

**THE FISH FAUNA OF THE RED RIVER SYSTEM (KENTUCKY RIVER BASIN) IN
EASTERN KENTUCKY, WITH A BIOTIC
ASSESSMENT OF WATER QUALITY**

By

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EXECUTIVE SUMMARY

The Red River is a sixth order tributary to the Kentucky River in east-central Kentucky. The drainage area includes a large portion of the Daniel Boone National Forest, as well as the Natural Bridge State Park and the Red River Gorge Geological Area. These protected areas help to make the fish fauna of the drainage diverse and relatively undisturbed. No comprehensive fish survey of the entire system had previously been done. The most complete survey to date was done by Branley Branson and Donald Batch of Eastern Kentucky University in the late 1960's and focused primarily on mainstem sites. A complete ichthyofaunal assessment was long overdue. Historical records were gathered and accounted for 206 collections at 138 different sites throughout the drainage. Previous collectors accurately reported 83 species and collected 27,827 individuals. A total of 12,939 specimens from 91 collections at 81 sites over two years were recorded in this survey. Seventy-nine species were collected, which included three species (*Stizostedion vitreum*, *Ichthyomyzon bdellium* and *Fundulus catenatus*) never before collected in the Red River drainage. Index of Biotic Integrity (IBI) scores were calculated for 80 sites in this study giving the Red River system an overall score of 50 (Good). IBI scores were also calculated for collections made by Branson and Batch in the late 1960's resulting in an overall score for the system of 44.2 (Fair). However, the overall scores for 27 sites sampled both by Branson and Batch (48.2 Fair/Good) and in this study (48.9 - Good) were similar indicating little change in water quality in the system. Percent similarities for multiple collections at the same sites over time, however, seemed to indicate a little change in the composition of the fauna for at least a few sites in the system. Nevertheless, IBI scores at two of these sites did not seem to indicate improving or declining water quality conditions. However, percent catch of several intolerant species appeared to be declining, possibly indicating a decline in some aspect of the water quality of the system. In some cases, the decline in the populations of an intolerant species (*Ambloplites rupestris*) seemed to be matched by an increase in a more tolerant species (*Lepomis cyanellus*). This study should be used as baseline data for further examination of the fish fauna of the Red River to monitor future impacts within the watershed.

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INTRODUCTION

General

The Red River is a sixth order tributary to the Kentucky River in east-central Kentucky. The stream originates in Wolfe County and flows roughly 155 kilometers westward where it empties into the Kentucky River in Estill County (Kornman 1985). The complete drainage area covers approximately 780 square kilometers and includes parts of Wolfe, Powell, Estill, Menifee and Clark counties (Branson and Batch 1974) (Figure 1).

While most of the lower reaches of the floodplain of the Red River is used for agriculture, the middle section of the drainage area is relatively undisturbed because it flows through the Daniel Boone National Forest. Thirty-two kilometers of the mainstem flows through the Red River Gorge Geological Area, a unique and pristine area with many unusual and fascinating rock formations. Both flora and fauna are diverse and extremely abundant (pers. obs.). This area has been impacted very little, and a 14.6 kilometer section of it has been designated as a Kentucky Wild River (Burr and Warren 1986). The gorge was the site of controversy in the late 1960's, because the U.S. Army Corps of Engineers recommended the construction of a dam which

would have inundated the entire gorge area (Branson and Batch 1974). Due to a public outcry to preserve this natural setting, which allowed for many forms of outdoor recreation, the dam proposal was switched to an alternate site on another tributary of the Kentucky River. Therefore, the Red River remains free-flowing from headwaters to mouth.

Ichthyofaunal Records

Excluding the current study, fish data from 206 collections throughout the drainage had been recorded (Table 1). These collections represented 103 different sites ranging from first order tributaries to the mouth of the Red River. Of the 206 collections, 59 were sampled in the 1960's, and a total of 131 of these collections were made before 1985. Therefore, only 75 collections in the entire drainage had been made over the last 15 years. Only 40 collections were made in the last 10 years.

The most active collectors over the past 50 years (number of collections in parentheses) include Lew Kornman (Kentucky Department of Fish and Wildlife Resources) (59), Branson and Batch (48), Kentucky Division of Water (36) and Kentucky State Nature Preserves Commission (23). Miscellaneous other collectors were responsible for another 40 unpublished collections throughout the drainage.

Branson and Batch (1974) collected at 34 sites along the Red River and most of the major tributaries, including Swift Camp Creek, Indian Creek, Middle and South Fork of the Red River and Lulbegrud Creek. They also sampled 14 sites located in the area of Mill Creek. Four of these sites were on Mill Creek itself, three were on Tight Hollow which feeds into Mill Creek, four were located on tributaries to Tight Hollow, and the final three were on the Middle Fork of the Red River near the mouth of Mill Creek. This system was selected as a representative tributary system.

Overall, Branson and Batch (1974) sampled a wide range of habitats and stream sizes, including small tributaries and larger mainstem segments. They recorded a total of 67 species (Table 2). This list included large river species such as the freshwater drum (*Aplodinotus grunniens*) as well as small headwater species like the mottled sculpin (*Cottus bairdi*). Some interesting records include one American eel (*Anguilla rostrata*) found at the mouth, and a single specimen of the slenderhead darter (*Percina phoxocephala*). Both were extremely rare in other historical collections in the drainage. Only one other *P. phoxocephala* had been recorded and just six *A. rostrata* had been collected. Branson and Batch (1974) also recorded six white bass (*Morone chrysops*), which had not been collected since then.

The survey by Branson and Batch (1974) was a great start to the study of the fish fauna of the drainage. They did not, however, collect many tributary systems. Since their study several additional species have been reported from these tributaries. Kornman, the Northeastern Fishery District Biologist for the Kentucky Department of Fish and Wildlife Resources (KDFWR), had sampled many of the smaller streams in the basin while conducting trout stream investigations. During these surveys, from 1985 until the present (KDFWR 1986, 1988, 1990, 1992, 1997), he recorded the presence of previously unreported small-stream species such as the redbreast dace (*Clinostomus elongatus*) and the blacknose dace (*Rhinichthys atratulus*) (KDFWR 1986). Two other previously unreported fish species found by Kornman were the brown and brook trouts (*Salmo trutta* and *Salvelinus fontinalis*, respectively). These two trout species, along with the rainbow trout (*Onchorhynchus mykiss*) had all been stocked throughout the Red River system by KDFWR. There was one population of possibly reproducing brook trout in a tributary to the Red River that was stocked several years ago by a private group (Kornman 1985). In these studies Kornman recorded a total of 48 species (Table 2) from 33 sites (KDFWR 1986, 1988, 1990, 1992, 1997).

Kornman also conducted a muskellunge (*Esox masquinongy*) study on the mainstem of the river (Kornman 1985). In this study, 14 sites were boat-shocked in 1982, and 12 of these sites were resampled the following year. In addition to muskellunge, all fish species were collected and identified, and the results were published in his report (Kornman 1985). In all, 61 species (Table 2) were found in these large river sections of the stream. New records for the species list of the Red River included the common carp (*Cyprinus carpio*), the quillback carpsucker (*Carpiodes cyprinus*) and the mooneye (*Hiodon tergisus*) (Kornman 1985).

Another major contributor to the study of fishes of the Red River was the Kentucky Division of Water (KDOW), which sampled 36 sites throughout the drainage from 1977 to 1998 (KDOW 1988). Prior to the start of the present study in the fall of 1997, only two sites, one in 1990, and one in 1997 had been sampled by KDOW since 1984. Nine additional fourth order sites were sampled by KDOW in 1998 as part of a larger survey of the Kentucky River drainage.

Most of the 36 sites sampled by KDOW were in the upper section of the drainage along the mainstem of the river. A total of 41 species were recorded in the Fish Collection Catalogue of the KDOW (1988), and since then eight other

species were reported on unpublished data sheets. These brought the KDOW checklist to a total of 49 species (Table 2).

The Kentucky State Nature Preserves Commission (KSNPC) sampled at 23 sites in the basin from 1978 to 1996. The records for these collections were not published. Seven of these collections were made on Lubegrud Creek, eight other collections were distributed evenly from two separate locations, while the remaining eight were from scattered locations. In all, KSNPC recorded 55 species (Table 2), including the only previous report of the channel darter (*Percina copelandi*). KSNPC personnel were also one of three sets of collectors to find the arrow darter (*Etheostoma sagitta spilotum*) in Rock Bridge Fork, which is a small tributary to Swift Camp Creek in the Red River Gorge Geological Area. This darter had not been found until 1980 (Greenberg and Steigerwald 1981). Based on known records, it seemed to be restricted to Rock Bridge Fork. It has subsequently also been reported by Kornman (KDFWR 1986) and the KSNPC in 1996 (unpublished original sorting sheets).

Unpublished sorting sheets from 1948 to 1998 had been obtained from various other collectors. These represented 40 collections from 29 sites scattered throughout the Red River basin over a 50 year period and included a total of 61

species (Table 2). One interesting record was that of the banded sculpin (*Cottus carolinae*) by Lawrence Page (Illinois Natural History Survey) in 1996. This had been the only report of this species from the drainage. Another unique record was that of one orange-throat darter (*Etheostoma spectabile*) reported by R.M. Mengel in 1948 from the Middle Fork of the Red River. This also had been the only report of this species from the basin.

In all, 86 species had been reported from the Red River drainage. These represented more than one-third of the 242 species (Burr and Warren 1986) known from Kentucky. This list included four species listed by KSNPC in a report of rare and extirpated plants and animals (KSNPC 1996). The arrow darter and the eastern sand darter (*Ammocrypta pellucida*) had both been designated as Special Concern species in Kentucky. The eastern sand darter had previously been listed federally as a Category 2 species. Two lamprey species which had been found in the Red River, have been listed as Threatened in the state. The northern brook lamprey (*Ichthyomyzon fossor*) and the American brook lamprey (*Lampetra appendix*) had only been collected a total of 12 times in the drainage.

Index of Biotic Integrity (IBI)

The Index of Biotic Integrity, or the IBI, was developed by Karr in 1981 (Karr et al. 1986). The IBI is a method for assessing the biological integrity of a stream using fish as biological monitors. One reason fish are used in this way is because simply halting chemical or other degradation does not ensure that the stream will regain biotic integrity. Biotic integrity could only be considered restored if the stream could support a healthy, natural biological community (Karr et al 1986). This method takes into account 12 metrics which include a range of attributes based on the fish populations. These 12 metrics fall into three categories: Species Composition, Trophic Composition, and Fish Abundance and Condition (Karr et al. 1986).

The IBI was developed for Illinois streams. Since the ichthyofaunal composition of streams changes from region to region, the IBI as developed by Karr must be modified in order to be used in different ecoregions (Karr et al. 1986).

KDOW modified certain metrics to allow for the IBI to be used in Kentucky streams (KDOW 1997). They also determined Maximum Species Richness Lines in order to determine expectation criteria for each metric. Finally, KDOW modified some metrics to distinguish between headwater streams and larger wadable streams.

Kentucky has been divided into seven distinct ecoregions based on physiography, soil types, potential natural vegetation, geology, and land use types (KDOW 1997). The Red River falls into the Western Allegheny Ecoregion. KDOW retained most of Karr's original metrics for this ecoregion. However, some metrics were calibrated to distinguish between headwater and wading sites. Headwater sites in this ecoregion were determined by KDOW (1997) to be any site with a drainage area less than or equal to 22 square kilometers. Wading sites, then, were those sites with a drainage area greater than 22 square kilometers.

METHODS

Site selection

An attempt was made to resample all of the original sites sampled by Branson and Batch (1974). While most were revisited, several were not, due to time constraints or inaccessibility. Other sites were determined by reviewing all other historical collections. These additional sites were based on areas of the drainage that had not been sampled, and also areas of interest, as far as distribution of specific species throughout the drainage.

Fish sampling

Each site was collected by the best possible methods, which were determined upon visiting the site. These methods included three meter, six meter and bag seines, and a backpack electroshocker for the smaller, wadable sites. A larger, tote-barge electroshocker was used at two of the sites. The larger sites where these methods were not possible, a boat shocker was employed, as well as gill nets and hoop nets. At each site collecting was conducted until it was determined that the area had been well examined and the likelihood of finding any additional species of fish was

minimal.

The fish collected at each site were preserved in the field in 10% formalin. Large fish and easily identified fish were counted, checked for sores and released. Voucher specimens of every species from almost all sites were retained. The preserved fish were taken to the laboratory and identified, counted, and examined for sores and deformities. Fish were identified using Etnier and Starnes (1993), Pflieger (1997) and Robison and Buchanan (1992).

All specimens were kept in formalin for 7-10 days. They were then rinsed and stored in tap water for three days before being transferred to 70% ethyl alcohol for permanent curation into the Branley A. Branson Museum of Zoology at Eastern Kentucky University.

DATA ANALYSIS

Collections database

All historical collections as well as all collections from this study were entered into a computerized database (Access, Microsoft, Inc). The database included the collectors' names and dates, locality information, species collected, and species information such as classification, common name and author.

IBI

The data obtained at each site were used to calculate the IBI scores. The scores were then used to assess the biotic integrity for each site (KDOW 1997). An overall IBI score was also calculated for the Red River.

Other Analyses

Other analyses were done to determine trends in the fish populations over time. The percent compositions of each species of the total catch for several different time periods were determined. The time periods examined were 1948 to 1970, 1948 to 1980, 1948 to 1985, 1948 to 1990, and

finally 1948 to 2000, which included all data collected. Graphs were made for species that showed evidence of changing percent abundance over these time periods.

