

**WATER QUALITY SURVEY**

**OF THE**

**MENA**

**Wastewater Treatment**

**Facility Effluent**

**ON**

**PRAIRIE CREEK**

**JANUARY 1994**



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**WATER QUALITY SURVEY  
OF  
THE MENA WASTEWATER TREATMENT FACILITY EFFLUENT  
ON PRAIRIE CREEK**

**INTRODUCTION**

A water quality investigation was conducted on Prairie Creek, the receiving stream of the Mena municipal wastewater treatment facility (WWTF), to evaluate the level of impact this discharge is having on the water quality and aquatic inhabitants of the receiving streams. This survey's purpose was to determine if elevated nutrient levels from the Mena WWTF discharge is impairing the stream uses, and the necessity of developing TMDL's (total maximum daily loads) for nutrients on Prairie Creek. This investigation was conducted on July 27-29, 1992. A preliminary survey was completed on July 22, 1992 to determine stream accessibility and potential station locations.

**GENERAL DISCUSSION**

**Waterway Description**

Prairie Creek has its origin approximately two miles south of the town of Mena in the north central part of Polk County. It flows in a northeast direction and joins the Ouachita River approximately three miles east of Mena. Prairie Creek is a small intermittent stream which drains about 24 square miles. The Mena WWTF effluent discharges into a man-made ditch, which flows 0.6 miles prior to discharging to Prairie Creek, which flows 2.8 miles to the Ouachita River. The stream gradient for Prairie Creek averages 20 feet/mile. The substrate composition consists predominantly of rubble and gravel. The pool/riffle ratio in the study area of Prairie Creek was approximately 2 to 1. There is an abundance of habitat cover available to both aquatic invertebrates and fish in Prairie Creek. At the time of the survey, stream flow was measured at 1.16 MGD (million gallons per day) (Appendix A).

**Previous Studies**

In October of 1981, Weston Designers and Consultants conducted a wasteload analysis to determine the impact of the Mena WWTF on the water quality of the receiving stream and to project future effluent limitations that would maintain the existing water quality standards. At that time, the Mena WWTF consisted of two oxidation ponds operated in series as a two-stage process. The facility was discharging a 1.4 MGD (million gallons per day) effluent volume containing 11 mg/L BOD<sub>5</sub>, 45 mg/L TSS, and 4000 fecal coliform col/100 ml. Their

dissolved oxygen analysis in Prairie Creek over a 24 hour sampling period revealed concentrations of 4.8 mg/L below the WWTF outfall to approximately 8.0 mg/L at the mouth of this stream. Their conclusions also stated Prairie Creek was of noticeably poor quality, with septic organic sludge deposits present in significant amounts. They also recorded the presence of a noticeable "mixing zone" in Prairie Creek below the confluence of Brier Creek. Their recommendations were that an upgrade or replacement of the existing treatment facility would be necessary to achieve maintenance of the existing water quality standards of the receiving stream.

In 1988, the City of Mena completed treatment plant improvements which consisted of three upflow sand filters, a chlorine contact chamber, and post aeration.

An October, 1992 report prepared by Engineering Services, Inc. indicated continued NPDES permit violations. They concluded the exceedances of the 30-day loading limits were caused by excessive inflow and infiltration to the Mena sewer collection system. Recommendations included sewer system rehabilitation and further treatment facility upgrades.

#### **Land Use**

Approximately 20 percent of the Prairie Creek watershed is composed of the corporate limits of Mena. The remainder is mostly forested with some improved pastureland.

#### **Geology**

Prairie Creek and its tributaries lie within the Ouachita Mountain ecoregion. Elevations range from 2000 feet in the Ouachita National Forest to 920 feet at the confluence of Prairie Creek and the Ouachita River. The geology of the Prairie Creek basin is characterized by the Wickham-Altavista-Congaree Association. This Association consists of deep, moderately permeable, well-to-moderately well-drained, acid, loamy soils.

#### **Water Quality Standards And Beneficial Uses**

Prairie Creek is classified as an Ouachita Mountain small watershed perennial fishery and has an applicable dissolved oxygen standard of 6 mg/L, with a 1 mg/L diurnal fluctuation being allowed for no longer than 8 hours in a 24 hour period when the stream temperature exceeds 22 degrees Centigrade. At stream temperatures of 22 degrees C. or less, the 6 mg/L standard generally applies. The exception to this, supported by Use Attainability Analysis, is Prairie Creek from the headwaters to the confluence with Brier Creek. This variation allows a critical season dissolved oxygen standard of 4 mg/L.

Designated beneficial uses of this stream consist of primary and secondary contact recreation which include wading, canoeing, fishing, and swimming. In addition, it is designated as a source of water for domestic, industrial and agricultural uses.

## METHODS

### Station Description

A total of nine water chemistry stations were established, six on Prairie Creek, two in the Mena WWTF effluent ditch, and one station in Brier Creek. These stations were selected to determine any impacts from non-point source contaminants, as well as any impact from the Mena WWTF effluent on Prairie Creek. Stations were spaced in order to identify any dissolved oxygen sag caused by the effluent load on Prairie Creek. The station descriptions are as follows:

- Station 1. Effluent ditch at the Mena WWTF
- Station 2. Mouth of the effluent ditch
- Station 3. Prairie Creek above the confluence of the effluent ditch
- Station 4. Prairie Creek below the effluent ditch
- Station 5. Prairie Creek, 200 yards below the effluent ditch
- Station 6. Prairie Creek above the confluence of Brier Creek
- Station 7. Brier Creek above the confluence of Prairie Creek
- Station 8. Prairie Creek 600 yards below the confluence of Brier Creek
- Station 9. Prairie Creek 100 yards above the confluence of the Ouachita River

Three stations (4, 6 and 9) were sampled for fish and four stations (2, 3, 4 and 6) for macroinvertebrate communities. These communities were identified and analyzed on an upstream/downstream basis, to quantify any adverse impact on population diversity and density in Prairie Creek. Figures 1 and 2 provide the locations of water sampling stations and areas sampled for aquatic life. Flow measurements were recorded at Stations 1, 3, 4, 6, 7 and 9.

