El Dorado Chemical Company
316(b) Supporting Documentation for NPDES Permit Renewal

Prepared for:

El Dorado Chemical Company

4500 North West Avenue

El Dorado, AR 71730

Prepared by:

Alliance Technical Group
219 Brown Lane
Bryant, AR 72022

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1.0 Background

El Dorado Chemical Company (EDCC), located in El Dorado, Arkansas, manufactures ammonium nitrate, ammonia, nitric acid, and sulfuric acid throughout several chemical processing units.

Water purchased from the Union County Water Conservation Board (UCWCB) is used to supply water for multiple chemical processing units throughout out the plant. A portion of that water is used for cooling purposes. The UCWCB has a water intake structure on the Ouachita River that is the source of the water used by EDCC. Since some of the water received from the UCWCB is used for cooling, EDCC is required to comply with Section 316(b) of the clean water act (40 CFR Part 125 Subpart J).

In order to comply with 316(b) requirements existing facilities are required to provide a list of specific 316(b) related information in their NPDES permit application. 40 CFR 122.22 r(ii)(A) states:

> *All existing facilities. The owner or operator of an existing facility defined at 40 CFR 125.92(k) must submit to the Director for review the information required under paragraphs (r)(2) and (3) of this section and applicable provisions of paragraphs (r)(4), (5), (6), (7), and (8) of this section.*

This document contains the required information as required by (40 CFR 122.22 r(ii)(A) as outline below:

- Source water physical data
- (r)(3) Intake structure data
- (r)(4) Baseline biological characterization
- (r)(5) Cooling water system data
- (r)(6) Chosen method of impingement compliance (BTA determination)
- (r)(7) Entrainment performance studies
- (r)(8) Operational status

2.0 (r)(2) Source Water Physical Data

The UCWCB withdraws water from the Ouachita River just upstream of the Hwy 167 road crossing near town of Calion, in Union County, Arkansas. The coordinates are 33.345154°, -92.533237° (Figure 1.)

The Ouachita River, at the intake structure, is a perennial large river. It is a meandering stream/river complex (sinuosity 1.2-1.6) with a Rosgen classification (Rosgen 1996) of C6 composed mostly of sand or silt/clay substrates in an alluvial valley. The channel is approximately 350 feet wide in the reach near the intake structure. River widths range from approximately 300 feet to over 400 feet in this area. The land uses along the river for several miles upstream of the intake are almost entirely forest and wetlands.

The river in this reach has historically been managed by the USACE for navigation. Up until recently the river had routine barge traffic. Due to historical navigation channel maintenance dredging the channel has depths that exceed 20 feet. A typical depth profile of the river is provided in Figure 2.

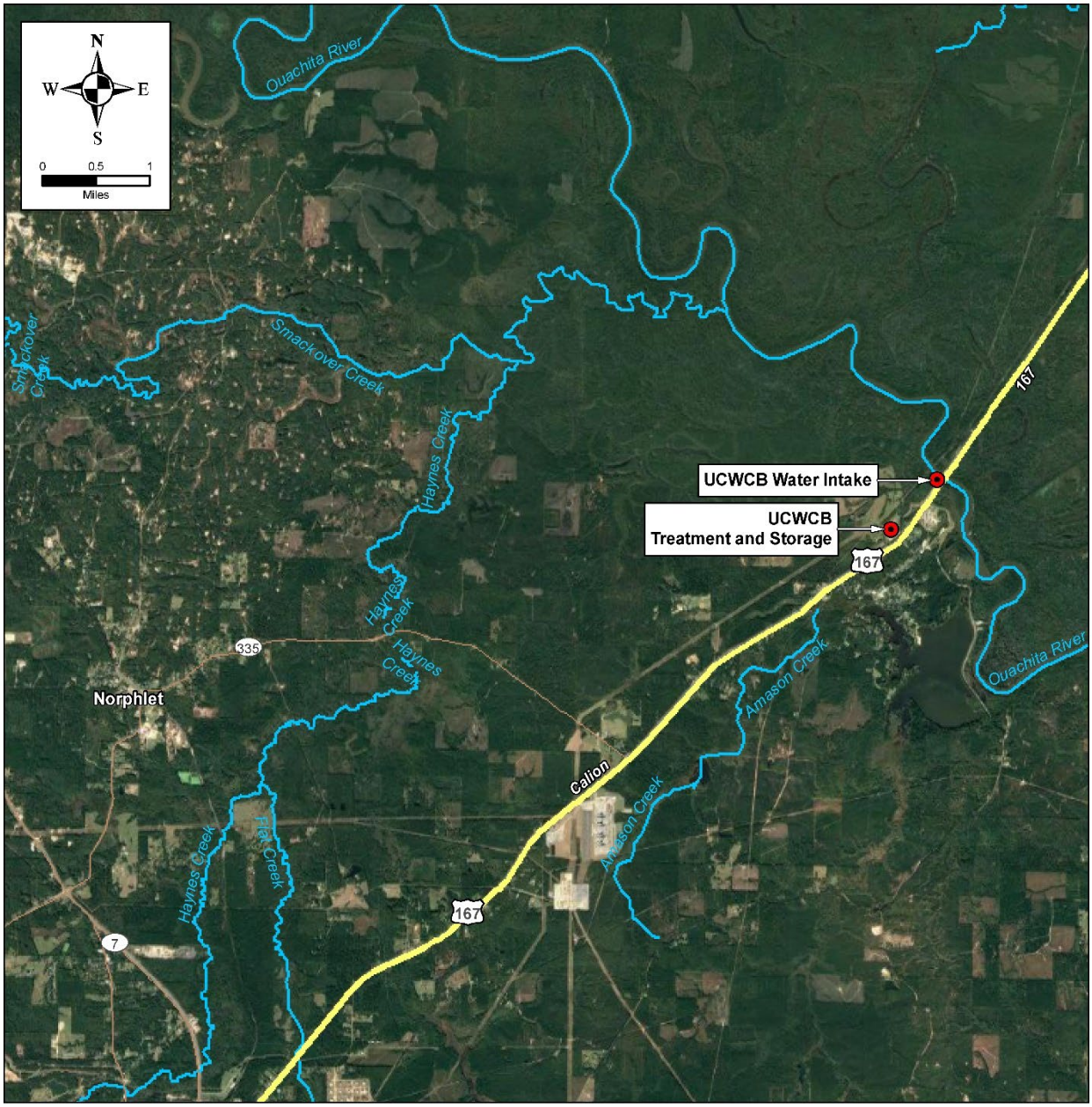


Figure 1. Location of UCWCB water intake.

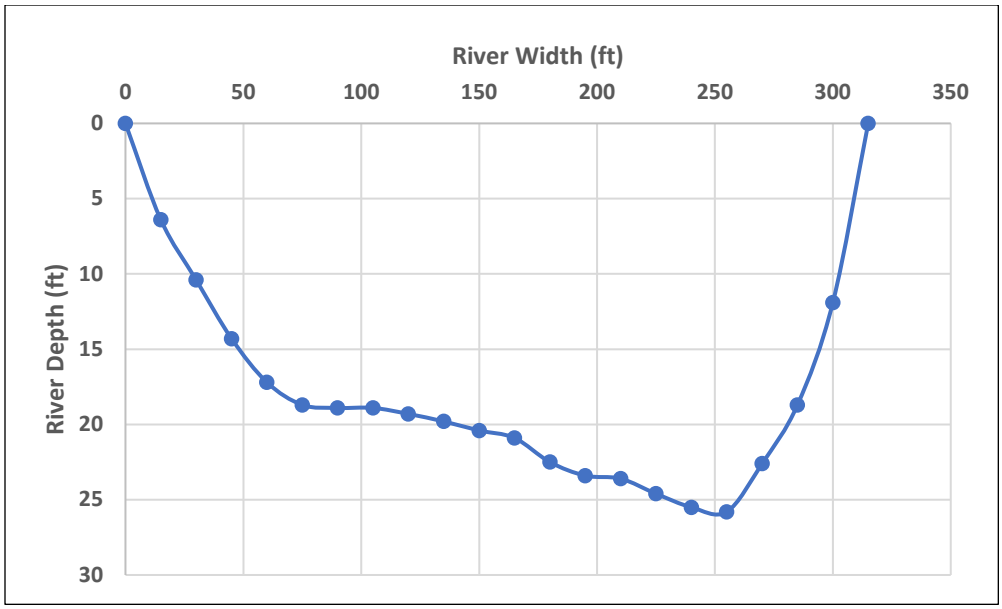


Figure 2. Typical river depth profile at approximately 1200 cfs.

Water quality data was compiled from two locations on the river, one near Camden, Arkansas upstream of the intake and one near Felsenthal Wildlife Refuge, downstream of the intake. A summary of that water quality is provided in Table 1.

Table 1. Average water quality in the Ouachita River bracketing the UCWCB intake.

River Station	Average Temperature (C)	Average pH (su)	Average Specific Conductance (us)	Average Dissolved Oxygen (mg/L)	Average Turbidity (ntu)
Below Camden (at CR381)	19.9	6.9	69	8.1	19.1
At Felsenthal Lock and Dam	20.8	6.9	81	7.6	17.3

3.0 (r)(3) Intake Structure Data

The water intake structure, which is owned and operated by UCWCB, is located on the right bank in the Ouachita River immediately upstream of the Highway 167 bridge (Figure 1.) The coordinates are 33.345154°, -92.533237°.

The cooling water intake structure has two bays, side by side. The structure extends to the river bottom at approximately 57 ft msl. The intake in the river is screened by a 7.5 ft wide and 50 ft tall bar screen to prevent debris and larger fish from entering the intake. Behind the bar screen in each bay is a 6 ft traveling screen and behind that are the pumps, two in each bay. The traveling screens are Rex style

flow through with a backwash system designed to prevent impingement/entrainment of aquatic life. The traveling screens are rotated 1/day which is sufficient to keep them free of debris and aquatic life. Each intake bay has two pumps, one large pump (28.8 MGD) and one smaller pump (14.4 MGD), which produce a total flow of 43.2 MGD.

UCWCB withdraws and pumps water from the river on average 365 days per year. The intake structure is designed for a maximum pumped flow from the river of 86.4 MGD. Actual average pumped flow from the river is 43.2 MGD, which originates from utilization of only one bay at a time. EDCC receives treated water ultimately from this water intake through a purchase agreement with UCWCB who owns and operates the river intake and water treatment plant.

A flow distribution and engineering drawings of the intake structure are provided in Appendix A and B, respectively.

4.0 (r)(4) Source Water Baseline Biological Characterization

To the best of our knowledge a source water biological investigation was not completed at the river intake specially for this intake structure. The following information that is required under this subheading has been provided from other studies completed in the river or in similar situations for similar river intakes. The required information is bulleted below with the relevant regulatory citation from 40 CFR Part 122.21(r)(i)-(xii).

(r)(4)(i) - This item is fulfilled in the bullets that follow (r)(4)(ii)- (r)(4)(vi).

(r)(4)(ii) – A list of species in the vicinity of the intake structure.

Two previous studies/reports were used to develop this list of species believed to be potentially present near the UCWCB intake in the river, the Final Report for *John L. McClellan Generating Station 316(b) 122.21(r) Information* (AECC, 2016) and the *Survey of the fish Community in the Lower Ouachita River, Arkansas* (Wise, 1993).

A list of fish species collected near the intake is proved in Tables 2 and 3. These tables are direct excerpt from the 1993 study report with their representative page number at the bottom. The key reaches that are pertinent to the UCWRB intake are Reach 4, which begins at the Little Missouri River confluence, upstream of the intake, and extends to Camden, Reach 5 which encompasses the intake and Reach 6 which is further downstream of the intake, extending to Felsenthal Lock and Dam. This study also included a summary of other Ouachita River fish collections. This entire report is included in Appendix C.

Table 2.

TABLE 2

LOWER OUACHITA RIVER WORK GROUP (1991) — RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Lepisosteidae	Gars								
Lepisosteus oculatus	Spotted gar	-	3.0	4.0	3.0	3.0	2.0	4.0	3.0
Lepisosteus osseus	Longnose gar	3.0	2.0	2.0	2.0	-	-	2.0	2.5
Amiidae	Bowfins								
Amia calva	Bowfin	-	1.5	-	-	-	-	-	-
Anguillidae	Eels								
Anguilla rostrata	American eel	3.0	3.0	3.0	2.0	2.0	-	-	-
Clupeidae	Herrings								
Dorosoma cepedianum	Gizzard shad	3.0	3.0	4.0	4.0	4.0	3.5	4.0	3.0
Dorosoma petenense	Threadfin shad	-	-	-	-	2.0	2.0	-	2.0
Esocidae	Pikes								
Esox americanus	Grass pickerel	-	-	-	2.0	-	-	-	-
Esox niger	Chain pickerel	-	1.5	-	-	-	2.0	2.5	2.0
Cyprinidae	Minnows								
Campostoma anomalum	Stoneroller	-	4.0	4.0	4.0	2.0	2.0	-	-
Cyprinella venustus	Blacktail shiner	-	2.0	2.5	1.0	3.5	2.5	4.0	3.0
Cyprinella whipplei	Steelcolor shiner	-	-	2.5	3.0	2.5	3.0	-	-
Cyprinus carpio	Carp	2.0	2.5	-	3.0	3.0	2.5	2.5	2.5
Erimystax x-punctatus	Gravel chub	-	-	2.0	-	-	-	-	-
Hybognathus hayi	Cypress minnow	-	3.0	-	-	-	2.0	3.0	-
Hybognathus nuchalis	Silvery minnow	-	3.0	4.0	4.0	2.0	3.0	3.0	2.5
Hybopsis amnis	Pallid shiner	-	-	2.0	-	-	-	-	-
Lythrurus fumeus	Ribbon shiner	-	-	-	-	-	-	2.0	-
Lythrurus umbratilis	Redfin shiner	-	2.0	-	-	-	-	-	-
Notemigonus chrysoleucas	Golden shiner	-	-	-	-	-	-	-	2.0
Notropis atherinoides	Emerald shiner	-	-	2.0	3.0	-	-	-	-
Notropis boops	Bigeye shiner	-	4.0	4.0	-	-	-	-	-
Notropis texanus	Weed shiner	-	1.5	-	2.0	-	-	-	-
Notropis volucellus	Mimic shiner	-	-	1.0	-	-	-	-	-
Opsopoeodus emiliae	Pugnose minnow	-	-	-	1.0	-	-	-	-
Pimephales notatus	Bluntnose minnow	-	-	2.0	-	-	-	-	-
Pimephales vigilax	Bullhead minnow	-	-	4.0	-	-	-	-	-
Catostomidae	Suckers								
Hypentelium nigricans	Northern hogsucker	-	2.0	2.0	1.0	-	-	-	-
Ictiobus bubalus	Smallmouth buffalo	-	-	2.0	2.0	2.0	-	2.0	-
Ictiobus cyprinellus	Bigmouth buffalo	-	3.0	1.0	2.0	3.0	-	-	3.0
Minytrema melanops	Spotted sucker	4.0	2.0	-	2.0	-	2.0	2.0	-
Moxostoma carinatum	River redhorse	2.0	-	3.0	2.0	-	-	-	-
Moxostoma erythrurum	Golden redhorse	4.0	3.0	2.0	4.0	2.5	2.0	-	-
Moxostoma poecilurum	Blacktail redhorse	-	-	2.0	2.0	2.5	-	-	-
Ictaluridae	Catfishes								
Ameiurus natalis	Yellow bullhead	-	-	1.0	-	-	-	-	-
Ictalurus furcatus	Blue catfish	-	-	-	-	2.0	-	2.0	-
Ictalurus punctatus	Channel catfish	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0
Noturus eleutherus	Mountain madtom	-	-	2.5	-	-	-	-	-
Noturus miurus	Brindled madtom	-	-	1.0	-	-	-	-	-
Noturus nocturnus	Freckled madtom	1.0	-	2.5	-	-	-	-	-
Polydictus olivaris	Flathead catfish	-	2.0	2.0	2.0	-	-	2.0	2.0

Table 2 cont.

TABLE 2 (cont)

LOWER OUACHITA RIVER WORK GROUP (1991)

RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Cyprinodontidae	Killifishes								
Fundulus catenatus	Northern studfish	-	2.0	1.0	-	-	-	-	-
Fundulus notatus	Blackstripe topminnow	1.0	-	-	2.5	-	-	-	3.0
Fundulus olivaceus	Blackspotted topminnow	2.0	2.0	1.0	2.5	2.0	3.0	3.5	-
Poeciliidae	Livebearers								
Gambusia affinis	Mosquitofish	-	2.0	2.0	2.0	-	2.5	-	-
Aphredoderidae	Pirate perch								
Aphredoderus sayanus	Pirate perch	-	-	2.0	2.0	-	-	-	-
Atherinidae	Silversides								
Labidesthes sicculus	Brook silverside	2.0	2.0	2.0	2.0	2.5	2.0	3.0	2.0
Percichthyidae	Temperate bass								
Morone chrysops	White bass	-	-	-	-	-	-	-	2.0
Centrarchidae	Sunfishes								
Ambloplites ariommus	Shadow bass	2.0	2.0	-	-	-	-	-	-
Elassoma zonatum	Banded pigmy sunfish	-	-	2.0	-	-	-	-	-
Lepomis cyanellus	Green sunfish	2.5	2.0	1.0	-	-	-	-	-
Lepomis gulosus	Warmouth sunfish	2.0	1.0	-	-	-	2.0	2.0	-
Lepomis humilis	Orangespotted sunfish	-	-	-	-	-	2.0	-	-
Lepomis macrochirus	Bluegill	3.0	2.0	2.0	3.0	2.0	3.0	3.0	1.5
Lepomis megalotis	Longear sunfish	4.0	3.0	2.0	3.0	4.0	3.0	3.0	3.0
Lepomis microlophus	Redear sunfish	-	2.0	1.0	2.0	3.0	2.0	2.0	3.0
Lepomis punctatus	Spotted sunfish	1.0	-	1.0	1.5	2.0	-	-	2.0
Micropterus dolomieui	Smallmouth bass	2.0	-	-	-	-	-	-	-
Micropterus punctulatus	Spotted bass	2.5	2.5	2.0	3.0	2.5	2.5	3.0	-
Micropterus salmoides	Largemouth bass	2.5	2.0	2.0	2.5	3.0	2.5	3.0	-
Pomoxis annularis	White crappie	2.0	2.0	-	2.0	2.0	2.0	2.5	2.5
Pomoxis nigromaculatus	Black crappie	-	-	2.0	2.0	3.0	2.0	2.5	3.5
Percidae	Perches								
Crystallaria asprella	Crystal darter	-	2.0	1.0	1.0	-	-	1.0	-
Etheostoma blennioides	Greenside darter	2.0	3.0	-	-	-	-	-	-
Etheostoma collettei	Creole darter	-	2.0	-	-	-	-	-	-
Etheostoma gracile	Slough darter	-	-	1.0	-	-	-	-	-
Etheostoma histrio	Harlequin darter	-	2.5	3.0	2.0	-	-	-	-
Etheostoma radiosum	Orangebelly darter	2.5	2.0	3.0	-	-	-	-	-
Etheostoma spectabile	Orangethroat darter	2.0	-	-	-	-	-	-	-
Etheostoma stigmaeum	Speckled darter	1.0	-	-	-	-	-	-	-
Etheostoma vivax	Scaly sand darter	-	-	2.0	-	-	2.0	2.0	-
Etheostoma zonale	Banded darter	3.5	3.0	2.0	-	-	-	-	-
Percina caprodes	Logperch	3.0	2.0	2.5	3.0	2.0	2.5	-	-
Percina copelandi	Channel darter	2.5	-	-	-	-	-	-	-
Percina maculata	Blackside darter	-	-	1.0	-	-	-	-	-
Percina sp.	Thompson darter	1.0	1.0	-	-	-	-	-	-
Percina sciera	Dusky darter	-	-	1.0	2.0	-	-	-	-
Percina uranidae	Stargazing darter	2.0	1.0	-	-	-	-	-	-
Stizostedion vitreum	Walleye	2.5	2.0	1.0	-	-	-	-	-
Sciaenidae	Drums								
Aplodinotus grunniens	Freshwater drum	-	2.0	2.0	2.0	3.0	2.5	2.0	2.0
	TOTAL SPECIES	32	44	52	40	27	28	27	22
	TOTAL RELATIVE ABUNDANCE	74.5	99.0	110.5	93.0	69.0	65.0	69.5	56.0

16 FAMILIES
39 GENERA
79 SPECIES

Note: RAV's based on a four point scale.

Table 3.

TABLE 3

LOWER OUACHITA RIVER WORK GROUP (1992)

RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2A	REACH 3	REACH 4A	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Petromyzontidae	Lampreys									
Ichthyomyzon species	Ammocetes	3.0	-	1.0	-	-	-	-	-	-
Lepisosteidae	Gars									
Lepisosteus oculatus	Spotted gar	1.0	-	3.0	2.0	2.5	5.0	3.0	3.0	4.0
Lepisosteus osseus	Longnose gar	-	-	-	2.0	1.0	-	-	-	2.0
Lepisosteus platostomus	Shortnose gar	-	-	-	-	-	-	-	-	1.0
Anguillidae	Eels									
Anguilla rostrata	American eel	4.0	3.0	1.0	2.0	2.0	-	-	-	-
Clupeidae	Herrings									
Alosa chrysochloris	Skipjack herring	-	-	-	-	-	-	-	-	1.0
Dorosoma cepedianum	Gizzard shad	1.0	2.0	3.0	3.0	7.0	4.0	8.0	8.0	6.0
Dorosoma petenense	Threadfin shad	-	-	-	-	6.0	2.0	-	-	5.0
Esocidae	Pikes									
Esox niger	Chain pickerel	5.0	3.0	-	-	-	-	1.5	3.0	2.0
Cyprinidae	Minnows									
Campostoma anomalum	Stoneroller	4.0	4.0	5.0	6.0	1.0	1.0	-	-	-
Cyprinella venustus	Blacktail shiner	-	1.0	4.0	4.0	4.5	5.0	6.0	3.0	7.0
Cyprinella whipplei	Steelcolor shiner	1.5	1.0	8.0	8.0	4.0	4.0	4.0	3.0	2.5
Cyprinus carpio	Carp	-	4.0	-	2.0	2.0	3.0	3.0	-	6.0
Erimystax x-punctatus	Gravel chub	-	-	5.0	7.0	-	-	-	-	-
Hybognathus nuchalis	Silvery minnow	-	-	1.0	-	7.0	-	6.0	6.0	6.0
Hybopsis amnis	Pallid shiner	-	-	-	-	-	-	-	-	1.0
Lythrurus fumeus	Ribbon shiner	-	-	-	-	-	-	-	1.0	3.0
Lythrurus umbratilis	Redfin shiner	-	5.0	-	-	-	-	-	-	-
Notemigonus chrysoleucas	Golden shiner	-	-	-	-	-	-	1.0	-	-
Notropis atherinoides	Emerald shiner	-	-	2.0	1.0	2.0	2.5	2.0	8.0	8.0
Notropis boops	Bigeye shiner	-	3.0	4.0	4.0	-	-	-	-	-
Notropis texanus	Weed shiner	-	-	-	-	-	-	1.0	-	5.0
Notropis volucellus	Mimic shiner	-	-	-	-	-	-	-	-	2.0
Opsopoeodus emiliae	Pugnose minnow	-	1.0	-	-	-	-	-	-	-
Pimephales notatus	Bluntnose minnow	-	3.0	4.0	-	-	-	-	-	6.0
Pimephales vigilax	Bullhead minnow	-	-	4.0	4.0	2.0	4.5	-	1.0	-
Catostomidae	Suckers									
Carpiodes carpio	River carpsucker	-	-	-	2.0	-	-	-	-	-
Carpiodes cyprinus	Quillback carpsucker	-	-	-	-	2.0	-	-	-	-
Hypentelium nigricans	Northern hogsucker	-	6.0	6.0	4.0	-	1.5	-	-	-
Ictiobus bubalus	Smallmouth buffalo	-	-	-	-	-	-	-	1.0	-
Ictiobus cyprinellus	Bigmouth buffalo	-	2.0	-	-	-	2.5	-	-	4.0
Ictiobus niger	Black buffalo	-	-	1.0	-	-	-	-	-	-
Minytrema melanops	Spotted sucker	4.0	1.0	1.0	-	3.0	2.0	2.0	2.0	-
Moxostoma carinatum	River redhorse	2.0	-	2.0	4.0	-	-	-	-	-
Moxostoma erythrurum	Golden redhorse	4.0	5.0	6.0	6.0	2.5	2.0	2.0	-	-
Moxostoma poecilurum	Blacktail redhorse	-	-	2.0	2.0	4.0	2.0	1.5	-	-
Ictaluridae	Catfishes									
Ameiurus natalis	Yellow bullhead	2.5	-	-	-	-	-	-	-	
Ictalurus furcatus	Blue catfish	-	-	-	-	-	2.0	-	-	2.0
Ictalurus punctatus	Channel catfish	1.0	2.5	3.0	2.0	2.0	2.0	-	2.0	1.0
Noturus eleutherus	Mountain madtom	-	-	2.0	5.0	-	-	-	-	-
Noturus gyrinus	Tadpole madtom	2.0	8.0	-	-	-	-	-	-	-
Noturus miurus	Brindled madtom	-	-	2.0	-	-	-	-	-	-
Noturus nocturnus	Freckled madtom	-	1.0	1.0	-	-	-	-	-	-
Polydictus olivaris	Flathead catfish	-	1.0	2.0	-	-	2.0	-	-	-

Table 3 cont.