Percent similarities for multiple collections from the same site were also calculated. Several sites were selected based on the number of collections, dates of those collections and sampling technique used. Sites that had four or more collections using comparable methods (i.e., backpack shocking or seining, but not sodium cyanide, boat shocking, gill nets or hoop nets) were examined. All sites that were sampled at least once between 1948 and 1970, again in the 1970's or 1980's, and then at least once more in the 1990's were used. Percent similarities between each collection at each qualifying site were then examined to look for any changes in the fish fauna over the past 50 years.

RESULTS AND DISCUSSION

General

In this study, a total of 91 collections were made from 81 different sites (Table 3) resulting in the collection of 12,939 individuals (Table 4). All the records, historic and present, represent a total 40,766 specimens (Table 5) from 297 collections made from 138 different sites (Appendix B and Figure 2). Thirty-five new sites were sampled during this study, including collections from 10 streams that were previously unsampled (Figure 2).

The most common fish collected was the bluntnose minnow (*Pimephales notatus*) making up almost 13% of the entire catch. The five most common species caught with percent of total catch are shown in Figure 3. Eight of the ten most abundant species were minnows. The longear sunfish (*Lepomis megalotis*) was the most common centrarchid and ninth most common species overall, and the fantail darter (*Etheostoma flabellare*) was the most common darter and tenth most abundant species overall.

Seventy-six of the 86 previously reported fish species were collected in the present study. The 86 previously reported species included three questionable species. The voucher specimen of the *Etheostoma spectabile* was examined. It was determined by myself and Dr. Patrick Ceas that the

specimen was in fact a female rainbow darter (*E. caeruleum*) based on pectoral fin ray counts, body shape and infra-orbital canal differences. Females of these two species are very similar and are often mistaken for one another.

The two other questionable species included the records of *Percina phoxocephala* and *Cottus carolinae*. Both species are very similar to other species that are common in the drainage, and the Red River lies in an overlap area for both species. *Percina phoxocephala* could easily be confused with *P. oxyrhyncha*, of which 12 individuals had been collected, compared to the two individuals of the former species.

Percina oxyrhyncha had been collected three times at one of the sites (21) that *P. phoxocephala* was recorded from in 1969 by Carter of KDFWR (Carter 1970). According to Burr and Warren (1986), the single *P. phoxocephala* recorded by Branson and Batch (1974) was based on a *P. oxyrhyncha* specimen. Carter's *P. phoxocephala* record from the Red River is also probably based on a *P. oxyrhyncha* specimen. Neither specimen was able to be located to be examined. Branson and Batch's voucher was not present in the ECU museum, and its location was unknown. Carter did not keep voucher specimens.

Since 1948, three *C. carolinae* had been recorded from the Red River. All three came from one collection in the

Red River by INHS in 1996 (unpub. sorting sheets). In that same time period, 495 individuals of *C. bairdi*, a very similar species, had also been collected, including from the same site (103) that the *C. carolinae* were collected. In a detailed examination of 16 sculpins collected in this study from various locations throughout the Red River, several characteristics stand out in distinguishing the two species. All character states recorded fall within the ranges of *C. bairdi*. The most consistent characters appeared to be pectoral fin ray counts (14-15 for *C. bairdi* vs 16-17 for *C. carolinae*), complete (*C. carolinae*) versus incomplete lateral line (*C. bairdi*), and presence of a distinct band on the caudal peduncle in *C. carolinae* which was absent in *C. bairdi*. At my request, Mike Hardman at the Illinois Natural History Survey examined the three specimens and determined that all three were, in fact, *C. bairdi*.

Deleting *E. spectabile*, *C. carolinae*, and *P. phoxocephala* from the species list brought the total of species collected from the Red River drainage to 83. Besides these three species, seven others were also not collected during this study. Seven American eels had been recorded in the river, but none had been caught since 1983. More intensive surveys of mainstem sites might reveal the presence of more eels, but it was likely that the presence

of multiple dams along the Kentucky River had blocked the migration of the eels up into tributaries such as the Red River.

Additional boat electrofishing sampling might also show the presence of four other species not found in this study. *Morone chrysops*, *Pomoxis nigromaculatus*, *Ichthyomyzon unicuspis*, and *Carpoides cyprinus* were all large river species that had been collected in very small numbers in the Red River. These species were common in the Kentucky River and it would not be surprising to occasionally collect individuals in larger tributaries.

Two other rare inhabitants in the Red River were *Ameiurus melas* and *Percina copelandi*. Only six *A. melas* had been collected in the drainage and the most recent collection was in 1989. All *Ameiurus* collected in this study were determined to be *A. natalis* because of a lack of pigment in the front barbels. Voucher specimens from Branson and Batch's (1974) study were examined and confirmed to be *A. melas*.

Only one specimen of *P. copelandi* had ever been recorded from the Red River drainage. This individual was collected by Ronald Cicerello of the KSNPC in 1996. The site (70) where this fish was found was thoroughly sampled in this study, but no additional specimens could be found.

In total, 79 fish species were collected in this two year study of the Red River drainage. All but seven of the 83 previously accurately recorded species were collected during the present study. This total also included three species that were previously unreported from the drainage.

A single individual of *Stizostedion vitreum* was found near the mouth of the Red River. This species was not uncommon in the Ohio River (Burr and Warren 1986) and could be expected as an occasional resident in most of the larger tributaries throughout the system. Two specimens of *Ichthyomyzon bdellium* were also collected, and represented an interesting find. The only other members of that genus previously found in the drainage were *I. fossor* and *I. unicuspis*, of which the latter could only be confused with *I. bdellium* which was discernible by having bicuspid teeth on the inner most row of the mouth; whereas, *I. unicuspis* had only single teeth. The appearance of this species in the drainage was not unusual because of the infrequency that larger river lampreys were collected.

The third new species record found in this study was *Fundulus catenatus*. Only one individual of this species was collected in the mainstem of the Red River at station 86. The specimen collected was a male in breeding coloration approximately 10 cm standard length. This specimen could

represent either an aquarium release or a bait-bucket release. Subsequent sampling at the same location did not reveal any further individuals. However, the presence of this species in the drainage should be carefully examined. It is an extremely hardy fish and can out compete many native species and has the capability of heavily populating a stream. In the Dix River system, for example, a study done by Branson and Batch in the late 1960's showed the species to be present at only one site in the drainage (Branson and Batch 1981). However, the same system is now dense with *F. catenatus*, including at sites where Branson and Batch sampled and did not collect any (pers. obs.).

Annotated List of Species

Petromyzontidae - lampreys

Ichthyomyzon bdellium (Jordan). Ohio lamprey.

Rare and sporadic in Kentucky and seldom taken in large numbers (Burr and Warren 1986). Found only in mainstem of the Red River near Campton, KY.

Previously: None.

Stations: 24(1 individual), 37(1).

Ichthyomyzon fossor Reighard and Cummins. Northern brook lamprey.

A state threatened species (KSNPC 1996). First found in

1981. Found only within DBNF prior to this study, but adults were collected at three sites outside the DBNF in this project.

Previously: 4 collections (3 sites) - 6 individuals.

Stations: 8. 24(1), 37(1), 47(1), 49(1), 70(1), 84(2),
86(1), 133(1).

Ichthyomyzon unicuspis Hubbs and Trautman. Silver lamprey.

Sporadic and rare in the Kentucky River (Burr and Warren 1986). Found only in 1966 in the Red River.

Previously: 1(1) - 6.

Stations: None.

Lampetra aepyptera (Abbott). Least brook lamprey.

The most common of the five lamprey species in the drainage. Previously recorded only within the DBNF, but found at four sites upstream of the boundary in this study.

Previously: 8(5) - 33.

Stations: 8. 74(1), 84(1), 89(3), 102(2), 119(1), 127(5),
132(2), 135(6).

Lampetra appendix (DeKay). American brook lamprey.

Sporadic and rare throughout the state and in the Kentucky River known only from the upper most sections and the Red River (Burr and Warren 1986). Prior to this study, not recorded in the Red River since 1979.

Previously: 2(2) - 6.

Stations: 5. 26(1), 37(3), 40(4), 47(4), 70(5).

Lepisosteidae - gars

Lepisosteus osseus (Linnaeus). Longnose gar.

A common big river species. Most records were from Kornman's muskellunge study in 1982-1983. Only six specimens collected in two collections since 1983. Local fisherman stated that gar were extremely abundant in the last few miles of the Red River (pers. comm).

Previously: 26(15) - 28.

Stations: 1. 2(1).

Hiodontidae - mooneyes

Hiodon tergisus Lesueur. Mooneye.

Another large river species sporadically collected from the lower mainstem pools of the Red River. All prior specimens recorded by Kornman in 1982-1983. Kornman listed only presence at some sites, so counts were not accurate for this and several other species.

Previously: 12(10) - 9.

Stations: 1. 3(1).

Anguillidae - freshwater eels

Anguilla rostrata (Lesueur). American eel.

Sporadic throughout large rivers in Kentucky (Burr and Warren 1986). Reported only by Branson and Batch (1

specimen) and Kornman in 1982-1983.

Previously: 20(12) - 7.

Stations: None.

Clupeidae - herrings and shad

Dorosoma cepedianum (Lesueur). Gizzard shad.

Very abundant throughout the state in big rivers and lakes (Burr and Warren 1986). Collected as far up as Swift Camp Creek in the mainstem. Previously not collected since 1983 due simply to a lack of sampling at lower mainstem sites. Two large schools of young-of-year collected in this study. Previously: 21(15) - 168.

Stations: 2. 1(250), 2(300).

Salmonidae - trouts

Oncorhynchus mykiss (Walbaum). Rainbow trout.

Stocked in Mill Creek Lake, Indian Creek system, Swift Camp Creek, and several other smaller streams in the DBNF (L.E. Kornman, pers. comm.).

Previously: 6(5) - 8.

Stations: 3. 76(2), 86(1), 106(1).

Salmo trutta (Linnaeus). Brown trout.

Stocked in Indian Creek and Parched Corn Creek (L.E. Kornman, pers. comm.).

Previously: 5(4) - 15.

Stations: 1. 72(6).

Salvelinus fontinalis (Mitchill). Brook trout.

Stocked occasionally in Indian Creek and Dog Fork of Swift Camp Creek, but not stocked in Parched Corn Creek (where it was common) since the 1950's (L.E. Kornman, pers. comm.).

Previously: 3(3) - 36.

Stations: 1. 100(4).

Esocidae - pikes

Esox masquinongy Mitchill. Muskellunge.

Occasionally stocked in the Red River (Kornman 1985), but sporadically captured. Anglers report excellent muskie fishing in the lower Red River (pers. comm.). Not recorded since 1983 prior to this study.

Previously: 20(11) - 5.

Stations: 1. 2(2).

Cyprinidae - carps and minnows

Campostoma anomalum (Rafinesque). Central stoneroller.

Fourth most common fish in the drainage. Collected at 115 of the 138 sites (Figure 4).

Previously: 136(82) - 2176.

Stations: 62. 6, 10, 11, 16-20, 22-24, 26-28, 30-32, 34, 36, 39-44, 46, 47, 52, 56, 59, 69, 69, 70-72, 76, 84-86, 89, 93-95, 104, 106, 109, 110, 116, 117, 119-121, 123-125, 129, 132, 133, 135, 137, 138.

Clinostomus elongatus (Kirtland). Redside dace.

Known only from Red River and very few tributaries of the Licking River (Burr and Warren 1986). Found only in pools of upper reaches of Edwards Branch, Gladie Creek, Parched Corn Creek, and Chimney Top Creek in Red River. First collected in 1981 by Kuehne.

Previously: 14(9) - 55.

Stations: 3. 85(1), 87(9), 95(10).

Cyprinella spiloptera (Cope). Spotfin shiner.

More common in historical data and found more often at smaller sites than *C. whipplei* to which it was very similar.

Previously: 49(33) - 254.

Stations: 28. 6,12,20-24,28,34,37,40,50,52,69-71,102,114,
116,117,119-121,123-125,127,135.

Cyprinella whipplei Girard. Steelcolor shiner.

Found almost exclusively at mainstem sites in the Red River.

Previously: 16(13) - 72.

Stations: 18. 6,21,22,26,28,30,34,46,47,49,59,69-71,89,119,
127,129.

Cyprinus carpio Linnaeus. Common carp.

Previously found only by Kornman in 1982 and 1983. Only collected in pools of mainstem sites below Gladie Creek.

Previously: 21(12) - 45.

Stations: 1. 2(3).

Ericymba buccata Cope. Silverjaw minnow.

Common throughout the eastern section of the state (Burr and Warren 1986) and throughout the Red River drainage.

Previously: 99(64) - 1103.

Stations: 53. 4,16,17,19,20,22-25,27,28,32,34,36,40,41,43,
44,46,47,50,56,67,69,71,76,84,86,89,93,94,95,
102,104,106-108,110,114,116,117,119-121,123-
125,127,132-135,137.

Erimystax dissimilis (Kirtland). Streamline chub.

Occasional and locally common throughout the southern and eastern parts of Kentucky (Red River was northern most population in state) (Burr and Warren 1986). Found only in pools of mainstem sites just above Campton to the mouth.

Previously: 5(4) - 15.

Stations: 2. 26(1), 34(2).

Hybopsis amblops (Rafinesque). Bigeye chub.

Very sporadic throughout the drainage. Found mostly at small to medium size sites (order 3-4). Less common now than historically.

Previously: 13(12) - 47.

Stations: 1. 71(1).

Luxilus chrysocephalus Rafinesque. Striped shiner.

The second most abundant species in the drainage found at 114 of the 138 sites.

Previously: 146(81) - 2782.