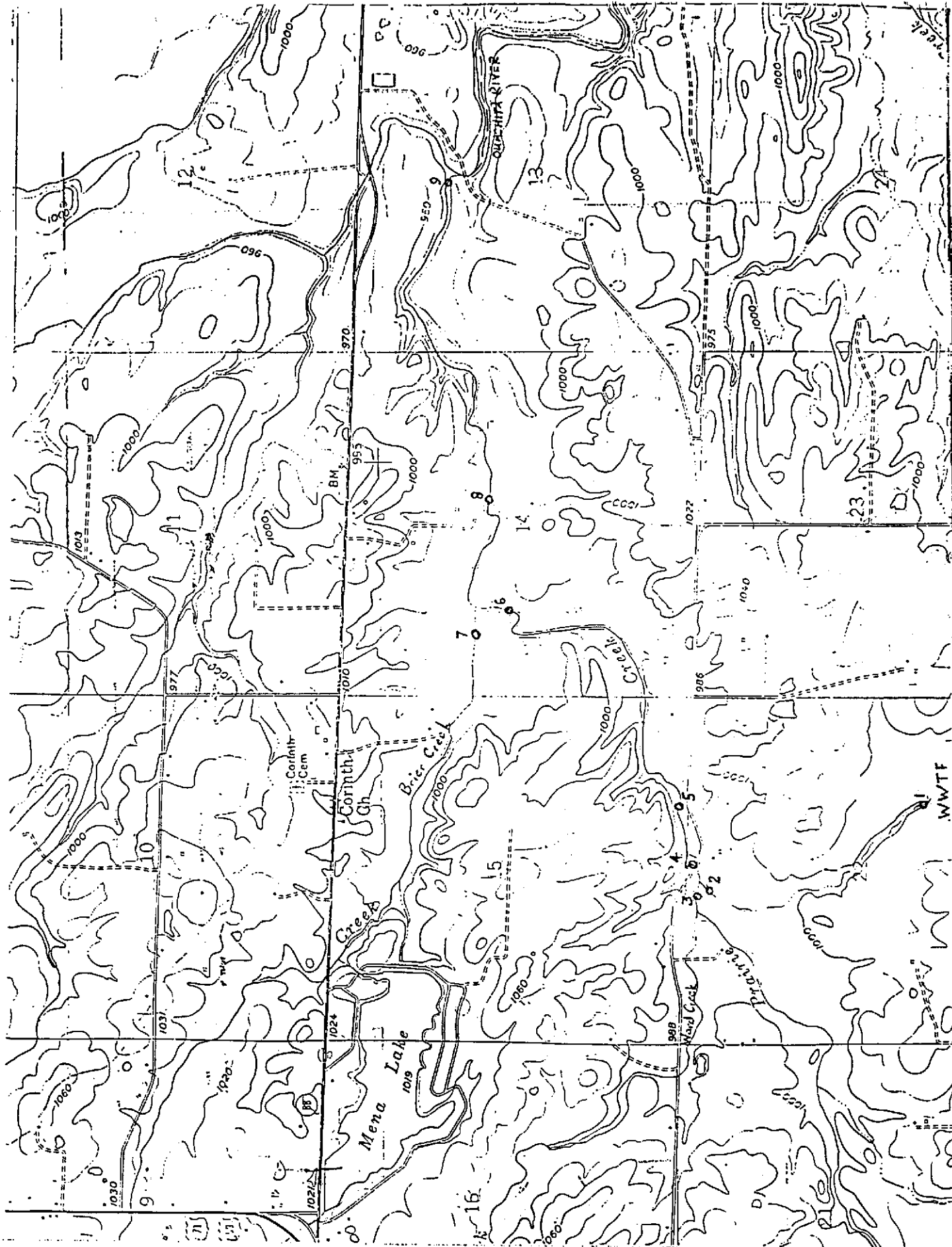


Figure 1  
Water Sampling Stations



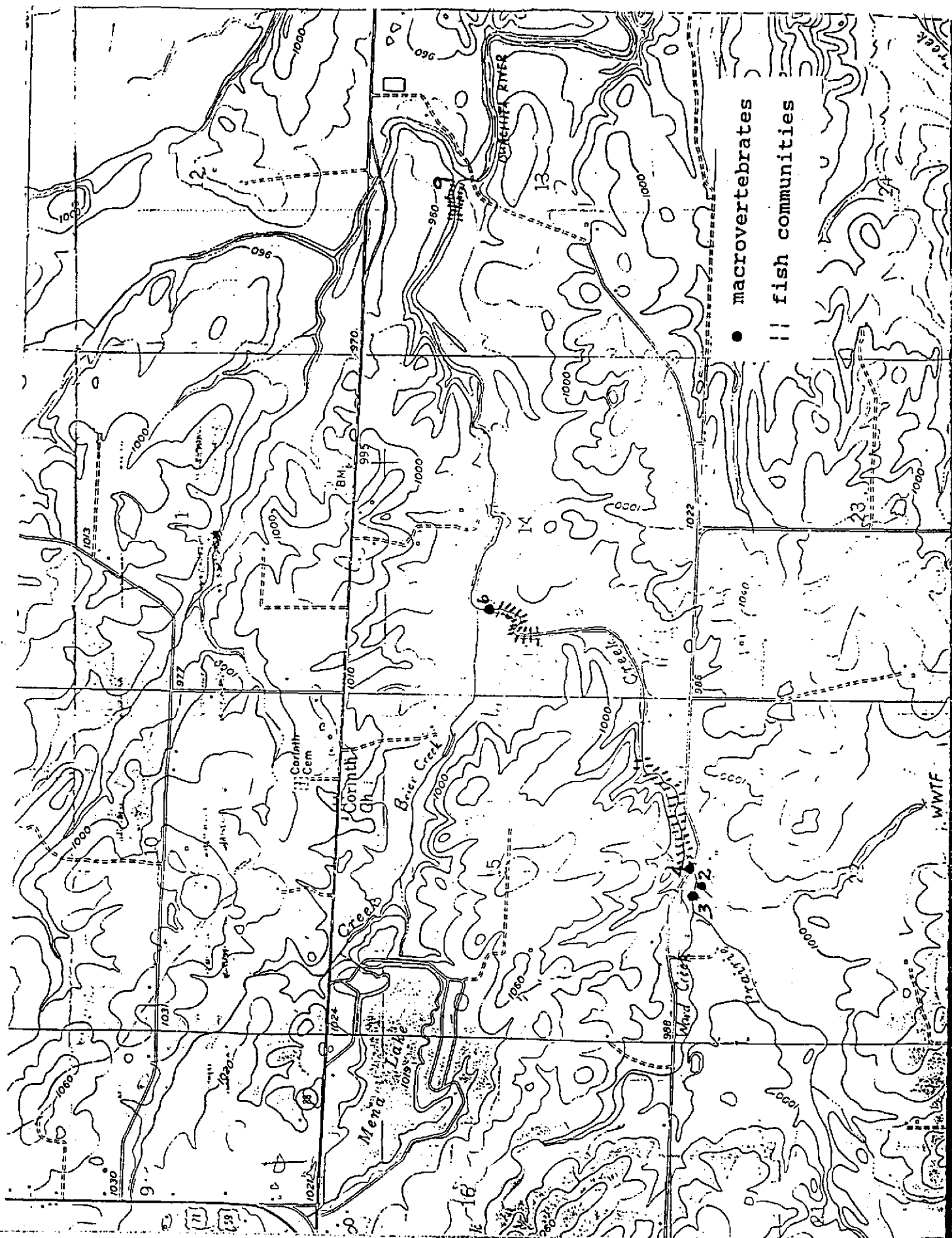


Figure 2  
Aquatic Life Sampling Stations

## **Data Acquisition**

Stream samples were collected, preserved, and analyzed according to the 17th Edition of Standard Methods for the Examination of Water and Wastewater. Analyses were conducted under ADPC&E's existing Quality Assurance Program. Dissolved oxygen and stream temperature during sample collection were measured by a Yellow Springs Instruments (Y.S.I.) Model 57 portable dissolved oxygen meter, which was calibrated by Winkler titration prior to use. Three Y.S.I. Model 56 continuous dissolved oxygen meters were used to determine diurnal variation in the dissolved oxygen concentration in Prairie Creek. Stream pH was analyzed by an Orion SA 230A portable pH meter, which was calibrated using buffer solutions of pH 4 and 7. Stream flow was measured using a Marsh-McBirney Model 201 flow meter by obtaining a representative number of velocities and depths across suitable stream locations. Macroinvertebrate samples were collected using rapid bioassessment (RBA) protocol as adapted for Arkansas by Shackelford (1988). The fish community was sampled using a Smith-Root backpack electrofishing device. Riffle areas were sampled by driving the fish into a seine, while the fish in the pools were collected by electroshocking favorable habitat areas.

## **Parameters**

In addition to the biological samples, these streams were sampled for dissolved oxygen (DO), temperature, pH, flow, chlorides, sulfates, total organic carbon, biochemical oxygen demand (BOD<sub>5</sub>), total suspended solids (TSS), total hardness, total dissolved solids (TDS), turbidity, ammonia nitrogen, nitrite + nitrate nitrogen, orthophosphate, and total phosphate.

## **DATA RESULTS**

### **Dissolved Oxygen**

During the survey of Prairie Creek, a spacial dissolved oxygen profile was conducted between 1300 to 1600 on July 27. A second profile, at the same stations, was conducted from 09:00 to 10:30 on July 29. In the initial profile, DO concentrations above the effluent ditch were 79% saturated, while the downstream stations ranged from 84% to 92% saturation. Stream temperatures ranged from 27 to 28 degrees Centigrade. The second profile was taken during the water chemistry sampling effort on July 29. The saturation values were lower for this sample, ranging from 64 to 66% at all stations. Stream temperatures were in the 25-26 degree range. This difference is due to greater photosynthetic activity

during the daylight hours, with the dissolved oxygen concentration fluctuation peaking in late afternoon and falling to its lowest value just prior to sunrise. This phenomenon is commonly associated with nutrient concentrations in the stream, thereby enhancing or depressing algal productivity.

Three continuous dissolved oxygen meters were placed in Prairie Creek. One was at Station 3 upstream of the Mena effluent, and the others were at Stations 5 and 6. These locations were selected to determine the effluent's zone of impact and the extent of the diurnal fluctuation over a 48 hour period. Figures 3-5 show the dissolved oxygen fluctuation at these three stations during the July 27-29 survey. The upstream station had a diurnal fluctuation of approximately 1.3 mg/L, while Stations 5 and 6 had fluctuations of 1.7 and 1.1 mg/L, respectively. These values are within the range of fluctuations recorded in the ecoregion study of the Ouachita Mountains. This fluctuation may have been suppressed due to the cloud cover present during this survey.

#### **pH and Temperature**

Stream pH values measured during this survey were typical for streams in the Ouachita Mountain (OM) ecoregion. The values ranged from 6.8 upstream to 7.0 at the lowest downstream station. The 1992 Water Quality Inventory Report indicated an average pH of 7.1 for Prairie Creek. Likewise, the stream temperatures were similar to those values reported by the routine ambient monitoring network. Figure 6 graphically depicts the temperature fluctuations of Stations 3, 5, and 6.

#### **Flow**

According to U.S. Geologic Survey data, Prairie Creek at Mena has a Q7-10 of 0.0 cfs; however, small stream flows are generally present during the summer months. The October 1981 Weston survey measured 0.04 cfs above the WWTF. Intermittent light showers contributed to the stream flows present during the 1992 survey. Prairie Creek above the Mena effluent ditch had a flow of 1.79 cfs. The Mena effluent (3.23 cfs) and Brier Creek (0.21 cfs) combined with Prairie Creek yielded a flow of 4.59 cfs at Station 9.

#### **Chlorides, Sulfates, And Total Dissolved Solids**

Ecoregion data indicate a "background" level of approximately 5 mg/L chlorides for small watershed streams. This is consistent with Station 3, the 1992 survey upstream station, which had a 4.37 mg/L chloride concentration. ADPC&E's on-going water monitoring network has established a station