TABLE 3 (cont)

LOWER OUACHITA RIVER WORK GROUP (1992)

RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2A	REACH 3	REACH 4A	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Cyprinodontidae	Killifishes									
Fundulus catenatus	Northern studfish	3.0	-	3.0	-	-	-	-	-	-
Fundulus notatus	Blackstripe topminnow	-	-	-	-	-	-	5.0	4.0	6.0
Fundulus olivaceus	Blackspotted topminnow	4.0	3.0	4.0	4.0	2.0	6.0	5.0	4.0	1.0
Poeciliidae	Livebearers									
Gambusia affinis	Mosquitofish	3.0	5.0	-	-	1.0	3.0	1.0	4.0	4.0
Aphredoderidae	Pirate perch									
Aphredoderus sayanus	Pirate perch	-	1.0	1.0	-	-	-	-	-	-
Atherinidae	Silversides									
Labidesthes sicculus	Brook silverside	3.0	6.0	3.0	4.0	-	5.0	8.0	5.0	6.0
Centrarchidae	Sunfishes									
Ambloplites ariommus	Shadow bass	3.0	4.0	1.0	-	-	-	-	-	-
Lepomis cyanellus	Green sunfish	5.0	2.0	-	-	-	-	1.0	-	-
Lepomis gulosus	Warmouth sunfish	4.0	4.0	-	-	-	-	1.0	-	-
Lepomis macrochirus	Bluegill	6.0	5.0	2.0	4.0	4.5	4.5	8.0	7.0	8.0
Lepomis megalotis	Longear sunfish	8.0	8.0	6.0	8.0	5.0	5.5	6.0	4.5	4.0
Lepomis microlophus	Redear sunfish	-	4.0	-	-	-	2.0	1.0	3.0	4.0
Lepomis punctatus	Spotted sunfish	4.0	3.0	-	2.0	-	-	2.0	-	-
Lepomis hybrid	Hybrid sunfish	1.0	-	-	-	-	-	-	-	1.0
Micropterus punctulatus	Spotted bass	5.0	4.0	5.0	7.0	3.5	4.5	4.5	5.3	3.0
Micropterus salmoides	Largemouth bass	6.0	5.0	1.0	4.0	5.0	3.5	6.0	6.0	6.0
Pomoxis annularis	White crappie	1.0	-	-	1.0	-	-	1.0	-	1.0
Pomoxis nigromaculatus	Black crappie	-	2.0	-	3.0	1.0	2.0	-	2.0	3.0
Percidae	Perches									
Etheostoma blennioides	Greenside darter	5.0	8.0	4.0	-	-	-	-	-	-
Etheostoma clara	Western sand darter	-	-	-	-	-	-	-	-	1.0
Etheostoma chlorosomum	Bluntnose darter	3.0	-	-	-	-	-	-	-	4.0
Etheostoma collettei	Creole darter	2.0	1.0	4.0	-	-	1.0	-	-	-
Etheostoma histrio	Harlequin darter	2.0	1.0	5.0	5.0	-	-	-	-	-
Etheostoma nigrum	Johnny darter	-	1.0	-	-	-	-	-	-	-
Etheostoma proeliare	Cypress darter	-	1.0	-	-	-	-	-	-	-
Etheostoma radiosum	Orangebelly darter	6.0	6.0	6.0	1.0	-	-	-	-	-
Etheostoma stigmaeum	Speckled darter	3.0	2.0	2.5	1.0	-	-	-		-
Etheostoma vivax	Scaly sand darter	-	-	-	-	1.0	2.0	-	4.0	4.0
Etheostoma zonale	Banded darter	8.0	8.0	4.0	8.0	-	-	-	-	-
Percina caprodes	Logperch	6.0	-	-	-	-	2.0	2.0	-	1.0
Percina copelandi	Channel darter	4.0	2.0	4.0	2.0	-	5.5	1.0	-	-
Percina maculata	Blackside darter	-	-	-	-	-	1.0	1.0	-	-
Percina sp.	Thompson darter	1.0	-	-	-	-	-	-	-	-
Percina ouachitae	Saddleback darter	-	-	1.0	-	-	-	-	-	-
Percina sciera	Dusky darter	-	-	-	1.0	-	-	-	-	-
Percina uranidea	Stargazing darter	4.0	-	1.0	-	-	-	-	-	-
Stizostedion vitreum	Walleye	2.0	3.0	-	-	-	-	-	-	-
Sciaenidae	Drums									
Aplodinotus grunniens	Freshwater drum	-	-	1.0	2.0	2.0	2.5	-	2.0	2.0
	TOTAL SPECIES	39	43	43	35	26	32	29	24	37
15 FAMILIES	TOTAL RELATIVE ABUNDANCE	134.0	145.5	130.5	126.0	79.5	97.0	94.5	91.5	136.0
38 GENERA										
82 SPECIES	Note: RAV's based on an eight point scale.									

(r)(4)(iii) - What species would be most susceptible to impingement and entrainment.

No entrainment of impingement studies have been completed by the UCWCB. Therefore, information from the available literature will be used to meet this requirement. The John L. McClellan Generating Station 316(b) 122.21(r) Information (AECC, 2016) report utilized two primary sources of information to address this (r)(4) (iii) requirement. The first was a study by EPRI, *National and Regional Summary of Impingement and Entrainment of Fish and Shellfish Based on an Industry Survey of Clean Water Act 316(b) Characterization Studies* (EPRI, 2011), that found the following identifiable species most commonly impinged (Imp) or entrained (Ent) in water intakes:

- Gizzard shad (Imp)
- Freshwater drum (Imp)
- Threadfin shad (Imp)
- Channel fatfish (Imp)
- Emerald shiner (Imp)
- Sunfishes (Ent)
- Herrings (Ent)
- Minnows/shiners (Ent)
- Suckers (Ent)
- Gizzard shad (Ent)
- Freshwater drum eggs (Ent)
- Freshwater drum (Ent)
- Perches (Ent)
- Common carp
- Other (Imp)

Additionally, the AECC competed an impingement study of their own in the Ouachita River at their McClelland facility near Camden, Arkansas. This data is provided in the referenced report (AECC, 2016) with the following species/taxa documented:

- Gizzard shad
- Minnows/shiners
- Channel catfish
- Flathead catfish
- Black crappie
- Sunfish species
- Crayfish species
- Asiatic clam
- Zebra mussels
- Native mussels (only one collected)
- Snails (only one collected)

It is anticipated that the same list of species should generally be most susceptible to impingement and entrainment at the UCWRB intake.

(r)(4)(iv) - Identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance for relevant taxa.

The primary period for all three measures of relevant taxa noted in the (iv) requirement generally occur in the spring and summer in the Ouachita River. The months of March through June capture the majority of the spawning and recruitment periods for nearly all species of importance, with some ancillary spawning occurring later in the summer through September. Peak numbers are likely to occur in the summer after the majority of spawning has occurred.

(r)(4)(v) - Data representative of the seasonal and daily activities in the vicinity of the intake.

Seasonal and daily variation of species near the intake will be difficult to ascertain as it is influenced by many environmental factors such as season, water temperature, antecedent rainfall/run-off, river flow/velocity, solar radiation, turbidity, etc. One notable factor that does affect fish movement is their feeding habits. Most fish and many other aquatic species feed at a more intense level in the morning or evening hours of the day. It is at these times they may be more mobile and are more likely to be impinged.

(r)(4)(vi) - Identification of all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at your cooling water intake structures.

According to the USFWS IPac report (Project Code: 2023-0115602) there are no Federally listed threatened or endangered species within the zone around the intake structure. As such, there are also no critical habitats in this area. A copy of this report is provided in Appendix D.

(r)(4)(vii) - Documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan; and

No public participation or consultation with Federal agencies was completed. The Arkansas Department of Energy and Environment was consulted for general explanation of applicability of the rule and for a general guidance on the level of information required for these sections.

(r)(4)(viii) - If any supplemental information is provided that includes new field studies, they must include the appropriate methodology, QA/QC, be competed in the appropriate area, etc, and be completed using approved techniques.

No supplemental field data has been collected.

(r)(4)(ix) - In the case of the owner or operator of an existing facility or new unit at an existing facility, the Source Water Baseline Biological Characterization Data is the information in paragraphs (r)(4)(i) through (xii) of this section.

EDCC and the UCWCB are existing facilities and this requirement is fulfilled in (i)-(vii) above.

(r)(4)(x) - For the owner or operator of an existing facility, identification of protective measures and stabilization activities that have been implemented, and a description of how these measures and activities affected the baseline water condition in the vicinity of the intake.

EDCC does not own or operate the intake structure and is unaware of any stabilization measures that may have been specially engineered to protect and stabilize the area around the structure. However,

some design features have been considered that are obvious from a review of the site, such as construction of a concrete structure with heavy grade screen bars that can handle high velocity and large log strikes, a slight set back from the river channel to avoid direct strikes from logs, but not far enough back to form large eddies or incur additional bank shear stresses.

(r)(4)(xi) - For the owner or operator of an existing facility, a list of fragile species, as defined at 40 CFR 125.92(m), at the facility. The applicant need only identify those species not already identified as fragile at 40 CFR 125.92(m).

According to 40 CFR 125.92(m) fragile species means those species of fish and shellfish that are least likely to survive any form of impingement. For purposes of this subpart, fragile species are defined as those with an impingement survival rate of less than 30 percent, including but not limited to alewife, American shad, Atlantic herring, Atlantic long-finned squid, Atlantic menhaden, bay anchovy, blueback herring, bluefish, butterfish, gizzard shad, grey snapper, hickory shad, menhaden, rainbow smelt, round herring, and silver anchovy.

Based on a review of fish present in the Ouachita River and those impinged in nearby studies the most likely fragile species to be impinged by the UCWCB intake are shad species such as gizzard shad and threadfin shad. Additionally, some sunfish species could also be impinged and would likely not survive.

(r)(4)(xii) - For the owner or operator of an existing facility that has obtained incidental take exemption or authorization for its cooling water intake structure(s) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, any information submitted in order to obtain that exemption or authorization may be used to satisfy the permit application information requirement of paragraph 40 CFR 125.95(f) if included in the application.

This clause is not applicable to EDCC or the UCWCB Intake.

5.0 (r)(5) Cooling Water System Data

Raw water from the Ouachita River is pumped through a single 48-inch pipe header from two circulating pumps and delivered through a 48-inch raw water line into the intake building at the shoreline for initial pretreatment with a coagulant and sodium hypochlorite. From there, the water is delivered (0.6 miles) to the onshore component for pH adjustment, residual bleach, flocculants, and micro-sand treatment to produce a finished clarified water for storage into the UCWCB's clear well for delivery to multiple downstream customers.

EDCC manufactures ammonium nitrate, ammonia, nitric acid, and sulfuric acid. EDCC operates 24 hours a day with two 12-hour shifts. EDCC utilizes water purchased from the UCWCB to supply water for multiple chemical processing units throughout the plant. Water that is used for cooling purposes includes but not limited to cooling tower makeup, boiler makeup, and non-contact cooling water systems. All chemical processing units utilize closed cycle systems. The rate of make-up water can be as high as 2,700 gpm during the hottest part of the year. EDCC receives an average of 4.11 MGD (Average for 2020-2022) from the UCWCB. This is 4.8% of the intake structure design intake flow of 86.4 MGD and 0.0513% of Ouachita River mean flow of 12,400 cfs (8,014 MGD) as measured at USGS Station 07362000.

The UCWCB cooling water intake structure intake face is situated perpendicular to the river flow, opens into the deeper water of the channel border habitat of the Ouachita River. The UCWCB intake

utilized by EDCC for its raw river water has a design intake flow of 86.4 MGD from its two intake bays with two rotating screens and four pumps. However, UCWCB only utilizes one intake bay with one screen and two pumps to provide clarified water to all UCWCB end users. This further reduces the possibility of both impingement and entrainment.

6.0 (r)(6) Chosen Method(s) of Compliance with Impingement Mortality Standard

According to 40 FR 125.94 the owner of an existing facility must choose the method of compliance with the impingement standard for the entire facility. There are several options provided in the rule for compliance:

(1) Closed-cycle recirculating system
(2) 0.5 fps through-screen design velocity
(3) 0.5 fps through-screen actual velocity
(4) Existing offshore velocity cap
(5) Modified traveling screen
(6) Systems of technology as the BTA for impingement mortality
(7) Impingement mortality performance standard

EDCC cooling water, which comes from the UCWCB intake on the Ouachita River could potentially show compliance with this requirement through either option (1), (2), (3) or (5). The chosen option for compliance is:

- Option (2) 0.5 fps through-screen design velocity.

This is based on calculations of screen size/area (6 ft X 52 ft for each bay) and flow through volume (43.2MGD for each bay) which achieves a ≤0.5 fps velocity through each screen, dependent on local river flow/stage.

7.0 (r)(7) Entrainment Performance Studies

No entrainment studies have been completed for the UCWCB intake structure which provides cooling water to EDCC. In addition, no known entrainment studies have been completed on the Ouachita River in Arkansas.

8.0 (r)(8) Operational Status

EDCC, located in El Dorado, Arkansas, manufactures ammonium nitrate, ammonia, nitric acid, and sulfuric acid throughout several chemical processing units. EDCC operates 24 hours a day with two 12-hour shifts. Production of specific products within individual chemical processing units vary due to market needs. At this time, EDCC does not have any plans for replacement of existing chemical process units or the addition of new process units within the next five years. However, EDCC will notify DEQ if plans change in the future.

Appendix A

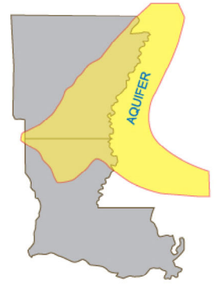
UCWCB Flow Distribution Map

SEPTEMBER 2012

OUACHITA RIVER ALTERNATIVE WATER SUPPLY PROJECT

OUACHITA RIVER

The Quachita River forms Union County's North and East Boundaries from the mouth of Smackover Creek to Calion and through the Felsenthal National Wildlife Refuge to the Lousina Line.



SMACKOVER
SMACKOVER CREEK
CROSS OIL & REFINERY
INTAKE & PUMP STATION
NON-POTABLE WATER TREATMENT PLANT AND PUMP STATION
CALION LUMBER
NORPHLET
CALION
48"
STANDARD-UMSTED **
WILDWOOD*
MT. HOLLY
WATSON SAWMILL
LISBON***
UNION POWER PARTNERS
CRABAPPLE POINT
QUINN***
THATCHER LOCK & DAM
OUACHITA RIVER
EL DORADO CHEMICAL
36"
30"
12"
STORAGE TANK AND PUMP STATION
South Arkansas Regional Airport
GOODWIN FIELD
BEULAH GROVE*
MARYSVILLE
MYSTIC CREEK
HWY 82 WEST
EL DORADO
OLD UNION***
NEW LONDON
30"
CLEAN HARBORS
20"
24"
20"
OAK MANOR*
LAWSON-URBANA
GREAT LAKES CHEMTURA WEST
DEL-TIN FIBER
LION OIL
(PILGRIM'S PRIDE)
PARKERS CHAPEL
TETRA
GREAT LAKES CHEMTURA CENTRAL
HARMONY*
ANTHONY FOREST PRODUCTS
JOHNSON TOWNSHIP ***
WESSON NEWELL
(GEORGIA PACIFIC)
GREAT LAKES CHEMTURA SOUTH
Felsenthal National Wildlife Refuge
BATTS - LAPILE
STRONG
NEW HOPE
FAIRCREST
AURELLE **
FELSENTHAL
HUTTIG
PLUM CREEK
FELSENTHAL LOCK & DAM
JUNCTION CITY

2 0 2 4
SCALE IN MILES
(APPROXIMATE)

UNION COUNTY WATER SYSTEMS

AURELLE**
BATTS-LAPILE
BEULAH GROVE*
CALION
CRABAPPLE POINT
EL DORADO
FAIRCREST
FELSENTHAL
HARMONY*
HUTTIG
HWY 82 WEST
JOHSON TOWNSHIP***
JUNCTION CITY
LAWSON-URBANA
LISBON***
MARYSVILLE
MT. HOLLY
NEW HOPE
NEW LONDON
NORPHLET
OAK MANOR*
OLD UNION***
PARKERS CHAPEL
QUINN***
SMACKOVER
STANDARD-UMSTED**
STRONG
WESSON-NEWELL
WILDWOOD**

* Purchase water from El Dorado Water Utilities
** Purchase water from another association or municipality
*** Dual sources: own wells and purchase from another association or municipality

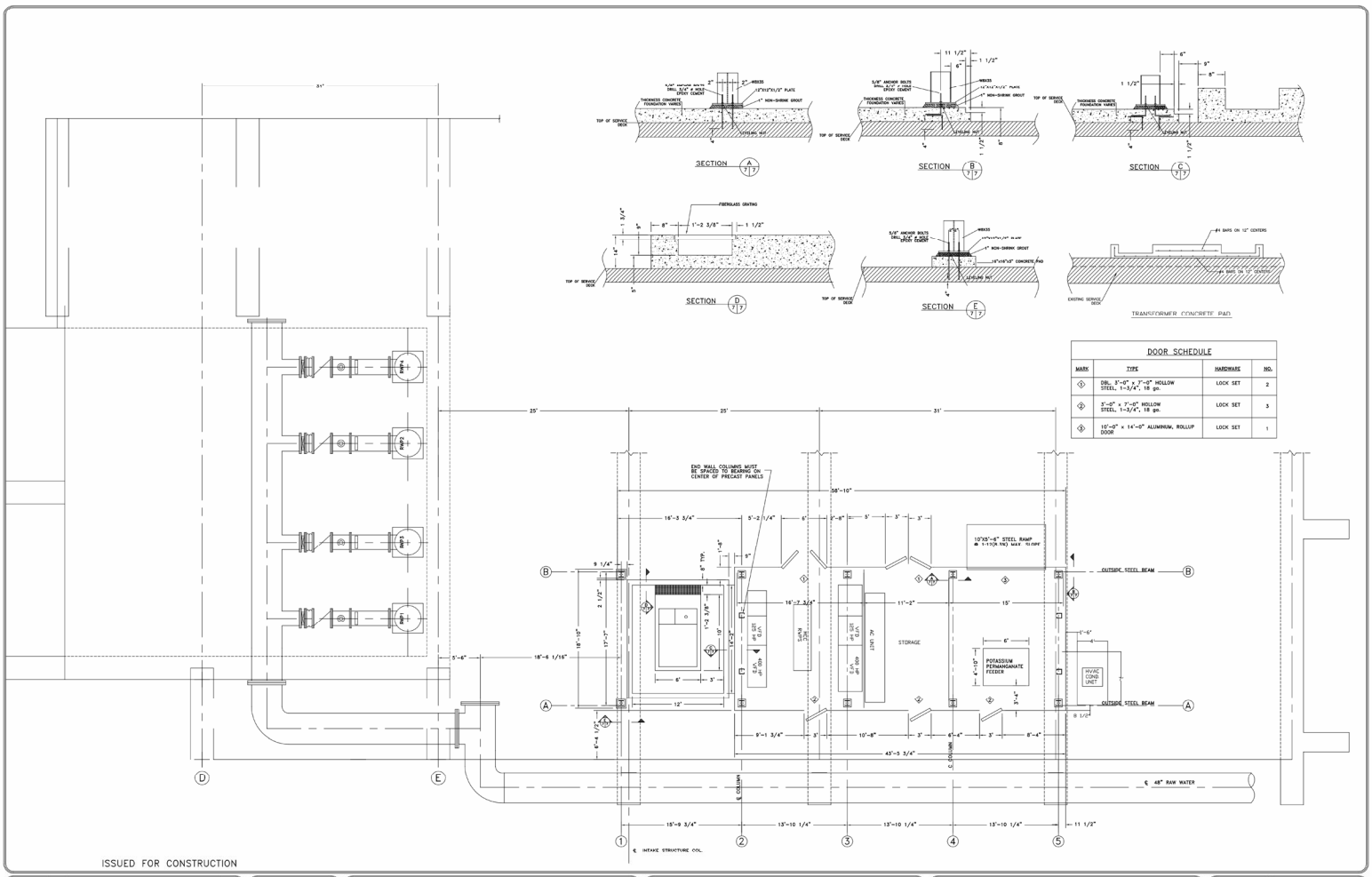
- UCWCB OUACHITA RIVER ALTERNATIVE WATER SUPPLY
- INDUSTRIES SERVED BY OUACHITA RIVER ALTERNATIVE WATER SUPPLY
- INDUSTRIES SERVED BY A WATER UTILITY (SPARTA GROUNDWATER) *
  * Parkers Chapel Water Serves TETRA for potable only
- INDUSTRIES WITH SPARTA WELLS
- ( ) NOT OPERATING
- SPARTA AQUIFER RECOVERY MONITORING WELL
- MYSTIC CREEK GOLF COURSE/HOUSING IRRIGATION
- EL DORADO HIGH SCHOOL SITE IRRIGATION

UNION COUNTY WATER CONSERVATION BOARD

441 W. Cedar • El Dorado, Arkansas 71730 • 870-814-2871 • www.ucwcb.org

Appendix B

UCWCB Cooling Water Intake Structure Engineering Drawings



ISSUED FOR CONSTRUCTION

Date	No.	Revision	By
11/09/01	4	ADD 4" TO CONCERT ALL AROUND BUILDING CHANGED ANCHOR BOLTS	ALB
11/26/01	5	CHANGED STORAGE ROOM DOORS	ALB
11/29/01	6	REVISED TRANS. PAD AND FLOOR ELEV.	SMT
5/06/02	7	AS-BUILT	ALB

Designed
Checked
Drawn
Approved

NRS CONSULTING ENGINEERS
4415 JEFFERSON AVE.
TEXARKANA, AR 71854
(870) 773-9967

MILAM CONSTRUCTION CO.
GENERAL CONTRACTORS
EL DORADO, ARKANSAS
(870) 862-4258

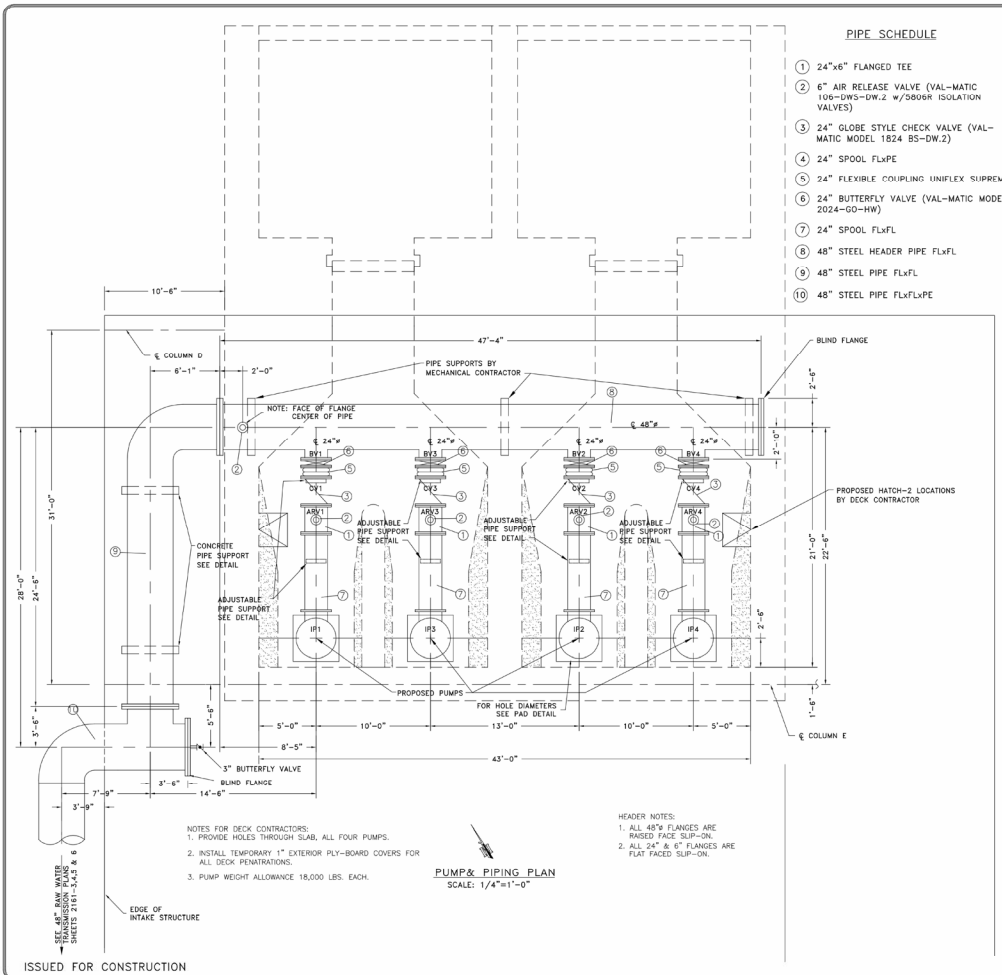
UNION POWER PARTNERS, L.P.
RAW WATER INTAKE STRUCTURE

INTAKE BUILDING FACILITY LOCATION

Scale	Job No.	
3/16" = 1'-0"		
Date	Drawing No.	Rev.
10/2001	2161-007	7

PIPE SCHEDULE

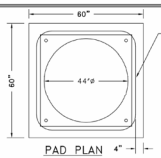
1. 24"x6" FLANGED TEE
2. 6" AIR RELEASE VALVE (VAL-MATIC 106-DWS-DW.2 w/3806R ISOLATION VALVES)
3. 24" GLOBE STYLE CHECK VALVE (VAL-MATIC MODEL 1824 BS-DW.2)
4. 24" SPOOL FLxPE
5. 24" FLEXIBLE COUPLING UNIFLEX SUPREME 200XL
6. 24" BUTTERFLY VALVE (VAL-MATIC MODEL 2024-GO-HW)
7. 24" SPOOL FLxFL
8. 48" STEEL HEADER PIPE FLxFL
9. 48" STEEL PIPE FLxFL
10. 48" STEEL PIPE FLxFLxPE



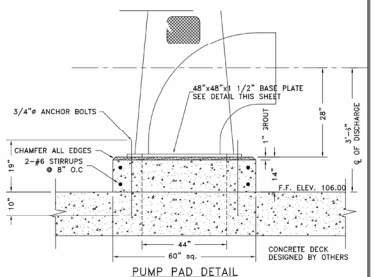
NOTES FOR DECK CONTRACTORS:
1. PROVIDE HOLES THROUGH SLAB, ALL FOUR PUMPS.
2. INSTALL TEMPORARY 1" EXTERIOR PLY-BOARD COVERS FOR ALL DECK PENATRATIONS.
3. PUMP WEIGHT ALLOWANCE 18,000 LBS. EACH.