Stations: 65. 4, 6, 10-12, 16, 17, 19, 20, 22-26, 28, 30, 34, 36, 39-44, 46, 47, 49, 50, 52, 56, 59, 67, 69-72, 76, 84, 86, 89, 93-95, 102, 104, 106, 108-110, 114, 116, 117, 119-121, 123-125, 127, 129, 132-135, 137.

Lythrurus fasciolaris (Gilbert). Rosefin shiner.

Found primarily only in DBNF, except for populations in Lulbegrud and Hardwick creeks. Not found upstream of the DBNF. Locally abundant.

Previously: 47(30) - 1230.

Stations: 25. 6, 12, 16, 17, 19, 20, 22-24, 41-44, 49, 50, 52, 67, 72, 76, 84, 86, 93-95, 110.

Macrhybopsis storeriana (Kirtland). Silver chub.

A larger river species found only in pools of the mainstem at or below Middle Fork. This species appeared to be declining in abundance.

Previously: 7(6) - 54.

Stations: 7. 3(2), 21(1), 24(3), 26(1), 34(4), 37(4), 40(1).

Nocomis micropogon (Cope). River chub.

A common species in the eastern third of the state (Burr and Warren 1986). Found in large numbers and almost exclusively at mainstem sites in the Red River.

Previously: 65(35) - 615.

Stations: 28. 21,24,26,28,30,34,37,40,46,47,49,69-71,84,86,
89,93,94,102,104,106,116,117,119,121,123,132.

Notropis atherinoides Rafinesque. Emerald shiner.

An extremely common species in large rivers (Burr and Warren 1986). Almost exclusively limited to mainstem sites.

Previously: 45(29) - 657.

Stations: 33. 1-4,6,10,12,20-22,24-28,30,34,36,37,39,40,43,
46,47,49,50,69-71,84,110,123,135.

Notropis boops Gilbert. Bigeye shiner.

Found only in mainstem Lulbehrad Creek above Falls Branch in Red River drainage (Figure 5). First recorded in 1967.

More abundant in upper reaches of Lulbehrad Creek than lower sections. May possibly be result of stream capture event with headwaters of South Fork Licking River (P.A. Ceas, pers. comm.).

Previously: 5(3) - 78.

Stations: 3. 16(13), 17(373), 19(42).

Notropis ludibundus (Cope). Sand shiner.

Occurred primarily in Lulbehrad Creek and the DBNF, where it was found almost exclusively at mainstem sites.

Previously: 19(13) - 78.

Stations: 16. 12,22,24,46,50,69-71,84,86,93,94,102,104,123,
132.

Notropis photogenis (Cope). Silver shiner.

Commonly found mostly at larger mainstem sites in the drainage. Appeared to be less common than historically.

Previously: 46(31) - 295.

Stations: 3. 37(1), 50(5), 86(23).

Notropis rubellus (Agassiz). Rosyface shiner.

An abundant species in the eastern half of the state (Burr and Warren 1986) as well as in the drainage. The third most abundant species in the drainage.

Previously: 90(47) - 2555.

Stations: 38. 21,22,24,26,28,31,34,37,39,40,43,46,47,49,50,
52,59,69-71,84,86,89,93,94,102,104,110,114,
116,117,119,121,123,124,127,132,137.

Notropis volucellus (Cope). Mimic shiner.

A common species found primarily in the mainstem of the river except for the upper quarter.

Previously: 45(29) - 261.

Stations: 19. 21,24,34,37,39,46,47,49,50,69-71,76,86,94,
102,110,121,124.

Phoxinus erythrogaster (Rafinesque). Southern redbelly dace

A common inhabitant of small, headwater sites throughout the drainage except for above the DBNF boundary. Most abundant in the DBNF. Only one record from a mainstem site.

Previously: 39(28) - 421.

Stations: 16. 11, 32, 42, 56, 85, 87, 89, 95, 98, 100, 108, 114, 116,
120, 133.

Pimephales notatus (Rafinesque). Bluntnose minnow.

One of the most abundant and ubiquitous minnows in Kentucky (Burr and Warren 1986). The most common fish in the Red River drainage. Found at 115 of the 138 sites and recorded in 216 of the 297 collections in the drainage.

Previously: 142(79) - 3373.

Stations: 71. 4, 6, 10-12, 16-28, 30-32, 34, 36, 37, 39-44, 47, 49,
50, 52, 56, 59, 67, 69-72, 76, 84, 86, 89, 93-95, 102,
104, 106, 108-110, 114, 116, 117, 119-121, 123-125,
127, 129, 132-135, 137, 138.

Pimephales promelas Rafinesque. Fathead minnow.

Most common in the Bluegrass Physiographic Region of the state (Burr and Warren 1986). Sporadic and uncommon in the Red River drainage. Most records were from Branson and Batch in the 1960's.

Previously: 6(6) - 37.

Stations: 1. 6(1).

Rhinichthys atratulus (Hermann). Blacknose dace.

Found only in the DBNF and also above State Road Fork. Very abundant in small, headwater streams in the DBNF boundaries. Not recorded in drainage until 1985.

Previously: 25(20) - 138.

Stations: 20. 72,76,85,87,89,95,98,100,104,106-110,114,116,
133-135,138.

Semotilus atromaculatus (Mitchill). Creek chub.

The fifth most abundant species in the drainage. Found at 115 of the 138 sites and recorded in 192 of the 297 collections. Very abundant in headwater sites, but occasionally collected at mainstem sites.

Previously: 132(81) - 2099.

Stations: 59. 4,6,10,11,16-20,22,23,25,27,32,34-36,39,41-
44,46,52,56,59,67,72,76,85,87,89,93-95,98,
100,106-110,114,116,117,119-121,123-125,127,
129,132,135,137,138.

Catostomidae - suckers

Carpiodes cyprinus (Lesueur). Quillback.

Common in big rivers, such as the Kentucky River, throughout the state and occasional in upland streams and rivers (Burr and Warren 1986). Only three specimens recorded at two sites by Kornman in 1982 and 1983. Probably more common than records indicated.

Previously: 2(2) - 3.

Stations: None.

Catostomus commersoni (Lacepede). White sucker.

Common in small to medium-size streams throughout the state (Burr and Warren 1986). Common throughout the Red River

drainage. Absent from middle section of Red River and its tributaries in that area except for Middle and South Forks. Previously: 56(44) - 139.

Stations: 24. 11,16,19,36,41-44,67,72,76,87,89,98,106,109, 117,119,123,125,129,134,135,137.

Hypentelium nigricans (Lesueur). Northern hog sucker.

Widespread throughout the drainage. Common in both smaller streams and mainstem sites. Second most abundant sucker. Previously: 120 (69) - 433.

Stations: 52. 1,6,10,12,16,21,22,24,26-28,30,34,36,37,40-44,46,47,49,52,59,67,69-72,76,84,86,87,89,93, 102,106,108,116,117,119,121,123-125,127,129, 132,133,135,137.

Ictiobus bubalus (Rafinesque). Smallmouth buffalo.

A larger river species that was an occasional inhabitant of the lower reaches of smaller rivers such as the Red River (Burr and Warren 1986). Found only in mainstem sites in the lower one-third of the river except for one specimen recorded from Stillwater Creek by Branson and Batch. Prior to this study not recorded since 1983.

Previously: 7(6) - 14.

Stations: 2. 1(1), 2(1).

Minytrema melanops (Rafinesque). Spotted sucker.

Occasional and often common in Kentucky (Burr and Warren

1986). Occasional in the Red River primarily below Middle Fork, but never collected in large numbers at any site.

Previously: 16(13) - 28.

Stations: 4. 1(2), 3(1), 10(1).

Moxostoma anisurum (Rafinesque). Silver redhorse.

Sporadic in the eastern two-thirds of Kentucky (Burr and Warren 1986) as well as in the Red River drainage. Found only at mainstem sites from Swift Camp Creek to the mouth. All but 23 individuals from historical collections were from Kornman's (1985) muskie study.

Previously: 27(14) - 229.

Stations: 3. 2(1), 3(1), 34(1).

Moxostoma carinatum (Cope). River redhorse.

Sporadic to occasional in all major rivers in the state (Burr and Warren 1986). All historical records were from Kornman's (1985) muskie study. Only found in the Red River proper below Gladie Creek.

Previously: 13(9) - 13.

Stations: 3. 1(1), 2(1), 3(1).

Moxostoma duquesnei (Lesueur). Black redhorse.

Common and more abundant in collections above Middle Fork, but also present below. Primarily found at mainstem sites.

Previously: 40(25) - 174.

Stations: 14. 1, 6, 23, 26-28, 30, 52, 70, 71, 76, 117, 125, 129.

Moxostoma erythrurum (Rafinesque). Golden redbhorse.

Most common redbhorse in the state (Burr and Warren 1986) and the most common sucker in the Red River drainage.

Distribution was almost exclusively mainstem sites below Middle Fork.

Previously: 59(34) - 749.

Stations: 23. 1-4, 6, 12, 21, 22, 26, 28, 30, 34, 37, 40, 41, 43, 50, 69, 70, 84, 86, 94, 129.

Moxostoma macrolepidotum (Lesueur). Shorthead redbhorse.

Sporadic in the drainage. Primarily found in the Red River proper. Not recorded since 1985 prior to this study.

Previously: 20(15) - 69.

Stations: 2. 30(2), 69(1).

Ictaluridae - catfishes

Ameiurus melas (Rafinesque). Black bullhead.

Very rare in the drainage. Only six specimens recorded totally and only two since 1966. Occurred in slow waters over soft bottoms (Etnier and Starnes 1993).

Previously: 6(6) - 6.

Stations: None.

Ameiurus natalis (Lesueur). Yellow bullhead.

Uncommon occupant of the Red River, found primarily in tributaries in the lower half of the drainage. Habitat similar to *A. melas*. *Ameiurus natalis* was recorded more

often in this study than in historical data; whereas, *A. melas* occurred more often in the historical data.

Previously: 2(2) - 4.

Stations: 8. 4(1), 19(2), 21(2), 27(1), 36(3), 40(1),
41(2), 134(2).

Ictalurus punctatus (Rafinesque). Channel catfish.

Common in deeper waters in the lower Red River proper.

Most records were from Kornman's muskie (1985) study.

Previously: 21(16) - 30.

Stations: 3. 24(1), 26(1), 84(1).

Noturus flavus Rafinesque. Stonecat.

Generally distributed and common in the eastern half of the state (Burr and Warren 1986). Found in large riffles in the mainstem of the Red River and large tributaries primarily in the middle section of the drainage.

Previously: 8(8) - 13.

Stations: 11. 21(10), 22(3), 24(13), 26(1), 28(4), 30(2),
34(3), 47(2), 69(3), 70(3), 104(1).

Noturus miurus Jordan. Brindled madtom.

Often common throughout Kentucky (Burr and Warren 1986) and common in sandy pools in the main stem of the Red River from the mouth of Swift Camp Creek to the mouth of Lulbegrad Creek.

Previously: 30(18) - 74.

Stations: 20. 21, 24, 26, 28, 30, 34, 37, 40, 46, 47, 50, 52, 59, 69, 70,
84, 86, 93, 95, 102.

Pylodictis olivaris (Rafinesque). Flathead catfish.

Common throughout Kentucky (Burr and Warren). Sporadic in the Red River drainage. Collected only in large pools in the mainstem below Gladie Creek. All but two historical records were from Kornman's (1985) muskie study.

Previously: 5(4) - 8.

Stations: 1. 1(1).

Fundulidae - topminnows

Fundulus catenatus (Storer). Northern studfish.

Known only from the south-central part of the state and in the middle Licking River (Burr and Warren 1986). In the Kentucky River drainage, previously only recorded from the Dix River, never from the Red River drainage. Only one specimen reported in this study, from the mainstem of the river near Nada, KY.

Previously: None.

Stations 1. 86(1).

Poeciliidae - livebearers

Gambusia affinis (Baird and Girard). Mosquitofish.

Abundant in the western part of the state, where it was probably native. Eastern populations, including the Red River specimens were assumed to be the result of stocking

for mosquito control (Burr and Warren 1986). Sporadic in pools of the lower mainstem of the river.

Previously: 5(4) - 8.

Stations: 5. 28(1), 34(2), 40(1), 50(1), 70(1).

Atherinidae - silversides

Labidesthes sicculus (Cope). Brook silverside.

Generally distributed throughout the state (Burr and Warren 1986). Sporadic in the Red River, found mainly in large pools in the lower section of the mainstem.

Previously: 4(4) - 4.

Stations: 6. 1(4), 24(2), 26(1), 27(4), 30(1), 31(1).

Moronidae - temperate basses

Morone chrysops (Rafinesque). White bass.

Six specimens collected at two sites by Branson and Batch (1974) in 1967.

Previously: 2(2) - 6.

Stations: None.

Centrarchidae - sunfishes

Ambloplites rupestris (Rafinesque). Rockbass.

Generally distributed in the eastern two-thirds of the state (Burr and Warren 1986), and common throughout the Red River drainage. Might be less common now than in the historical data.

Previously: 76(48) - 265.

Stations: 22. 16,22,28,34,40,42,43,49,59,69,76,89,93,102,
117,120,123,125,132-134,137.

Lepomis cyanellus Rafinesque. Green sunfish.

Common throughout the state (Burr and Warren 1986) and also throughout the Red River drainage. Records seemed to indicate that this species might be increasing in abundance in the drainage in the last 30 years.

Previously: 32(26) - 84.

Stations: 40. 1,4,6,10,11,16,18-23,26,32,35-37,39-41,43,
44,47,49,52,76,87,96,109,117,119,121,123-
125,127,129,132,133,137.

Lepomis gulosus (Cuvier). Warmouth.