Figure 3

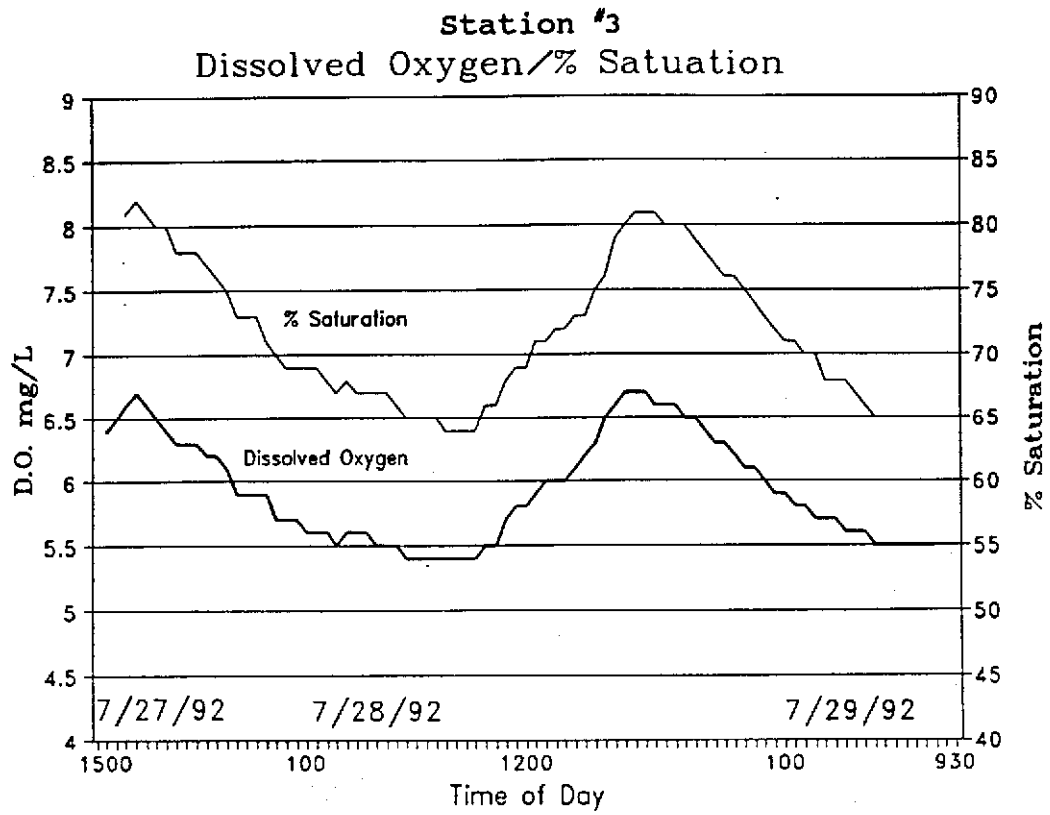


Figure 4

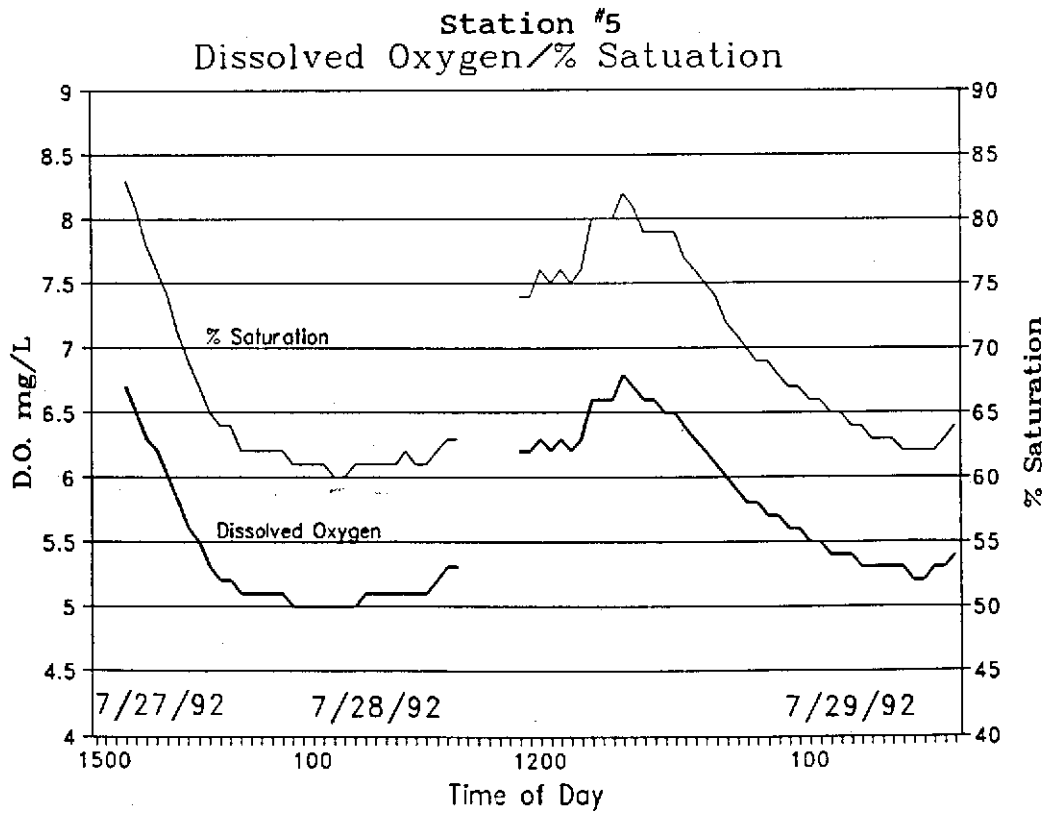


Figure 5

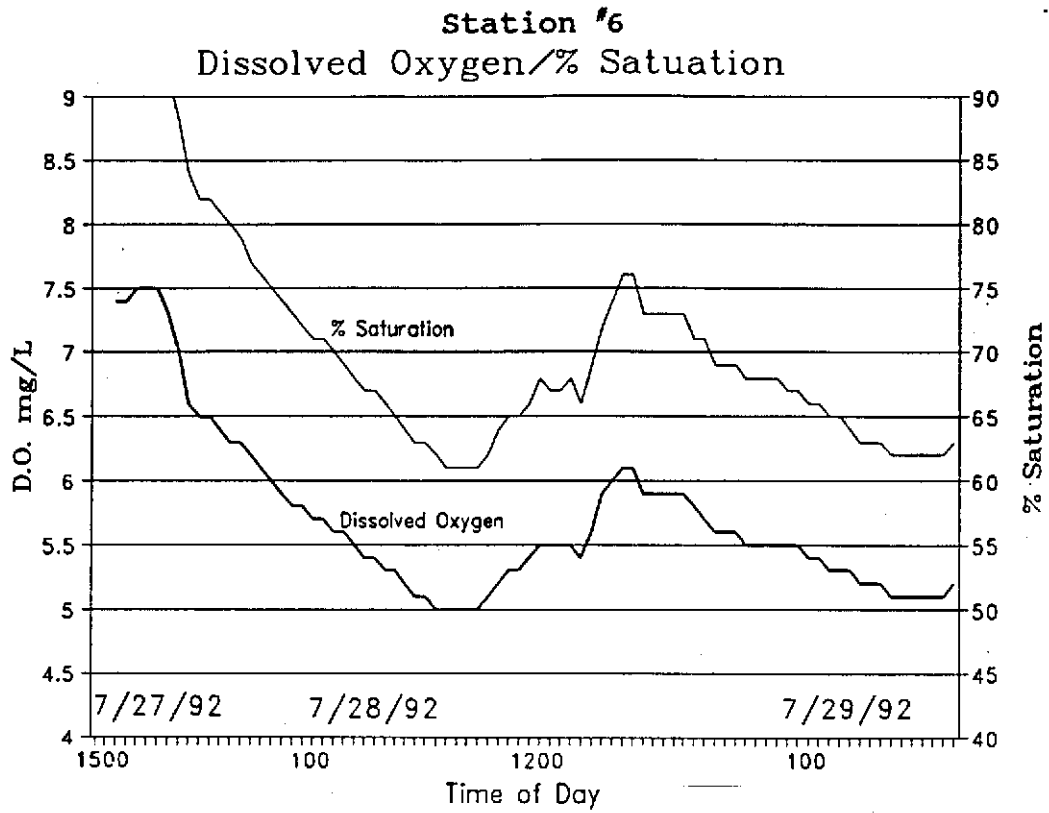


Figure 6

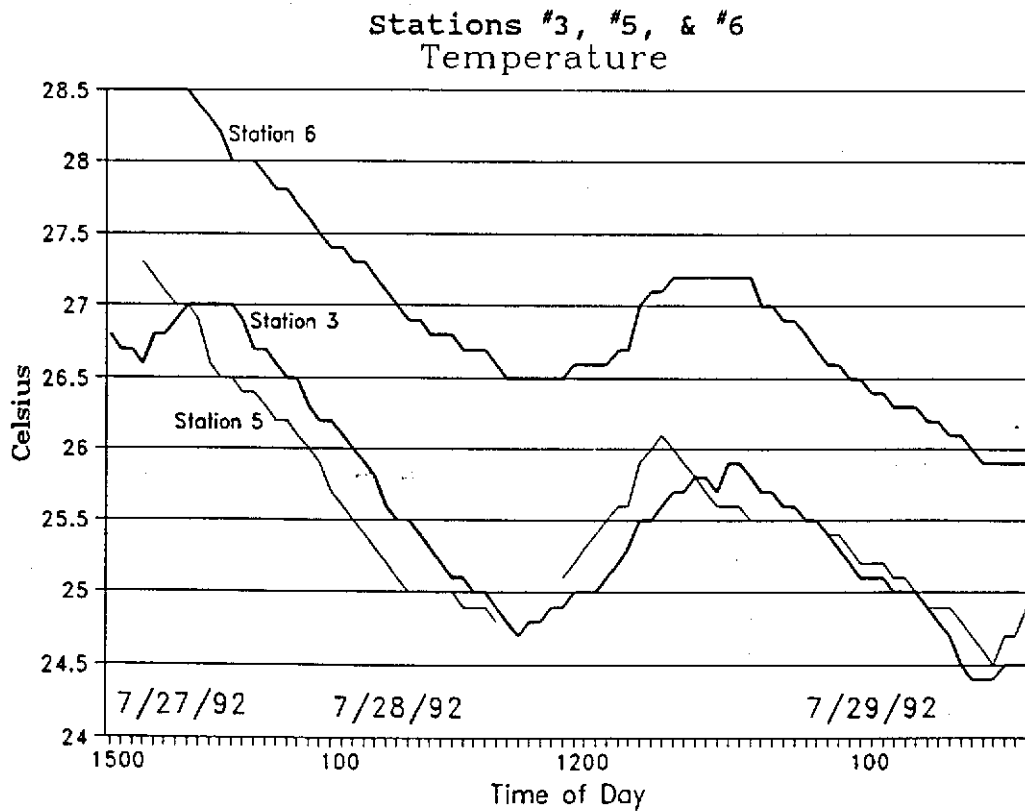
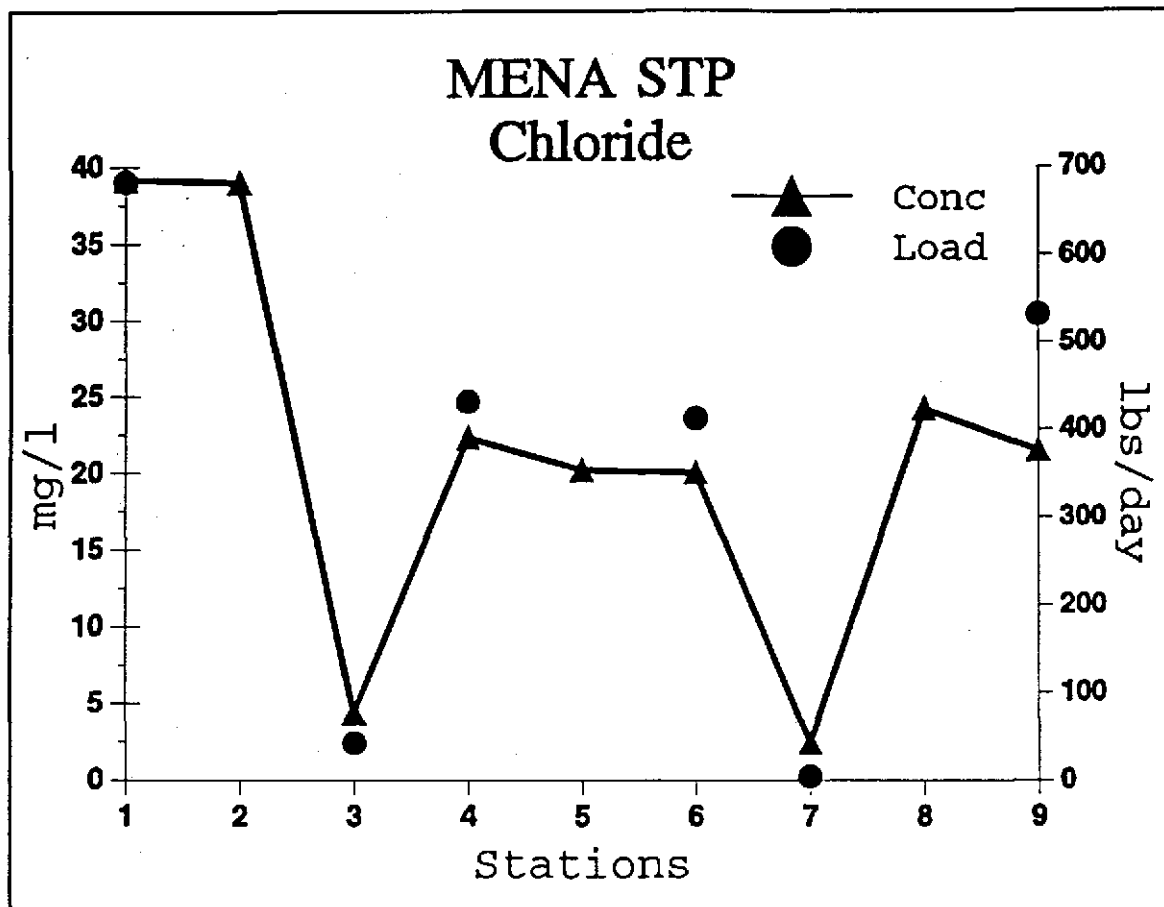