PUMP& PIPING PLAN
SCALE: 1/4"=1'-0"

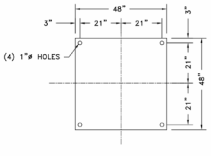
HEADER NOTES:
1. ALL 48"ø FLANGES ARE RAISED FACE SLIP-ON.
2. ALL 24" & 6" FLANGES ARE FLAT FACED SLIP-ON.



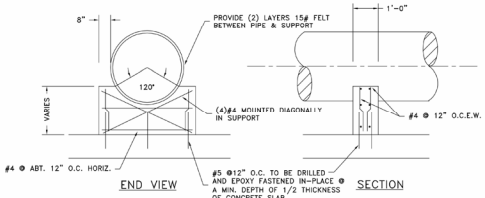
PAD PLAN
N.T.S.



PUMP PAD DETAIL
N.T.S.



BASE PLATE DETAIL
N.T.S.



END VIEW SECTION

CONCRETE PIPE SUPPORT
N.T.S.
(BY MECHANICAL CONTRACTOR)

ISSUED FOR CONSTRUCTION

Date	No.	Revision	By
09/05/2001	1	ADJUSTED 48" PIPE	DSS
10/04/2001	2	RE-ADJUSTED 48" PIPE	DSS
01/15/2002	3	CHANGED RWP TP IP	DSS
03/19/02	4	AS-BUILT	ALB

Designed L.J.S.
Checked L.J.S.
Drawn D.S.S.
Approved L.J.S.

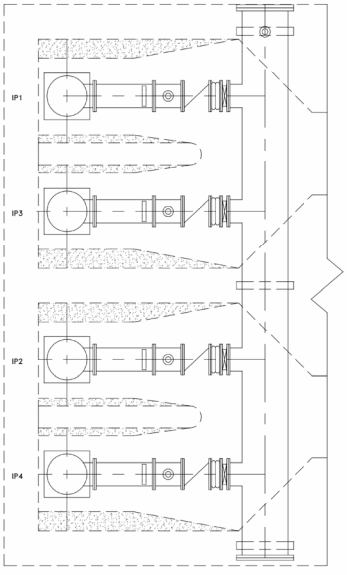
NRS CONSULTING ENGINEERS
4415 JEFFERSON AVE.
TEXARKANA, AR 71854
(870) 773-9967

MILAM CONSTRUCTION CO.
GENERAL CONTRACTORS
EL DORADO, ARKANSAS
(870) 862-4258

UNION POWER PARTNERS, L.P.
WATER CLARIFICATION FACILITY

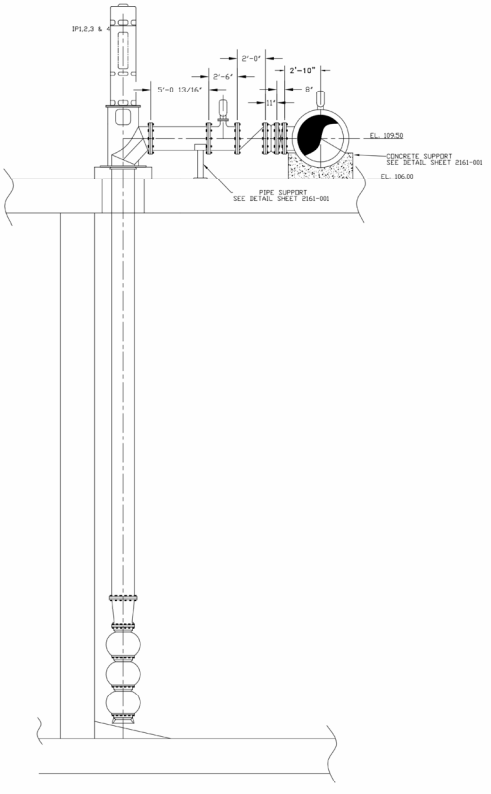
RAW WATER INTAKE
PUMPS & PIPING LAYOUT

Scale	Job No.
1/4" = 1'	
Date 8/29/01	Drawing No. 2161-001
	Rev. 4



INTAKE–RAW WATER PUMPS

NOTE:
FOR PIPING SCHEDULE SEE
SHEET 2161-001



SECTION VIEW

ISSUED FOR CONSTRUCTION

Date	No.	Revision	By
09/05/2001	1	REMOVED COLUMN SCREEN	DSS
01/15/2002	2	CHANGED RWP TO IP	DSS
05/02/2002	3	AS-BUILT	ALB

Designed
Checked
Drawn
Approved

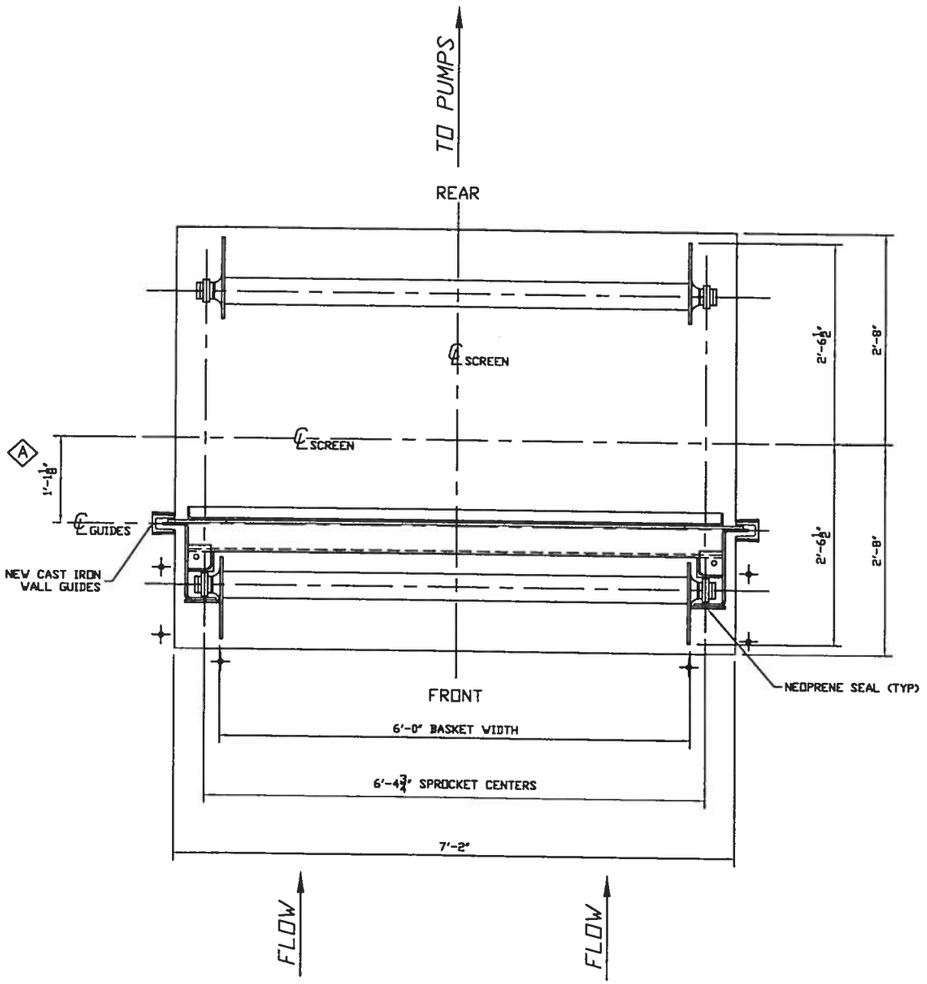
NRS CONSULTING ENGINEERS
4415 JEFFERSON AVE.
TEXARKANA, AR 71854
(870) 773-9967

MILAM CONSTRUCTION CO.
GENERAL CONTRACTORS
EL DORADO, ARKANSAS
(870) 862-4258

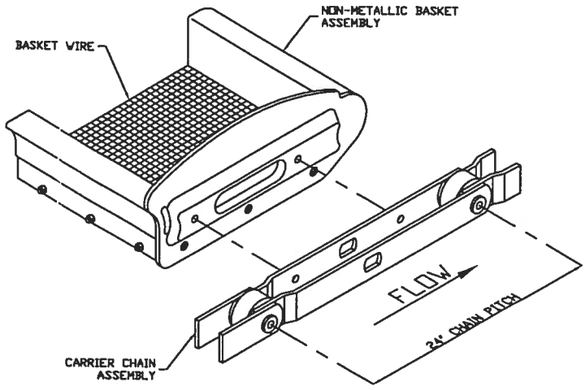
UNION POWER PARTNERS, L.P.
WATER CLARIFICATION FACILITY

RAW WATER PUMP STATION
MECHANICAL VIEW

Scale	Job No.	
1/4" = 1'-0"		
Date	Drawing No.	Rev.
07/2001	2161-002	3

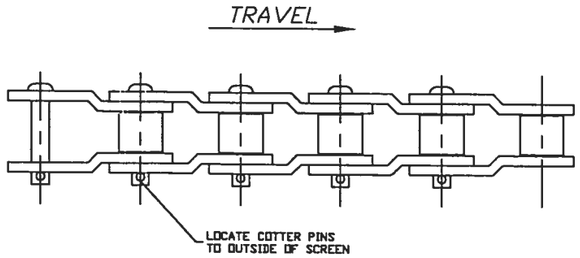


PLAN VIEW



BASKET & CHAIN DETAIL

NOTE DIRECTION OF TRAVEL WHEN ASSEMBLING THE CARRIER CHAIN OVER THE SPROCKETS. WHEN THE BASKETS ARE ERECTED ON THE CHAINS, THEY SHOULD BE BALANCED, OR SOME MEANS SHOULD BE PROVIDED FOR SNUBBING THE HEADSHAFT.



DRIVE CHAIN

DESIGN DATA:

TWO (2) REX STYLE TRAVELING WATER SCREENS, 2-POST DESIGN, 6'-0" WIDE x 52'-0" CENTERS.

THE CAPACITY OF THE SCREENS IS 31,600 GPM AT 1.15 FPS THROUGH A 100% CLEAN SCREEN AT LOW WATER DEPTH 18'-0".

THE SCREEN DRIVE DESIGN IS BASED ON LOADS SPECIFIED AND A STARTING DIFFERENTIAL HEAD OF 2'-6" AT 42'-6" HIGH WATER DEPTH.

STRUCTURAL FRAME MATERIAL:

MATERIAL OF ALL STRUCTURAL FRAME MEMBERS IS 3/8" MINIMUM THICKNESS A-36 STEEL. MATERIAL OF ALL HEAD SECTION STRUCTURAL MEMBERS IS 1/4" MINIMUM THICKNESS A-36 STEEL.

DRIVE MACHINERY:

◇C SK53C145 NORD HELICAL GEAR REDUCER. 294:1 REDUCTION RATIO, 1725 RPM INPUT, 5.9 RPM OUTPUT. MOTOR TO BE C-FACE MOUNTED. 2-SPEED, 1.0/0.5 HP, 480-VAC/3-PH/60-HZ WITH 143TC FRAME, TEFC ENCLOSURE, 1.15 SERVICE FACTOR AND CLASS 'F' INSULATION. DRIVE SPROCKET AS20-8T-6.70" P.D. FAB. STEEL WITH SHEAR PIN DEVICE. DRIVEN SPROCKET AS20-56T-45.71" P.D. FAB. STEEL.

BASKETS:

(58) HIGH STRENGTH COMPOSITE BASKETS. WIRE MESH TO BE 14 GA., Ø0.080", 304 STAINLESS STEEL WITH 3/8" SQUARE OPENINGS. CLAMPING BARS AND MESH ATTACHMENT BOLTS ARE TO BE 304 STAINLESS STEEL.

◇D CARRIER CHAIN:

CARRIER CHAIN TO BE OF THE FOLLOWING MATERIALS:
- PINS - 8620 STEEL
- ROLLERS - CAST CHROME
- BUSHINGS - 8620 STEEL
- SIDEBARS - 1045 STEEL
- COTTER PINS - 18-8 SSTL

SPRAY WATER REQUIREMENTS:

ALL USFilter SUPPLIED PIPING TO BE Ø2" SCH. 40 CARBON STEEL PIPE. ALL FITTINGS TO BE 150# MALLEABLE IRON. SPRAY NOZZLES TO BE 3/8" NPT, BRASS. ◇B
WASH WATER VOLUMES AND PRESSURES:
- 278 GPM AT 40 PSI FOR SMALL AMOUNTS OF REFUSE
- 340 GPM AT 60 PSI FOR LEAVES AND GENERAL REFUSE
- 392 GPM AT 80 PSI FOR REFUSE CLINGING TO TRAYS

PAINT INSTRUCTIONS:

ALL NONFERROUS MATERIAL WILL REMAIN UNPAINTED,
ALL GALVANIZED SURFACES WILL REMAIN UNPAINTED,
ALL PURCHASED EQUIPMENT (I.E. MOTORS & REDUCERS) WILL HAVE MANUFACTURER'S STANDARD PAINT,
ALL SHAFTING AND EXPOSED MACHINED SURFACES WILL RECEIVE STANDARD SHOP PRESERVATION,
CARRIER CHAIN AND DRIVE CHAIN WILL RECEIVE ONE COAT OF SLUSH OIL,
DRIVE AND DRIVEN SPROCKETS WILL HAVE MANUFACTURER'S STANDARD PAINT,
FIBERGLASS HOUSINGS AND CHAIN GUARD WILL REMAIN MANUFACTURER'S STANDARD GEL COAT PRIMER GRAY,
◇D ALL FERROUS STRUCTURAL SHAPES, PLATES AND CASTINGS CURRENTLY COATED WITH COAL TAR EPOXY WILL BE SANDBLASTED TO ACHIEVE AN ANCHOR PROFILE AND OVERCOATED WITH SHOP COATS OF TNEMEC N140 POTA-POX (BLACK) TO 12-14 MILS DFT.

ASSEMBLY NOTE:

THE SCREENS WILL BE FULLY SHOP ASSEMBLED IN OUR MANUFACTURING FACILITY WITH CHAIN AND SCREEN TRAYS ATTACHED. THE DRIVE UNIT, DRIVE SPROCKET, DRIVEN SPROCKET, DRIVE CHAIN GUARD AND SPLASH HOUSINGS WILL BE SHIPPED SEPARATELY FOR FIELD ASSEMBLY TO THE HEAD SECTION.
PRIOR TO SHIPMENT, EACH SCREEN WILL BE ASSEMBLED, RUN IN THE SHOP IN THE HORIZONTAL POSITION AND CHECKED TO ENSURE ALL OPERATING CLEARANCES ARE WITHIN TOLERANCES.

SPARE PARTS:

THE FOLLOWING SPARE PARTS WILL BE INCLUDED WITH THE SHIPMENT:
- (6) SHEAR PINS
- (3) PIECES OF SCREEN CLOTH (MESH)
- (6) SPRAY NOZZLES
- (10) SETS OF TRAY TO CHAIN ATTACHMENT HARDWARE.

NOTES:

1. LUBRICANTS AND SEALERS NOT PROVIDED BY USFilter.
2. ALL FASTENERS FOR EQUIPMENT ASSEMBLY WILL BE 18-8 STAINLESS STEEL UNLESS OTHERWISE NOTED.
3. "SAFETY HAZARD" WARNING LABELS ARE AFFIXED TO USFilter INTAKE SYSTEMS EQUIPMENT WHEN A VISUAL WARNING IS APPROPRIATE. THE EQUIPMENT OWNER IS RESPONSIBLE FOR KEEPING THE LABELS VISIBLE AND IN GOOD CONDITION. REPLACEMENT LABELS ARE AVAILABLE FROM THE USFilter INTAKE SYSTEMS PARTS DEPARTMENT.
4. THE WELD QUALITY PARAMETERS WILL BE IN ACCORDANCE WITH THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE (STEEL) D1.1.
5. TOTAL ESTIMATED WEIGHT = 26,200 LBS. PER SCREEN.
6. NO SPECIAL TOOLS ARE REQUIRED OR PROVIDED FOR THIS SCREEN.

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
D	REVISED CHAIN & PAINT INSTRUCTIONS.	10/08/01	MCT	MCT	SBT	
C	CHANGED MOTOR TO 480V.	07/12/01	MCT	MCT	SBT	
B	CHANGED SPRAY NOZZLE MATERIAL.	05/12/01	MCT	MCT	SBT	
A	REVISED GUIDE LOCATION	03/12/01	MCT	MCT	SBT	

DIMENSIONS IN INCHES UNLESS SPECIFIED
TOLERANCES UNLESS OTHERWISE SPECIFIED
TWO (2) PLACE DECIMAL ±.06
THREE (3) PLACE DECIMAL ±.005
ANGULAR ±.50
STRUCTURAL DIMENSIONS ±1/16
MACHINED SURFACES 250/ V

DESIGNER	DATE
MCT	01/17/01
CHECKER	DATE
RBH	01/24/01
ENGINEER	DATE
MANAGER	DATE
SBT	
FILE	30237-103_D
SCALE:	NONE

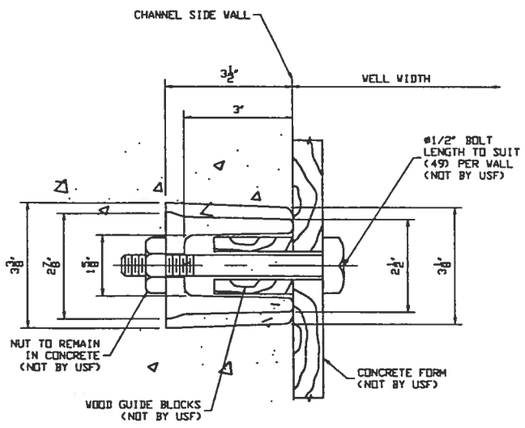
TITLE: DETAILS AND SPECIFICATIONS FOR REX STYLE BACKWASH, THRU-FLOW TRAVELING WATER SCREEN 6'-0" TRAY WIDTH x 52'-0" CENTERS

CLIENT: WILLBROS ENGINEERS, INC. ON BEHALF OF UNION POWER PARTNERS, L.P.

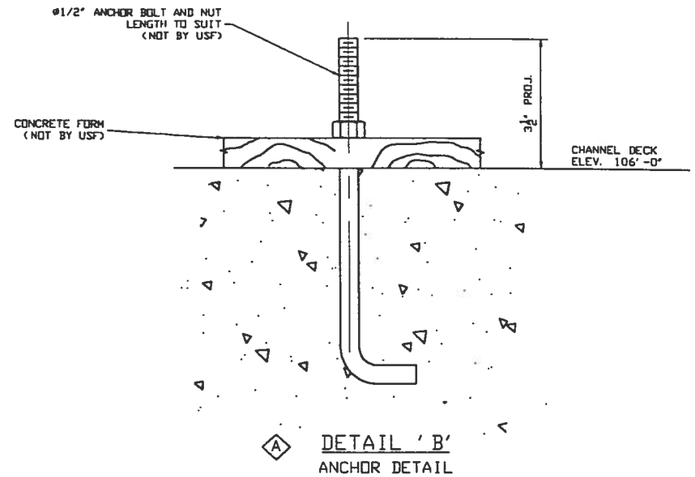
USFilter — Rex & Link-Belt Intake Products, Chalfont, PA, 800-207-9490

PROJECT	CODE	DRAWING	SHEET
30237	3017	30237-103	1 OF 1

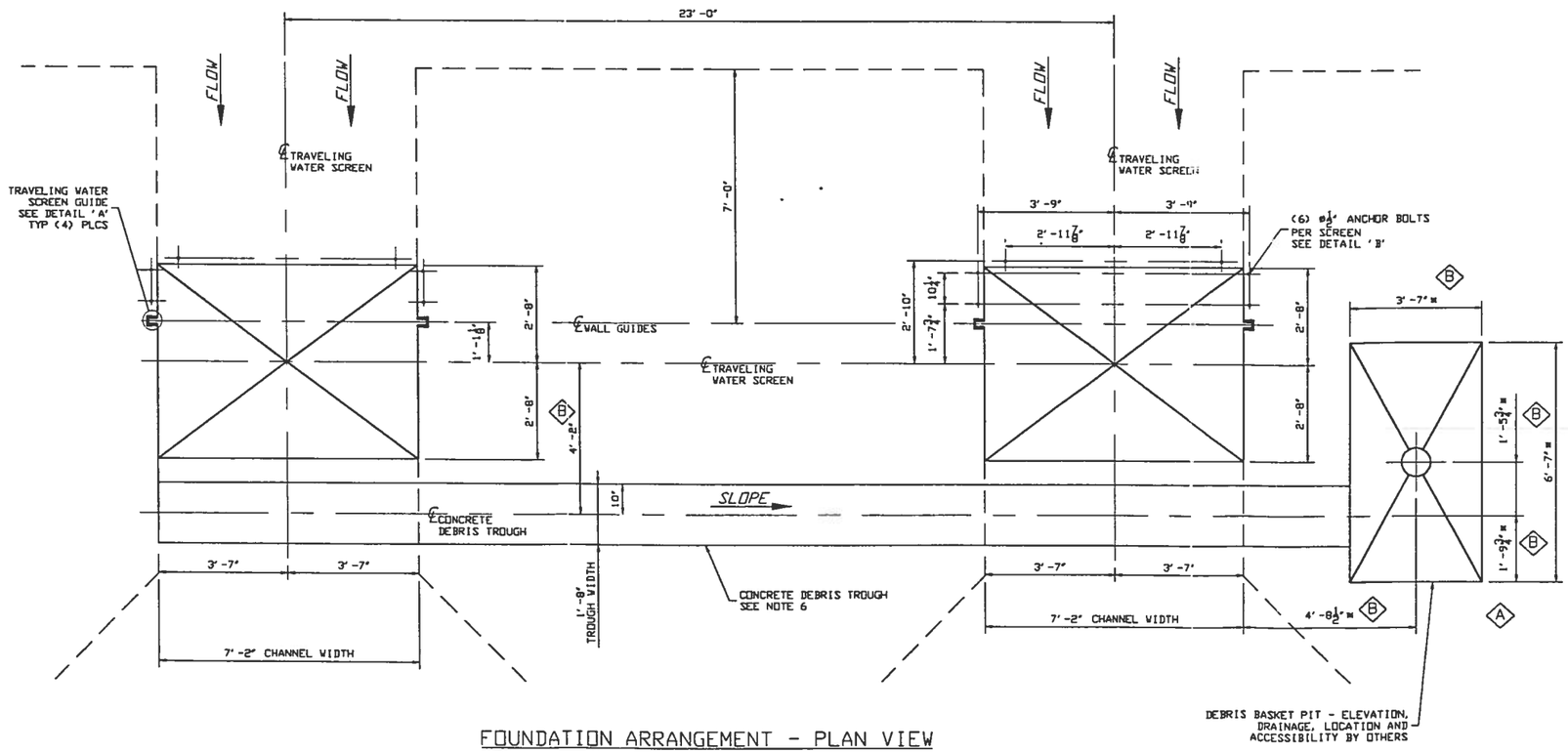
STD: 2-0799-22x34D | MADE FROM: | BAR = 1" AT PLOT SCALE



DETAIL 'A'
METHOD TO SECURE GUIDES
SCALE: 6" = 1'-0"



Ⓐ DETAIL 'B'
ANCHOR DETAIL
SCALE: 6" = 1'-0"



FOUNDATION ARRANGEMENT - PLAN VIEW

NOTES:

1. ANCHOR BOLTS MUST BE ACCURATELY PLACED (±1/8"), WITH RESPECT TO GIVEN DIMENSIONS.
2. GUIDEWAYS MUST BE PLUMB & STRAIGHT (±3/16").
3. THE SIDE WALLS OF THE SCREEN WELL MUST BE PLUMB AND TRUE, AND MUST BE PARALLEL WITH EACH OTHER. THEY CAN NOT BE OUT OF PLUMB MORE THAN 1/2" FOR THE ENTIRE DEPTH.
4. THE WIDTH BETWEEN THE SIDE WALLS MAY NOT BE MORE THAN 1/2" OVER OR UNDER THE GIVEN DIMENSIONS AT ANY GIVEN POINT.
5. THE ANCHOR BOLT AND GUIDE LOCATIONS ARE TYPICAL FOR BOTH SCREENS.
6. CONCRETE DEBRIS TROUGH TO HAVE A MINIMUM SLOPE OF 1/4" PER FOOT. THE MINIMUM DEPTH IS TO BE 6", AND THE RECOMMENDED DEPTH IS 8".
7. Ⓑ DEBRIS PIT DIMENSIONS (MARKED WITH AN ASTERISK) ARE PER INFORMATION PROVIDED BY WILLBROS ENGINEERS, INC.