Uncommon in the drainage. Recorded primarily from the lower two-thirds of the main stem. Never collected in large numbers, with only one specimen caught per location.

Previously: 5(5) - 5.

Stations: 3. 10(1), 22(1), 30(1).

Lepomis macrochirus Rafinesque. Bluegill.

Generally distributed and abundant throughout the state (Burr and Warren 1986), as well as the Red River drainage.

Previously: 73(51) - 242.

Stations: 41. 1-4,6,10,11,16,17,20-22,25-28,30,34,36,37,
39-41,44,46,49,69,70,84,98,102,109,110,117,
119,123-125,129,137,138.

Lepomis megalotis (Rafinesque). Longear sunfish.

The most common sunfish in Kentucky streams and rivers (Burr and Warren 1986) and also in the Red River drainage.

Previously: 113(60) - 876.

Stations: 58. 1,2,4,6,10,12,16,17,19,21-28,30,31,34,36,37,
39-44,47,49,50,52,59,69-71,76,84,86,89,93,
102,104,116,117,119,120,123-125,127,129,132-
135,137,138.

Lepomis microlophus (Gunther). Redear sunfish.

Sporadic and uncommon in the state (Burr and Warren 1986).

Also sporadic in the Red River drainage. Not recorded since 1977 prior to this study.

Previously: 4(4) - 8.

Stations: 1. 6(1).

Micropterus dolomieu Lacepede. Smallmouth bass.

Common throughout the drainage, but most abundant in the confines of the Daniel Boone National Forest.

Previously: 77(47) - 176.

Stations: 38. 1,2,6,10,11,16,17,21,22,24-27,31,34,36,37,
40,46,47,49,69,70,84,86,102,106,109,117,120,
123,124,127,129,132,134,135,137.

Micropterus punctulatus (Rafinesque). Spotted bass.

Common in the mainstem of the Red River except for the upper quarter of the stream.

Previously: 58(32) - 113.

Stations: 38. 1, 2, 6, 10, 11, 16, 17, 21, 22, 24-27, 31, 34, 36, 37,
40, 46, 47, 49, 69, 70, 84, 86, 102, 106, 109, 117, 120,
123, 124, 127, 129, 132, 134, 135, 137.

Micropterus salmoides (Lacepede). Largemouth bass.

Found primarily at mainstem sites in the lower half of the Red River. Nearly all historical records were from Kornman's (1985) muskie study.

Previously: 23(17) - 29.

Stations: 7. 1(1), 3(1), 30(1), 32(3), 34(1), 36(1),
108(1).

Pomoxis annularis Rafinesque. White crappie.

Sporadic in the lower half of the Red River drainage. Recorded only at one site not located on the mainstem.

Previously: 8(8) - 19.

Stations: 2. 1(3), 2(1).

Pomoxis nigromaculatus (Lesueur). Black crappie.

Recorded once in the drainage in 1983 by Kornman (1985). No quantitative data reported, only presence of the species.

Previously: 1(1) - 0.

Stations: None.

Percidae - perches

Ammocrypta pellucida (Putnam). Eastern sand darter.

Sporadic and localized in the state (Burr and Warren 1986).

Listed as a species of special concern in Kentucky (KSNPC 1996). Locally abundant in sandy pools in the mainstem of the lower two-thirds of the Red River.

Previously: 13(8) - 71.

Stations: 9. 24(4), 26(6), 34(4), 37(5), 40(3), 46(10),
47(1), 69(1), 86(2).

Etheostoma baileyi Page and Burr. Emerald darter.

* Endemic in the middle Cumberland and upper Kentucky rivers (Burr and Warren 1986). Common in the Red River which represented its most northern range. Ubiquitous in the drainage, but most abundant within the confines of the Daniel Boone National Forest.

Previously: 83(45) - 473.

Stations: 43. 21,23,24,26,28,30,34,40,43,46,47,49,50,52,
59,67,69,70,72,76,84,86,87,89,93-95,102,104,
110,116,117,119-121,123,124,127,129,132,133,
135,137.

Etheostoma blennioides Rafinesque. Greenside darter.

Generally distributed and abundant in the state (Burr and Warren 1986) and the drainage.

Previously: 91(56) - 419.

Stations: 36. 10,12,16,17,21,22,24,26,28,30,31,40,43,47,
52,59,69-72,76,86,89,93-95,102,104,116,117,
121,123,127,132,135,137.

Etheostoma caeruleum Storer. Rainbow darter.

One of the most common darters in the drainage. Present throughout the Red River drainage except conspicuously absent from the upper quarter of the drainage. Most abundant in the Daniel Boone National Forest (DBNF).

Previously: 107(66) - 863.

Stations: 40. 6, 10, 16, 17, 19, 21-24, 26-28, 30-32, 34, 36, 39-44, 52, 56, 59, 67, 70-72, 76, 84-87, 89, 93-95, 104.

Etheostoma flabellare Rafinesque. Fantail darter.

Ubiquitous and abundant throughout the drainage.

Previously: 99(70) - 674.

Stations: 60. 4, 6, 10, 16-24, 26-28, 30, 31, 34, 36, 39-44, 47, 52, 56, 59, 67, 69, 70, 72, 76, 87, 89, 93-95, 100, 104, 106-109, 114, 116, 117, 119, 120, 123-125, 127, 132-135, 137, 138.

Etheostoma nigrum Rafinesque. Johnny darter.

Generally distributed and common in Kentucky (Burr and Warren 1986). One of the most common percids in the Red River drainage.

Previously: 109(75) - 733.

Stations: 53. 4, 6, 10, 11, 16, 19, 21, 23, 24, 26, 28, 30, 34, 37, 42, 43, 47, 50, 56, 67, 69-72, 76, 84-87, 89, 93-95, 102, 106-108, 110, 114, 116, 117, 119, 121, 123-125, 127, 129, 132-135, 137.

Etheostoma sagitta (Jordan and Swain). Arrow darter.

Endemic in the upper Kentucky and Cumberland rivers (Burr and Warren 1986). Not recorded in the Red River drainage until 1980. Prior to this study restricted to Rock Bridge Fork, a Swift Camp Creek tributary, in the Red River drainage. Two specimens found in this study in Swift Camp Creek approximately 400 meters below Rock Bridge Fork, but none found in Rock Bridge Fork. Listed as a species of special concern in Kentucky (KSNPC 1996).

Previously: 3(1) - 9.

Stations: 1. 106(2).

Etheostoma variatum Kirtland. Variegate darter.

Generally distributed and common in the upper Kentucky River (Burr and Warren 1986). Locally abundant in the Red River drainage. Almost exclusively restricted to DBNF streams.

Previously: 67(33) - 392.

Stations: 24. 21,24,26,28,30,31,34,40,46,47,49,50,52,59,
69,70,72,76,84,86,93,104,123,127.

Etheostoma zonale (Cope). Banded darter.

Occasional and locally common in the eastern two-thirds of the state (Burr and Warren 1986). Absent from the Kentucky River below the Red River. Most common in mainstem sites in the DBNF.

Previously: 59(33) - 507.

Stations: 29. 21,22,24,26,28,30,31,34,40,46,47,49,50,52,
59,69-71,84,86,93,102,104,116,117,119,121,
123,127.

Percina caprodes (Rafinesque). Logperch.

Common at mainstem sites in the lower three quarters of the drainage. One specimen was recorded in the extreme upper section (station 134) of the mainstem in this study.

Previously: 45(26) - 186.

Stations: 12. 1(1), 12(1), 16(6), 21(1), 22(2), 30(1),
37(1), 43(2), 47(2), 50(1), 69(2), 134(1).

Percina copelandi (Jordan). Channel darter.

Listed by Burr and Warren (1986) as sporadic and uncommon, and only shown to be present in Sturgeon Creek and above in the Kentucky River. The only specimen collected in the Red River drainage was reported by Cicerello (orig. unpub. sorting sheets) in 1996 at station 70. Revisiting this station in my study resulted in the collection of no additional individuals.

Previously: 1(1) - 1.

Stations: None.

Percina maculata (Girard). Blackside darter.

Common throughout the Red River drainage, but most abundant at DBNF mainstem sites. The most common *Percina* species.

Previously: 65(36) - 235.

Stations: 11. 21(1), 34(2), 40(2), 49(1), 70(1), 76(1),
116(1), 127(1), 133(1), 134(2), 135(1).

Percina oxyrhyncha (Hubbs and Raney). Sharpnose darter.

Sporadic and uncommon in the Kentucky River from the Red River upstream (Burr and Warren 1986). Very uncommon in the Red River. Found only at five mainstem sites from just above Middle Fork to just above Lulbegrud Creek.

Previously: 4(3) - 6.

Stations: 4. 21(1), 46(1), 47(1), 69(1).

Percina sciera (Swain). Dusky darter.

Occasional and common in the Kentucky River from the Red River and upstream (Burr and Warren 1986). Found almost exclusively in the Red River at mainstem sites below Swift Camp Creek. Not reported until 1981.

Previously: 27(16) - 68.

Stations: 18. 1,21,24,26-28,30,31,34,37,40,46,47,49,50,69,
70,86.

Percina shumardi (Girard). River darter.

Sporadic and uncommon in the state (Burr and Warren 1986). The only Kentucky River drainage records in Burr and Warren (1986) are from two stations in the Red River sampled by Branson and Batch (1974). It had also been found by Cicerello of KSNPC (orig. unpub. sorting sheets) in 1983 and 1996, as well as in this study. It has now been recorded

from four mainstem sites from the mouth of Black Creek to the mouth of the Red River.

Previously: 4(3) - 17.

Stations: 1. 26(1).

Percina stictogaster Burr and Page. Frecklebelly darter.

Endemic to Kentucky (Burr and Warren 1986). Prior to this study the species was collected only at sites within the DBNF, but one individual was found in the mainstem above Hardwick Creek. In the DBNF it was present at most sites except for those in the Middle and South forks.

Previously: 33(21) - 88.

Stations: 13. 24(1), 40(1), 43(2), 47(1), 59(1), 69(1),
70(5), 76(2), 84(1), 87(4), 89(2), 93(1),
100(1).

Stizostedion vitreum (Mitchill). Walleye.

Not recorded in the Red River drainage or in the Middle Kentucky River drainage (Burr and Warren 1986) until this study. One specimen collected boat shocking near the mouth of the Red River.

Previously: None.

Stations: 1. 3(1).

Sciaenidae - drums

Aplodinotus grunniens Rafinesque. Freshwater drum.

Occasional in medium-size streams and rivers in Kentucky

(Burr and Warren 1986). Found only in the Red River at mainstem sites from around the mouth of Middle Fork and below. All but one historical record came from Kornman's (1985) muskie study.

Previously: 15(10) - 33.

Stations: 2. 1(2), 2(2).

Cottidae - sculpins

Cottus bairdi Girard. Mottled sculpin.

Sporadic to occasional from the Kentucky River eastward (Burr and Warren 1986). Locally abundant in small streams in the Red River drainage. Common in the DBNF, but never collected at any site outside the boundaries of the forest (Figure 6).

Previously: 47(34) - 405.

Stations: 16. 59, 67, 70-72, 76, 85-87, 89, 93-95, 100, 104, 110.

Hybrids

Luxilus chrysocephalus x Notropis rubellus Minnow hybrid.

The most common cyprinid hybrid reported from the Red River. Except for two specimens, restricted to the DBNF. The hybrid was sympatric with both parent species at all sites at which it was collected.

Previously: 2(2) - 4.

Stations: 3. 76(1), 84(2), 127(2).

Clinostomus elongatus x *Phoxinus erythrogaster* Dace hybrid.

One specimen recorded in the drainage from Wolfpen Creek.

Previously: None.

Stations: 1. 87(1).

Lepomis macrochirus x *Lepomis megalotis* Sunfish hybrid.

Two specimens reported by Branson and Batch (1974) at station 71, at which both parent species had been recorded.

Kornman reported only sunfish hybrids, but not what the parent species might have been (Kornman 1985, KDFWR 1988, 1997). *Lepomis macrochirus* and *L. megalotis* had both been recorded from the sites at which he reported the hybrid.

Previously: 7(7) - 8.

Stations: 11. 1(1), 10(1), 11(2), 16(2), 17(1), 26(1),
37(1), 39(2), 123(1), 125(1), 129(15).

IBI

Index of Biotic Integrity scores were calculated for 80 sites in this study (Table 3). Judy Creek in Powell County received the lowest score (20 - Very Poor), and there were five perfect scores (60 - Excellent) in the drainage, four of which were on the mainstem of the river. The average score for the drainage was 50 which indicated an overall water quality rating of Good.

IBI scores were also calculated for data collected by Branson and Batch (1974) using 47 of their 48 sites (Table 1). The one site not analyzed was an incomplete collection due to high water. No percent DELT data existed for these sites, so percent DELTS were assumed zero for each of these sites and the metric was scored a five in each case. All sites during the current study scored fives for the percent DELTS metric. Therefore, Branson and Batch's data could then be compared to the data of this study.

The lowest score among Branson and Batch's sites was a 16 (Very Poor), the highest score was a 56 (Good/Excellent) found at six sites, and the average score was a 44.2 (Fair). However, the average score might be deceptively low, because it took into account scores for seven headwater sites with drainage areas of 1.5 square kilometer or less. At all but one of these sites, two or less species were collected. The IBI might not accurately represent the quality of such small headwater streams when so few species were collected. When the average was taken for the 40 sites with a drainage area of greater than three square kilometers the score for the basin increased to a 47.9 (Fair/Good). This was still lower than the average score (50) for the basin from the sites sampled in my study. However, there were 27 sites for which IBI scores were calculated for both studies. The average

IBI score for these sites during Branson and Batch's study was 48.2 (Fair/Good), and the average score for the more recent study at these same sites was a 48.9 (Good). This indicated that for these 27 sites based on the Index of Biotic Integrity scores, there was little to no change in the water quality of the Red River in the past 30 years.