Figure 7

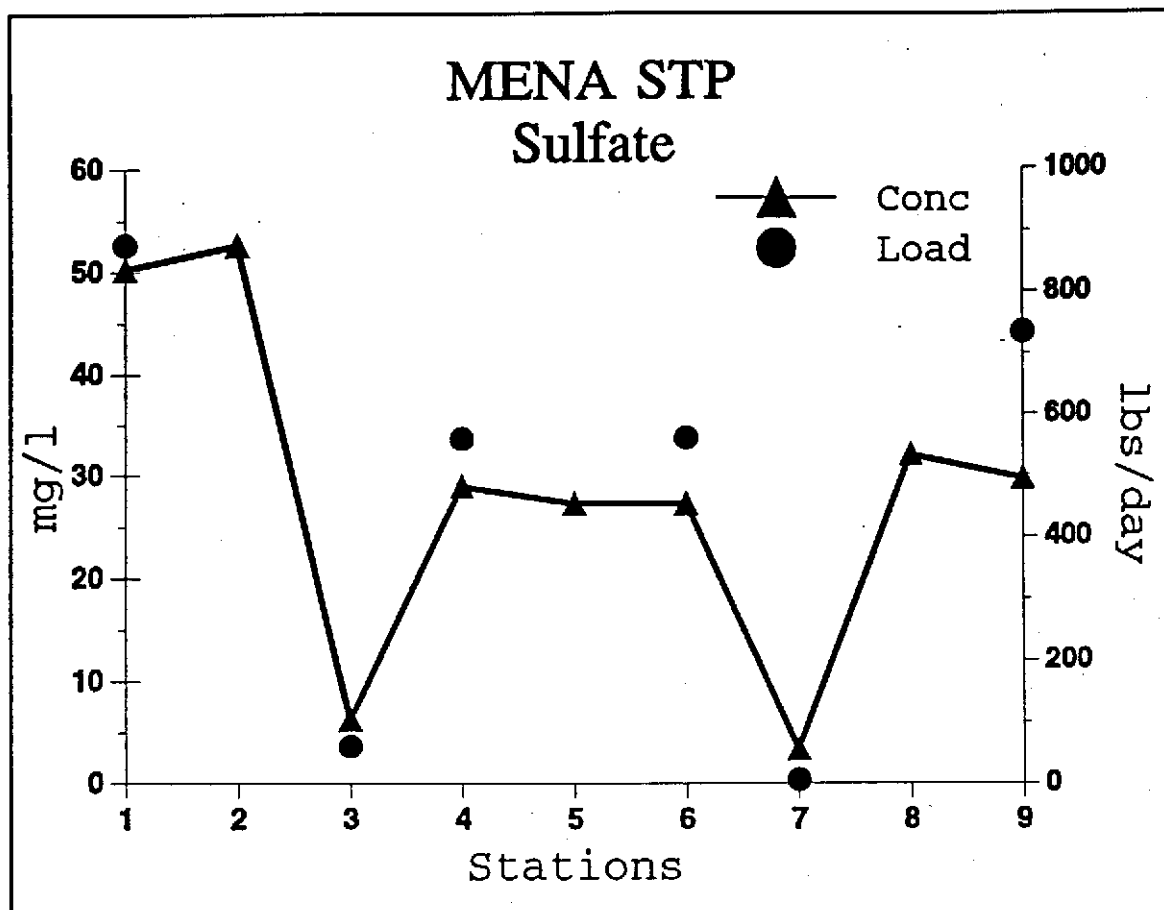


(OUA40) on Prairie Creek, just below the Mena WWTF effluent. Station 4 of the 1992 survey corresponds to this sample point. The 1992 biennial Water Quality Inventory Report (305-b) summarized two years of monthly samples from this site.

The mean value for chlorides at this station was 9.2 mg/L, with 24.0 mg/L and 3.0 mg/L reported as the maximum and minimum, respectively. The 1992 survey sample collected at this station yielded 22.3 mg/L chlorides. The remaining Prairie Creek sample concentrations ranged from 20.0 to 24.2 mg/L. The chloride concentration in the Mena WWTF discharge was 39.0 mg/L. Figure 7 provides chloride concentrations and loading values obtained in this survey.

Sulfate ( $\text{SO}_4$ ) concentrations of approximately 7 mg/L are reported in Ouachita Mountain ecoregion survey data. Consistent with this information, Station 3 of the 1992 survey

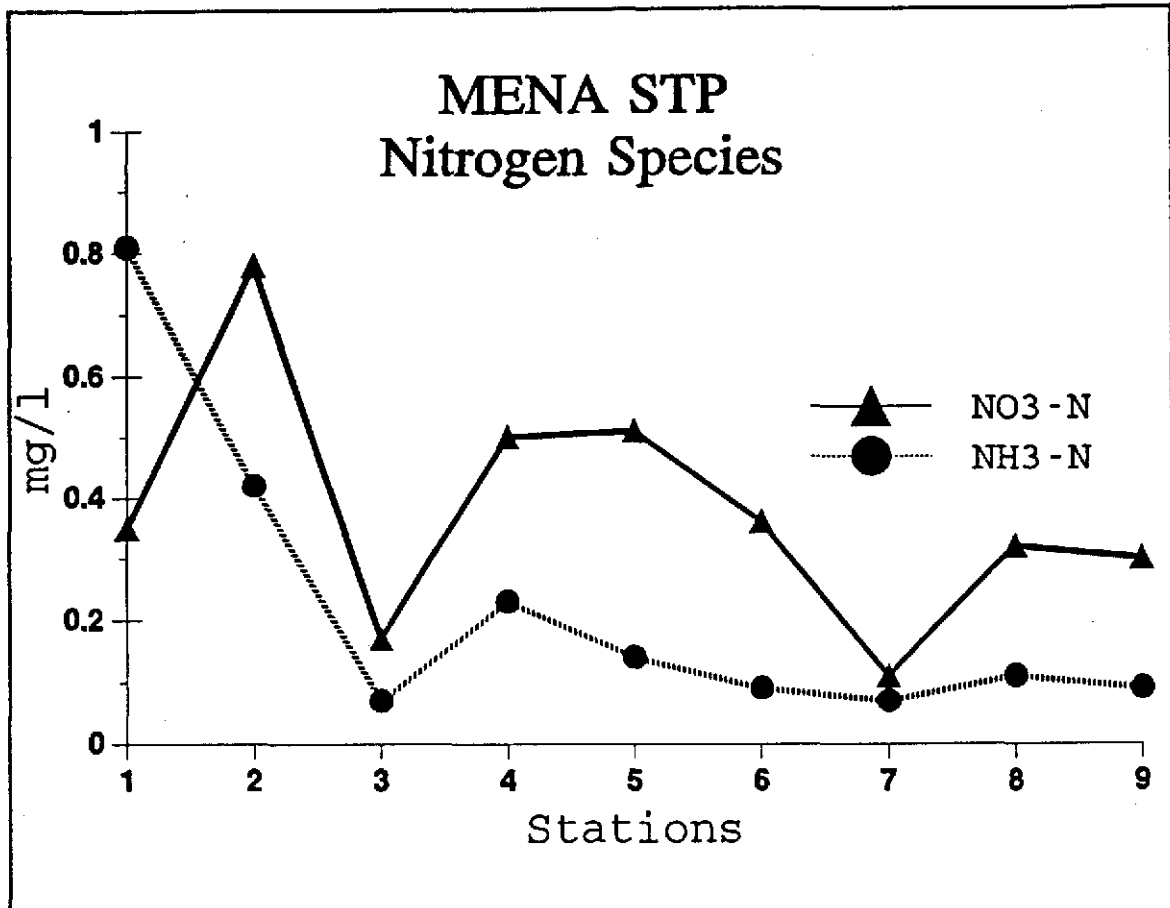
Figure 8



had a concentration of 6.3 mg  $\text{SO}_4/\text{L}$ . The effluent stream  $\text{SO}_4$  value was 50 mg/L. The 1992 305-b reported OUA40 sulfate values of 24.43, 83.0 and 3.0 mg/L for the mean, maximum and minimum, respectively. Prairie Creek sample concentrations, as shown in Figure 8, ranged from 28.9 to 32.0 mg/L sulfates.

Total dissolved solids (TDS) of the "unimpacted" 1992 survey stations (Stations 3 and 7) were consistent with the ecoregion values. The CM ecoregion TDS concentrations are reported as 40 mg/L while upstream Prairie and Brier Creeks were 50 and 41 mg/L, respectively. TDS values in the most recent 305-b averaged 87.19 mg/L, with a maximum of 190 mg/L and minimum of 16.0 mg/L. Station 4 approached the maximum at 122 mg/L TDS. The effluent concentration was 190 mg/L.