DIMENSIONS IN INCHES UNLESS SPECIFIED							
TOLERANCES UNLESS OTHERWISE SPECIFIED							
TWO (2) PLACE DECIMAL ±.05 THREE (3) PLACE DECIMAL ±.005 ANGULAR ±.50'							
STRUCTURAL DIMENSIONS ±1/16	MACHINED SURFACES 250	Ⓑ	REVISED TROUGH, DEBRIS BASKET PIT LOCATIONS.	03/12/01	MCT	MCT	SBT
		Ⓐ	DEBRIS BASKET WAS ON OTHER SIDE. ADDED DIM. REVISED DETAIL 'B'.	02/05/01	MCT	MCT	SBT

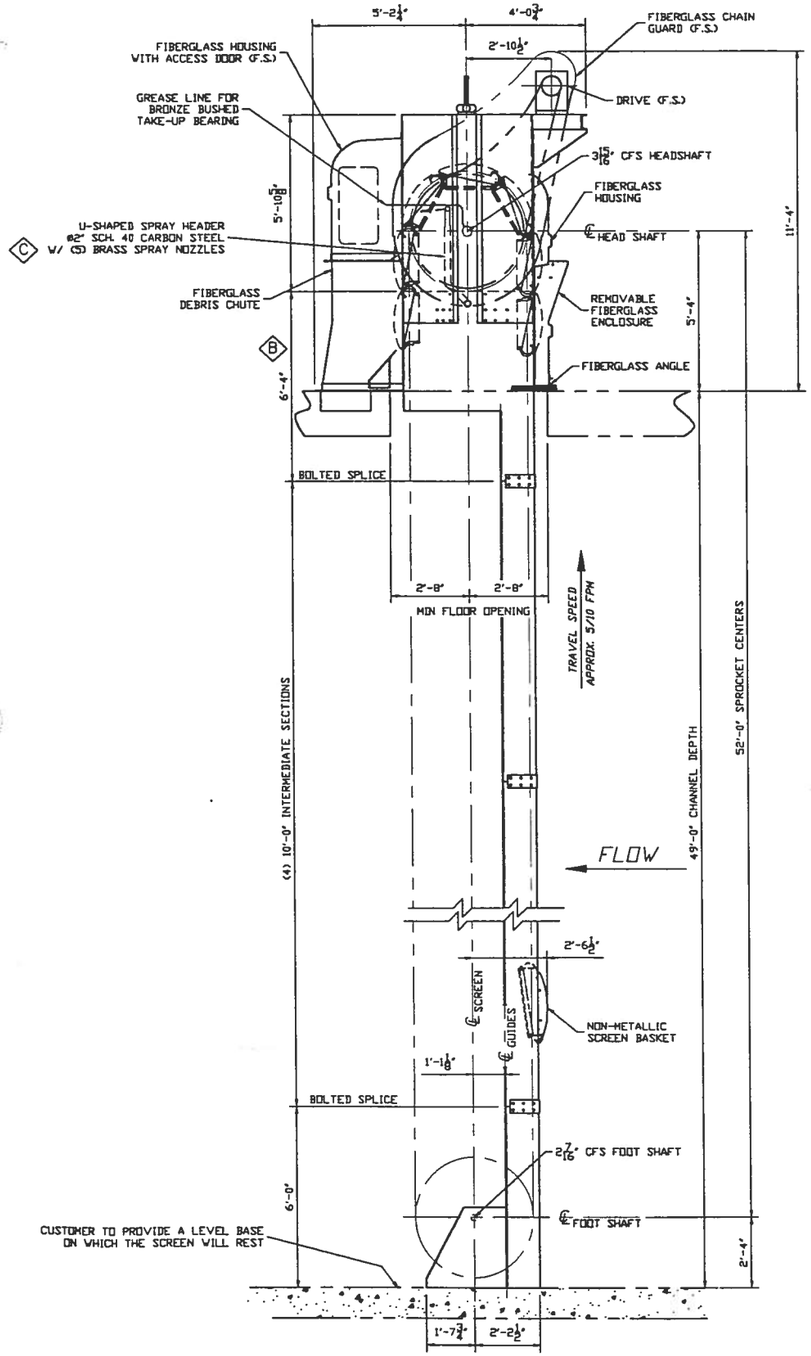
	DESIGNER	DATE
	MCT	01/05/01
	CHECKER	DATE
	RBI	01/08/01
	ENGINEER	DATE
	MANAGER	DATE
	SBT	
	FILE:	30237-101_B
	SCALE:	

TITLE: FOUNDATION ARRANGEMENT FOR TRAVELING WATER SCREEN & DEBRIS BASKET

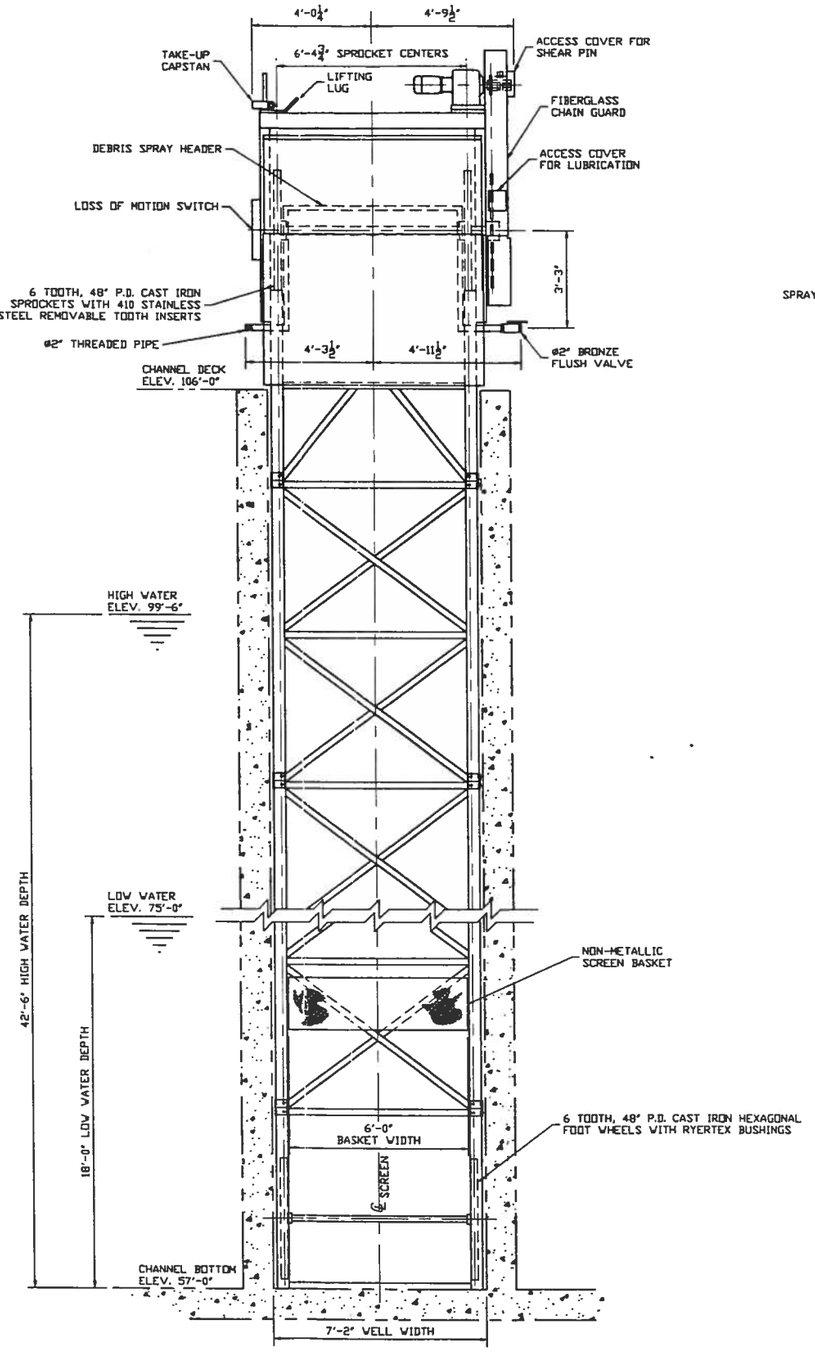
CLIENT: WILLBROS ENGINEERS, INC.
ON BEHALF OF UNION POWER PARTNERS, L.P.

USFilter — Rex & Link-Belt Intake Products
Chalfont, PA
800-207-9490

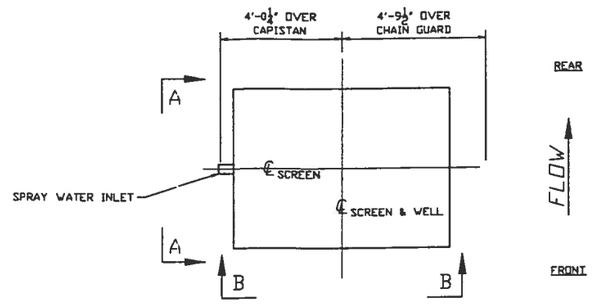
PROJECT	CODE	DRAWING	SHEET	REV



VIEW 'A-A' - SIDE ELEVATION



VIEW 'B-B' - FRONT ELEVATION



KEY PLAN

DIMENSIONS IN INCHES UNLESS SPECIFIED							
TOLERANCES UNLESS OTHERWISE SPECIFIED							
TWO (2) PLACE DECIMAL ±.06 THREE (3) PLACE DECIMAL ±.005 ANGULAR ±.50'	C	CHANGED SPRAY NOZZLE MATERIAL.	05/12/01	MCT	MCT	SBT	
STRUCTURAL DIMENSIONS ±1/16 MACHINED SURFACES 250	B	REVISED TROUGH LOCATION.	03/26/01	MCT	MCT	SBT	
	A	GENERAL REVISIONS PER WILLBROS COMMENTS.	03/12/01	MCT	MCT	SBT	

DESIGNER	DATE
MCT	01/15/01
CHECKER	DATE
RBH	01/24/01
ENGINEER	DATE
MANAGER	DATE
SBT	

FILE: 30237-102_C
REV: C

TITLE: GENERAL ARRANGEMENT FOR REX STYLE BACKWASH, THRU-FLOW TRAVELING WATER SCREEN 6'-0" TRAY WIDTH x 52'-0" CENTERS

CLIENT: WILLBROS ENGINEERS, INC. ON BEHALF OF UNION POWER PARTNER, L.P.

USFilter — Rex & Link-Belt Intake Products, Chalfont, PA, 800-207-9490

PROJECT	CODE	DRAWING	SHEET	REV
		30237-102	1 OF 1	C

Appendix C

Survey of the fish Community in the Lower Ouachita River, Arkansas (Wise, 1993).

A SURVEY OF THE FISH COMMUNITY

IN THE

LOWER OUACHITA RIVER,

ARKANSAS

Prepared by
the

LOWER OUACHITA RIVER WORK GROUP

Compiled
by

James Wise

and

Steve Filipek, John Giese,
Bill Keith, and Don Turman

Arkansas Game and Fish Commission
Arkansas Department of Pollution Control and Ecology

JANUARY 1993
WQ93-01-1

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

This report would have not been possible if not for the countless hours of field work performed by the following personnel:

Arkansas Game and Fish Commission:

Steve Filipek, Don Turman, John Stark, Craig Uyeda, Mark Shaw, Brian Wagner, Brett Hobbs, Stuart Wooldridge, Pat Fitts, Jerry Smith

Arkansas Department of Pollution Control and Ecology:

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Ouachita Baptist University:

Dr. Tim Knight

Private Consultant

Dr. Forest Payne

It is impossible to note every individual who cooperated with and/or who participated in the field activities to make this report possible. Therefore, the author apologizes to those persons whom may have been overlooked in the above list.

INTRODUCTION

A series of stream fishery surveys conducted by Arkansas Game and Fish Commission (AGFC) fisheries biologists from 1987 to 1990 on the lower Ouachita River indicated problems with the river's sport fishery. Estimates of sportfish densities in the main channel of the Ouachita River were compared with similar estimates from a nearby stream, the Saline River. Populations of black bass were almost fifty percent less, sunfish populations were sixty percent less, and catfish populations were even less abundant in 1990 in the Ouachita River than in the Saline River. Because of the numerous anthropogenic impacts to the Ouachita River, traditional fisheries management efforts were not deemed adequate to improve the river's fisheries. Therefore, in late 1990, a committee was formed to ascertain possible causes for the impacted aquatic biota and to work towards the river's enhancement. This committee was called the Lower Ouachita River Work Group and consisted of personnel from six state agencies, three federal agencies, a state university representative, and a private consultant. After the group reviewed the river's existing historical data, a scope of work was developed to help define the problems of the Ouachita River, their magnitude, and hopefully find their source(s) for future ameliorative work.

One part of the analysis was evaluating the river's fisheries. During the summer and fall of 1991 and 1992, the Arkansas Game and Fish Commission (AGFC) and the Arkansas Department of Pollution Control and Ecology (PC&E), in conjunction with the Lower Ouachita

River Work Group (LORWG), initiated a fish community survey of the lower Ouachita River. Eight collecting segments (Reaches) were identified on the lower Ouachita River from just below Remmel Dam in Hot Spring County, to the Arkansas/Louisiana State line. In 1991, there was one collecting station in each designated reach of the river, except Reach #7, the Felsenthal Reservoir. Two stations were located in Reach #6. After analysis of the 1991 data, it was decided that additional sampling was needed. In 1992, samples were collected from each of the 1991 stations except the Reach #2 station. Also, two new stations were added, one each in Reach #2 and one in Reach #5. At each station, fishes were collected by several different methods to obtain a representative sample of the fish community.

The objectives of this survey were: 1) to determine the fish community structure in each designated reach, 2) to determine if the fish community is impaired, 3) to obtain fish flesh samples for contaminant analysis, and 4) to determine the needs for any future collections.

The purpose of this report is to summarize the results of the fish community survey from the summer and fall of 1991 and 1992.

Description of Survey Area

The Ouachita River arises in the Ouachita Mountains Ecoregion near Mena, Arkansas, and flows almost due east through three impoundments, Lakes Ouachita, Hamilton, and Catherine, before entering the Gulf Coastal Plains Ecoregion near Malvern, Arkansas (ADPC&E 1987). The river bottom below Lake Catherine lies within the Alluvium Formation of gravel, sand, silt, and clay, with additional formations consisting of sands, gravel, clays, silts, and some paleozoic rock along the Alluvium's border (Hosman 1982).

In Reach #1 (Remmel Dam to Rockport, approximately seven river miles) the river has a relatively steep gradient, 3 to 5 ft/mi, with a moderate to swift current and flows out of the Ouachita Mountains Ecoregion and across the "Fall Line"[1]. The bedrock bottom is covered by loose gravel or large to medium sized boulders. Light penetration usually extends the depth of the water column.

The river flows southwest along the "Fall Line" in Reach #2 (Rockport to the Caddo River, approximately 23 river miles). The gradient is less, 3 to 3.5 ft/mi. The bottom consists of gravel, a few medium sized rocks, and little bedrock. The water is clear, moderately flowing, with little sedimentation occurring.

In Reach #3 (the Caddo River to the Little Missouri River, approximately 51 river miles) the river turns more southeasterly again and the gradient decreases to approximately 1 ft/mi. Riffle

[1]The "Fall Line" stretches from Northeast to Southwest Arkansas, along which the topography changes from the Arkansas Delta to the Interior Highlands.

bottoms are gravel, pool bottoms are fine gravel to sand, and there is little to no bedrock present. The velocity has decreased, sedimentation increased, and the river is taking on characteristics of a larger river system. There are some shallow areas in the middle of the river forming deep riffles. Light penetration has decreased, and turbidity is noticeably higher.

Significant changes can be seen in the river's morphology in Reach #4 (Little Missouri River to Camden, approximately 26 river miles). The gradient has decreased to less than 1 ft/mi. The bottom becomes mostly sand, with some gravel-to-sand in the few riffle areas. Light penetration is one to two feet, turbidity and sedimentation has increased, and the velocity has decreased.

Reaches #5 and #6 (approximately 100 river miles, Camden to the Felsenthal Pool) are morphologically similar, but are distinctively different from the upstream reaches. The stream gradient is less than 0.5 ft/mi, no riffles are present, the bottom is sand/silt, and light penetration is usually less than one foot. There are very few shallow areas or sand bars along the steep banks, and a heavy sediment load is evident.

Reach #7, the Felsenthal pool, is a lentic environment and will not be discussed in this report.

Reach #8 (approximately six river miles, Felsenthal Dam to the Ark/La State line) has a stream gradient less than 0.5 ft/mi. The river has a deep channel with steep cut sandy banks and no riffle areas. Light penetration is less than one foot, a heavy sediment load is observable, and the bottom is a shifting sand/silt makeup.

MATERIALS/METHODS

SAMPLING MATERIALS:

Several different sampling gear types were used to meet the objectives of this survey. These included:

1) 2 - boat mounted, electrofishing devices utilizing pulsed D.C. current
2) 1 - backpack electrofisher utilizing pulsed D.C. current
3) 1 - 20' X 6', 3/16" mesh seine
4) 4 - 4' hoop nets (1991 only)
5) 1 - 4' fiddler net (1991 only)

The substrate and water conditions at each location dictated the type of sampling gear used. Therefore, not all gear types listed above were used at each sampling station.

SAMPLING METHODS:

Boat shockers were used at all locations, primarily in the deep pools. The size of the sample area determined the number of boat shockers deployed. The hoop nets and fiddler nets were also used (1991 only) in the deeper areas to obtain additional species which may elude shocking units. The backpack shocker and seine were used along the shorelines, in the shallows, and in the riffles which were inaccessible to the boat shockers. Fish species of all types were collected from all available habitat within the sample area until all available habitat was sampled and a fully representative sample of the species in the area was thought to be obtained. Collections were made only once at each station during the duration of the surveys.

Most large specimens were field identified and released.

Small specimens and those unidentifiable in the field were preserved in a ten percent (10%) formalin solution and returned to the lab at PC&E for identification. The taxonomic keys of Robison and Buchanan (1991), Pflieger (1975), and Douglas (1974) were used in the identifications. A Relative Abundance Value (RAV) for each species collected and/or observed was determined according to Keith (1987). The values are as follows:

1 -- Rare - Species or age group represented by only one or very few individuals in the population; more than likely a remnant, migrant or a displaced species.

1.5 -- Rare to Present

2 -- Present - Species or age group collected with enough frequency to indicate the likely presence of an established population but definitely a subordinate species in the species group.

2.5 -- Present to Common

3 -- Common - Species or age group collected in most areas where such species would exist; individuals frequently seen and apparently well established in the populations; one of the more frequent species of the species group.

3.5 -- Common to Abundant

4 -- Abundant - Species or age group collected easily in a variety of habitats where species expected; numerous individuals seen with consideration of sampling gear limitations and expected abundance of such species; a dominant species of the species group.

For the 1991 survey, the young, sub-adult and adult specimens within each species were ranked together and given one value, resulting in a four point ranking scale. An eight point scale was used in the 1992 survey. The young and sub-adult specimens within each species were ranked together and given one value, and the adult specimens within each species were given a separate value.

STATION LOCATION/DESCRIPTION:

REACH 1 -- STATION - REMMEL DAM

Ouachita River adjacent to Arkansas Highway 270 below Cove Creek. (SECs 29,30, T3S, R17W) Hot Spring County.

DATE OF SAMPLE: July 15, 1991

UNIT OF EFFORT: Boat shocker, 3600 seconds
Backpack shocker, 0.8 km. upstream

DATE OF SAMPLE: [2]July 13, 1992, August 24, 1992, September 14, 1992

UNIT OF EFFORT: Boat shocker, 6700 seconds
Backpack shocker, 6300 seconds w/seine

STREAM CONDITION: Very low flow, clear. Pools and riffles with moderate to large boulders and some aquatic vegetation. Pools also with logs/treetops.

REACH 2 -- STATION A - GRISBY FORD ACCESS

Ouachita River at Grisby Ford Access, approx. 1 mi. E. of I-30, above and below Chatman Creek. (SEC 25, T4S, R18W). Hot Spring County.

DATE OF SAMPLE: August 24, 1992

UNIT OF EFFORT: Boat shocker, 3500 seconds
Backpack shocker, 1230 seconds w/seine

STREAM CONDITION: Low flow, clear. Riffles with moderate to small cobble to gravel, some aquatic vegetation. Pools of gravel to sand bottom with logs/treetops.

REACH 2 -- STATION - HWY 67

Ouachita River at Arkansas Highway 67 bridge, 0.8 km upstream and downstream of the bridge. (SEC 5, T6S, R18W) Hot Spring County.

DATE OF SAMPLE: July 16, 1991

---

[2]This station was located below Remmel Dam, a hydropower structure. We were unable to obtain an adequate sample from our first two visits because of the releases for hydropower generation.

UNIT OF EFFORT: Boat shocker, 4072 seconds
Backpack shocker, 2700 seconds, w/seine

STREAM CONDITION: Low flow, relatively clear. Pools and riffles mainly with gravel bottom. Pools also with logs/treetops.

REACH 3 -- STATION - DALLAS COUNTY ACCESS

Ouachita River at the Dallas County Access, approximately 1.6 km upstream and downstream. (SECs 31,36, T9S, R17-18W) Dallas County.

DATE OF SAMPLE: JULY 17, 1991

UNIT OF EFFORT: 2 boat shockers, 7200 seconds
backpack shocker

DATE OF SAMPLE: August 26, 1992

UNIT OF EFFORT: Boat shocker, 2043 seconds
Backpack shocker, 2200 seconds w/seine

STREAM CONDITION: Water level low but with a substantial flow. Pools primarily with logs/treetops and roots. Riffles primarily with gravel bottom.

REACH 4 -- STATION A - TATE'S BLUFF

Ouachita River at Tate's Bluff Access, downstream of the Little Missouri River confluence. (SEC 1, R18W, SEC 6, R17W, T11S) Ouachita County.

DATE OF SAMPLE: August 24, 1992

UNIT OF EFFORT: 2 Boat shockers, 3600 seconds
Backpack shocker, 1200 seconds w/seine

STREAM CONDITION: Moderate flow with shallow shoal over gravel substrate. Pools with logs/treetops and sandy to gravel bottom.

REACH 4 -- STATION - CAMDEN

Ouachita river 2.4 km. to 4.8 km. above Arkansas Highway 7 bridge. (SECs 10,11,14,15, T13N, R17W) Ouachita County.

DATE OF SAMPLE: July 18, 1991

UNIT OF EFFORT: Boat shocker, 4375 seconds
Backpack shocker

DATE OF SAMPLE: July 13, 1992

UNIT OF EFFORT: 2 Boat shockers, 4160 seconds
Backpack shocker, 1300 seconds w/seine

STREAM CONDITION: Moderate flow, 1-2 foot visibility. Pools mainly with logs/treetops, gravel bottom, rootwads, and undercut banks. Riffles primarily with gravel bottom.

REACH 5 -- STATION - WEST TWO BAYOU

Ouachita River just below the confluence of West Two Bayou. (SECs 5,8,9, T14S, R16W) Ouachita county.

DATE OF SAMPLE: July 30, 1991

UNIT OF EFFORT: 2 boat shockers
Backpack shocker
20′ X 6′ seine
3-3 1/2" gill nets

DATE OF SAMPLE: July 14, 1992

UNIT OF EFFORT: 2 boat shockers, 2889 seconds
Backpack shocker, 1700 seconds w/seine

STREAM CONDITION: Water six feet high and rising, 1 foot visibility. Pools primarily with logs/treetops. Some roots and terrestrial vegetation. No obvious riffle area.

REACH 6 -- STATION A - SMACKOVER

Ouachita River downstream from Smackover Creek. (SECs 4,5, T16S, R14W) Union County.

DATE OF SAMPLE: August 2, 1991

UNIT OF EFFORT: 2 boat shockers
20′ X 6′ seine
1-3 1/2" gill net
3-4′ hoop nets

DATE OF SAMPLE: July 17, 1992

UNIT OF EFFORT: 2 boat shockers 4850 seconds
backpack shocker 2178 seconds
15-20 seine hauls

STREAM CONDITION: Flooded into some terrestrial vegetation, 1 foot visibility. Pools primarily with logs/treetops. Some terrestrial vegetation. No obvious riffle area.

REACH 6 -- STATION B - PIGEON HILL ACCESS

Ouachita River downstream of the Pigeon Hill Access. (SECs 29,30, T16S, R12W) Union County.

DATE OF SAMPLE: July 31, 1991

UNIT OF EFFORT: 2 boat shockers
20' X 6' seine
2-3 1/2" gill nets
2-4' hoop nets

DATE OF SAMPLE: August 25, 1992

UNIT OF EFFORT: Boat shocker, 4222 seconds
Backpack shocker, 802 seconds

STREAM CONDITION: Water level 1 to 1.5 feet high, 1 foot visibility. Pools primarily with logs/treetops. Some terrestrial vegetation and roots. No riffle area.

REACH 8 -- STATION - COFFEE CREEK

Ouachita River below Felsenthal Lock and Dam, and below confluence of Coffee Creek. (SECs 30,31, T19S, R9W) Union County.