Percent Abundance

Changes in the percent compositions of certain species in the Red River over the past 50 years indicated that there was some evidence of declining water quality. Several cyprinid species showed a distinct decline in abundance since 1948. This trend was best seen in *Erimystax dissimilis* (0.13% in 1970 to 0.045% in 1999), *Macrhybopsis storeriana* (0.38% to 0.175%), and *Hybopsis amblops* (0.33% to 0.12% (Figure 7). All three species had declined by at least 50% in abundance. These three minnows were all reliant upon clear water to obtain food (Etnier and Starnes 1997), which was indicated by the presence of two large eyes. This might indicate that the waters in the Red River drainage had increased in turbidity in the past 50 years. The sources of increased siltation include the loss of riparian edge due to growing residential areas, deforestation, and poor agricultural practices.

It had been documented that livestock grazing had resulted in considerable damage to streamside vegetation in not only the Red River basin, but throughout the United States (Armour, et al. 1991). Of the 150 million acres of land on which the Bureau of Land Management allowed grazing, 58% was in fair or poor condition (Armour, et al. 1991). Overgrazing and other poor management practices could result in increased erosion of the land which increased turbidity of streams and decreased the effectiveness of aquatic visual feeders.

This study also noted an increase in certain tolerant species and decline in intolerant species. These included the intolerant rock bass (*Ambloplites rupestris*) and the more tolerant green sunfish (*Lepomis cyanellus*). In collections made in the drainage before 1970, rock bass made up more than 1.1% of the total fish caught (Figure 8), while in all collections made to date, rock bass made up only 0.75% of the fish fauna of the Red River. Conversely, the percent abundance of green sunfish in the basin had risen 1000% from 0.05% before 1970 to 0.55% in all collections to date (Figure 8). It might be argued that this rise in abundance of green sunfish was due to the increased use of back-pack electrofishing, an effective method for collecting sunfish, but rock bass should have shown generally the same

trend. It appeared, however, that the reverse was true for the rock bass.

When examining the percent similarities of collections at single stations over the 50 year period, two stations showed strong trends over the time period. Stations 84 and 104 seemed to indicate that the fish composition of collections were most similar to that of collections closely related temporally. A 1997 collection at station 84, for example, was only 30.5% similar to a 1966 collection at the same station, 30.9% similar to a 1969 collection, 33.4% similar to a 1983 collection and 44.2% similar to a collection made in 1996. In the same way, a 1967 collection at station 104 decreased from 60.3% to 56.7% to 53.6% in similarity with collections made in 1978, 1987 and 1997, respectively. This trend, seen at several other sites also, but not as strongly, seemed to indicate changing fish compositions in the Red River since at least 1966. This examination, however, merely showed a change in composition, but not whether water quality had improved or worsened.

To determine if the changing fish fauna at the two sites represented positive or negative trends, Index of Biotic Integrity scores were calculated and compared for each collection at each of the two sites. The IBI scores for the five collections at station 84 were as following: 48

in 1966, 60 in 1969, 58 in 1983, 54 in 1996 and 60 in 1997. The scores for the four collections at station 104 were: 52 (1967), 50 (1978), 56 (1987) and 44 (1997). No trend in the change of water quality could be drawn from these data.

Future Study of the Red River

This project was designed to be a repeatable baseline survey of the fish diversity and overall health of the Red River system. With data from this study as a guideline, the water quality of the Red River drainage could be monitored in regular intervals to determine the damage of future impacts in the watershed, or possibly to measure improving water quality conditions over the next generations to come.

Shortly after the completion of the field work for this project in the spring of 1999, 1500 gallons of hydrochloric acid were spilled in the Middle Fork of the Red River along Highway 11 near the Natural Bridge State Park. Thousands of fish were killed, as well as many other forms of wildlife living in the stream (L.E. Kornman, pers. comm.). It is important that long term effects of events such as this are examined as well as the short term effects at the time of the impact. Therefore, in order to make this project as valuable as possible, further examinations of the fish fauna of the Red River drainage need to be conducted regularly.

Literature Cited

- Armour, C.L., D.A. Duff and W. Elmore. 1991. The effects of livestock grazing on riparian and stream ecosystems. American Fisheries Society. 16(1):7-11.
- Branson, Branley A. and D.L. Batch. 1974. Fishes of the Red River Drainage, Eastern Kentucky. The University Press of Kentucky, Lexington, KY. 67 pp.
- Branson, Branley A. and D.L. Batch. 1981. Fishes of the Dix River, Kentucky. Kentucky Nature Preserves Commission. Frankfort, KY. 26 pp.
- Burr, Brooks, M. and M.L. Warren. 1986. A Distributional Atlas of Kentucky Fishes. Kentucky Nature Preserves Commission. Frankfort, KY. 398 pp.
- Carter, James, P. 1970. Survey and Classification of Six Kentucky Streams. Kentucky Department of Fish and Wildlife Resources. Frankfort, KY.
- Etnier, David A. and W.C. Starnes. 1993. The Fishes of Tennessee. The University of Tennessee Press, TN. 681 pp.
- Greenberg, Larry A. and S. Steigerwald. 1981. New distributional record for *Etheostoma sagitta* in Kentucky. Trans. Ky. Acad. Sci. 42(1-2):37.
- Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant and I.J. Schlosser. 1986. Assessing biological integrity in running waters: A method and its rationale. Illinois Natural History Survey Special Publication 5. 28 pp.
- Kentucky Department of Fish and Wildlife Resources. 1986. Annual Performance Report for *Statewide Fisheries Management Project Part II of III Subsection II: Streams Research and Management.*
- Kentucky Department of Fish and Wildlife Resources. 1988. Annual Performance Report for *District Fisheries Management Project Part II of III Subsection II: Streams Research and Management.*
- Kentucky Department of Fish and Wildlife Resources. 1990. Annual Performance Report for *District Fisheries Management Project Part II of II Subsection II: Streams Research and Management.*

- Kentucky Department of Fish and Wildlife Resources. 1992. Annual Performance Report for *District Fisheries Management Project* Part II of II Subsection II: Streams Research and Management.
- Kentucky Department of Fish and Wildlife Resources. 1997. Annual Performance Report for *Statewide Fisheries Management*.
- Kentucky Division of Water. 1988. Fish Collection Catalogue of the Kentucky Division of Water (1976-1987). Water Quality Branch, Frankfort, KY.
- Kentucky Division of Water. 1997. Reference Reach Fish Community Report. Water Quality Branch, Frankfort, KY.
- Kentucky State Nature Preserves Commission. 1996. Rare and extirpated plants and animals of Kentucky. *Trans. Ky. Acad. Sci.* 57(2):69-91.
- Kornman, Lewis E. 1985. Muskellunge Streams Investigation in Red River, Station Camp Creek, and Sturgeon Creek. *Fisheries Bulletin of the Kentucky Department of Fish and Wildlife Resources.* Bulletin No. 77. Frankfort, KY.
- Pflieger, William L. 1997. *The Fishes of Missouri.* Conservation Commission of the State of Missouri, MO. 372 pp.
- Robison, Henry W. and T.M. Buchanan. 1992. *Fishes of Arkansas.* The University of Arkansas Press, Arkansas. 536 pp.

APPENDIX A.

Tables 1-6.

Table 1. Historical fish collections from the Red River.

SITE	STREAM	COLLECTOR	GROUP	DATE	METHOD	C ^a	IBI
1	Red River	Branson	EKU	10/12/67	NA	Y	48*
2	Red River	Kornman	KDFWR	7/20/82	BOAT EF	Y	
2	Red River	Kornman	KDFWR	7/3/83	BOAT EF	Y	
3	Red River	Branson	EKU	7/15/67	NA	Y	52*
4	Log Lick Cr	Branson	EKU	4/1/67	NA	Y	46*
5	Red River	Kornman	KDFWR	7/19/82	BOAT EF	Y	
5	Red River	Kornman	KDFWR	8/3/83	BOAT EF	Y	
7	Twin Creek	Branson	EKU	4/29/67	NA	Y	54*
8	Red River	Branson	EKU	7/1/67	NA	Y	54*
9	Lulbehrad Cr	Branson	EKU	4/1/67	NA	Y	36*
12	Lulbehrad Cr	Branson	EKU	11/3/67	NA	Y	56*
12	Lulbehrad Cr	Carter	KDFWR	7/9/69	NA	Y	
12	Lulbehrad Cr	KDOW	KDOW	8/11/98	BP EF	Y	58
13	Lulbehrad Cr	KSNPC	KSNPC	6/24/93	SEINE	Y	
13	Lulbehrad Cr	KSNPC	KSNPC	9/21/93	SEINE	Y	
14	Lulbehrad Cr	KSNPC	KSNPC	6/24/93	SEINE	Y	
14	Lulbehrad Cr	KSNPC	KSNPC	9/21/93	SEINE	Y	
15	Lulbehrad Cr	Cicerello	KSNPC	6/18/82	NaCN	Y	
15	Lulbehrad Cr	KSNPC	KSNPC	6/7/93	SEINE	Y	
15	Lulbehrad Cr	KSNPC	KSNPC	9/21/93	SEINE	Y	
16	Lulbehrad Cr	Branson	EKU	3/24/67	NA	Y	48*
20	Plum Cr	Branson	EKU	4/29/67	NA	Y	54*
21	Red River	Branson	EKU	6/18/67	NA	Y	44*
21	Red River	Carter	KDFWR	7/8/69	NA	Y	
21	Red River	Cicerello	KSNPC	7/26/83	NA	Y	
21	Red River	Cicerello	KSNPC	10/11/83	NA	Y	
21	Red River	KSNPC	KSNPC	10/4/96	SEINE	Y	
22	Hardwick Cr	Branson	EKU	5/13/67	NA	Y	54*
22	Hardwick Cr	Page	MISC	6/12/84	NA	Y	
22	Hardwick Cr	KDOW	KDOW	8/11/98	SEINE	Y	60
26	Red River	Branson	EKU	10/6/67	NA	Y	56*
27	Black Cr	Branson	EKU	11/3/67	NA	Y	44*
29	Red River	Kornman	KDFWR	7/14/82	BOAT EF	Y	
29	Red River	Kornman	KDFWR	8/2/83	BOAT EF	Y	
31	Hatton Cr	Branson	EKU	3/4/67	NA	Y	46*
31	Hatton Cr	Greenberg	MISC	7/31/80	NA	Y	
32	Hatton Cr	Warren	KSNPC	10/25/78	SEINE	Y	
33	Red River	Kornman	KDFWR	7/13/82	BOAT EF	Y	
33	Red River	Kornman	KDFWR	7/8/83	BOAT EF	Y	
34	Red River	Branson	EKU	6/10/67	NA	Y	56*
35	Judy Cr	Branson	EKU	3/4/67	NA	Y	26*
37	Red River	Branson	EKU	10/29/66	NA	N	
38	Red River	Kornman	KDFWR	7/12/82	BOAT EF	Y	
38	Red River	Kornman	KDFWR	7/6/83	BOAT EF	Y	
39	Hatcher Cr	Branson	EKU	12/17/66	NA	Y	50*
43	Cane Cr	Branson	EKU	10/29/66	NA	Y	54*
43	Cane Cr	Burr	MISC	3/16/93	NA	N	
43	Cane Cr	KDOW	KDOW	8/18/98	SEINE	Y	50
45	Anders Br	Burr	MISC	6/8/93	NA	N	
46	Red River	Branson	EKU	12/17/66	NA	N	28*
46	Red River	Kornman	KDFWR	6/25/82	BOAT EF	Y	
46	Red River	Burr	MISC	6/8/93	NA	Y	
47	Red River	Kornman	KDFWR	6/25/82	BOAT EF	Y	
47	Red River	Kornman	KDFWR	6/30/83	BOAT EF	Y	
47	Red River	KDOW	KDOW	5/3/85	SEINE	Y	
47	Red River	Ceas	MISC	9/6/97	SEINE	Y	
48	Red River	Kornman	KDFWR	6/25/82	BOAT EF	Y	
48	Red River	Kornman	KDFWR	6/30/82	BOAT EF	Y	

Table 1. (continued).