Figure 9

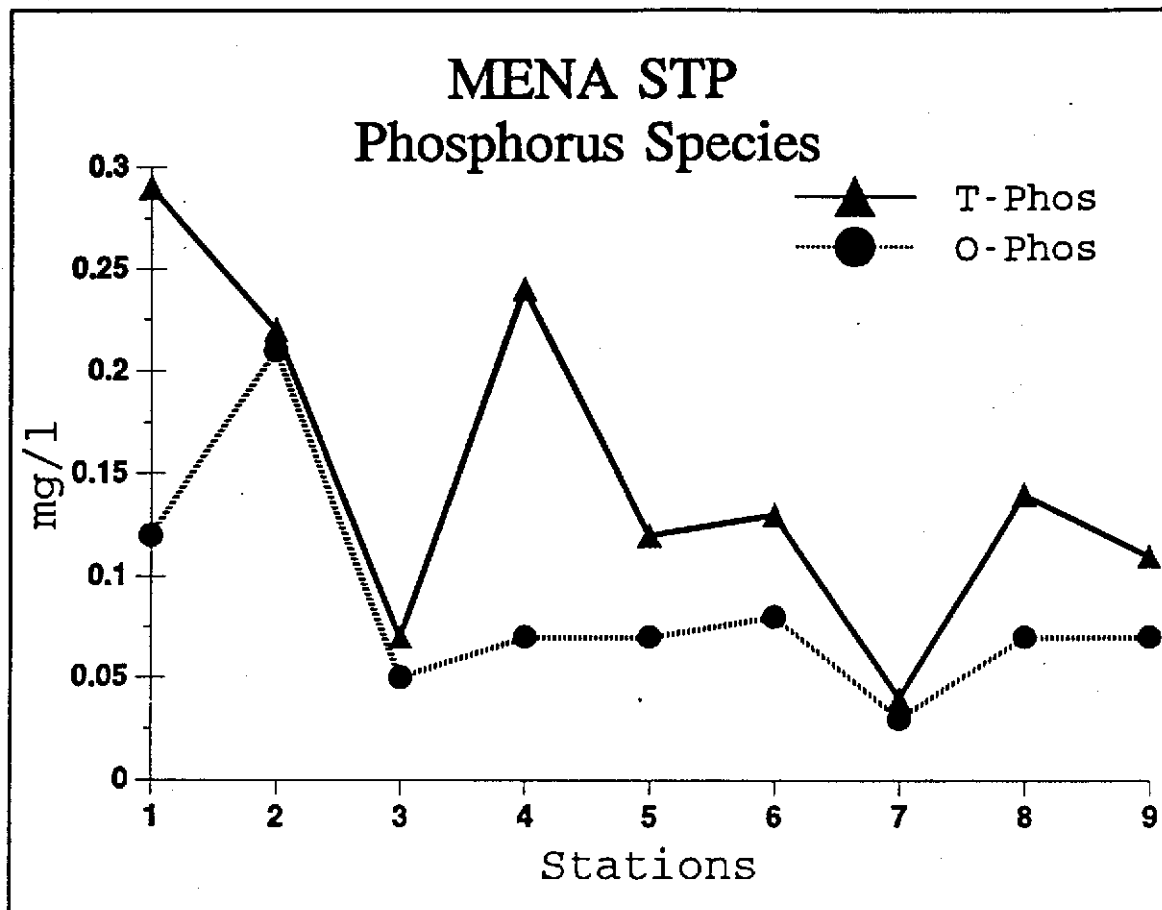


#### BOD<sub>5</sub> And Nutrients

At the mouth of the effluent ditch (Station 2) the BOD<sub>5</sub> was 5.3 mg/L. Upstream of the effluent at Station 3 the BOD<sub>5</sub> was consistent with OM ecoregion data at 1.0 mg/L. Station 4 (OUA40) had a BOD<sub>5</sub> of 3.9 mg/L. The 305-b reported a mean BOD<sub>5</sub> of 2.08 mg/L, for this sample location. The BOD<sub>5</sub> decreased in the downstream stations. Stations 5, 6, 8, and 9 had BOD<sub>5</sub>s of 2.1, 1.3, 1.4 and 0.9 mg/L, respectively. Brier Creek had a BOD<sub>5</sub> of 0.1 mg/L. Nutrient parameters associated with nitrogen and phosphorus were very low (0.02 mg/L) in the OM ecoregion work. The 305-b report gives nitrate concentrations of 0.09 mg/L to 2.49 mg/L, with a mean of 0.57 mg/L at OUA40. The 1992 survey results measured 0.5 mg/L nitrate at this station. The downstream stations remained constant in the 0.35 mg/L range (Figure 9).



Figure 10



Total phosphorus (T-phos) at the Mena WWTF was measured at 0.29 mg/L, during this survey. Upstream T-phos was 0.07 mg/L. The 305-b report lists 0.19 mg/L, 0.75 mg/L, and 0.04 mg/L as the mean, maximum and minimum at OUA40.

Station 4, of the 1992 survey, had a T-phos concentration of 0.24 mg/L. The downstream stations had a fairly constant T-phos concentration ranging from 0.11 to 0.14 mg/L (Figure 10).

#### **TSS and Turbidity**

Ecoregion data, applicable to small watershed streams, indicate relatively low TSS and turbidity values at 2 mg/L and 3 NTU's, respectively. The less impacted stations of the 1992 survey (Stations 3 and 7) had values of 6 and 2 mg/L TSS. These sites had turbidity levels of 4.8 and 3.8 NTU's. Two years of OUA40 data had mean values of 14 mg/L TSS and 2 NTUs. Station 4 data were 37 mg/L TSS, and 8.6 NTUs.

Figure 11

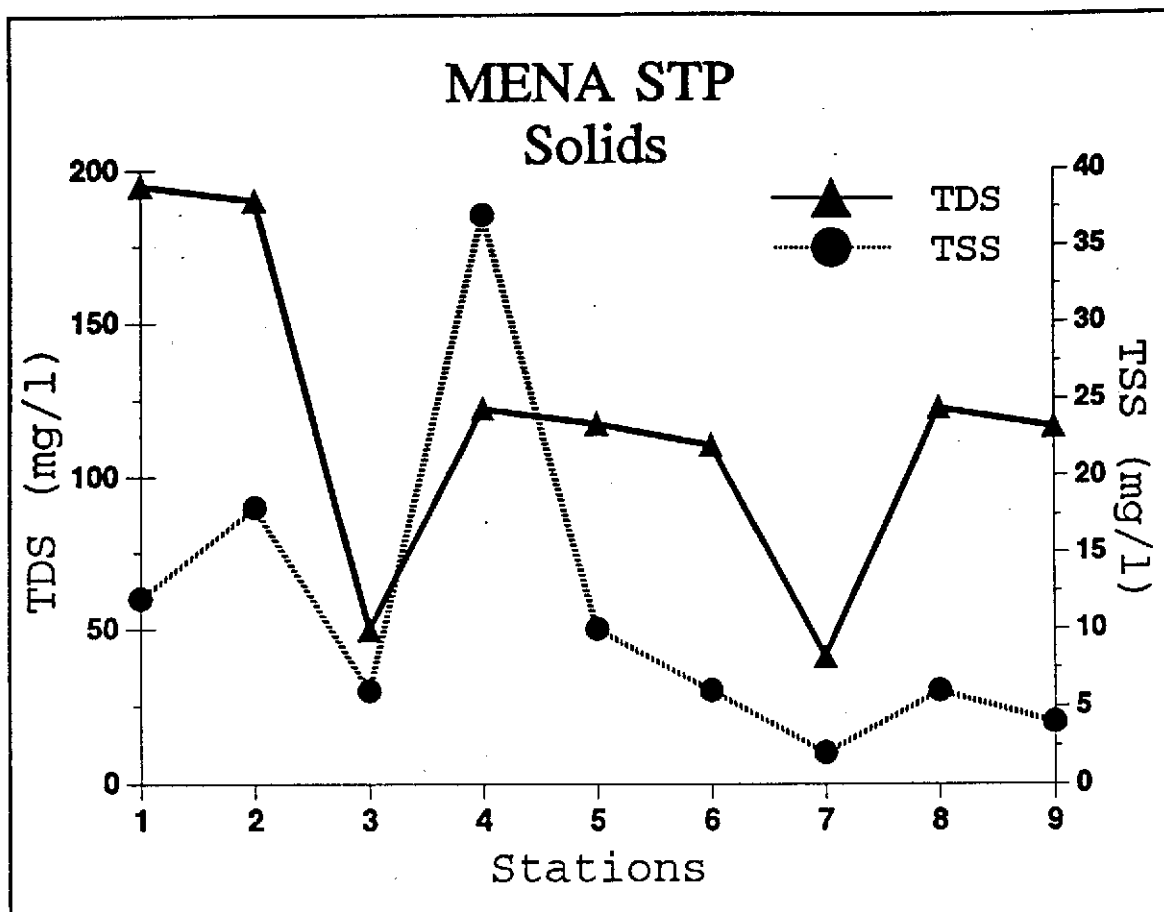


Figure 11 shows a slight decrease in TSS in the downstream direction (10 to 4 mg/L). Turbidity also decreased from 6 to 3.6 NTU's.

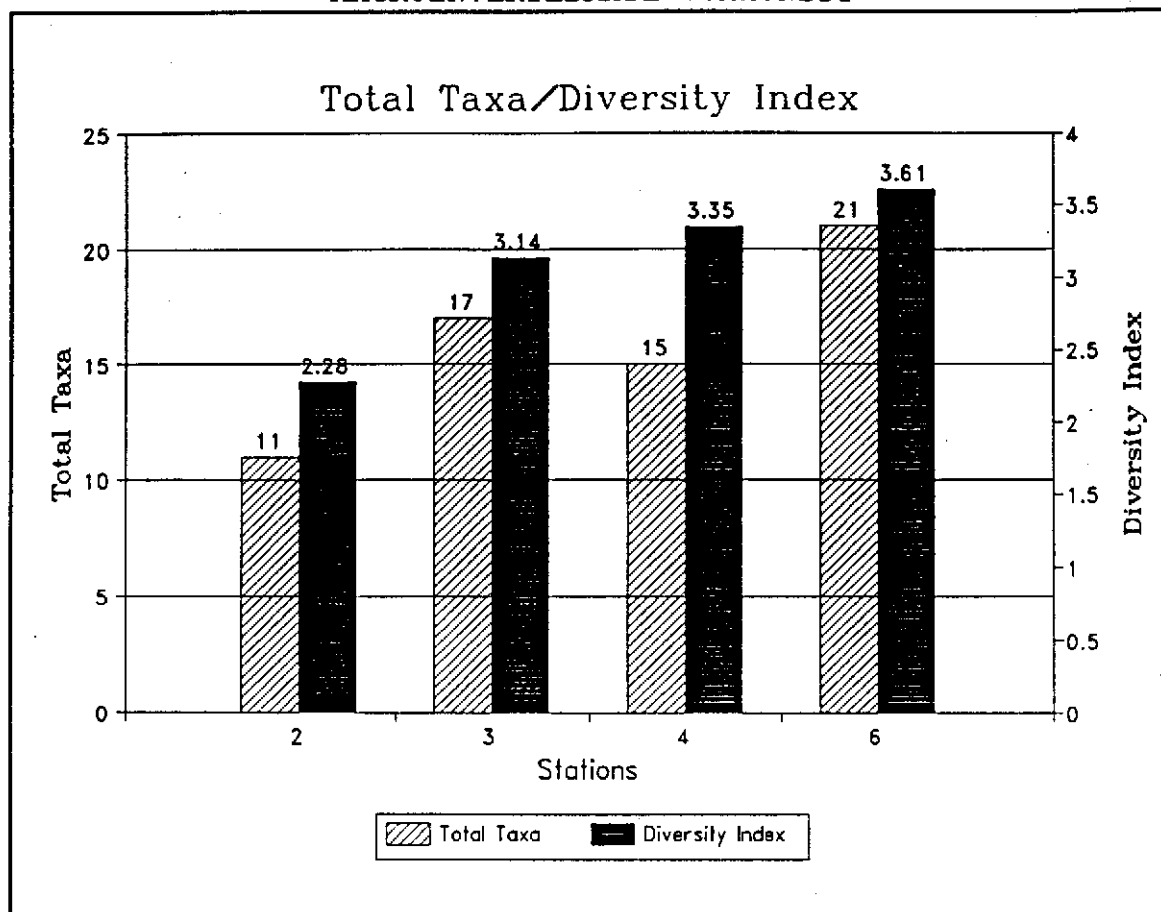
Appendix A presents the analyses of the water chemistry samples taken during this survey, loading values calculated for certain parameters, and a stick diagram of Prairie Creek and its tributaries.

#### Macroinvertebrates

A total of four sampling stations (Figure 2) were established for this survey. Two stations located on Prairie Creek were immediately above and below the Mena WWTF effluent ditch (Stations 3 & 4). A sample was also collected at the mouth of this ditch (Station 2). The fourth sample point was above the mouth of Brier Creek (Station 6). It was assumed that the discharge was completely mixed with Prairie Creek at this point. Five minute riffle samples were collected at these stations with a Turtox indestructible benthos net.