DATE OF SAMPLE: August 1, 1991

UNIT OF EFFORT: 2 boat shockers
1-20' X 6' seine
4-4' hoop nets
1-4' fiddler net

DATE OF SAMPLE: August 25, 1992

UNIT OF EFFORT: 2 boat shockers, 3754 seconds
Backpack shocker 576 seconds w/seine
5 to 10 seine hauls

STREAM CONDITION: Water level 1 foot high, 1 foot visibility. Pools primarily with logs/treetops. Some terrestrial vegetation and roots. No riffle area.

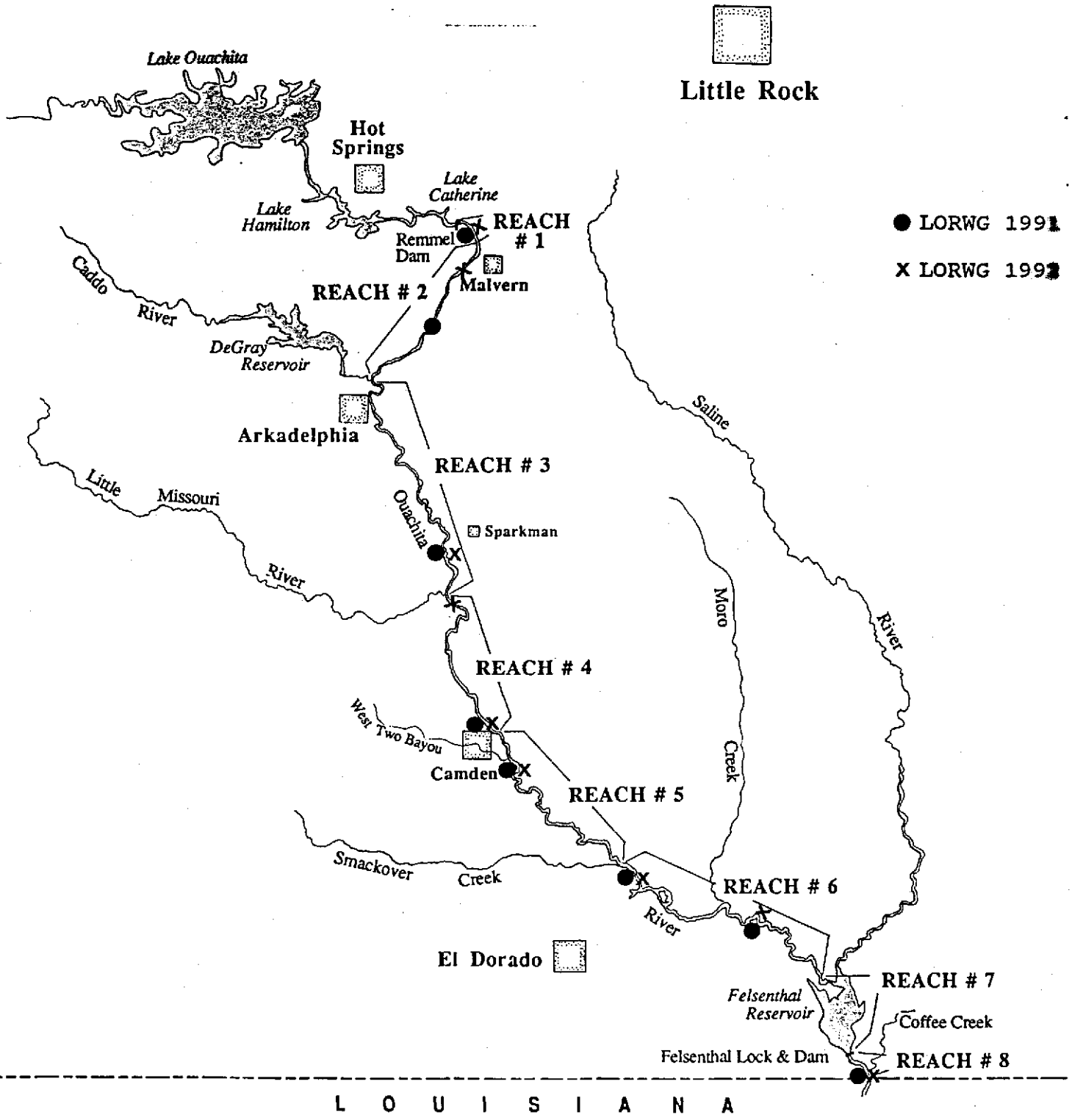
RESULTS - 1991 COLLECTIONS

Eight collecting stations, one within each designated reach of the lower Ouachita River except Reach #7 (Felsenthal Reservoir), and two within Reach #6 (#6A and #6B), are identified in Figure 1. The two stations within Reach #6 will be referred to as Reach #6A, and Reach #6B. Table 1 describes the limits of each of the eight reaches. A single collection was made at each station during the summer and fall of 1991. The materials and methods used at each sampling station are described in the station/description section above.

A total of seventy-nine species, representing thirty-eight genera, and sixteen families were collected during the survey. Table 2 gives a list of these species, outlined by family, and includes the common name of each species. Also found in Table 2 is the Relative Abundance Value (RAV) assigned to each species and the total number of species collected at each station. A four point ranking system was used. There were 32, 44, 52, 40, 27, 28, 27, and 22 species collected from the stations in Reaches 1, 2, 3, 4, 5, 6A, 6B, and 8, respectively (Figure 2).

The cyprinids were the most diverse group. Eighteen species were collected throughout the survey area. However, only six species consistently appeared at three or more locations, with nine species only appearing at a single location. Only one Cyprinid, Cyprinus carpio, the common carp, was reported from the Reach #1 station. The Reach #3 station hosted the most diverse and abundant community of cyprinids with 11 species collected.

FIGURE 1



Ouachita River Eight (8) Reaches
LORWG Station Locations

TABLE 1

Limits for Each River Reach

Reach	Location
#1	Remmel Dam to Rockport
#2	Rockport to confluence with Caddo River
#3	Confluence with Caddo to confluence with Little Missouri River
#4	Confluence with Little Missouri to Camden, Arkansas
#5	Camden, Arkansas, to confluence with Smackover Creek
#6	Confluence with Smackover Creek to upper end of Felsenthal Reservoir
#7	Felsenthal Reservoir
#8	Felsenthal dam to Louisiana line

TABLE 2

LOWER OUACHITA RIVER WORK GROUP (1991)

RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Lepisosteidae	Gars								
Lepisosteus oculatus	Spotted gar	-	3.0	4.0	3.0	3.0	2.0	4.0	3.0
Lepisosteus osseus	Longnose gar	3.0	2.0	2.0	2.0	-	-	2.0	2.5
Amiidae	Bowfins								
Amia calva	Bowfin	-	1.5	-	-	-	-	-	-
Anguillidae	Eels								
Anguilla rostrata	American eel	3.0	3.0	3.0	2.0	2.0	-	-	-
Clupeidae	Herrings								
Dorosoma cepedianum	Gizzard shad	3.0	3.0	4.0	4.0	4.0	3.5	4.0	3.0
Dorosoma petenense	Threadfin shad	-	-	-	-	2.0	2.0	-	2.0
Esocidae	Pikes								
Esox americanus	Grass pickerel	-	-	-	2.0	-	-	-	-
Esox niger	Chain pickerel	-	1.5	-	-	-	2.0	2.5	2.0
Cyprinidae	Minnows								
Campostoma anomalum	Stoneroller	-	4.0	4.0	4.0	2.0	2.0	-	-
Cyprinella venustus	Blacktail shiner	-	2.0	2.5	1.0	3.5	2.5	4.0	3.0
Cyprinella whipplei	Steelcolor shiner	-	-	2.5	3.0	2.5	3.0	-	-
Cyprinus carpio	Carp	2.0	2.5	-	3.0	3.0	2.5	2.5	2.5
Erimystax x-punctatus	Gravel chub	-	-	2.0	-	-	-	-	-
Hybognathus hayi	Cypress minnow	-	3.0	-	-	-	2.0	3.0	-
Hybognathus nuchalis	Silvery minnow	-	3.0	4.0	4.0	2.0	3.0	3.0	2.5
Hybopsis amnis	Pallid shiner	-	-	2.0	-	-	-	-	-
Lythrurus fumeus	Ribbon shiner	-	-	-	-	-	-	2.0	-
Lythrurus umbratilis	Redfin shiner	-	2.0	-	-	-	-	-	-
Notemigonus chrysoleucas	Golden shiner	-	-	-	-	-	-	-	2.0
Notropis atherinoides	Emerald shiner	-	-	2.0	3.0	-	-	-	-
Notropis boops	Bigeye shiner	-	4.0	4.0	-	-	-	-	-
Notropis texanus	Weed shiner	-	1.5	-	2.0	-	-	-	-
Notropis volucellus	Mimic shiner	-	-	1.0	-	-	-	-	-
Opsopoeodus emiliae	Pugnose minnow	-	-	-	1.0	-	-	-	-
Pimephales notatus	Bluntnose minnow	-	-	2.0	-	-	-	-	-
Pimephales vigilax	Bullhead minnow	-	-	4.0	-	-	-	-	-
Catostomidae	Suckers								
Hypentelium nigricans	Northern hogsucker	-	2.0	2.0	1.0	-	-	-	-
Ictiobus bubalus	Smallmouth buffalo	-	-	2.0	2.0	2.0	-	2.0	-
Ictiobus cyprinellus	Bigmouth buffalo	-	3.0	1.0	2.0	3.0	-	-	3.0
Minytrema melanops	Spotted sucker	4.0	2.0	-	2.0	-	2.0	2.0	-
Moxostoma carinatum	River redhorse	2.0	-	3.0	2.0	-	-	-	-
Moxostoma erythrurum	Golden redhorse	4.0	3.0	2.0	4.0	2.5	2.0	-	-
Moxostoma poecilurum	Blacktail redhorse	-	-	2.0	2.0	2.5	-	-	-
Ictaluridae	Catfishes								
Ameiurus natalis	Yellow bullhead	-	-	1.0	-	-	-	-	-
Ictalurus furcatus	Blue catfish	-	-	-	-	2.0	-	2.0	-
Ictalurus punctatus	Channel catfish	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0
Noturus eleutherus	Mountain madtom	-	-	2.5	-	-	-	-	-
Noturus miurus	Brindled madtom	-	-	1.0	-	-	-	-	-
Noturus nocturnus	Freckled madtom	1.0	-	2.5	-	-	-	-	-
Polydictus olivaris	Flathead catfish	-	2.0	2.0	2.0	-	-	2.0	2.0

TABLE 2 (cont)

LOWER OUACHITA RIVER WORK GROUP (1991)

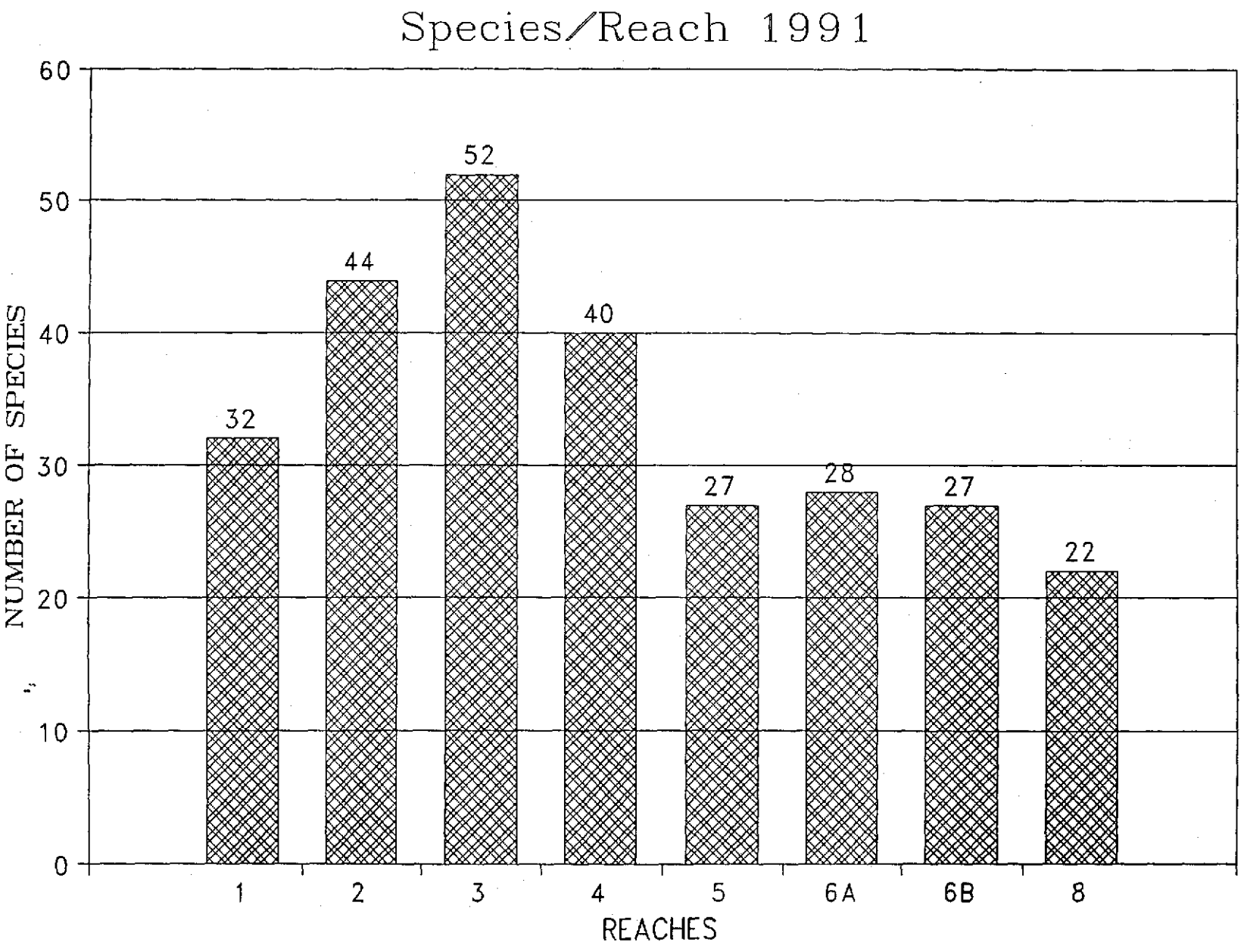
RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Cyprinodontidae	Killifishes								
Fundulus catenatus	Northern studfish	-	2.0	1.0	-	-	-	-	-
Fundulus notatus	Blackstripe topminnow	1.0	-	-	2.5	-	-	-	3.0
Fundulus olivaceus	Blackspotted topminnow	2.0	2.0	1.0	2.5	2.0	3.0	3.5	-
Poeciliidae	Livebearers								
Gambusia affinis	Mosquitofish	-	2.0	2.0	2.0	-	2.5	-	-
Aphredoderidae	Pirate perch								
Aphredoderus sayanus	Pirate perch	-	-	2.0	2.0	-	-	-	-
Atherinidae	Silversides								
Labidesthes sicculus	Brook silverside	2.0	2.0	2.0	2.0	2.5	2.0	3.0	2.0
Percichthyidae	Temperate bass								
Morone chrysops	White bass	-	-	-	-	-	-	-	2.0
Centrarchidae	Sunfishes								
Ambloplites ariommus	Shadow bass	2.0	2.0	-	-	-	-	-	-
Elassoma zonatum	Banded pigmy sunfish	-	-	2.0	-	-	-	-	-
Lepomis cyanellus	Green sunfish	2.5	2.0	1.0	-	-	-	-	-
Lepomis gulosus	Warmouth sunfish	2.0	1.0	-	-	-	2.0	2.0	-
Lepomis humilis	Orangespotted sunfish	-	-	-	-	-	2.0	-	-
Lepomis macrochirus	Bluegill	3.0	2.0	2.0	3.0	2.0	3.0	3.0	1.5
Lepomis megalotis	Longear sunfish	4.0	3.0	2.0	3.0	4.0	3.0	3.0	3.0
Lepomis microlophus	Redear sunfish	-	2.0	1.0	2.0	3.0	2.0	2.0	3.0
Lepomis punctatus	Spotted sunfish	1.0	-	1.0	1.5	2.0	-	-	2.0
Micropterus dolomieui	Smallmouth bass	2.0	-	-	-	-	-	-	-
Micropterus punctulatus	Spotted bass	2.5	2.5	2.0	3.0	2.5	2.5	3.0	-
Micropterus salmoides	Largemouth bass	2.5	2.0	2.0	2.5	3.0	2.5	3.0	-
Pomoxis annularis	White crappie	2.0	2.0	-	2.0	2.0	2.0	2.5	2.5
Pomoxis nigromaculatus	Black crappie	-	-	2.0	2.0	3.0	2.0	2.5	3.5
Percidae	Perches								
Crystallaria asprella	Crystal darter	-	2.0	1.0	1.0	-	-	1.0	-
Etheostoma blennioides	Greenside darter	2.0	3.0	-	-	-	-	-	-
Etheostoma collettei	Creole darter	-	2.0	-	-	-	-	-	-
Etheostoma gracile	Slough darter	-	-	1.0	-	-	-	-	-
Etheostoma histrio	Harlequin darter	-	2.5	3.0	2.0	-	-	-	-
Etheostoma radiosum	Orangebelly darter	2.5	2.0	3.0	-	-	-	-	-
Etheostoma spectabile	Orangethroat darter	2.0	-	-	-	-	-	-	-
Etheostoma stigmaeum	Speckled darter	1.0	-	-	-	-	-	-	-
Etheostoma vivax	Scaly sand darter	-	-	2.0	-	-	2.0	2.0	-
Etheostoma zonale	Banded darter	3.5	3.0	2.0	-	-	-	-	-
Percina caprodes	Logperch	3.0	2.0	2.5	3.0	2.0	2.5	-	-
Percina copelandi	Channel darter	2.5	-	-	-	-	-	-	-
Percina maculata	Blackside darter	-	-	1.0	-	-	-	-	-
Percina sp.	Thompson darter	1.0	1.0	-	-	-	-	-	-
Percina sciera	Dusky darter	-	-	1.0	2.0	-	-	-	-
Percina uranidae	Stargazing darter	2.0	1.0	-	-	-	-	-	-
Stizostedion vitreum	Walleye	2.5	2.0	1.0	-	-	-	-	-
Sciaenidae	Drums								
Aplodinotus grunniens	Freshwater drum	-	2.0	2.0	2.0	3.0	2.5	2.0	2.0
	TOTAL SPECIES	32	44	52	40	27	28	27	22
	TOTAL RELATIVE ABUNDANCE	74.5	99.0	110.5	93.0	69.0	65.0	69.5	56.0

16 FAMILIES
39 GENERA
79 SPECIES

Note: RAV's based on a four point scale.

FIGURE 2


Species/Reach 1991
NUMBER OF SPECIES
60
50
40
30
20
10
0
32
44
52
40
27
28
27
22
1
2
3
4
5
6A
6B
8
REACHES

The genus Pimephales, represented in the LORWG survey by two species, was collected only at the Reach #3 station, but these species were given RAV rankings of "present" and "abundant". The lower four Reaches, #5, #6A, #6B, and #8, had only six or fewer species of cyprinids represented within their communities. The RAV rankings of each of the species were usually "present" or "common". The number of cyprinid species reported from each reach is illustrated in Figure 3, Cyprinidae.

There were 14 centrarchid species collected throughout the survey area. Ambloplites ariommus, the shadow bass, and Micropterus dolomieui, the smallmouth bass, were only reported from the upper two reaches. Lepomis cyanellus, the green sunfish, was reported from Reaches #1, #2, and #3, only. Lepomis humilis, the orangespotted sunfish, and Elassoma zonatum, the banded pygmy sunfish, were each reported from only one reach, #1, and #3, respectively. The other ten centrarchids were relatively common throughout the survey area with eight or more species being reported from all reaches except Reach #8, only six centrarchid species reported. Figure 3, Centrarchidae, illustrates the number of centrarchid species collected in each reach.

Seven species of catostomids were reported throughout the survey area. There were only three species of catostomids reported from Reach #1. Reach #4 hosted all seven species while only one catostomid species, Ictiobus cyprinellus, the bigmouth buffalo, was reported from Reach #8. Reaches #6A, and #6B, each had only two species reported, each with a reported RAV ranking of "present".

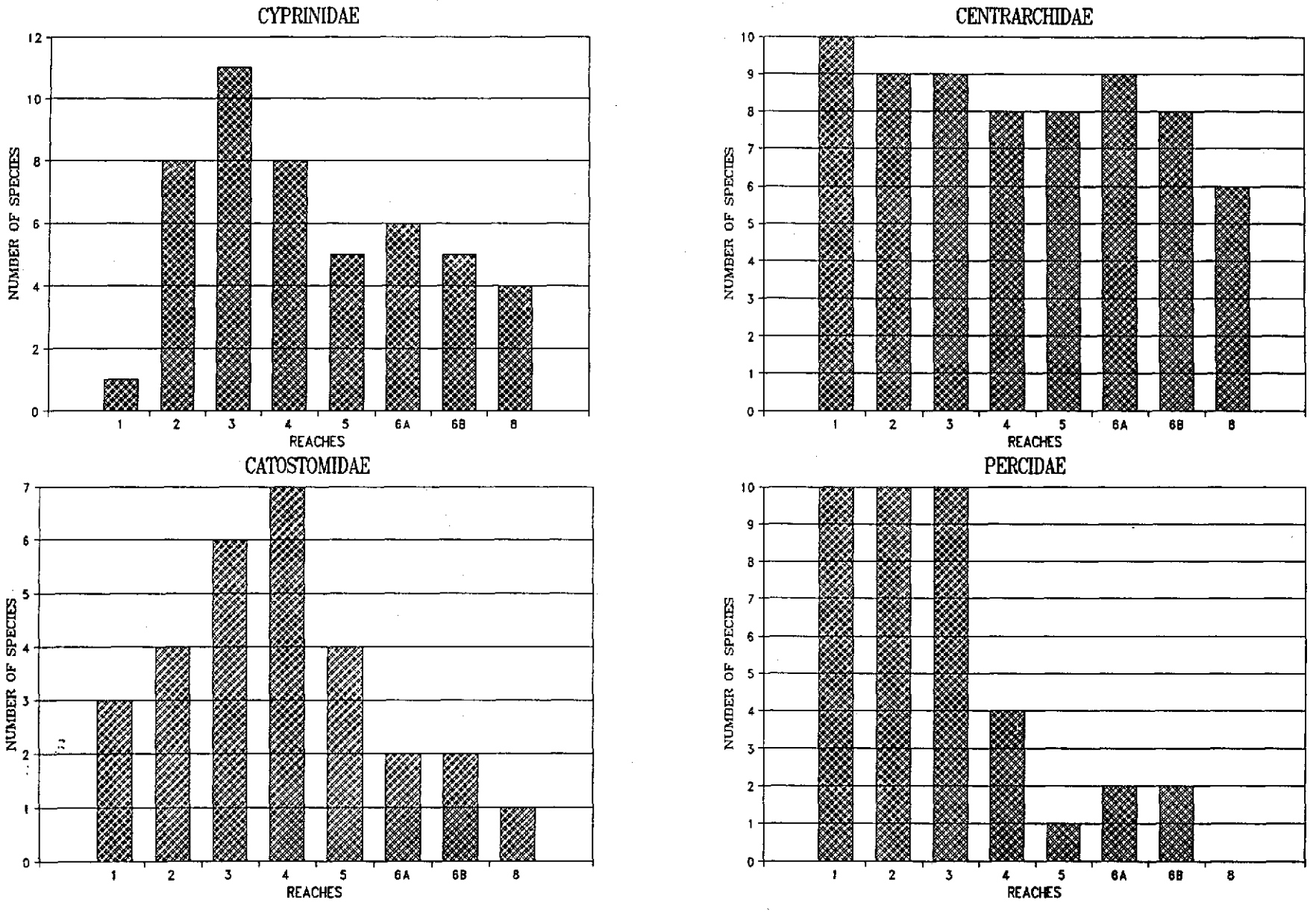


FIGURE 3 -- Number of species by station within selected fish families on the lower Ouachita River, Arkansas (LOWRG 1991).

The number of catostomid species reported from each reach is illustrated in Figure 3, Catostomidae.

There were 17 species of percids reported throughout the survey area. However, there were only seven species that were randomly common to three or more reaches. Percina caprodes, the logperch, was the most frequently collected darter. It was reported from the upper six reaches as "present", "present-to-common", or "common". Stizostedion vitreum, the walleye, was reported from Reaches #1, #2, and #3. These three reaches also each supported ten species of percids which was 20 to 30 percent of the total fish species in those areas (percid species/total species). Three of the four lower reaches, #5, #6A, and #6B, hosted only three species of darters between them, all in low abundances. There were not any Etheostoma species reported from any of the lower four reaches, and no percids of any kind reported from Reach #8. The number of percid species reported from each reach is illustrated in Figure 3, Percidae.

RESULTS - 1992 COLLECTIONS

Nine collecting stations, one within each designated reach of the lower Ouachita River except Reach #7 (Felsenthal Reservoir), and two within Reaches #4 (#4 and #4A) and #6 (#6A and #6B) are identified in Figure 1. A single collection was made at each station during the summer and fall of 1992. The materials and methods used at each station are described in the station/description section above.

A total of eighty-two species, representing thirty-eight

genera, and fifteen families were collected during the survey. Table 3 gives a list of these species, outlined by family, and includes the common name of each species. Also found in Table 3 is the Relative Abundance Values (RAV) assigned to each species and the total number of species collected at each station. Unlike the LORWG 1991 survey, an eight point scoring system was used to determine the RAVs in 1992. There were 39, 43, 43, 35, 26, 32, 29, 24, and 37 species collected from the stations in Reaches 1, 2A, 3, 4A, 4, 5, 6A, 6B, and 8 respectively (Figure 4).