SITE	STREAM	COLLECTOR	GROUP	DATE	METHOD	C ^a	IBI
48	Red River	KSNPC	KSNPC	10/4/96	SEINE	Y	
49	Middle Fk	Branson	EKU	11/26/66	NA	Y	52*
50	Middle Fk	Greenberg	MISC	7/31/80	NA	Y	
50	Middle Fk	KDOW	KDOW	5/3/85	SEINE	Y	
50	Middle Fk	KDOW	KDOW	8/19/98	SEINE	Y	54
50	Middle Fk	KDOW	KDOW	9/22/98	BP EF, SEINE	Y	58
51	South Fk	Greenberg	MISC	7/29/80	NA	Y	
51	South Fk	KDOW	KDOW	8/3/85	SEINE	Y	
52	South Fk	Branson	EKU	11/26/66	NA	Y	52*
52	South Fk	KDOW	KDOW	5/2/85	SEINE	Y	
53	Sand Lick	KDOW	KDOW	8/20/98	BP EF, SEINE	Y	50
54	South Fk	KDOW	KDOW	8/20/98	SEINE	Y	54
55	South Fk	Greenberg	MISC	7/29/80	NA	Y	
55	South Fk	KDOW	KDOW	5/2/85	SEINE	Y	
57	Middle Fk	KDOW	KDOW	5/2/85	SEINE	Y	
58	Middle Fk	Branson	EKU	11/26/66	NA	Y	56*
58	Middle Fk	Greenberg	MISC	7/28/80	NA	Y	
59	Middle Fk	KDOW	KDOW	5/14/97	SEINE	Y	
60	Middle Fk	Mengel	MISC	6/26/48	NA	Y	
60	Middle Fk	Mengel	MISC	6/29/48	NA	Y	
60	Middle Fk	Mengel	MISC	7/1/48	NA	I	
60	Middle Fk	Kornman	KDFWR	10/2/87	BP EF	Y	
61	Middle Fk	Branson	EKU	7/9/66	NA	Y	46*
62	Middle Fk	Branson	EKU	7/2/66	NA	Y	40*
63	Mill Creek Lake	Branson	EKU	6/25/66	NA	Y	46*
64	Mill Creek	Branson	EKU	4/23/66	NA	Y	48*
64	Mill Creek	Branson	EKU	5/14/66	NA	Y	54*
64	Mill Creek	Branson	EKU	5/22/66	NA	Y	52*
64	Mill Creek	Schaff	MISC	6/13/67	NA	Y	
65	Tight Hollow	Branson	EKU	4/2/66	NA	Y	16*
65	Tight Hollow	Branson	EKU	4/2/66	NA	Y	24*
65	Tight Hollow	Branson	EKU	4/7/66	NA	Y	38*
66	Trib, Tight Hollow	Branson	EKU	2/26/66	NA	Y	18*
66	Trib, Tight Hollow	Branson	EKU	3/5/66	NA	Y	18*
66	Trib, Tight Hollow	Branson	EKU	3/10/66	NA	Y	32*
66	Trib, Tight Hollow	Branson	EKU	3/12/66	NA	Y	18*
67	Middle Fk	Branson	EKU	6/11/66	NA	Y	52*
67	Middle Fk	Carter	KDFWR	7/8/69	NA	Y	
67	Middle Fk	Kornman	KDFWR	10/2/87	BP EF	Y	
68	Red River	Kornman	KDFWR	6/25/82	BOAT EF	Y	
68	Red River	Kornman	KDFWR	6/30/83	BOAT EF	Y	
69	Red River	Branson	EKU	10/29/66	NA	Y	48*
69	Red River	Kornman	KDFWR	6/24/82	BOAT EF	Y	
69	Red River	Kornman	KDFWR	6/29/83	BOAT EF	Y	
70	Red River	Kornman	KDFWR	6/24/82	BOAT EF	Y	
70	Red River	KSNPC	KSNPC	8/5/96	SEINE	Y	
71	Indian Cr	Branson	EKU	5/27/66	NA	Y	56*
73	Leatherwood Fk	Kornman	KDFWR	7/31/85	BP EF	Y	
74	Indian Cr	Kornman	KDFWR	8/1/96	BP EF	N	
75	Indian Cr	Kornman	KDFWR	8/5/85	BP EF	Y	
76	East Fk Indian Cr	Kornman	KDFWR	7/5/85	BP EF	Y	
77	Powell Br	Kornman	KDFWR	7/30/85	BP EF	Y	
78	East Fk Indian Cr	Carter	KDFWR	7/7/69	NA	Y	
79	East Fk Indian Cr	Kornman	KDFWR	7/30/85	BP EF	Y	

Table 1. (continued).

SITE	STREAM	COLLECTOR	GROUP	DATE	METHOD	C ^a	IBI
79	East Fk Indian Cr	Kornman	KDFWR	8/20/91	BP EF	N	
80	Big Amos Cr	Kornman	KDFWR	8/16/91	BP EF	N	
81	Little Amos Cr	Kornman	KDFWR	8/16/91	BP EF	N	
82	East Fk Indian Cr	Kornman	KDFWR	9/21/89	BP EF	N	
82	East Fk Indian Cr	Kornman	KDFWR	7/31/96	BP EF	N	
83	East Fk Indian Cr	Kornman	KDFWR	4/5/92	NA	N	
84	Red River	Branson	EKU	10/29/66	NA	Y	48*
84	Red River	Carter	KDFWR	8/10/69	NA	Y	60*
84	Red River	Kornman	KDFWR	6/21/82	BOAT EF	Y	
84	Red River	Kornman	KDFWR	6/28/83	BOAT EF	Y	58*
84	Red River	KSNPC	KSNPC	8/1/96	SEINE	Y	54*
85	Edward Br	Kuehne	MISC	4/19/82	SEINE	N	
86	Red River	Warren	KSNPC	10/25/78	NA	Y	
86	Red River	Burr	MISC	11/23/80	NA	Y	
86	Red River	Burr	MISC	5/27/81	NA	Y	
86	Red River	Cicerello	KSNPC	8/11/88	NA	Y	
86	Red River	Taylor	MISC	3/24/98	NA	Y	
87	Wolfpen Cr	Kornman	KDFWR	7/2/85	BP EF	Y	
87	Wolfpen Cr	Kornman	KDFWR	9/12/89	BP EF	N	
88	Red River	Cooper	MISC	4/11/68	NA	N	
88	Red River	Kornman	KDFWR	6/23/82	BOAT EF	Y	
88	Red River	Kornman	KDFWR	7/1/83	BOAT EF	Y	
88	Red River	Page	MISC	10/19/92	NA	Y	
90	Chimney Top Cr	Kornman	KDFWR	9/13/89	BP EF	N	
91	Rt Fk Chimney Top	Kornman	KDFWR	7/5/85	BP EF	Y	
92	Chimney Top Cr	Kornman	KDFWR	7/5/85	BP EF	Y	
95	Salt Fork	Burr	MISC	1/9/84	NA	Y	
95	Salt Fork	Meade	MISC	5/4/84	NA	N	
95	Salt Fork	Kornman	KDFWR	7/3/85	BP EF	Y	
96	Dry Fork	Kornman	KDFWR	7/31/85	BP EF	Y	
96	Dry Fork	Kornman	KDFWR	9/12/91	BP EF	N	
97	Laurel Fork	Kornman	KDFWR	7/31/85	BP EF	Y	
97	Laurel Fork	Kornman	KDFWR	9/12/91	BP EF	N	
98	Gladie Cr	Kornman	KDFWR	8/5/85	BP EF	Y	
98	Gladie Cr	Kornman	KDFWR	8/13/91	BP EF	N	
99	Red River	Schaaf	MISC	4/15/67	NA	N	
99	Red River	Garcia	MISC	2/27/80	NA	N	
101	Parched Corn Cr	Kornman	KDFWR	7/3/85	BP EF	Y	
102	Red River	Branson	EKU	10/21/66	NA	Y	56*
103	Red River	Mengel	MISC	7/2/48	NA	Y	
103	Red River	Warren	KSNPC	6/17/78	NA	Y	
103	Red River	Warren	KSNPC	10/25/78	NA	Y	
103	Red River	Greenberg	MISC	7/30/80	NA	Y	
103	Red River	Haag	MISC	5/4/86	NA	N	
103	Red River	KSNPC	KSNPC	8/7/96	SEINE	N	
103	Red River	Page	MISC	9/28/96	NA	Y	
103	Red River	KDOW	KDOW	8/21/98	SEINE	Y	60
104	Swift Camp Cr	Branson	EKU	5/13/67	NA	Y	52*
104	Swift Camp Cr	Warren	KSNPC	6/17/78	NA	Y	50*
104	Swift Camp Cr	Kornman	KDFWR	9/9/87	BP EF	Y	56*
104	Swift Camp Cr	Surmount	MISC	10/9/87	NA	N	
104	Swift Camp Cr	Ceas	MISC	4/16/96	SEINE	N	
105	Dog Fork	Kornman	KDFWR	9/20/89	BP EF	N	
107	Rockbridge Fk	Greenberg	MISC	5/30/80	SEINE	N	
107	Rockbridge Fk	Kornman	KDFWR	7/3/85	BP EF	Y	
107	Rockbridge Fk	KSNPC	KSNPC	10/2/96	SEINE	Y	
111	Clifty Cr	Kornman	KDFWR	7/30/85	BP EF	Y	
112	Osborne Br	Kornman	KDFWR	7/16/85	BP EF	Y	
113	Clifty Cr	Kornman	KDFWR	7/16/85	BP EF	Y	
115	Red River	Branson	EKU	10/21/66	NA	Y	52*

Table 1. (continued).

SITE	STREAM	COLLECTOR	GROUP	DATE	METHOD	C ^a	IBI
115	Red River	Carter	KSNPC	8/11/69	NA	Y	
117	Stillwater Cr	Branson	EKU	5/27/66	NA	Y	26*
117	Stillwater Cr	KDOW	KDOW	8/18/98	SEINE	Y	56
118	Trace Fk	Smith	MISC	4/12/68	NA	Y	
121	Red River	Branson	EKU	10/21/66	NA	Y	50*
121	Red River	KDOW	KDOW	7/21/77	SEINE	Y	
121	Red River	KDOW	KDOW	7/26/77	SEINE	Y	
121	Red River	KDOW	KDOW	8/3/77	BP EF, SEINE	Y	
121	Red River	Warren	KSNPC	6/15/78	SEINE	Y	
121	Red River	Warren	KSNPC	10/25/78	NaCN	Y	
121	Red River	KDOW	KDOW	8/29/85	SEINE	N	
121	Red River	KDOW	KDOW	8/2/90	BP EF, SEINE	Y	
122	Red River	KDOW	KDOW	4/26/77	SEINE	Y	
122	Red River	KDOW	KDOW	7/21/77	SEINE	Y	
122	Red River	KDOW	KDOW	8/3/77	BP EF, SEINE	Y	
122	Red River	KDOW	KDOW	10/17/79	BP EF	Y	
122	Red River	KDOW	KDOW	10/15/80	BP EF, SEINE	Y	
122	Red River	KDOW	KDOW	8/4/81	BP EF	Y	
123	Red River	Branson	EKU	10/8/66	NA	Y	48*
124	Lacy Cr	KDOW	KDOW	7/21/77	SEINE	Y	
124	Lacy Cr	KDOW	KDOW	8/3/77	BP EF	Y	
126	Lacy Cr	KDOW	KDOW	7/21/77	SEINE	Y	
128	Gillmore Cr	KDOW	KDOW	7/20/77	SEINE	Y	
130	Gillmore Cr	KDOW	KDOW	7/20/77	SEINE	Y	
131	Red River	Page	MISC	5/16/84	NA	Y	
132	Red River	Branson	EKU	10/8/66	NA	Y	34*
134	Rose Fk	KDOW	KDOW	7/20/77	SEINE	Y	
134	Rose Fk	KDOW	KDOW	8/3/77	BP EF	Y	
136	Red River	Carter	KSNPC	7/10/69	NA	Y	
137	Red River	Branson	EKU	10/8/66	NA	Y	40*
138	Red River	KDOW	KDOW	7/20/77	SEINE	Y	

a = complete (y) or incomplete (n) collection information

* = no DELT data available, so automatic score of 5 given for metric

Table 2. Species checklist and abundance by historical collectors in the Red River system.

<u>Family</u>	EKU	KDFWR	KDOW	KSNPC	MISC	TOTAL
<u>Genus species</u>						
<u>Petromyzontidae</u>						
<i>Ichthyomyzon fossor</i>	0	0	3	0	3	6
<i>Ichthyomyzon unicuspis</i>	6	0	0	0	0	6
<i>Lampetra aepyptera</i>	1	10	0	0	22	33
<i>Lampetra appendix</i>	5	0	1	0	0	6
<u>Lepisosteidae</u>						
<i>Lepisosteus osseus</i>	2	21	0	5	0	28
<u>Anguillidae</u>						
<i>Anguilla rostrata</i>	1	6	0	0	0	7
<u>Clupeidae</u>						
<i>Dorosoma cepedianum</i>	46	120	0	2	0	168
<u>Hiodontidae</u>						
<i>Hiodon tergisus</i>	0	9	0	0	0	9
<u>Salmonidae</u>						
<i>Onchorhynchus mykiss</i>	4	4	0	0	0	8
<i>Salmo trutta</i>	0	15	0	0	0	15
<i>Salvelinus fontinalis</i>	0	36	0	0	0	36
<u>Esocidae</u>						
<i>Esox masquinongy</i>	0	5	0	0	0	5
<u>Cyprinidae</u>						
<i>Campostoma anomalum</i>	639	819	459	145	114	2176
<i>Clinostomus elongatus</i>	0	31	0	0	24	55
<i>Cyprinella spiloptera</i>	108	18	87	8	33	254
<i>Cyprinella whipplei</i>	21	0	17	15	19	72
<i>Cyprinus carpio</i>	0	45	0	0	0	45
<i>Ericymba buccata</i>	499	82	287	117	118	1103
<i>Erimystax dissimilis</i>	14	1	0	0	0	15
<i>Hybopsis amblops</i>	37	1	5	1	3	47
<i>Luxilus chrysocephalus</i>	817	556	960	150	299	2782
<i>Lythrurus fasciolaris</i>	617	60	446	59	48	1230
<i>Macrhybopsis storeriana</i>	45	6	0	3	0	54
<i>Nocomis micropogon</i>	194	42	204	74	101	615
<i>Notropis atherinoides</i>	267	41	201	134	14	657
<i>Notropis boops</i>	14	0	0	64	0	78
<i>Notropis ludibundus</i>	4	10	30	26	8	78
<i>Notropis photogenis</i>	160	54	20	21	40	295
<i>Notropis rubellus</i>	781	244	571	630	329	2555
<i>Notropis volucellus</i>	27	40	45	54	95	261
<i>Phoxinus erythrogaster</i>	188	174	0	22	37	421
<i>Pimephales notatus</i>	1148	935	605	410	275	3373
<i>Pimephales promelas</i>	36	X	0	0	1	37
<i>Rhinichthys atratulus</i>	0	134	0	2	2	138
<i>Semotilus atromaculatus</i>	476	1241	268	42	72	2099
<u>Catostomidae</u>						
<i>Carpiodes cyprinus</i>	0	3	0	0	0	3
<i>Catostomus commersoni</i>	62	57	9	11	0	139
<i>Hypentelium nigricans</i>	70	179	108	45	31	433
<i>Ictiobus bubalus</i>	4	10	0	0	0	14

Table 2. (continued).

