169	(1.6)	
	3	25	1055	(2.3)	
	4	47	1983	(2.7)	
	5	41	1730	(3.2)	
	6	37	1561	(4.2)	
	7	19	802		
	8	37	1561		
	9	5	211		
	10	21	886		
	11	4	169		
	12	9	380		
	13	1	42		
14	6	253			
15	1	42			
16	7	295			
18	5	211			
19	3	127			
20	6	253			
22	1	42			
		<u>279</u>	<u>11,772</u>		

Table 3. (Continued)

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>	<u>Weight (lb./fish)</u>
<u>Lepomis spp</u> (sunfish)	1	2	84	
	2	39	1646	
	3	57	2405	
	4	23	971	
	5	4	169	
		<u>125</u>	<u>5275</u>	
<u>Cyprinus carpio</u> (Common carp)	6	7	295	
	8	1	42	
	12	1	42	(1.0)
	14	1	42	(1.2)
	18	6	253	(2.5)
	20	9	380	(4.0)
	24	11	464	(6.2)
		<u>36</u>	<u>1518</u>	
<u>Menidia beryllina</u> (Inland silverside)	1	5	211	
	2	30	1266	
	4	1	42	
		<u>36</u>	<u>1519</u>	
<u>Poecilia latipinna</u> (saffin molly)	1	18	760	
	2	2	84	
	3	1	42	
		<u>21</u>	<u>886</u>	
<u>Dorosoma cepedianum</u> (gizzard shad)	4	1	42	
	5	6	253	
	6	1	42	
	7	1	42	
	8	2	84	
	10	2	84	
	11	1	42	
	14	1	42	
		<u>15</u>	<u>631</u>	
				(1.0)

Table 3. (Continued)

<u>Species</u>	<u>Inch Class</u>	<u>Number Counted</u>	<u>Expanded Number</u>	<u>Weight (lb./fish)</u>
<u>Gambusia affinis</u> <u>(mosquitofish)</u>	1	14	591	
<u>Lepisosteus spatula</u> <u>(alligator gar)</u>	14 24 40	2 1 1 4	84 42 42 168	(1.1) (7.0)
<u>Micropterus salmoides</u> <u>(largemouth bass)</u>	4 5	1 1 2	42 42 84	
<u>Moxostoma congestum</u> <u>(gray redhorse)</u>	5 10	1 1 2	42 42 84	
<u>Anguilla rostrata</u> <u>(American eel)</u>	20 24	1 1 2	42 42 84	(0.80) (1.00)
SUBTOTAL		1981	83,591	