Seventeen species of cyprinids were collected throughout the study area. Nine species appeared at three or more locations, with five species appearing at only single locations. Reach #1 had the poorest diversity of cyprinids with only two species collected, Campostoma anomalum, the stoneroller, and Cyprinella whipplei, the steelcolor shiner. Reach #8 had the most diverse group with ten species, and nine species were collected in Reach #3. Figure 5, Cyprinidae illustrates the number of cyprinid species collected from each reach.

There were twelve species of centrarchids collected throughout the survey area in 1992. Ambloplites ariommus, the shadow bass, was reported at the upper three reaches only, and the green sunfish, Lepomis cyanellus, and the warmouth sunfish, L. gulosus, were reported from Reaches #1, #2, and #6A, only. The other nine centrarchid species were relatively common throughout the survey area. The number of centrarchid species reported from each reach is illustrated in Figure 5, Centrarchidae.

TABLE 3

LOWER OUACHITA RIVER WORK GROUP (1992)

RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2A	REACH 3	REACH 4A	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Petromyzontidae	Lampreys									
Ichthyomyzon species	Ammocetes	3.0	-	1.0	-	-	-	-	-	-
Lepisosteidae	Gars									
Lepisosteus oculatus	Spotted gar	1.0	-	3.0	2.0	2.5	5.0	3.0	3.0	4.0
Lepisosteus osseus	Longnose gar	-	-	-	2.0	1.0	-	-	-	2.0
Lepisosteus platostomus	Shortnose gar	-	-	-	-	-	-	-	-	1.0
Anguillidae	Eels									
Anguilla rostrata	American eel	4.0	3.0	1.0	2.0	2.0	-	-	-	-
Clupeidae	Herrings									
Alosa chrysochloris	Skipjack herring	-	-	-	-	-	-	-	-	1.0
Dorosoma cepedianum	Gizzard shad	1.0	2.0	3.0	3.0	7.0	4.0	8.0	8.0	6.0
Dorosoma petenense	Threadfin shad	-	-	-	-	6.0	2.0	-	-	5.0
Esocidae	Pikes									
Esox niger	Chain pickerel	5.0	3.0	-	-	-	-	1.5	3.0	2.0
Cyprinidae	Minnows									
Campostoma anomalum	Stoneroller	4.0	4.0	5.0	6.0	1.0	1.0	-	-	-
Cyprinella venustus	Blacktail shiner	-	1.0	4.0	4.0	4.5	5.0	6.0	3.0	7.0
Cyprinella whipplei	Steelcolor shiner	1.5	1.0	8.0	8.0	4.0	4.0	4.0	3.0	2.5
Cyprinus carpio	Carp	-	4.0	-	2.0	2.0	3.0	3.0	-	6.0
Erimystax x-punctatus	Gravel chub	-	-	5.0	7.0	-	-	-	-	-
Hybognathus nuchalis	Silvery minnow	-	-	1.0	-	7.0	-	6.0	6.0	6.0
Hybopsis amnis	Pallid shiner	-	-	-	-	-	-	-	-	1.0
Lythrurus fumeus	Ribbon shiner	-	-	-	-	-	-	-	1.0	3.0
Lythrurus umbratilis	Redfin shiner	-	5.0	-	-	-	-	-	-	-
Notemigonus chrysoleucas	Golden shiner	-	-	-	-	-	-	1.0	-	-
Notropis atherinoides	Emerald shiner	-	-	2.0	1.0	2.0	2.5	2.0	8.0	8.0
Notropis boops	Bigeye shiner	-	3.0	4.0	4.0	-	-	-	-	-
Notropis texanus	Weed shiner	-	-	-	-	-	-	1.0	-	5.0
Notropis volucellus	Mimic shiner	-	-	-	-	-	-	-	-	2.0
Opsopoeodus emiliae	Pugnose minnow	-	1.0	-	-	-	-	-	-	-
Pimephales notatus	Bluntnose minnow	-	3.0	4.0	-	-	-	-	-	6.0
Pimephales vigilax	Bullhead minnow	-	-	4.0	4.0	2.0	4.5	-	1.0	-
Catostomidae	Suckers									
Carpiodes carpio	River carpsucker	-	-	-	2.0	-	-	-	-	-
Carpiodes cyprinus	Quillback carpsucker	-	-	-	-	2.0	-	-	-	-
Hypentelium nigricans	Northern hogsucker	-	6.0	6.0	4.0	-	1.5	-	-	-
Ictiobus bubalus	Smallmouth buffalo	-	-	-	-	-	-	-	1.0	-
Ictiobus cyprinellus	Bigmouth buffalo	-	2.0	-	-	-	2.5	-	-	4.0
Ictiobus niger	Black buffalo	-	-	1.0	-	-	-	-	-	-
Minytrema melanops	Spotted sucker	4.0	1.0	1.0	-	3.0	2.0	2.0	2.0	-
Moxostoma carinatum	River redhorse	2.0	-	2.0	4.0	-	-	-	-	-
Moxostoma erythrurum	Golden redhorse	4.0	5.0	6.0	6.0	2.5	2.0	2.0	-	-
Moxostoma poecilurum	Blacktail redhorse	-	-	2.0	2.0	4.0	2.0	1.5	-	-
Ictaluridae	Catfishes									
Ameiurus natalis	Yellow bullhead	2.5	-	-	-	-	-	-	-	
Ictalurus furcatus	Blue catfish	-	-	-	-	-	2.0	-	-	2.0
Ictalurus punctatus	Channel catfish	1.0	2.5	3.0	2.0	2.0	2.0	-	2.0	1.0
Noturus eleutherus	Mountain madtom	-	-	2.0	5.0	-	-	-	-	-
Noturus gyrinus	Tadpole madtom	2.0	8.0	-	-	-	-	-	-	-
Noturus miurus	Brindled madtom	-	-	2.0	-	-	-	-	-	-
Noturus nocturnus	Freckled madtom	-	1.0	1.0	-	-	-	-	-	-
Polydictus olivaris	Flathead catfish	-	1.0	2.0	-	-	2.0	-	-	-

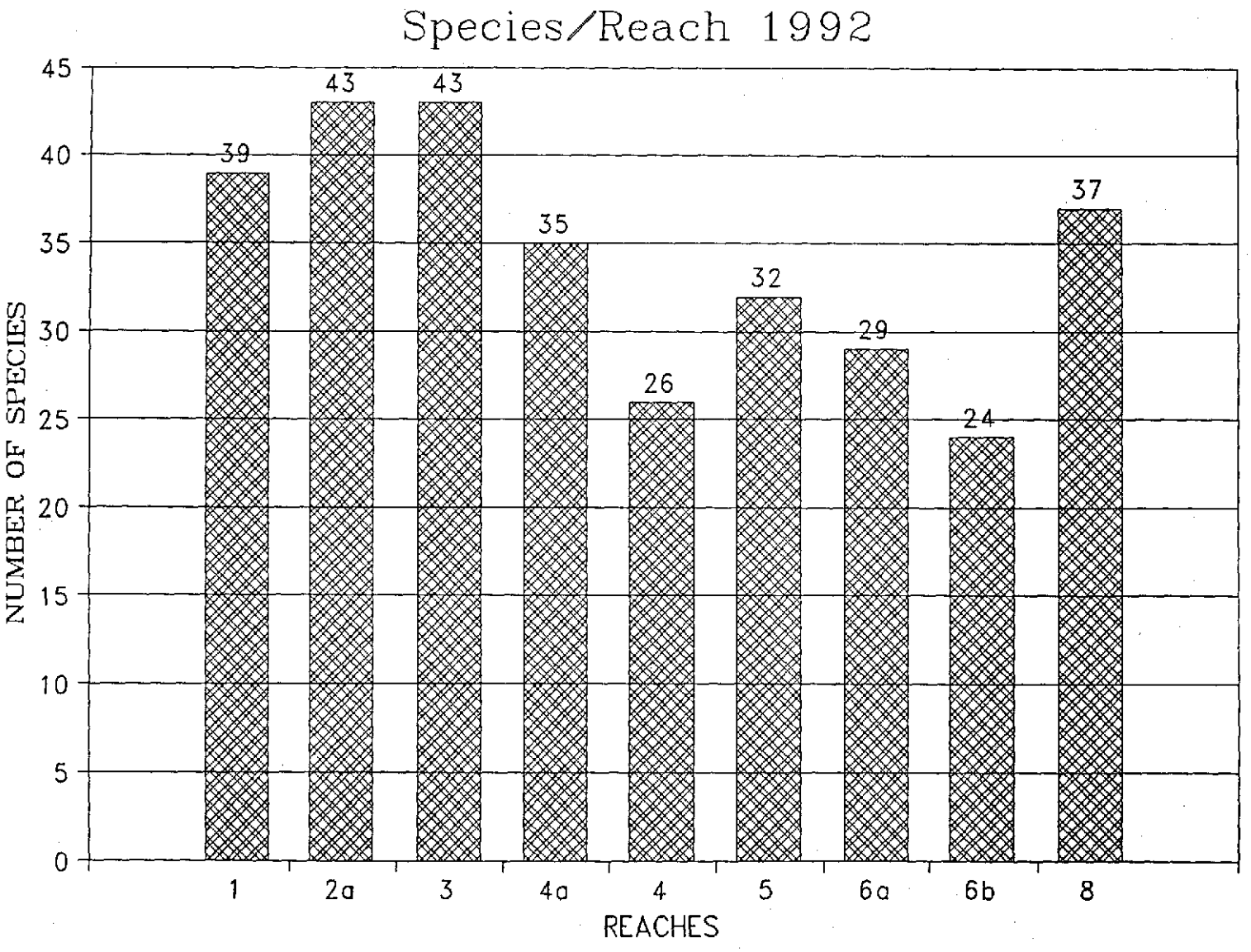
TABLE 3 (cont)

LOWER OUACHITA RIVER WORK GROUP (1992) — RELATIVE ABUNDANCE VALUES

FISH FAMILY AND SPECIES		REACH 1	REACH 2A	REACH 3	REACH 4A	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Cyprinodontidae	Killifishes									
Fundulus catenatus	Northern studfish	3.0	-	3.0	-	-	-	-	-	-
Fundulus notatus	Blackstripe topminnow	-	-	-	-	-	-	5.0	4.0	6.0
Fundulus olivaceus	Blackspotted topminnow	4.0	3.0	4.0	4.0	2.0	6.0	5.0	4.0	1.0
Poeciliidae	Livebearers									
Gambusia affinis	Mosquitofish	3.0	5.0	-	-	1.0	3.0	1.0	4.0	4.0
Aphredoderidae	Pirate perch									
Aphredoderus sayanus	Pirate perch	-	1.0	1.0	-	-	-	-	-	-
Atherinidae	Silversides									
Labidesthes sicculus	Brook silverside	3.0	6.0	3.0	4.0	-	5.0	8.0	5.0	6.0
Centrarchidae	Sunfishes									
Ambloplites ariommus	Shadow bass	3.0	4.0	1.0	-	-	-	-	-	-
Lepomis cyanellus	Green sunfish	5.0	2.0	-	-	-	-	1.0	-	-
Lepomis gulosus	Warmouth sunfish	4.0	4.0	-	-	-	-	1.0	-	-
Lepomis macrochirus	Bluegill	6.0	5.0	2.0	4.0	4.5	4.5	8.0	7.0	8.0
Lepomis megalotis	Longear sunfish	8.0	8.0	6.0	8.0	5.0	5.5	6.0	4.5	4.0
Lepomis microlophus	Redear sunfish	-	4.0	-	-	-	2.0	1.0	3.0	4.0
Lepomis punctatus	Spotted sunfish	4.0	3.0	-	2.0	-	-	2.0	-	-
Lepomis hybrid	Hybrid sunfish	1.0	-	-	-	-	-	-	-	1.0
Micropterus punctulatus	Spotted bass	5.0	4.0	5.0	7.0	3.5	4.5	4.5	5.3	3.0
Micropterus salmoides	Largemouth bass	6.0	5.0	1.0	4.0	5.0	3.5	6.0	6.0	6.0
Pomoxis annularis	White crappie	1.0	-	-	1.0	-	-	1.0	-	1.0
Pomoxis nigromaculatus	Black crappie	-	2.0	-	3.0	1.0	2.0	-	2.0	3.0
Percidae	Perches									
Etheostoma blennioides	Greenside darter	5.0	8.0	4.0	-	-	-	-	-	-
Etheostoma clara	Western sand darter	-	-	-	-	-	-	-	-	1.0
Etheostoma chlorosomum	Bluntnose darter	3.0	-	-	-	-	-	-	-	4.0
Etheostoma collettei	Creole darter	2.0	1.0	4.0	-	-	1.0	-	-	-
Etheostoma histrio	Harlequin darter	2.0	1.0	5.0	5.0	-	-	-	-	-
Etheostoma nigrum	Johnny darter	-	1.0	-	-	-	-	-	-	-
Etheostoma proeliare	Cypress darter	-	1.0	-	-	-	-	-	-	-
Etheostoma radiosum	Orangebelly darter	6.0	6.0	6.0	1.0	-	-	-	-	-
Etheostoma stigmaeum	Speckled darter	3.0	2.0	2.5	1.0	-	-	-		-
Etheostoma vivax	Scaly sand darter	-	-	-	-	1.0	2.0	-	4.0	4.0
Etheostoma zonale	Banded darter	8.0	8.0	4.0	8.0	-	-	-	-	-
Percina caprodes	Logperch	6.0	-	-	-	-	2.0	2.0	-	1.0
Percina copelandi	Channel darter	4.0	2.0	4.0	2.0	-	5.5	1.0	-	-
Percina maculata	Blackside darter	-	-	-	-	-	1.0	1.0	-	-
Percina sp.	Thompson darter	1.0	-	-	-	-	-	-	-	-
Percina ouachitae	Saddleback darter	-	-	1.0	-	-	-	-	-	-
Percina sciera	Dusky darter	-	-	-	1.0	-	-	-	-	-
Percina uranidae	Stargazing darter	4.0	-	1.0	-	-	-	-	-	-
Stizostedion vitreum	Walleye	2.0	3.0	-	-	-	-	-	-	-
Sciaenidae	Drums									
Aplodinotus grunniens	Freshwater drum	-	-	1.0	2.0	2.0	2.5	-	2.0	2.0
	TOTAL SPECIES	39	43	43	35	26	32	29	24	37
15 FAMILIES	TOTAL RELATIVE ABUNDANCE	134.0	145.5	130.5	126.0	79.5	97.0	94.5	91.5	136.0
38 GENERA										
82 SPECIES										

Note: RAV's based on an eight point scale.

FIGURE 4


Species/Reach 1992
NUMBER OF SPECIES
0
5
10
15
20
25
30
35
40
45
39
43
43
35
26
32
29
24
37
1
2a
3
4a
4
5
6a
6b
8
REACHES

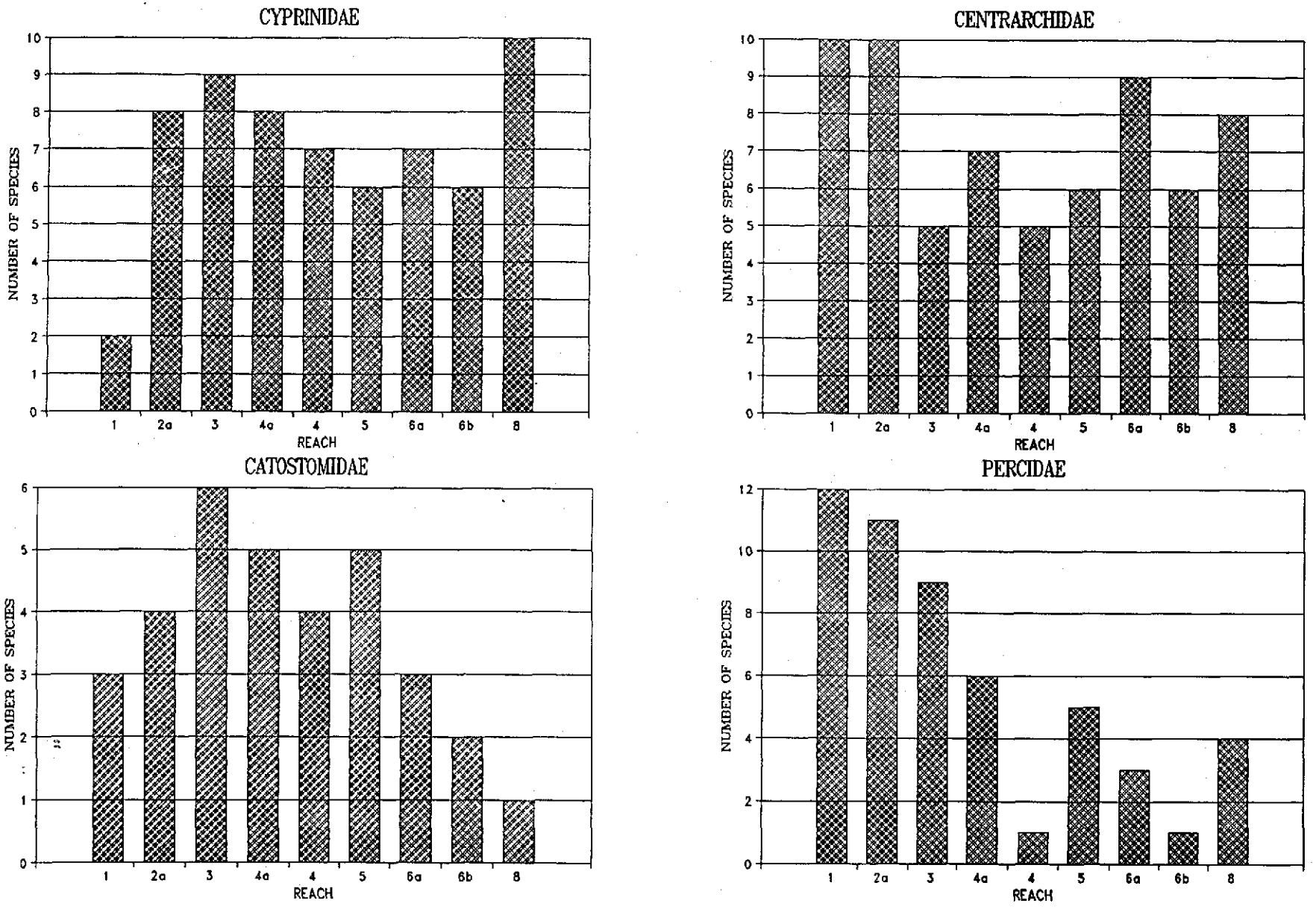


FIGURE 5 -- Number of species by station within selected fish families on the lower Ouachita River, Arkansas (LORWG 1992)

Ten species of catostomids were reported throughout the survey area, however only three species were reported from Reach #1. Reach #3 hosted six species of catostomids while only one species, Ictiobus cyprinellus, the bigmouth buffalo, was reported from Reach #8. Reaches #6A and #6B had only two and three species respectively. The quillback carpsucker, Carpiodes cyprinus, was collected at Reach #4. The number of catostomid species reported from each reach is illustrated in Figure 5, Catostomidae.

The Percidae family was the most diverse group collected during the survey with nineteen species being reported. Nine species were randomly common to three or more reaches. Percina copelandi, the channel darter, was collected from six of the reaches. Six darters were collected at only single locations, and three others appeared at only two locations. Percina sp., the Thompson darter was collected only at Reach #1, and the walleye, Stizostedion vitreum, was reported from only the upper two stations. Only one darter was reported at Reaches #4, and #6B, and Reaches #4, and #8 were the only reaches from the lower five reaches that had any Etheostoma species collected. The number of percids collected from each reach is illustrated in Figure 5, Percidae.

DISCUSSION

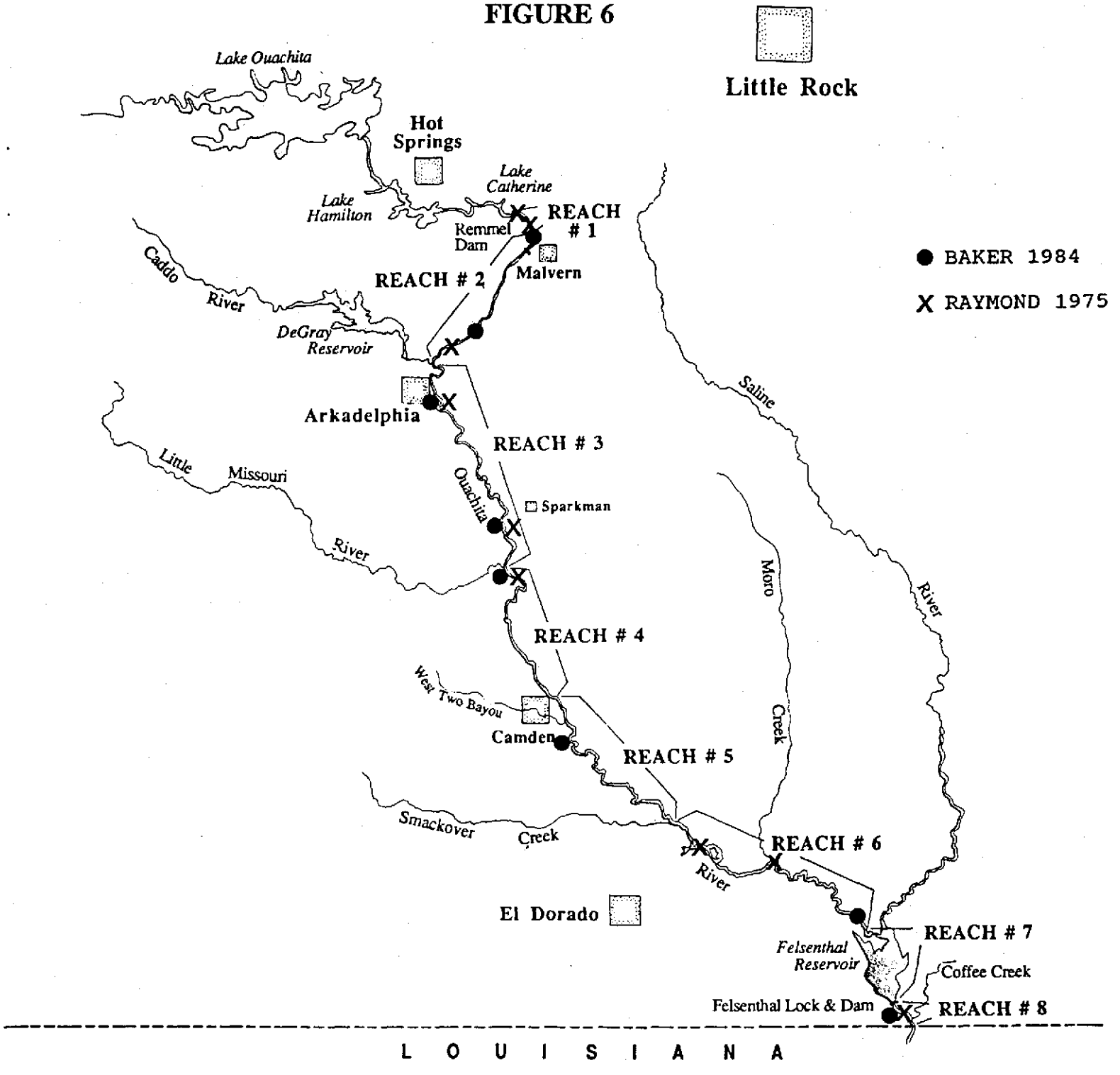
A comparison of the results of the LORWG surveys can be made with the earlier surveys of Baker (1984) and Raymond (1975). The collecting effort at each sampling station was significantly different among the surveys, so direct comparisons of number of

individuals is not appropriate. In addition, the number of species collected may also be influenced by collecting effort. Among the three surveys, sampling stations within a reach are often not at the same locations, and many of the stations of the earlier surveys were sampled more than once. Therefore, the eight reaches of the Ouachita River described above will be used in the comparison. Those sampling stations of Baker's and Raymond's surveys (Figure 6) which fell within the same river reach were combined to better compare the data. This allows the comparison of species trends within and between the surveys. The Felsenthal Reservoir, impounded in the fall of 1984, now occupies most of Reach #7, and was not sampled by the LORWG. The habitats reported by Baker and Raymond from their respective sampling locations in Reach #7 are similar to those reported by the LORWG in Reach #8. Because of this, and the close proximity of these sampling stations to Reach #8, Baker's station #1 and Raymond's station XXIII were compared to the LORWG's station in Reach #8. Table 4 lists the location of sample sites by Baker and Raymond by reaches.

Baker reported collecting sixty-nine species of fish representing thirty-nine genera and sixteen families on the lower Ouachita River (Table 5). He collected fishes from eight sites on the river proper in the summer of 1983 using the following gear types:

1) Boat shocker
2) Backpack shocker
3) 3-150' gill nets
4) 6-3' hoop nets
5) 1/8 in. mesh seines

FIGURE 6



Ouachita River Eight (8) Reaches

TABLE 4

LOCATIONS OF COLLECTION STATIONS

RAYMOND (1975)

REACH	SITE	DESCRIPTION
#1	I	1/2 mi. below Remmel Dam (Sec 36, T3S, R18W).
	III	1/8 mi. N. Hwy. 171 (SEC 16, T4S, R17W).
#2	IV&VI	1 mi. E. US Hwy 67 (SECs 16, 21, T6S, R19W).
#3	VIII	3/4 mi. E. US Hwy 67 (SEC 8, T7S, R19W).
	X	3 mi. W. Hwy 128 (SEC 31, T9S, R17W).
#4	XIII	At the mouth of the Little Missouri River (SEC 1, T11S, R18W).
#5	NONE	
#6	XX	Calion Boat Ramp (SECs 14, 23, T16S, R12W).
#7	XXI	Moro Bay State Park, Hwy 15. (SEC 28, T16S, R12W).
#8	XXIII	US Hwy 82 Bridge (SEC 14, T18S, R10W).