<u>Family</u> <u>Genus species</u>	EKU	KDFWR	KDOW	KSNPC	MISC	TOTAL
<i>Minytrema melanops</i>	3	17	4	2	2	28
<i>Moxostoma anisurum</i>	0	223	0	1	5	229
<i>Moxostoma carinatum</i>	0	13	0	0	0	13
<i>Moxostoma duquesnei</i>	50	57	45	18	4	174
<i>Moxostoma erythrurum</i>	32	665	23	14	15	749
<i>Moxostoma macrolepidotum</i>	41	27	1	0	0	69
<u>Ictaluridae</u>						
<i>Ameiurus melas</i>	4	1	1	0	0	6
<i>Ameiurus natalis</i>	0	4	0	0	0	4
<i>Ictalurus punctatus</i>	17	12	0	1	0	30
<i>Noturus flavus</i>	2	1	1	7	2	13
<i>Noturus miurus</i>	16	14	4	20	20	74
<i>Pylodictis olivaris</i>	1	9	0	0	0	10
<u>Poeciliidae</u>						
<i>Gambusia affinis</i>	7	X	1	0	0	8
<u>Atherinidae</u>						
<i>Labidesthes sicculus</i>	1	1	1	1	0	4
<u>Moronidae</u>						
<i>Morone chrysops</i>	6	0	0	0	0	6
<u>Centrarchidae</u>						
<i>Ambloplites rupestris</i>	31	153	58	13	10	265
<i>Lepomis cyanellus</i>	4	43	23	10	4	84
<i>Lepomis gulosus</i>	1	2	1	0	1	5
<i>Lepomis macrochirus</i>	62	84	68	23	5	242
<i>Lepomis megalotis</i>	124	482	202	38	30	876
<i>Lepomis microlophus</i>	1	0	7	0	0	8
<i>Micropterus dolomieu</i>	26	77	47	19	7	176
<i>Micropterus punctulatus</i>	30	50	18	11	4	113
<i>Micropterus salmoides</i>	2	19	3	5	0	29
<i>Pomoxis annularis</i>	18	X	0	0	1	19
<i>Pomoxis nigromaculatus</i>	0	X	0	0	0	0
<u>Percidae</u>						
<i>Ammocrypta pellucida</i>	2	3	23	42	1	71
<i>Etheostoma baileyi</i>	99	50	191	61	72	473
<i>Etheostoma blennioides</i>	83	60	97	138	41	419
<i>Etheostoma caeruleum</i>	257	241	157	139	69	863
<i>Etheostoma flabellare</i>	191	197	101	143	42	674
<i>Etheostoma nigrum</i>	279	148	160	73	73	733
<i>Etheostoma sagitta</i>	0	3	0	5	1	9
<i>Etheostoma variatum</i>	125	19	108	75	65	392
<i>Etheostoma zonale</i>	43	41	191	155	77	507
<i>Percina caprodes</i>	56	97	2	26	5	186
<i>Percina copelandi</i>	0	0	0	1	0	1
<i>Percina maculata</i>	34	150	14	20	17	235
<i>Percina oxyrhyncha</i>	1	1	0	5	1	8
<i>Percina sciera</i>	0	16	12	30	10	68
<i>Percina shumardi</i>	5	0	0	12	0	17
<i>Percina stictogaster</i>	26	30	0	8	24	88

Table 2. (continued).

<u>Family</u>	EKU	KDFWR	KDOW	KSNPC	MISC	TOTAL
<u>Genus species</u>						
<u>Scianidae</u>						
<i>Aplodinotus grunniens</i>	1	32	0	0	0	33
<u>Cottidae</u>						
<i>Cottus bairdi</i>	71	320	1	2	14	408
<u>Hybrids</u>						
<i>Lepomis</i> hybrid	2	6	0	0	0	8
Cyprinid hybrid	0	0	0	4	2	6
<u>Other</u>						
<i>Moxostoma</i> sp.	0	0	12	0	0	12
Lamprey ammocoetes	0	11	13	1	1	26
Total species	66	74	49	55	51	83
Total individuals	8047	8388	5916	3163	2313	27827

X = no quantitative data; presence/absence only

Table 3. Red River system fish collection information for current study (1997-1999).

SITE	STREAM	DATE	METHOD	C ^a	IBI
1	Red River	9/26/98	BOAT EF, HNET, GNET	Y	36
1	Red River	10/5/98	BOAT EF	Y	42
2	Red River	9/26/98	BOAT EF	Y	40
3	Red River	9/26/98	BOAT EF, HNET, GNET	Y	36
4	Log Lick Cr	9/26/98	BP EF, SEINE	Y	42
6	Woodward Cr	10/15/98	BP EF	Y	50
10	Lulbegrud Cr	12/19/97	BP EF, SEINE	Y	50
11	Snow Cr	10/15/98	BP EF	Y	34
12	Lulbegrud Cr	9/26/98	BP EF, SEINE	Y	46
16	Lulbegrud Cr	10/15/98	BP EF	Y	56
17	N Br Lulbegrud Cr	6/17/98	BP EF, SEINE	Y	46
18	Trib, N Br Lulbegrud Cr	6/17/98	BP EF, SEINE	Y	34
19	Lulbegrud Cr	6/17/98	BP EF, SEINE	Y	44
20	Plum Cr	5/7/99	BP EF	Y	36
21	Red River	10/24/97	BP EF, SEINE	N	
21	Red River	11/8/97	BP EF, SEINE	N	
21	Red River	9/26/98	BP EF, SEINE	N	
21	Red River	11/22/98	BP EF	Y	44
21	Red River	8/17/98	SEINE	N	
22	Hardwick Cr	5/20/98	BP EF, SEINE	Y	60
23	Hardwick Cr	10/24/98	BP EF, SEINE	Y	44
24	Red River	11/9/98	BP EF, SEINE	Y	54
25	Brushy Cr	11/22/98	BP EF	Y	36
26	Red River	11/18/98	BARGE EF, SEINE	Y	58
27	Black Cr	10/11/98	BP EF, SEINE	Y	48
28	Red River	10/11/98	BP EF, SEINE	Y	56
30	Red River	10/24/98	BP EF, SEINE	Y	58
31	Hatton Cr	10/24/97	SEINE	N	
32	Hatton Cr	6/17/98	SEINE	Y	36
34	Red River	8/17/98	SEINE	Y	60
35	Judy Cr	9/3/98	SEINE	Y	20
36	Morris Cr	9/3/98	BP EF	Y	44
37	Red River	11/18/98	BARGE EF	Y	52
39	Hatcher Cr	6/17/98	BP EF, SEINE	Y	48
40	Red River	10/24/98	BP EF, SEINE	Y	60
41	Cat Cr	5/20/98	BP EF, SEINE	Y	42
42	Cat Cr	5/20/98	BP EF, SEINE	Y	46
43	Cane Cr	8/27/98	SEINE	Y	50
44	Lower Cane Cr	8/27/98	SEINE	Y	48
46	Red River	8/27/98	SEINE	Y	54
47	Red River	10/17/98	BP EF, SEINE	Y	56
49	Middle Fk	11/9/98	BP EF, SEINE	Y	56
50	Middle Fk	10/11/98	SEINE	Y	50
52	South Fk	4/7/99	BP EF	Y	56
56	South Fk	5/20/98	SEINE	Y	42
59	Middle Fk	10/25/97	BP EF, SEINE	Y	52
67	Middle Fk	10/11/98	BP EF, SEINE	Y	48
69	Red River	10/17/98	BP EF, SEINE	Y	60
70	Red River	10/17/98	BP EF, SEINE	Y	58
71	Indian Cr	11/8/97	BP EF, SEINE	Y	50
72	Indian Cr	5/19/98	BP EF, SEINE	Y	50
76	East Fk Indian Cr	5/19/98	BP EF, SEINE	Y	56
84	Red River	11/8/97	BP EF, SEINE	Y	60

Table 3. (continued).

SITE	STREAM	DATE	METHOD	C ^a	IBI
85	Edward Br	10/10/98	BP EF	Y	52
86	Red River	9/12/98	SEINE	Y	56
86	Red River	4/7/99	BP EF	N	
87	Wolfpen Cr	5/19/98	BP EF, SEINE	Y	52
87	Wolfpen Cr	2/12/99	BP EF	N	
87	Wolfpen Cr	4/7/99	BP EF	N	
89	Chimney Top Cr	10/10/98	BP EF	Y	56
93	Gladie Cr	5/4/99	SEINE	Y	52
94	Gladie Cr	4/10/99	SEINE	Y	44
95	Salt Fork	4/10/99	SEINE	Y	56
98	Gladie Cr	5/7/99	BP EF	Y	30
100	Parched Corn Cr	4/25/98	BP EF, SEINE	Y	52
102	Red River	10/25/97	BP EF, SEINE	Y	50
104	Swift Camp Cr	10/25/97	SEINE	Y	44
106	Swift Camp Cr	8/5/98	BP EF	Y	44
107	Rockbridge Fk	2/21/98	SEINE	N	
107	Rockbridge Fk	4/25/98	SEINE	N	
108	Swift Camp Cr	5/4/99	SEINE	Y	38
109	Swift Camp Cr	11/23/98	BP EF	Y	38
110	Clifty Cr	9/19/98	SEINE	Y	54
114	Big Calaboose Cr	9/19/98	SEINE	Y	48
116	Stillwater Cr	9/18/98	SEINE	Y	50
117	Stillwater Cr	11/22/98	BP EF	Y	56
119	Stillwater Cr	11/22/98	BP EF	Y	54
120	Stillwater Cr	11/22/98	BP EF	Y	40
121	Red River	9/18/98	SEINE	Y	46
123	Red River	10/3/98	BP EF, SEINE	Y	58
124	Lacy Cr	11/20/98	BP EF	Y	40
125	Lacy Cr	11/20/98	BP EF	Y	46
127	Red River	11/20/98	BP EF	Y	52
129	Gillmore Cr	11/20/98	BP EF	Y	46
132	Red River	10/3/98	BP EF, SEINE	Y	47
133	State Road Fork	11/20/98	BP EF	Y	50
134	Rose Fk	7/28/98	BP EF	Y	48
135	Red River	11/20/98	BP EF	Y	46
137	Red River	6/19/98	SEINE	N	
137	Red River	7/28/98	SEINE	Y	50
138	Red River	7/28/98	BP EF	Y	38

a = complete (y) or incomplete (n) collection made

Table 4a. Species checklist and abundance data for stations 1-17 in the Red River system (1997-1999).

Family											
Genus species	1	1	2	3	4	6	10	11	12	16	17
<u>Petromyzontidae</u>											
<i>Ichthyomyzon bdellium</i>											
<i>Ichthyomyzon fossor</i>											
<i>Lampetra aepyptera</i>											
<i>Lampetra appendix</i>											
<u>Lepisosteidae</u>											
<i>Lepisosteus osseus</i>			1								
<u>Clupeidae</u>											
<i>Dorosoma cepedianum</i>	250		300	18							
<u>Hiodontidae</u>											
<i>Hiodon tergisus</i>				1							
<u>Salmonidae</u>											
<i>Onchorhynchus mykiss</i>											
<i>Salmo trutta</i>											
<i>Salvelinus fontinalis</i>											
<u>Esocidae</u>											
<i>Esox masquinongy</i>			2								
<u>Cyprinidae</u>											
<i>Camptostoma anomalum</i>						5	3	1		24	34
<i>Clinostomus elongatus</i>									1		
<i>Cyprinella spiloptera</i>						1			1		
<i>Cyprinella whipplei</i>						1					
<i>Cyprinus carpio</i>			3								
<i>Ericymba buccata</i>					2					1	31
<i>Erimystax dissimilis</i>											
<i>Hybopsis amblops</i>											
<i>Luxilus</i>					6	11	1	1	1	10	9
<i>chrysocephalus</i>											
<i>Lythrurus fasciolaris</i>						2			83	8	61
<i>Macrhybopsis</i>				2							
<i>storeriana</i>											
<i>Nocomis micropogon</i>											
<i>Notropis atherinoides</i>	10		17	5	100	24	2		18		
<i>Notropis boops</i>										13	373
<i>Notropis ludibundus</i>									1		
<i>Notropis photogenis</i>											
<i>Notropis rubellus</i>											
<i>Notropis volucellus</i>											
<i>Phoxinus</i>								10			
<i>erythrogaster</i>											
<i>Pimephales notatus</i>					28	46	6	33	7	74	409
<i>Pimephales promelas</i>						1					
<i>Rhinichthys atratulus</i>											
<i>Semotilus</i>					1	4	1	9		14	12
<i>atromaculatus</i>											
<u>Catostomidae</u>											
<i>Catostomus commersoni</i>								1		1	
<i>Hypentelium nigricans</i>		1				1	3		3	16	
<i>Ictiobus bubalus</i>		1	1								
<i>Minytrema melanops</i>	1	1		1			1				
<i>Moxostoma anisurum</i>			1	1							
<i>Moxostoma carinatum</i>		1	1	1							
<i>Moxostoma duquesnei</i>	1					4					
<i>Moxostoma erythrurum</i>	2	3	2	2	3	4			1		
<i>Moxostoma</i>											
<i>macrolepidotum</i>											
<u>Ictaluridae</u>											
<i>Ameiurus natalis</i>					1						

Table 4a. (continued).