Figure 12

MACROINVERTEBRATE COMMUNITY

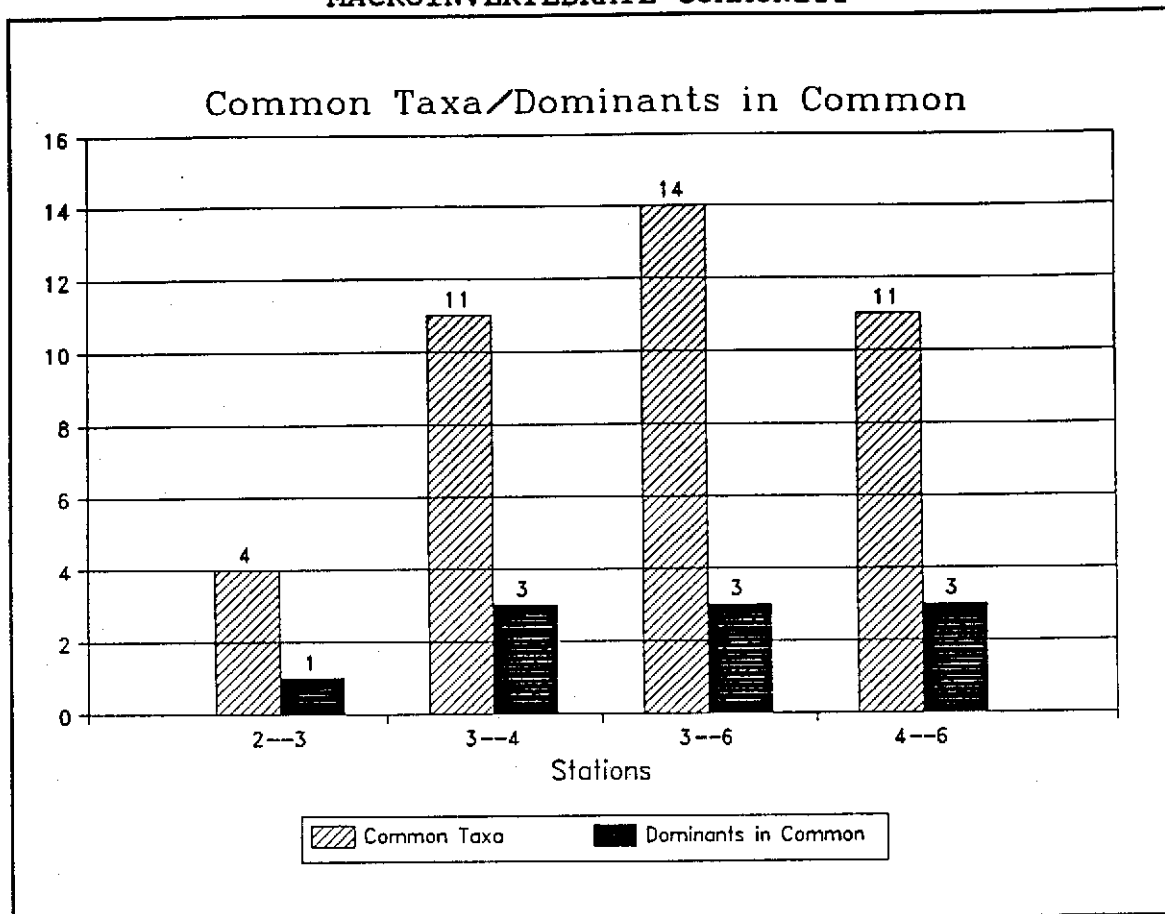


The samples were sorted and identified on-site, and the 100 organism subsample was preserved in 70% ethanol for future reference, if necessary. The benthic species lists generated from this survey are included as Appendix B.

In the Ouachita Mountains Ecoregion survey, five characteristic orders comprised 81% of all organisms collected. These include Ephemeroptera (34%), Tricoptera (18%), Coleoptera (14%), Odonata (10%), and Diptera (7%). At Station 3, above the effluent ditch, 17 taxa were collected. Ephemeroptera and Tricoptera were dominant at 48% and 35%, respectively. Fifteen taxa were present at Station 4. Ephemeroptera and Tricoptera were still dominant at 46% and 17%, respectively; however, a slight shift from caddisfly to bloodworm species was observed. Figure 12 presents the Total Taxa and Diversity Indices for these data.

Figure 13

MACROINVERTEBRATE COMMUNITY

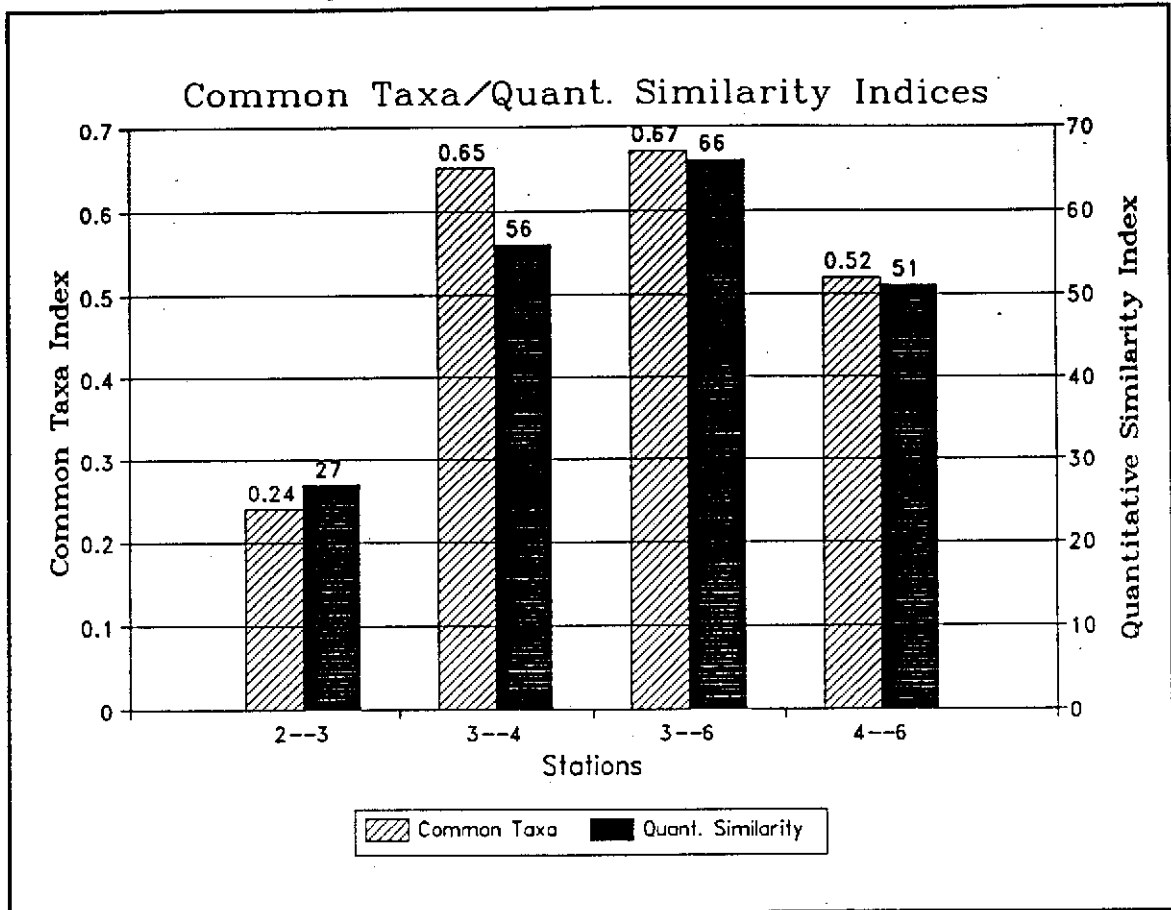


At Station 6, well below the mixing zone, 21 taxa were collected. Dominant orders were consistent with ecoregion work. The sample was comprised of Ephemeroptera (24%), Tricoptera (34%) and Coleoptera (10%).

The extent of impairment of the benthic community below the wastewater discharge is determined by use of the biometric scoring system. This system, which assigns scores to various characteristics of the benthic community, can define relative change between communities upstream and downstream of a pollutant source. A mean biometric score is assigned to each community identifying its aquatic life use status, as determined by the extent of impairment ranging from none, minimal, substantial to excessive.

Figure 14

MACROINVERTEBRATE COMMUNITY



The biometrics (Shackleford, 1988) evaluated from the 1992 survey data focus primarily on community diversity, and consist of Dominants in Common (DIC), Common Taxa Index (CTI), (Figure 13) and Quantitative Similarity Index (QSI) (Figure 14). Community comparisons were made between Prairie Creek above and below the effluent ditch (Stations 3 and 4), upstream Prairie Creek and Prairie Creek at Stations 6, upstream Prairie Creek and the effluent ditch (Stations 3 and 2), and also between Station 4 and Station 6. Figure 2 identifies the sites where macroinvertebrate samples were collected. As might be expected, the effluent ditch benthic community appears to be impacted more than the other sites. This stream flow is almost entirely municipal effluent, except possibly during rainfall events. A comparison of the benthic community from this site to that located at Station 3--the background site on Prairie Creek--revealed fewer taxa, a DIC

value of 1, CTI of 0.24 and a QSI of 27. The DIC, CTI, and QSI values correspond to excessive impairment.

The comparison of Stations 3 and 4 should most accurately represent the effect of the Mena WWTF effluent on Prairie Creek. Biometric scores of DIC=3, CTI=0.65, and QSI=56 are obtained from this upstream/downstream comparison. All three metrics indicate minimal impairment.

Interestingly, the only biometric to show substantial impairment on Prairie Creek is the QSI from the comparison of Stations 4 and 6. These stations represent Prairie Creek downstream of the effluent and Prairie Creek above the confluence with Brier Creek. This is due to the shift in the Ephemeroptera/Trichoptera composition. Higher organic concentrations cause a shift from scraper to collector species. The dominant organism at Station 4, just below the effluent ditch, was a gathering collector. Downstream, at Station 6, scrapers regained dominance.

Further analyses of the macroinvertebrate community (comparison of Stations 3 and 6) show improvement downstream. The DIC, CTI, and QSI values correspond to no impairment, minimal impairment, and minimal impairment, respectively. There are also more taxa present in the downstream station.

### **Fish Community**

Three stream segments were sampled for fish communities:

Station #4 Prairie Creek below the outfall ditch from county road #54 to 1/2 mile downstream.