BAKER (1984)

#1	10	1-3 mi. downstream of I-30 Bridge
#2	9	2-3 mi. upstream of US Hwy 67 bridge
#3	7	4 mi. downstream of Arkadelphia
	6	0.5-2 mi. downstream of Dallas County Access
#4	5	below mouth of Little Missouri River
#5	4	5-7 river miles below Camden
#6	NONE	
#7	3	0.5-2 mi upstream of Saline River mouth
#8	1	2 mi. sample area below Saline River

TABLE 5

FISHES COLLECTED BY BAKER (1984)

NUMBER OF SPECIMENS COLLECTED

FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Polyodontidae	Paddlefishes								
Polyodon spathula	Paddlefish	-	1	1	-	1	-	-	-
Lepisosteidae	Gars								
Atractosteus spatula	Alligator gar	-	-	-	-	-	-	1	-
Lepisosteus oculatus	Spotted gar	1	3	3	1	-	-	12	-
Lepisosteus osseus	Longnose gar	1	3	5	5	1	-	2	4
Lepisosteus platostomus	Shortnose gar	-	-	-	-	-	-	3	-
Amiidae	Bowfins								
Amia calva	Bowfin	-	-	-	-	-	-	1	-
Anguillidae	Eels								
Anguilla rostrata	American eel	2	3	3	3	-	-	-	-
Clupeidae	Herrings								
Alosa chrysochloris	Skipjack herring	1	-	2	1	-	-	2	3
Dorosoma cepedianum	Gizzard shad	24	23	76	6	3	-	38	25
Dorosoma petenense	Threadfin shad	-	-	44	-	118	-	-	-
Hiodontidae	Mooneyes								
Hiodon alosoides	Goldeye	1	-	2	-	-	-	-	-
Hiodon tergisus	Mooneye	-	-	2	-	-	-	-	-
Esocidae	Pikes								
Esox americanus	Grass pickerel	-	-	-	-	1	-	-	-
Esox niger	Chain pickerel	1	-	-	-	-	-	1	-
Cyprinidae	Minnows								
Campostoma anomalum	Stoneroller	3	12	-	-	-	-	-	-
Cyprinella venustus	Blacktail shiner	-	1	24	50	135	-	148	157
Cyprinella whipplei	Steelcolor shiner	3	4	49	20	69	-	2	-
Cyprinus carpio	Carp	20	4	20	3	-	-	3	-
Erimystax x-punctatus	Gravel chub	3	1	2	2	-	-	-	1
Hybognathus nuchalis	Silvery minnow	-	-	-	-	58	-	9	19
Luxilus chrysocephalus	Striped shiner	-	-	-	-	4	-	-	-
Lythrurus fumeus	Ribbon shiner	-	-	-	-	-	-	1	63
Lythrurus umbratilis	Redfin shiner	-	-	-	1	-	-	-	-
Notemigonus chrysoleucas	Golden shiner	-	-	-	-	-	-	-	1
Notropis atherinoides	Emerald shiner	-	1	3	2	11	-	2	45
Notropis boops	Bigeye shiner	274	80	73	20	10	-	1	-
Notropis texanus	Weed shiner	-	-	-	-	-	-	1	57
Opsopoeodus emiliae	Pubnose minnow	-	-	-	-	-	-	-	3
Pimephales notatus	Bluntnose minnow	-	-	1	5	-	-	-	-
Pimephales vigilax	Bullhead minnow	-	-	-	-	-	-	-	5
Catostomidae	Suckers								
Carpiodes carpio	River carpsucker	1	-	-	1	-	-	-	-
Hypentelium nigricans	Northern hogsucker	3	1	2	-	-	-	-	-
Ictiobus bubalus	Smallmouth buffalo	1	5	2	1	1	-	1	-
Ictiobus cyprinellus	Bigmouth buffalo	-	1	1	-	-	-	-	-
Ictiobus niger	Black buffalo	-	-	1	-	-	-	-	-
Minytrema melanops	Spotted sucker	11	-	1	-	-	-	1	-
Moxostoma carinatum	River redhorse	2	10	9	-	-	-	-	-
Moxostoma duquesni	Black redhorse	-	1	1	-	-	-	-	-
Moxostoma erythrurum	Golden redhorse	19	11	28	5	-	-	-	-
Moxostoma poecilurum	Blacktail redhorse	-	-	5	3	-	-	-	-

TABLE 5 (cont)

FISHES COLLECTED BY BAKER (1984)		NUMBER OF SPECIMENS COLLECTED							
FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Ictaluridae	Catfishes								
Ameiurus natalis	Yellow bullhead	-	-	-	-	1	-	-	-
Ictalurus punctatus	Channel catfish	-	7	7	16	2	-	-	-
Polydictus olivaris	Flathead catfish	1	-	-	-	3	-	1	-
Cyprinodontidae	Killifishes								
Fundulus catenatus	Northern studfish	-	-	2	-	-	-	-	-
Fundulus olivaceus	Blackspotted topminnow	-	1	6	6	1	-	3	3
Poeciliidae	Livebearers								
Gambusia affinis	Mosquitofish	1	-	-	-	9	-	-	-
Atherinidae	Silversides								
Labidesthes sicculus	Brook silverside	11	4	7	14	11	-	53	129
Menidia beryllina	Mississippi silverside	-	-	-	-	2	-	-	-
Centrarchidae	Sunfishes								
Ambloplites ariommus	Shadow bass	-	-	3	-	-	-	-	-
Lepomis gulosus	Warmouth sunfish	-	-	-	-	-	-	1	-
Lepomis macrochirus	Bluegill	2	3	7	3	1	-	22	14
Lepomis megalotis	Longear sunfish	25	12	50	4	1	-	6	7
Lepomis microlophus	Redear sunfish	1	-	-	-	-	-	4	1
Lepomis punctatus	Spotted sunfish	5	-	1	-	-	-	-	-
Micropterus punctulatus	Spotted bass	-	3	11	5	13	-	1	2
Micropterus salmoides	Largemouth bass	2	5	4	3	1	-	9	1
Pomoxis annularis	White crappie	1	-	1	-	1	-	5	6
Pomoxis nigromaculatus	Black crappie	-	-	1	2	1	-	5	6
Percidae	Perches								
Etheostoma chlorosomum	Bluntnose darter	-	-	-	1	-	-	-	-
Etheostoma collettei	Creole darter	1	-	-	-	-	-	-	-
Etheostoma histrio	Harlequin darter	-	-	1	-	-	-	-	-
Etheostoma radiosum	Orangebelly darter	1	5	-	-	-	-	-	-
Etheostoma stigmaeum	Speckled darter	-	-	1	1	-	-	-	-
Etheostoma vivax	Scaly sand darter	-	-	-	3	2	-	3	6
Etheostoma zonale	Banded darter	-	-	4	-	-	-	-	-
Percina caprodes	Logperch	-	-	-	-	-	-	1	-
Percina copelandi	Channel darter	-	3	2	2	-	-	-	-
Stizostedion vitreum	Walleye	-	-	1	-	-	-	-	-
Sciaenidae	Drums								
Aplodinotus grunniens	Freshwater drum	1	2	6	1	-	-	3	2
	TOTAL SPECIES	30	28	30	30	26	-	33	22

16 FAMILIES
39 GENERA
69 SPECIES

Note: Numerals represent the total number of specimens collected.

Approximately one hour of boat shocking was performed at each location and up to six hauls were made with the seine(s) at each location (Baker 1984).

Raymond reported collecting one hundred eleven species of fish representing forty-one genera and twenty families from the lower Ouachita River and its tributaries (Table 6). He made sixty-two collections from twenty-five locations from the summer of 1972 to the summer of 1975 using the following gear types:

1) Electrofishing unit used once
2) 1-100', 2" mesh gill net
3) hoop net-fished two nights
4) 3/16" and 1/4" mesh seines

Only those stations located within the Ouachita River proper are used for comparison in this report. He reports one hundred seven species representing forty-five genera and seventeen families from forty-two collections at ten collecting sites on the river.

A comparison of species collected by Raymond, Baker, and the two LORWG surveys is shown in Table 7. Also, Figure 7 compares the number of species by reach collected in the four surveys.

Reach #1 of the lower Ouachita River (Remmel Dam to Rockport) is effected by the releases from Lake Catherine, impounded by Remmel Dam. This is primarily a "peaking" hydropower structure operated by the Arkansas Power and Light Company (AP&L). However, the greatest influence on this area is from the hydropower dischargers from two other upstream reservoirs. These discharges cause unnatural flow regimes and atypical temperature and dissolved oxygen levels in the Ouachita River for several miles. The sudden releases of high volumes of water also cause scouring and

TABLE 6

FISHES COLLECTED BY RAYMOND (1975)

NUMBER OF SPECIMENS COLLECTED

FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Petromyzontidae	Lampreys								
Ichthyomyzon castaneus	Chestnut lamprey	1	-	5	-	-	-	-	-
Lepisosteidae	Gars								
Lepisosteus oculatus	Spotted gar	-	-	-	-	-	-	2	-
Lepisosteus osseus	Longnose gar	-	1	3	3	-	1	-	-
Lepisosteus platostomus	Shortnose gar	-	-	1	-	-	-	-	-
Anguillidae	Eels								
Anguilla rostrata	American eel	-	-	-	2	-	-	-	-
Clupeidae	Herrings								
Alosa chrysochloris	Skipjack herring	-	-	1	1	-	-	-	-
Dorosoma cepedianum	Gizzard shad	2	2	8	6	-	14	89	-
Dorosoma petenense	Threadfin shad	2	13	6	51	-	75	294	-
Hiodontidae	Mooneyes								
Hiodon tergisus	Mooneye	-	-	1	1	-	-	-	-
Esocidae	Pikes								
Esox americanus	Grass pickerel	-	-	-	1	-	32	277	8
Esox niger	Chain pickerel	-	-	3	-	-	59	243	25
Cyprinidae	Minnows								
Campostoma anomalum	Stoneroller	17	115	309	296	-	2	9	-
Cyprinella venustus	Blacktail shiner	-	2	86	422	-	438	818	184
Cyprinella whipplei	Steelcolor shiner	32	31	301	1593	-	57	29	8
Cyprinus carpio	Carp	1	-	3	1	-	-	2	-
Erimystax x-punctatus	Gravel chub	-	235	15	1065	-	-	-	-
Hybognathus hayi	Cypress minnow	-	-	-	-	-	142	2458	8
Hybognathus nuchalis	Silvery minnow	-	2	6	31	-	157	562	1
Hybopsis amnis	Pallid shiner	-	-	-	28	-	98	165	12
Lythrurus fumeus	Ribbon shiner	1	-	186	-	-	336	241	4
Lythrurus umbratilis	Redfin shiner	176	2	20	6	-	-	71	-
Luxilus chrysocephalus	Striped shiner	13	2	-	-	-	-	-	-
Macrhybopsis storeriana	Silver chub	-	-	7	-	-	-	-	-
Notemigonus chrysoleucas	Golden shiner	1	-	1	2	-	28	795	11
Notropis atherinoides	Emerald shiner	-	713	811	423	-	98	336	88
Notropis boops	Bigeye shiner	45	225	1447	4585	-	-	6	11
Notropis buchanani	Ghost shiner	-	-	-	-	-	-	13	-
Notropis chalybaeus	Ironcolored shiner	-	-	-	-	-	-	2	-
Notropis maculatus	Taillight shiner	-	-	-	-	-	205	452	132
Notropis perpallidus	Peppered shiner	-	-	-	1	-	-	-	-
Notropis rubellus	Rosyface shiner	-	-	-	19	-	-	-	-
Notropis texanus	Weed shiner	-	-	-	-	-	50	479	89
Notropis volucellus	Mimic shiner	-	-	2	35	-	-	264	3
Opsopoeodus emiliae	Pubnose minnow	-	-	-	16	-	54	402	13
Pimephales notatus	Bluntnose minnow	-	1	28	437	-	3	1	-
Pimephales vigilax	Bullhead minnow	4	-	11	154	-	108	377	490

TABLE 6 (cont)

FISHES COLLECTED BY RAYMOND (1975)		NUMBER OF SPECIMENS COLLECTED							
FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Catostomidae	Suckers								
Erimyzon oblongus	Creek chubsucker	-	-	-	-	-	-	5	-
Hypentelium nigricans	Northern hogsucker	-	13	37	25	-	-	-	-
Ictiobus cyprinellus	Bigmouth buffalo	-	-	-	-	-	1	-	-
Ictiobus niger	Black buffalo	-	-	3	-	-	-	-	-
Minytrema melanops	Spotted sucker	-	-	-	3	-	-	19	23
Moxostoma carinatum	River redhorse	1	-	1	7	-	-	-	-
Moxostoma duquesni	Black redhorse	-	-	2	-	-	-	-	-
Moxostoma erythrurum	Golden redhorse	-	-	8	115	-	5	4	-
Moxostoma poecilurum	Blacktail redhorse	-	-	5	-	-	1	-	-
Ictaluridae	Catfishes								
Ameiurus melas	Black bullhead	-	-	-	-	-	2	4	40
Ameiurus natalis	Yellow bullhead	-	-	-	-	-	-	16	-
Ictalurus furcatus	Blue catfish	-	-	-	-	-	-	-	4
Ictalurus punctatus	Channel catfish	-	-	2	31	-	-	45	19
Noturus eleutherus	Mountain madtom	-	-	-	16	-	-	-	-
Noturus gyrinus	Tadpole madtom	-	-	-	-	-	-	2	-
Noturus lachneri	Ouachita madtom	1	-	-	-	-	-	-	-
Noturus miurus	Brindled madtom	-	-	5	106	-	-	-	-
Noturus nocturnus	Freckled madtom	-	-	1	1	-	-	-	-
Polydictus olivaris	Flathead catfish	-	-	-	1	-	2	-	-
Cyprinodontidae	Killifishes								
Fundulus catenatus	Northern studfish	-	1	78	2	-	-	-	-
Fundulus chrysotus	Golden topminnow	-	-	-	1	-	11	5	-
Fundulus notatus	Blackstripe topminnow	-	-	-	-	-	30	113	3
Fundulus notti	Starhead topminnow	-	-	-	2	-	24	2	-
Fundulus olivaceus	Blackspotted topminnow	32	6	6	16	-	101	227	20
Poeciliidae	Livebearers								
Gambusia affinis	Mosquitofish	-	18	113	111	-	98	1688	423
Aphredoderidae	Pirate perch								
Aphredoderus sayanus	Pirate perch	-	-	-	8	-	-	26	45
Atherinidae	Silversides								
Labidesthes sicculus	Brook silverside	125	24	36	351	-	905	752	153
Percichthyidae	Temperate bass								
Morone chrysops	White bass	-	-	1	2	-	1	14	6
Morone mississippiensis	Yellow bass	-	-	-	-	-	-	1	-
Morone saxatilis	Striped bass	-	-	1	-	-	-	-	-
Centrarchidae	Sunfishes								
*Ambloplites rupestris	Rock bass	-	-	2	5	-	-	-	-
Centrarchus macropterus	Flier	-	-	1	1	-	1	60	3
Elassoma zonatum	Banded pigmy sunfish	-	5	-	1	-	8	8	1
Lepomis cyanellus	Green sunfish	3	-	21	-	-	12	6	-
Lepomis gulosus	Warmouth sunfish	-	-	1	3	-	26	132	26
Lepomis humilis	Orangespotted sunfish	-	-	5	-	-	15	8	10
Lepomis macrochirus	Bluegill	21	-	16	28	-	246	796	81
Lepomis marginatus	Dollar sunfish	-	-	-	-	-	46	129	1
Lepomis megalotis	Longear sunfish	66	46	178	534	-	34	28	62
Lepomis microlophus	Redear sunfish	-	-	3	1	-	43	19	15
Lepomis punctatus	Spotted sunfish	-	-	-	-	-	1	3	10
Lepomis symmetricus	Bantam sunfish	-	-	-	-	-	31	5	4

TABLE 6 (cont)

FISHES COLLECTED BY RAYMOND (1975)		NUMBER OF SPECIMENS COLLECTED							
FISH FAMILY AND SPECIES		REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6A	REACH 6B	REACH 8
Centrarchidae (cont)									
Micropterus dolomieui	Smallmouth bass	-	1	-	4	-	-	-	-
Micropterus punctulatus	Spotted bass	-	6	42	46	-	48	25	4
Micropterus salmoides	Largemouth bass	4	1	4	8	-	14	62	53
Pomoxis annularis	White crappie	-	-	-	-	-	3	5	-
Pomoxis nigromaculatus	Black crappie	-	-	-	2	-	2	136	6
Percidae	Perches								
Crystallaria asprella	Crystal darter	-	1	1	13	-	-	-	-
Etheostoma asprigene	Mud darter	-	2	1	2	-	4	160	-
Etheostoma blennioides	Greenside darter	9	13	34	9	-	-	-	-
Etheostoma chlorosomum	Bluntnost darter	-	-	2	9	-	50	171	435
Etheostoma collettei	Creole darter	20	-	7	10	-	-	3	2
Etheostoma gracile	Slough darter	-	-	-	-	-	8	7	-
Etheostoma histrio	Harlequin darter	-	21	4	11	-	-	-	-
Etheostoma nigrum	Johnny darter	-	1	-	-	-	-	-	-
Etheostoma proeliare	Cypress darter	-	-	-	-	-	8	37	1
Etheostoma radiosum	Orangebelly darter	67	13	24	16	-	-	-	-
Etheostoma stigmaeum	Speckled darter	-	1	25	95	-	-	-	-
Etheostoma vivax	Scaly sand darter	-	-	1	16	-	-	10	-
Etheostoma whipplei	Redfin darter	-	1	-	34	-	-	-	-
Etheostoma zonale	Banded darter	-	26	62	158	-	-	-	-
Percina caprodes	Logperch	-	2	4	21	-	83	40	383
Percina copelandi	Channel darter	-	25	148	575	-	2	8	11
Percina maculata	Blackside darter	-	-	-	2	-	3	7	1
Percina ouachitae	Saddleback darter	-	-	-	3	-	1	15	-
Percina sciera	Dusky darter	-	-	-	8	-	-	2	-
Percina shumardi	River darter	-	-	-	-	-	2	8	4
Percina uranidae	Stargazing darter	-	-	22	5	-	-	-	-
Stizostedion vitreum	Walleye	-	-	2	9	-	-	3	-
Sciaenidae	Drums								
Aplodinotus grunniens	Freshwater drum	-	-	-	4	-	1	6	-
	TOTAL SPECIES	24	34	62	71	-	57	72	48

16 FAMILIES
45 GENERA
107 SPECIES

Note: Numerals represent the total number of specimens collected.
* See footnote No. 3.

TABLE 7

LOWER OUACHITA RIVER SPECIES COMPARISON LIST

FISH FAMILY AND SPECIES		RAYMOND 1975	BAKER 1984	LORWG 1991	LORWG 1992
Petromyzontidae	Lampreys				
Ichthyomyzon castaneus	Chestnut lamprey	X			
Polyodontidae	Paddlefishes				
Polyodon spathula	Paddlefish		X		
Lepisosteidae	Gars				
Atractosteus spatula	Alligator gar	X			
Lepisosteus oculatus	Spotted gar	X	X	X	X
Lepisosteus osseus	Longnose gar	X	X	X	X
Lepisosteus platostomus	Shortnose gar		X		X
Amiidae	Bowfins				
Amia calva	Bowfin		X	X	
Anguillidae	Eels				
Anguilla rostrata	American eel	X	X	X	X
Clupeidae	Herrings				
Alosa chrysochloris	Skipjack herring	X	X		X
Dorosoma cepedianum	Gizzard shad	X	X	X	X
Dorosoma petenense	Threadfin shad	X	X	X	X
Hiodontidae	Mooneyes				
Hiodon alosoides	Goldeye		X		
Hiodon tergisus	Mooneye	X	X		
Esocidae	Pikes				
Esox americanus	Grass pickerel	X	X	X	
Esox niger	Chain pickerel	X	X	X	X
Cyprinidae	Minnows				
Campostoma anomalum	Stoneroller	X	X	X	X
Cyprinella venustus	Blacktail shiner	X	X	X	X
Cyprinella whipplei	Steelcolor shiner	X	X	X	X
Cyprinus carpio	Carp	X	X	X	X
Erimystax x-punctatus	Gravel chub	X	X	X	X
Hybognathus hayi	Cypress minnow	X		X	
Hybognathus nuchalis	Silvery minnow	X	X	X	X
Hybopsis amnis	Pallid shiner				X
Luxilus chrysocephalus	Striped shiner	X	X		
Lythrurus fumeus	Ribbon shiner	X	X	X	X
Lythrurus umbratilis	Redfin shiner	X	X	X	X
Macrhybopsis storeriana	Silver chub	X			
Notemigonus crysoleucas	Golden shiner	X	X	X	X
Notropis atherinoides	Emerald shiner	X	X	X	X
Notropis boops	Bigeye shiner	X	X	X	X
Notropis buchanani	Ghost shiner	X	X	X	X
Notropis chalybaeus	Ironcolored shiner	X			
Notropis maculatus	Taillight shiner	X			
Notropis perpallidus	Peppered shiner	X			
Notropis rubellus	Rosyface shiner	X			
Notropis texanus	Weed shiner	X	X	X	X
Notropis volucellus	Mimic shiner	X		X	X
Opsopoeodus emiliae	Pugnose minnow	X	X	X	X
Pimephales notatus	Bluntnose minnow	X	X	X	X
Pimephales vigilax	Bullhead minnow	X	X	X	X
Cyprinodontidae	Killifishes				
Fundulus catenatus	Northern studfish	X	X	X	X
Fundulus chrysotus	Golden topminnow	X			
Fundulus notatus	Blackstripe topminnow	X		X	X
Fundulus notti	Starhead topminnow	X			
Fundulus olivaceus	Blackspotted topminnow	X	X	X	X
Poeciliidae	Livebearers				
Gambusia affinis	Mosquitofish	X	X	X	X
Aphredoderidae	Pirate perch				
Aphredoderus sayanus	Pirate perch	X	X	X	X
Atherinidae	Silversides				
Labidesthes sicculus	Brook silverside	X	X	X	X
Menidia beryllina	Mississippi silverside		X		
Percichthyidae	Temperate bass				
Morone chrysops	White bass	X		X	
Morone mississippiensis	Yellow bass	X			
Morone saxatilis	Striped bass	X			
Centrarchidae	Sunfishes				
Ambloplites ariommus	Shadow bass	X	X	X	X
Centrarchus macropterus	Flier	X			
Elassoma zonatum	Banded pigmy sunfish	X		X	
Lepomis cyanellus	Green sunfish	X		X	X
Lepomis gulosus	Warmouth sunfish	X	X	X	X
Lepomis humilis	Orangespotted sunfish	X		X	
Lepomis macrochirus	Bluegill	X	X	X	X
Lepomis marginatus	Dollar sunfish	X			
Lepomis megalotis	Longear sunfish	X	X	X	X
Lepomis microlophus	Redear sunfish	X	X	X	X
Lepomis punctatus	Spotted sunfish	X	X	X	X
Lepomis symmetricus	Bantam sunfish	X			
Micropterus dolomieui	Smallmouth bass	X		X	X
Micropterus punctulatus	Spotted bass	X	X	X	X
Micropterus salmoides	Largemouth bass	X	X	X	X
Pomoxis annularis	White crappie	X	X	X	X
Pomoxis nigromaculatus	Black crappie	X	X	X	X

TABLE 7

LOWER OUACHITA RIVER SPECIES COMPARISON LIST

FISH FAMILY AND SPECIES		RAYMOND 1975	BAKER 1984	LORWG 1991	LORWG 1992
Catostomidae	Suckers				
Carpiodes carpio	River carpsucker		X		X
Carpiodes cyprinus	Quillback carpsucker				X
Erimyzon oblongus	Creek chubsucker	X			
Hypentelium nigricans	Northern hogsucker	X	X	X	X
Ictiobus bubalus	Smallmouth buffalo		X	X	X
Ictiobus cyprinellus	Bigmouth buffalo	X	X	X	X
Ictiobus niger	Black buffalo	X	X		X
Minytrema melanops	Spotted sucker	X	X	X	X
Moxostoma carinatum	River redhorse	X	X	X	X
Moxostoma duquesnei	Black redhorse	X	X		
Moxostoma erythrurum	Golden redhorse	X	X	X	X
Moxostoma poecilurum	Blacktail redhorse	X	X	X	X
Ictaluridae	Freshwater catfishes				
Ameiurus melas	Black bullhead	X			
Ameiurus natalis	Yellow bullhead	X	X	X	X
Ictalurus furcatus	Blue catfish	X		X	X
Ictalurus punctatus	Channel catfish	X		X	X
Noturus eleutherus	Mountain madtom	X		X	X
Noturus gyrinus	Tadpole madtom	X			X
Noturus lachneri	Ouachita madtom	X			
Noturus miurus	Brindled madtom	X		X	X
Noturus nocturnus	Freckled madtom	X		X	X
Polydictus olivaris	Flathead catfish	X	X	X	X
Percidae	Perches				
Crystallaria asprella	Crystal darter	X		X	
Etheostoma asprigene	Mud darter	X			
Etheostoma blennioides	Greenside darter	X		X	X
Etheostoma clara	Western sand darter				X
Etheostoma chlorosomum	Bluntnose darter	X	X		X
Etheostoma collettei	Creole darter	X	X	X	X
Etheostoma fusiforme	Swamp darter	X			
Etheostoma gracile	Slough darter	X			
Etheostoma histrio	Harlequin darter	X	X	X	X
Etheostoma nigrum	Johnny darter	X			X
Etheostoma proeliare	Cypress darter	X			X
Etheostoma radiosum	Orangebelly darter	X	X	X	X
Etheostoma spectabile	Orangethroat darter			X	
Etheostoma stigmaeum	Speckled darter	X	X	X	X
Etheostoma vivax	Scaly sand darter	X	X	X	X
Etheostoma whipplei	Redfin darter	X			
Etheostoma zonale	Banded darter	X	X	X	X
Percina caprodes	Logperch	X	X	X	X
Percina copelandi	Channel darter	X	X	X	X
Percina maculata	Blackside darter	X		X	X
Percina sp.	Thompson darter			X	X
Percina ouachitae	Saddleback darter	X			X
Percina sciera	Dusky darter	X		X	X
Percina shumardi	River darter	X			
Percina uranidae	Stargazing darter	X		X	X
Stizostedion vitreum	Walleye	X	X	X	X
Sciaenidae	Drums				
Aplodinotus grunniens	Freshwater drum	X	X	X	X
	TOTAL SPECIES	107	68	79	81

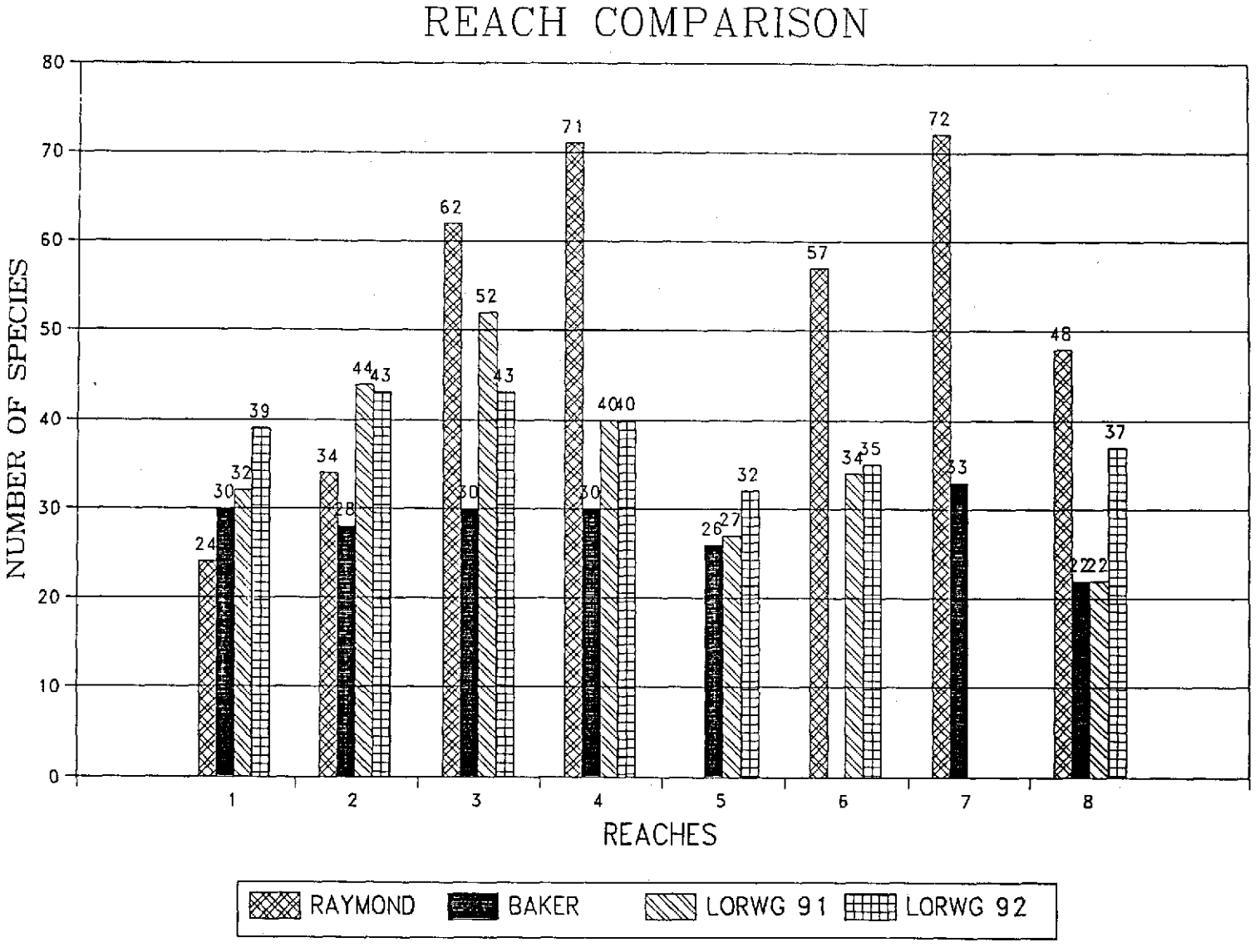


FIGURE 7 -- Total species collected by reach between the four surveys.

displacement of tailwater substrate, thus decreasing macroinvertebrate habitat, which is important to the trophic relationships in a riverine environment. Temperature profiles of four to seven degrees celsius less than normal have been observed as far down river as Arkadelphia (US COE 1985). The hypolimnetic discharge from Lake Ouachita, an impoundment approximately 18 river miles upstream of Lake Catherine, greatly influence the characteristics of the Lake Catherine releases (US COE 1985). These unnatural characteristics are reflected in the fish community of Reach #1.

The cyprinid community in Reach #1 was represented by only one species in the LORWG (1991) survey, and two species in 1992. Surveys by Baker and Raymond collected five and nine species of cyprinids, respectively, within this reach. By comparing the cyprinid community of Reaches #1, #2, and #3, between each of the surveys, a definite trend of increasing species in a downstream direction can be seen (Figure 8). However, in the river's upper reaches we would expect to find a much greater diversity and abundance of cyprinids. It is also noted that a possible trend of decreasing cyprinids over time may exist at the upstream locations.

Normally, a fish community within a riverine environment will increase in both diversity and abundance in a downstream direction. The lower Ouachita River cyprinids do not exhibit this trend. The cyprinid diversity peaks in Reaches #3, and #4, in the three surveys (except Reach #7 in Raymond), then either levels off or declines in Reaches #5 thru #8 (Figures 3, 5, 9, and 10, Cyprinidae).

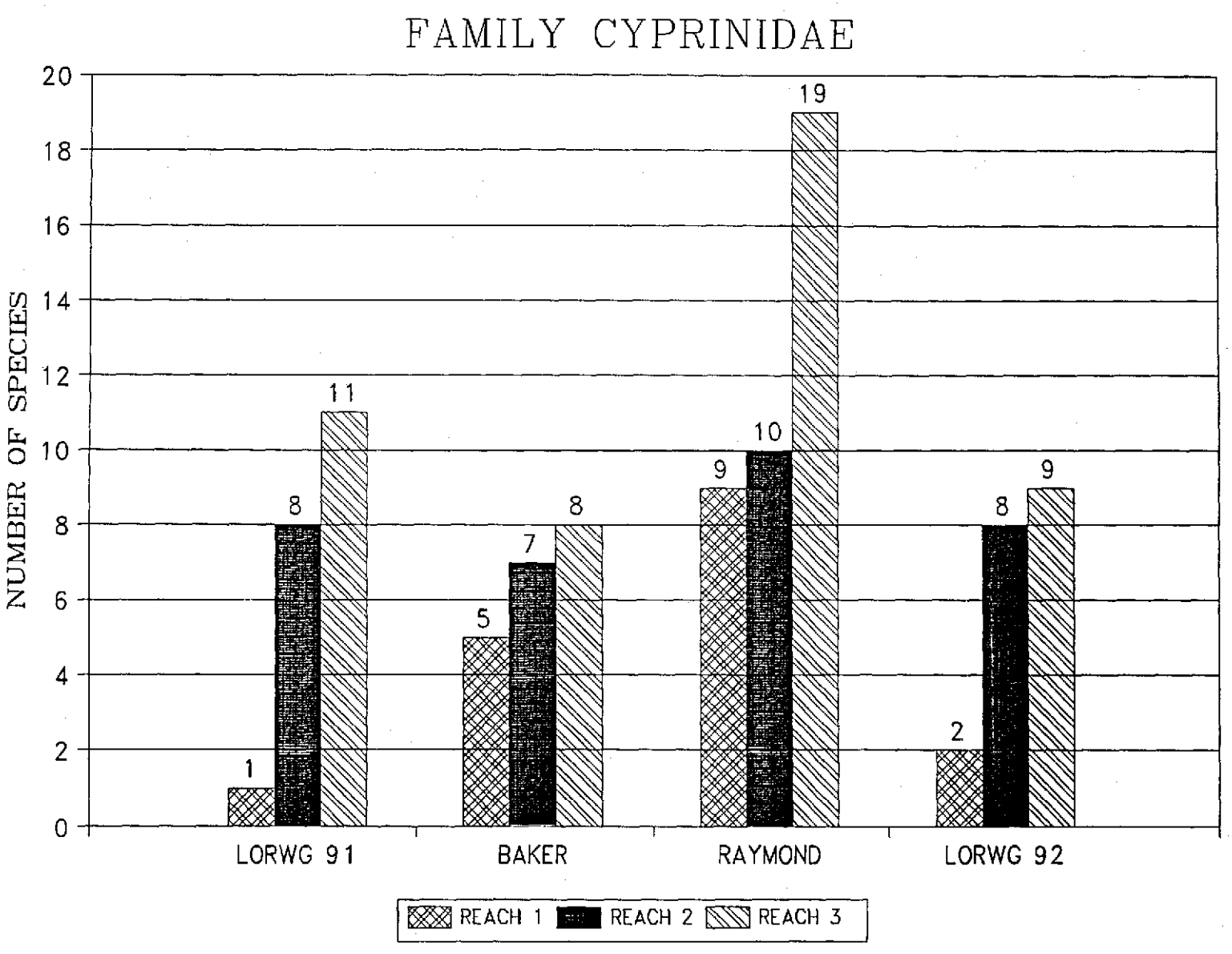


FIGURE 8 -- The number of cyprinid species collected from the lower Ouachita River from reaches #1, #2, and #3, between the four sampling events.

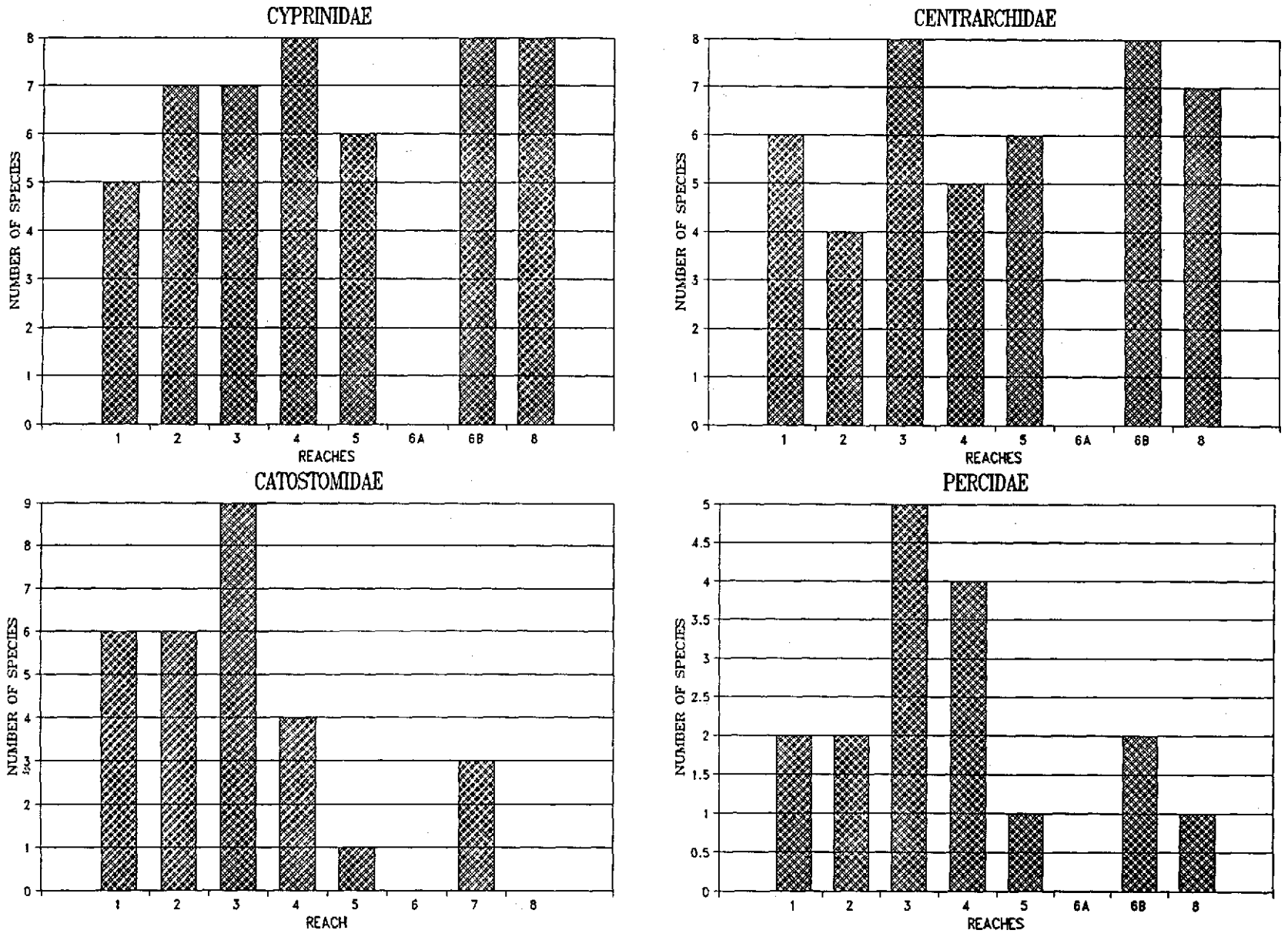


FIGURE 9 -- Number of species by station within selected fish families on the lower Ouachita River, Arkansas (Baker 1984).

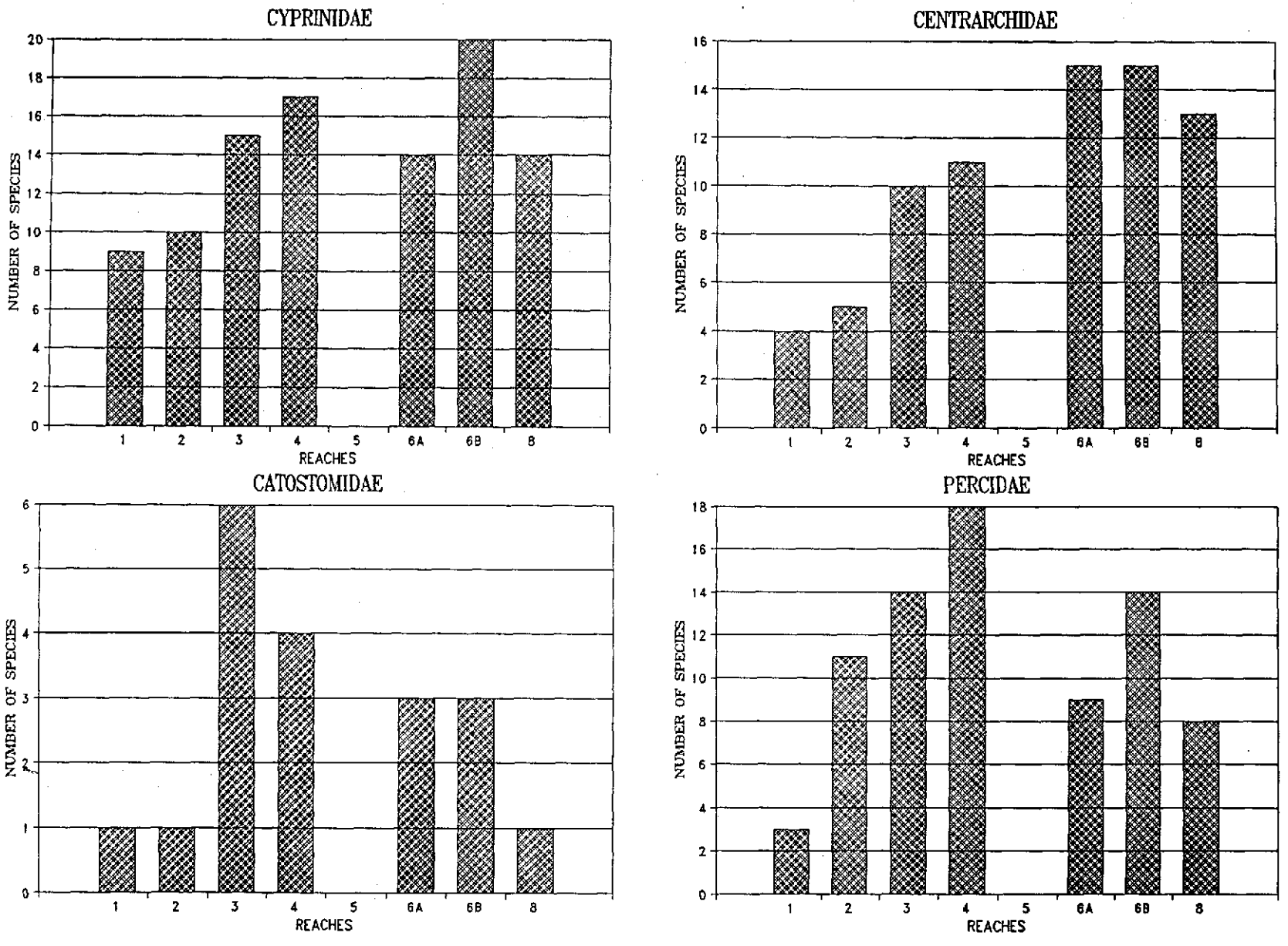


FIGURE 10 -- Number of species by station within selected fish families on the lower Ouachita River, Arkansas (Raymond 1975).

This is most noticeable in Reaches #5 and #8, which demonstrate significant decreases in total number of species and specimens collected, except in the LORWG 1992 sampling. This could be related to water quality, limited habitat, or the ineffectual sampling of all habitat types. However, since this trend has appeared in three separate surveys, the later is unlikely. Some discrepancies could be related to differences in the sampling efforts among the surveys within each reach.

The Catostomidae family distribution throughout the river is quite similar to that of the Cyprinidae family. There is a increase in both the total number of species and specimens sampled from Reaches #1 thru #3 in the Raymond and Baker surveys and from Reaches #1 thru #4 in both LORWG surveys. A drastic decrease begins in the middle river reaches and continues throughout the lower portion (Figures 3, 5, 9, and 10, Catostomidae). No more than three species, all of which were in low abundances, were reported from any one of the lower three reaches among the surveys. This is not what one would expect to find in a healthy riverine environment.

Catostomids are basically bottom dwelling fishes which use their sucker-like mouths to suck food materials from the bottom sediments. Most species feed upon burrowing insects and small mollusks (Pflieger, 1975). Therefore, any impairment of the benthic community by the releases from Lake Catherine would limit the catostomid population in the upper reaches. Similarly, deposition of heavy silt or toxic silt loads in the river's lower

reaches would embed and suffocate or be toxic to benthic organisms and would impair the development of the catostomid population. Also, channel dredging operations contribute to the sediment load in the river and at the same time greatly disturb the benthic community.

The LORWG (1992) reported collecting two sub-adult specimens of the quillback carpsucker, Carpiodes cyprinus, In Reach #4. Robison, 1991, reports that this species has only been reported from the river on one previous occasion. This most recent record now helps to varify the validity of the first record, and also helps to confirm the existence of a quillback carpsucker population in the river.

The family Centrarchidae was represented by 14 species in the LORWG 1991 survey and a total of 17 species between the three surveys (Table 7). Baker reported only a minimal change in the centrarchid population throughout the survey area. However, a downstream decrease in species of centrarchids occurred during both LORWG surveys. There were 10 species reported in Reach #1, with an decreasing downstream trend to Reach #8 (Figure 3, 5, 9, and 10, Centrarchidae).

The smallmouth bass and the shadow bass were reported in only the upper three reaches during this survey. These two species require clear, cool water, usually with some kind of flow most of the year, and are intolerant of severe habitat changes and high turbidity (Robison 1991). All of these required conditions are found in the tail waters of Lake Catherine, clear, cool, low

turbidity water with some sort of continuous flow. Severe habitat changes do occur with generation and is probably why these two species were limited in abundance within these reaches.

Raymond reports a definite downstream increase in both species and total abundances of the centrarchids within the survey area (Figure 10, Centrarchidae). The upper four reaches contained 4 to 11 species, while the lower three reaches were represented by 13 to 15 species. The shadow bass[3] and the smallmouth bass were the only two common centrarchids absent from the lower three reaches. The warmer water temperatures of the lower reaches probably limits the downstream migration of these two species.

All three surveys demonstrated similar trends in the Percidae family. Twenty-five species of percids were reported between the three surveys. Raymond reported many species that were not reported by either Baker nor the LORWG (Table 7). Several of these are species which primarily inhabit the river's backwaters where Baker and the LORWG did not sample. Raymond and Baker both reported an increase in the number of species and total abundances from Reach #1 to #4, and then a sharp decline throughout the lower reaches (Figures 9, and 10, Percidae). The LORWG reported equal numbers of species and abundances from the first three reaches with a sharp decline through the last five reaches (Figure 3, Percidae). Most percids prefer the swifter-flowing, less turbid streams

[3]Raymond (1975) identified specimens of rock bass as Ambloplites ruprestris, which was the correct identification at that time. Since then, the rock bass genus has been split into several species with those occurring in the Ouachita River as being Ambloplites ariommus, the shadow bass (Cashner, 1977).

characteristic of the headwaters of major rivers (Pflieger, 1975). Therefore, we would expect to see a decline in percid species in a downstream direction of major rivers. However, the decline shown in the LORWG data appears excessive.

There are some percid species which prefer the larger river environments, e.g. Crystallaria asprella, the crystal darter, Percina shumardi, the river darter, and P. copelandi, the channel darter. These species, however, are unable to adapt to large amounts of turbidity (Pflieger 1975). All of these species are endemic to the Ouachita River watershed in Arkansas and would be expected to be located in the river's lower reaches in at least moderate abundances. During the surveys of Baker and LORWG (1991), the crystal darter, scaly sand darter, and logperch were the only species reported below Reach #5 and were in low abundances. This sharp decline in abundance and diversity could be the result of altered water quality, excessive siltation, the destruction of habitat, or inefficient sampling. Much more work must be completed before a definite conclusion can be made on this point.

An important sportfish of the Percid family, the walleye, is usually found in fairly deep pools, prefers cooler water temperatures and is not very tolerant of turbidity (Robison 1991). Walleye were only taken in the upper three reaches during the LORWG surveys and had decreasing values of abundances in a downstream direction. This is understandable since both the water temperature and the turbidity increase in a downstream direction.

SUMMARY

There appears to be two sections of the lower Ouachita River where the fish communities are being negatively impacted in some fashion. Reaches #1, and #2, Remmel Dam to the Caddo River, seem to be strongly influenced by discharges from Remmel Dam and above. The fluctuation in water levels, depressed summer water temperatures, erratic dissolved oxygen levels and the disturbance of the benthic habitat in these reaches tends to place excessive stress on the fish communities. There may also be other impacts associated with the hypolimnetic discharges, such as the redox activities of trace metals and/or other compounds. Additionally, upstream point source discharges and nonpoint source run-off from strip mining activities are suspect.

In the lower reaches of the river, particularly below Reach #4, fish community impairments are also indicated. The causes may be hydrology related too, but the apparent spatial fluctuations in the fish community indicate point source impacts, either single source or cumulative, particularly near West Two Bayou and Smackover Creek. Although not apparent from the current data, heavy siltation from nonpoint sources and dredging for navigation channel maintenance may also be causing adverse impacts.

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Appendix D

USFWS IPac Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arkansas Ecological Services Field Office
110 South Amity Suite 300
Conway, AR 72032-8975
Phone: (501) 513-4470 Fax: (501) 513-4480

In Reply Refer To:
Project Code: 2023-0115602
Project Name: UCWCB Intake 316B

August 10, 2023

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Arkansas Ecological Services Field Office
110 South Amity Suite 300
Conway, AR 72032-8975
(501) 513-4470

PROJECT SUMMARY

Project Code: 2023-0115602
Project Name: UCWCB Intake 316B
Project Type: Water Supply Facility - Withdrawal - Surface
Project Description: Lanxess 316B analysis
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@33.34931485,-92.53578182496064,14z

Counties: Calhoun and Union counties, Arkansas

ENDANGERED SPECIES ACT SPECIES

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Red-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered

REPTILES

NAME	STATUS
Alligator Snapping Turtle *Macrochelys temminckii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4658	Proposed Threatened

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Pondberry *Lindera melissifolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1279	Endangered

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Greg Phillips
Address: 219 Brown Lane
City: Bryant
State: AR
Zip: 72022
Email gphillips@gbmcassoc.com
Phone: 5018477077