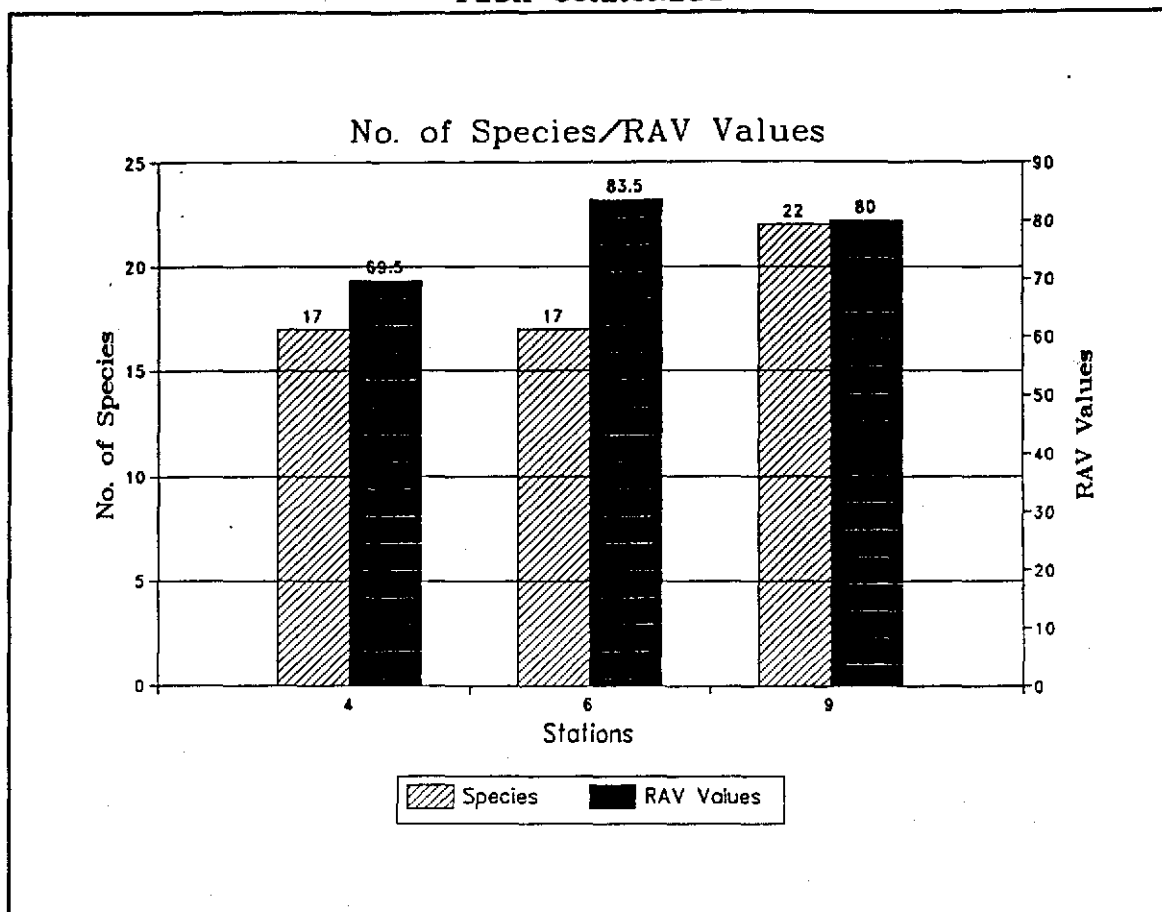
Station #6 Prairie Creek from the confluence of Brier Creek to 1/4 mile upstream.

Station #9 Prairie Creek 100 yds upstream of the confluence of the Ouachita River to 300 yards upstream.

Each site was sampled approximately 45-60 minutes using a Smith-Root backpack electrofisher, set on 400 volts D.C. The larger fish specimens collected were field identified and released. Smaller specimens were returned to the lab for further identification. Relative Abundance Values (RAV's) were assigned to the adults and sub-adults of each species according to Keith (1987). These values are based on the numerical abundance of the species relative to the habitat and the typical abundance of the species. A value from one to four is assigned to the adult and the sub-adult segment of

Figure 15

FISH COMMUNITY



each species population. The total maximum RAV for any one species at each station is eight. Appendix C outlines the species collected during this survey outlined by family, and includes the RAV assigned to each.

Fish community samples from Station 4 and Station 6 contained 17 species each. The total RAV value from Station 4 was much lower than that of Station 6, 69.5 and 83.5 respectively (Figure 15). However, the similarity index (86.5) of the two samples was quite high. It is therefore concluded that the fish communities of Prairie Creek at Station 4 and Station 6 are similar.

Perhaps one difference between these two stations, which may be related to sedimentation from the outfall, is in the relative abundance of the greenside darter and the orangebelly

darther at the two stations. The RAV for the greenside darther at Station 4 was 4.0, 14 specimens collected, and at Station 6 was 6.0, 37 specimens collected. The orangebelly darther had a RAV at Station 4 of 5.5, 47 specimens collected, and a RAV of 8.0 at Station 6, 99 specimens collected. These two species primarily feed on the macroinvertebrates found within the benthic substrate. As sedimentation increases, embeddedness decreases the macroinvertebrate populations, thus limiting the amount of the available food supply for these species.

There were 22 species of fish collected at Station 9, with a total RAV value of 80.0, less than that of Station 6. Even though the total RAV value was less for this downstream station, the fish community can be described as somewhat more healthy in comparison with the upper two Stations. An increase in species in a downstream direction is typical of a healthy fish community within a stream because of the increase in habitat diversity.

Appendix C lists the species collected at each station and the relative abundance for each species.

#### CONCLUSIONS

A review of the water chemistry analyses in terms of permitted constituents in the Mena WWTF discharge indicates a fair removal efficiency for BOD<sub>5</sub>, TSS, and NH<sub>3</sub>N, with values of 5.3, 18, and 0.42 mg/L, respectively, at the confluence with Prairie Creek.

Dissolved oxygen concentrations at the upstream station ranged from a minimum of around 5.4 mg/L to a maximum of 6.7 mg/L, while at the downstream location the minimum was just below 5 mg/L, with a maximum concentration of 6.8 mg/L. This diurnal fluctuation seems fairly consistent with the OM Ecoregion data. The benthic and fish communities also indicate minimal impact below the Mena WWTF.

A review of only the permitted parameters indicates that there are no adverse impacts on water quality from this wastewater discharge; however, a review of the non-permitted wastewater constituents, i.e. chlorides, sulfates, nitrates, phosphates, indicates a change in water quality is occurring due to the wastewater influence. A five-fold increase in chloride and sulfate concentrations from the upstream Prairie Creek station to the downstream location is evident. Prairie Creek's nutrient (nitrate and T-phos) concentration doubles below the outfall and remains fairly constant to the confluence of the Ouachita River; however, these values are relatively low compared to most WWTF discharges.



Results of this study indicate that background levels of the physical, chemical and biological characteristics of Prairie Creek are typical of small Ouachita Mountain Ecoregion streams. Discharges from the City of Mena WWTF are causing increased nutrient and minerals (chlorides, sulfates, total dissolved solids) levels in Prairie Creek; however, no impairments to the designated uses of the stream were identified by this study. The stream is, therefore, not considered to be water quality limited nor in need of TMDL limitations.

#### **RECOMMENDATIONS**

The City of Mena should continue the WWTF upgrade to correct the inflow/infiltration problems in order to further reduce the facility's loading to the stream.

# APPENDIX A

## MENA WASTE LOAD ALLOCATION

Concentration (mg/l)

SITE	TIME	DO	pH	TOC	BOD	NH3-N	NO3-N	O-PHOS	T-PHOS	CL	TDS	SO4	HARD	TURB	TSS	FLOW MGD
#1	0900	6.8	6.22	11.9	10.0	0.81	0.35	0.12	0.29	39.20	195	50.3	46	7.8	12	2.09
#2	0915	4.6	6.44	10.7	5.3	0.42	0.78	0.21	0.22	39.00	190	52.6	42	7.4	18	
#3	0917	5.7	6.84	4.1	1.0	0.07	0.17	0.05	0.07	4.37	50	6.3	22	4.8	6	1.16
#4	0925	5.3	6.70	7.9	3.9	0.23	0.50	0.07	0.24	22.30	122	28.9	36	8.6	37	2.32
#5	0935	5.4	6.79	6.3	2.1	0.14	0.51	0.07	0.12	20.20	117	27.2	38	6.0	10	
#6	1003	5.4	6.80	5.9	1.3	0.09	0.36	0.08	0.13	20.00	110	27.2	38	4.0	6	2.47
#7	1000	6.1	7.08	5.1	0.1	0.07	0.11	0.03	0.04	2.44	41	3.4	26	3.8	2	0.21
#8	0945	4.9	6.78	6.3	1.4	0.11	0.32	0.07	0.14	24.20	122	32.0	48	3.8	6	
#9	1030	6.2	7.06	5.9	0.9	0.09	0.30	0.07	0.11	21.50	116	29.7	38	3.6	4	2.97

Loadings lbs/day)

SITE	NH3-N	NO3-N	O-PHOS	T-PHOS	CL	SO4
#1	14.12	6.10	2.09	5.05	683.28	876.76
#3	0.68	1.64	0.48	0.68	42.14	61.05
#4	4.45	9.67	1.35	4.64	431.32	558.97
#6	1.85	7.41	1.65	2.68	411.62	559.80
#7	0.12	0.19	0.05	0.07	4.21	5.81
#9	2.23	7.42	1.73	2.72	531.68	734.46

## Site Locations

- #1 -- Effluent ditch at STP
- #2 -- Mouth of effluent ditch
- #3 -- Prairie Creek above effluent ditch
- #4 -- Prairie Creek below effluent ditch
- #5 -- Prairie Creek 200 yds below site #4
- #6 -- Prairie Creek above Brier Creek
- #7 -- Brier Creek above Prairie Creek
- #8 -- Prairie Creek 600 yds below Brier Creek
- #9 -- Prairie Creek at mouth/Ouachita River

<--Prairie Creek

Dallas Creek

Ward Creek

Mena STP

#1

#2

#4

#5

#7

Brier Creek

#6--

#8--

Ouachita River

#9--

Benthic Bioassessment  
Station # OUA0120  
MENA STP EFFLUENT DITCH AT MOUTH, NEAR MENA  
Eco Reg. # OUMT  
Segment # 2F  
Sample Date 92-07-28  
Sample Time 0930  
Sampling technique employed 5MR  
Printed on 10-JUN-1993

Diversity index = 2.2825587

SH%= 1 PR%= 12 PA%= 10 GC%= 21 FC%= 56

Bio #	Name		Gr	Count	%
18020704002	CADDISFLY LARVA	Cheumatops	FC	56	56.0
17010102	AQUATIC EARTHWORM	Naididae	GC	10	10.0
17020102017002	LEECH	Piscicola milneri	PA	10	10.0
18020503002	MAYFLY NYMPH	Caenis	GC	6	6.0
18021115002	BLOODWORM	Ablabesmyi	PR	6	6.0
18021115095	BLOODWORM	Pseudochir	GC	3	3.0
1802120700100001	WHIRLIGIG BEETLE LAR	Dineutus larvae	PR	3	3.0
17020101003	LEECH	Glossiphon	PR	2	2.0
8021215020	RIFFLE BEETLE, ADULT	Stenelmis adult	GC	2	2.0
18020411002	DAMSELFLY NAIAD	Hetaerina	PR	1	1.0
18010302003	CRAYFISH	Orconectes	SH	1	1.0

Station # OUA0121  
Prairie Cr. above confluence of STP eff. ditch - nr Mena, AR  
Eco Reg. # OUMT  
Segment # 2F  
Sample Date 92-07-28  
Sample Time 1000  
Sampling technique employed 5MR  
Printed on 10-JUN-1993

```
# of Taxa = 17      # of organisms = 100      Biotic score = 0
% Annelida          = 0.0
# Ephemeroptera taxa = 5      % Ephemeroptera = 48.0
# Trichoptera taxa = 3      % Trichoptera = 35.0
# Coleoptera taxa = 2      % Coleoptera = 2.0
# Chironomidae taxa = 1      % Chironomidae = 1.0
```

### Group summary

SH%= 3 SC%= 29 PR%= 8 GC%= 22 FC%= 38

Bio #	Name		Gr	Count	%
18020510007	MAYFLY NYMPH	Stenonema	SC	25	25.0
18020704002	CADDISFLY LARVA	Cheumatops	FC	22	22.0
18020508002	MAYFLY NYMPH	Baetis	GC	16	16.0
18020702001999	CADDISFLY LARVA	Chimarra	FC	12	12.0
18020511005	MAYFLY NYMPH	Isonychia	FC	4	4.0
18020307003001	STONEFLY NYMPH	Neoperla clymene	PR	4	4.0
18020802001001	HELLGRAMMITE	Corydalus cornutus	PR	3	3.0
18010302003049	CRAYFISH	Orconectes neglectus	SH	3	3.0
18020503002	MAYFLY NYMPH	Caenis	GC	2	2.0
8021215020	RIFFLE BEETLE, ADULT	Stenelmis adult	GC	2	2.0
18021215005001	BEETLE, ELMID, ADULT	Dubiraphia vittata	GC	1	1.0
18020712001001	CADDISFLY LARVA	Helicopsyc borealis	SC	1	1.0
18021110002	CRANEFLY LARVA	Hexatoma	PR	1	1.0
18020510011005	MAYFLY NYMPH	Stenacron interpunct	SC	1	1.0
19031005002	SNAIL	Physa	SC	1	1.0
18021115095	BLOODWORM	Pseudochir	GC	1	1.0
18021215020	BEETLE, ELMID, LARVA	Stenelmis	SC	1	1.0

## Benthic Bioassessment

Station # OUA0122

Prairie Cr. below confluence of STP eff. ditch - nr Mena, AR

Eco Req. # OUMT

Segment # 2F

Sample Date 92-07-28

Sample Time 1030

Sampling technique employed 5MR

Printed on 10-JUN-1993

# of organisms

Biotic score = 0

\* Annelida = 1.0

# Ephemeroptera taxa = 4 % Ephemeroptera = 46.0

# Trichoptera taxa = 2 % Trichoptera = 17.0

```
# Coleoptera      taxa = 1  % Coleoptera      = 2.0
```

# Chironomidae taxa = 2 % Chironomidae = 7.0

3.3501644

## Group summary

SH= 4 SC= 18 PR= 24 PA= 1 GC= 36 FC= 17

SH%= 4 SC%= 18 PR%= 24 PA%= 1 GC%= 36 FC%= 17

Bio #	Name		Gr	Count	%
18020508002	MAYFLY NYMPH	Baetis	GC	24	24.0
18020704002	CADDISFLY LARVA	Cheumatops	FC	15	15.0
18020802001001	HELLGRAMMITE	Corydalis cornutus	PR	13	13.0
18020510011005	MAYFLY NYMPH	Stenacron interpunct	SC	8	8.0
18020510007	MAYFLY NYMPH	Stenonema	SC	8	8.0
18020307003001	STONEFLY NYMPH	Neoperla clymene	PR	7	7.0
18020503002	MAYFLY NYMPH	Caenis	GC	6	6.0
18021115095	BLOODWORM	Pseudochir	GC	6	6.0
18010302003049	CRAYFISH	Orconectes neglectus	SH	4	4.0
18020411002	DAMSELFLY NAIAD	Hetaerina	PR	2	2.0
18021215020	BEEBLE, ELMID, LARVA	Stenelmis	SC	2	2.0
18020702001999	CADDISFLY LARVA	Chimarra	FC	2	2.0
18021115002	BLOODWORM	Ablabesmyi	PR	1	1.0
18020611001	BUG, BR SHD WATERSTR	Rhagovelia	PR	1	1.0
17020102017002	LEECH	Piscicola milneri	PA	1	1.0

Benthic Bioassessment  
 Station # OUA0123  
 Prairie Cr. above confluence of Brier Cr. near Mena, AR  
 Eco Reg.# OUMT  
 Segment # 2F  
 Sample Date 92-07-28  
 Sample Time 1100  
 Sampling technique employed 5MR  
 Printed on 10-JUN-1993

# of Taxa = 21    # of organisms = 100    Biotic score = 0

# Ephemeroptera	taxa = 6	% Annelida	= 1.0
# Trichoptera	taxa = 3	% Ephemeroptera	= 24.0
# Coleoptera	taxa = 2	% Trichoptera	= 34.0
# Chironomidae	taxa = 2	% Coleoptera	= 10.0
		% Chironomidae	= 3.0

Diversity index = 3.6146595

Group summary

SH=	7	SC=	26	PR=	20	GC=	11	FC=	36
SH%=	7	SC%=	26	PR%=	20	GC%=	11	FC%=	36

Bio #	Name		Gr	Count	%
18020704002	CADDISFLY LARVA	Cheumatops	FC	26	26.0
18020510007	MAYFLY NYMPH	Stenonema	SC	15	15.0
18021215020	BEETLE, ELMID, LARVA	Stenelmis	SC	9	9.0
18020802001001	HELLGRAMMITE	Corydalus cornutus	PR	8	8.0
18020702001999	CADDISFLY LARVA	Chimarra	FC	7	7.0
18010302003049	CRAYFISH	Orconectes neglectus	SH	5	5.0
18020307003001	STONEFLY NYMPH	Neoperla clymene	PR	5	5.0
18021110002	CRANEFLY LARVA	Hexatoma	PR	4	4.0
8021215020	RIFFLE BEETLE, ADULT	Stenelmis adult	GC	4	4.0
18020508002	MAYFLY NYMPH	Baetis	GC	3	3.0
18020510011005	MAYFLY NYMPH	Stenacron interpunct	SC	2	2.0
18020511005	MAYFLY NYMPH	Isonychia	FC	2	2.0
18021115087998	BLOODWORM	Polypedilu	SH	2	2.0
18020503002	MAYFLY NYMPH	Caenis	GC	1	1.0
18021215005001	BEETLE, ELMID, ADULT	Dubiraphia vittata	GC	1	1.0
18020502002	MAYFLY NYMPH	Tricorytho	GC	1	1.0
18021115002	BLOODWORM	Ablabesmyi	PR	1	1.0
17010102	AQUATIC EARTHWORM	Naididae	GC	1	1.0
19050430002	CLAM	Musculium	FC	1	1.0
18020708005	CADDISFLY LARVA	Oecetis	PR	1	1.0
18021118001	HORSEFLY LARVA	Tabanus	PR	1	1.0

# Appendix C

## Fish Community of Prairie Creek

Fish Family and Species	Common Name	Station 4		Station 6		Station 9	
		# sp.	RAV	# sp.	RAV	# sp.	RAV
=====							
Lepisosteidae	Gars						
Lepisosteus oculatus	Spotted gar			2	1.5		
Cyprinidae	Minnows						
Campostoma anomalum	Stoneroller	125	8.0	216	8.0	302	8.0
Cyprinella whipplei	Steelcolor shiner	11	4.0	30	6.0	16	5.0
Luxilus chrysocephalus	Striped shiner			2	1.0		
Lythrurus umbratilis	Redfin shiner	1	1.0			2	1.5
Notropis boops	Bigeye shiner	91	8.0	158	8.0	141	8.0
Opsopoeodus emiliae	Pugnose minnow			1	1.0		
Pimephales notatus	Bluntnose Minnow	17	4.0	9	4.0	13	4.0
Catostomidae	Suckers						
Hypentelium nigricans	Northern hogsucker	4	3.0	6	3.5	5	3.0
Minytrema melanops	Spotted sucker	1	1.0				
Moxostoma erythrurum	Golden redborse	2	2.0			3	2.0
Ictaluridae	Catfishes						
Ameiurus melas	Black bullhead	1	1.0				
Ameiurus natalis	Yellow bullhead	15	6.0	9	6.0	5+	6.0
Ictalurus punctulatus	Channel catfish					1	1.0
Noturus nocturnus	Freckled madtom					6	3.0
Atherinidae	Silversides						
Labidesthes sicculus	Brook silverside					1	1.0
Centrarchidae	Sunfishes						
Lepomis cyanellus	Green sunfish	13	4.0	20	6.0	4	3.0
Lepomis gulosus	Warmouth sunfish			3	3.0		
Lepomis macrochirus	Bluegill sunfish	22	6.0	18	6.0	5	3.0
Lepomis megalotis	Longear sunfish	73	8.0	46	8.0	38+	8.0
Lepomis hybrid	Hybrid	1	1.0	1	2.0		
Micropterus punctulatus	Spotted bass					3	2.0
Micropterus salmoides	Largemouth bass	1	1.0	6	3.5	6	3.5
Pomoxis nigromaculatus	Black crappie					1	1.0
Percidae	Perches						
Etheostoma blennioides	Greenside darter	14	4.0	37	6.0	31	5.0
Etheostoma radiosum	Orangebelly darter	47	5.5	99	8.0	49	6.0
Etheostoma stigmaeum	Speckled darter					1	1.0
Etheostoma zonale	Banded darter					2	2.0
Percina caprodes	Logperch	2	2.0	2	2.0	4	3.0
=====							
Totals (Species, RAVs)		17	69.5	17	83.5	22	80.0
=====							
Similarity Indices		4-6		6-9		4-9	
		86.5		80.3		84.7	

Station #4 -- Prairie Creek below WWTF ditch outfall at Co. Rd. #54 bridge to downstream 1/2 mi.  
(Sec 15, T2S, R30W).

Station #6 -- Prairie Creek from confluence of Brier Creek to upstream 1/4 mi. (Sec 14, T2S, R30W).

Station #9 -- Prairie Creek 100 yds upstream of the confluence with the Ouachita River to 300 yds upstream  
(Sec 13, T2S, R30W)