<u>Family</u>												
<u>Genus species</u>	1	1	2	3	4	6	10	11	12	16	17	
<i>Ictalurus punctatus</i>												
<i>Noturus flavus</i>												
<i>Noturus miurus</i>												
<i>Pylodictis olivaris</i>	1											
<u>Fundulidae</u>												
<i>Fundulus catenatus</i>												
<u>Poeciliidae</u>												
<i>Gambusia affinis</i>												
<u>Atherinidae</u>												
<i>Labidesthes sicculus</i>	3	1										
<u>Centrarchidae</u>												
<i>Ambloplites rupestris</i>											4	
<i>Lepomis cyanellus</i>		2			5	2	3	9			5	
<i>Lepomis gulosus</i>							1					
<i>Lepomis macrochirus</i>	6		2	3	6	6	6	5		5	2	
<i>Lepomis megalotis</i>		1	1		1	6	7		5	19	3	
<i>Lepomis microlophus</i>						1						
<i>Micropterus dolomieu</i>											3	
<i>Micropterus punctulatus</i>	6		1				5	3	1	1	2	
<i>Micropterus salmoides</i>	1			1								
<i>Pomoxis annularis</i>	1		1									
<u>Percidae</u>												
<i>Ammocrypta pellucida</i>												
<i>Etheostoma baileyi</i>												
<i>Etheostoma blennioides</i>							2		1	21	2	
<i>Etheostoma caeruleum</i>							5	9		16	9	
<i>Etheostoma flabellare</i>					2	7	25			8	125	
<i>Etheostoma nigrum</i>					1	3	2	2		8		
<i>Etheostoma sagitta</i>												
<i>Etheostoma variatum</i>												
<i>Etheostoma zonale</i>												
<i>Percina caprodes</i>		1							1	6		
<i>Percina maculata</i>												
<i>Percina oxyrhyncha</i>												
<i>Percina sciera</i>		1										
<i>Percina shumardi</i>												
<i>Percina stictogaster</i>												
<i>Stizostedion vitreum</i>				1								
<u>Sciaenidae</u>												
<i>Aplodinotus grunniens</i>	2		2									
<u>Cottidae</u>												
<i>Cottus bairdi</i>												
<u>Hybrids</u>												
<i>Lepomis hybrid</i>		1						1	2		2	1
<i>Cyprinid hybrid</i>												
<u>Larvae</u>												
<i>Lamprey ammocoetes</i>												
Total individuals	283	14	335	36	156	139	76	74	122	259	107	3
Total species	11	11	14	11	12	20	17	11	11	21	14	

Table 4b. Species checklist and abundance data for stations 18-24 in the Red River system (1997-1999).

Family	18	19	20	21	21	21	21	21	22	23	24
<u>Petromyzontidae</u>											
<i>Ichthyomyzon bdellium</i>											1
<i>Ichthyomyzon fossor</i>											1
<i>Lampetra aepyptera</i>											
<i>Lampetra appendix</i>											
<u>Lepisosteidae</u>											
<i>Lepisosteus osseus</i>											
<u>Clupeidae</u>											
<i>Dorosoma cepedianum</i>											
<u>Hiodontidae</u>											
<i>Hiodon tergisus</i>											
<u>Salmonidae</u>											
<i>Onchorhynchus mykiss</i>											
<i>Salmo trutta</i>											
<i>Salvelinus fontinalis</i>											
<u>Esocidae</u>											
<i>Esox masquinongy</i>											
<u>Cyprinidae</u>											
<i>Camptostoma anomalum</i>	25	23	2						1	7	10
<i>Clinostomus elongatus</i>			2				1		19	13	6
<i>Cyprinella spiloptera</i>				2			1		3		
<i>Cyprinella whipplei</i>						1					
<i>Cyprinus carpio</i>											
<i>Ericymba buccata</i>		51	2						5	6	1
<i>Erimystax dissimilis</i>											
<i>Hybopsis amblops</i>											
<i>Luxilus chrysocephalus</i>		5	4						3	17	10
<i>Lythrurus fasciolaris</i>		84	1						13	11	1
<i>Macrhybopsis storeriana</i>							1				3
<i>Nocomis micropogon</i>				3	2		1				32
<i>Notropis atherinoides</i>			5	146	22	2	4	29	55		308
<i>Notropis boops</i>		42									
<i>Notropis ludibundus</i>									2		1
<i>Notropis photogenis</i>											
<i>Notropis rubellus</i>							5		3		25
<i>Notropis volucellus</i>				75	1						2
<i>Phoxinus erythrogaster</i>											
<i>Pimephales notatus</i>	9	67	42	5	1	1	1	1	20	59	23
<i>Pimephales promelas</i>											
<i>Rhinichthys atratulus</i>											
<i>Semotilus atromaculatus</i>	15	20	3						2	2	
<u>Catostomidae</u>											
<i>Catostomus commersoni</i>		1									
<i>Hypentelium nigricans</i>						1			2		3
<i>Ictiobus bubalus</i>											
<i>Minytrema melanops</i>											
<i>Moxostoma anisurum</i>											
<i>Moxostoma carinatum</i>											
<i>Moxostoma duquesnei</i>											1
<i>Moxostoma erythrurum</i>						3			1		
<i>Moxostoma macrolepidotum</i>											
<u>Ictaluridae</u>											
<i>Ameiurus natalis</i>		2				2					

Table 4b. (continued).

<u>Family</u> <u>Genus species</u>	18	19	20	21	21	21	21	21	22	23	24
<i>Ictalurus punctatus</i>											1
<i>Noturus flavus</i>				1		6	1	2	3		13
<i>Noturus miurus</i>						1	1				1
<i>Pylodictis olivaris</i>											
<u>Fundulidae</u>											
<i>Fundulus catenatus</i>											
<u>Poeciliidae</u>											
<i>Gambusia affinis</i>											
<u>Atherinidae</u>											
<i>Labidesthes sicculus</i>											2
<u>Centrarchidae</u>											
<i>Ambloplites rupestris</i>									1		
<i>Lepomis cyanellus</i>	5	3	5	1		3			1	2	
<i>Lepomis gulosus</i>									1		
<i>Lepomis macrochirus</i>			3				1		1		
<i>Lepomis megalotis</i>		18				3			4	15	4
<i>Lepomis microlophus</i>										3	
<i>Micropterus dolomieu</i>											
<i>Micropterus punctulatus</i>						2			3		1
<i>Micropterus salmoides</i>											
<i>Pomoxis annularis</i>											
<u>Percidae</u>											
<i>Ammocrypta pellucida</i>											4
<i>Etheostoma baileyi</i>								1		1	1
<i>Etheostoma blennioides</i>				1	1		1	1	15		3
<i>Etheostoma caeruleum</i>		4					1	1	8	2	2
<i>Etheostoma flabellare</i>	25	65	2				3	1	7	2	5
<i>Etheostoma nigrum</i>		9		2			1			2	3
<i>Etheostoma sagitta</i>											
<i>Etheostoma variatum</i>				1			3	4			15
<i>Etheostoma zonale</i>				3		1	2	11	10		18
<i>Percina caprodes</i>							1		2		
<i>Percina maculata</i>							1				
<i>Percina oxyrhyncha</i>								1			
<i>Percina sciera</i>				2	2	2	4	1			25
<i>Percina shumardi</i>											
<i>Percina stictogaster</i>											1
<i>Stizostedion vitreum</i>											
<u>Sciaenidae</u>											
<i>Aplodinotus grunniens</i>											
<u>Cottidae</u>											
<i>Cottus bairdi</i>											
<u>Hybrids</u>											
<i>Lepomis hybrid</i>											
<i>Cyprinid hybrid</i>											
<u>Larvae</u>											
<i>Lamprey ammocoetes</i>											
Total individuals	79	394	71	242	29	28	33	53	185	143	526
Total species	5	14	11	12	6	13	18	11	25	15	31

Table 4c. Species checklist and abundance data for stations 25-37 in the Red River system (1997-1999).

Family	25	26	27	28	30	31	32	34	35	36	37
<u>Genus species</u>											
<u>Petromyzontidae</u>											
<i>Ichthyomyzon bdellium</i>											1
<i>Ichthyomyzon fossor</i>											1
<i>Lampetra aepyptera</i>											
<i>Lampetra appendix</i>		1									3
<u>Lepisosteidae</u>											
<i>Lepisosteus osseus</i>											
<u>Clupeidae</u>											
<i>Dorosoma cepedianum</i>											
<u>Hiodontidae</u>											
<i>Hiodon tergisus</i>											
<u>Salmonidae</u>											
<i>Onchorhynchus mykiss</i>											
<i>Salmo trutta</i>											
<i>Salvelinus fontinalis</i>											
<u>Esocidae</u>											
<i>Esox masquinongy</i>											
<u>Cyprinidae</u>											
<i>Camptostoma anomalum</i>		1	14	7	3	1	11	25		42	
<i>Clinostomus elongatus</i>				7				3			1
<i>Cyprinella spiloptera</i>				7	9			42			
<i>Cyprinella whipplei</i>		5		7							
<i>Cyprinus carpio</i>											
<i>Ericymba buccata</i>	2		7	8			47	1		1	
<i>Erimystax dissimilis</i>		1						2			
<i>Hybopsis amblops</i>											
<i>Luxilus chrysocephalus</i>	1	1		5	3			27		16	
<i>Lythrurus fasciolaris</i>											
<i>Macrhybopsis storeriana</i>		1						4			4
<i>Nocomis micropogon</i>		14		4	12			18			1
<i>Notropis atherinoides</i>	9	51	2	54	9			63		28	52
<i>Notropis boops</i>											
<i>Notropis ludibundus</i>											
<i>Notropis photogenis</i>											1
<i>Notropis rubellus</i>		1		16		1		14			3
<i>Notropis volucellus</i>								11			2
<i>Phoxinus erythrogaster</i>								13			
<i>Pimephales notatus</i>	1	30	12	48	4	7	21	10		21	31
<i>Pimephales promelas</i>											
<i>Rhinichthys atratulus</i>											
<i>Semotilus atromaculatus</i>	12		7					12	1	6	76
<u>Catostomidae</u>											
<i>Catostomus commersoni</i>										12	
<i>Hypentelium nigricans</i>		8	1	3	1			12		3	2
<i>Ictiobus bubalus</i>											
<i>Minytrema melanops</i>											
<i>Moxostoma anisurum</i>								1			
<i>Moxostoma carinatum</i>											
<i>Moxostoma duquesnei</i>		1	1	1	1						
<i>Moxostoma erythrurum</i>		5		2	1			7			6
<i>Moxostoma macrolepidotum</i>						2					
<u>Ictaluridae</u>											
<i>Ameiurus natalis</i>			1							3	

Table 4c. (continued).

<u>Family</u>	25	26	27	28	30	31	32	34	35	36	37
<u>Genus species</u>											
<i>Ictalurus punctatus</i>		1									
<i>Noturus flavus</i>		1		4	2			3			
<i>Noturus miurus</i>		3		3	1			3			3
<i>Pylodictis olivaris</i>											
<u>Fundulidae</u>											
<i>Fundulus catenatus</i>											
<u>Poeciliidae</u>											
<i>Gambusia affinis</i>				1				2			
<u>Atherinidae</u>											
<i>Labidesthes sicculus</i>		1	4		1	1					
<u>Centrarchidae</u>											
<i>Ambloplites rupestris</i>				1				1			
<i>Lepomis cyanellus</i>		1					2		6	11	6
<i>Lepomis gulosus</i>					1						
<i>Lepomis macrochirus</i>	3	1	12	1	2			1		9	6
<i>Lepomis megalotis</i>	2	13	8	3	5	1		3		13	17
<i>Lepomis microlophus</i>											
<i>Micropterus dolomieu</i>								1			
<i>Micropterus punctulatus</i>	1	2	2			6		2		3	1
<i>Micropterus salmoides</i>					1		3	1		1	
<i>Pomoxis annularis</i>											
<u>Percidae</u>											
<i>Ammocrypta pellucida</i>		6						4			5
<i>Etheostoma baileyi</i>		2		3	3			11			
<i>Etheostoma blennioides</i>		1		1	5	3					
<i>Etheostoma caeruleum</i>		1	3	2	11	1	7	2		2	
<i>Etheostoma flabellare</i>		5	1	7	5	1		5		7	
<i>Etheostoma nigrum</i>		3		5	2			2			2
<i>Etheostoma sagitta</i>											
<i>Etheostoma variatum</i>		5		5	5	8		11			
<i>Etheostoma zonale</i>		20		14	25	7		29			
<i>Percina caprodes</i>					1						1
<i>Percina maculata</i>								2			
<i>Percina oxyrhyncha</i>											
<i>Percina sciera</i>		20	1	9	15	1		2			7
<i>Percina shumardi</i>		1									
<i>Percina stictogaster</i>											
<i>Stizostedion vitreum</i>											
<u>Sciaenidae</u>											
<i>Aplodinotus grunniens</i>											
<u>Cottidae</u>											
<i>Cottus bairdi</i>											
<u>Hybrids</u>											
<i>Lepomis hybrid</i>		1									1
<i>Cyprinid hybrid</i>											
<u>Larvae</u>											
<i>Lamprey ammocoetes</i>				1							1
Total individuals	31	208	76	222	130	38	116	326	12	248	158
Total species	8	32	15	27	26	12	8	34	2	16	24

Table 4d. Species checklist and abundance data for stations 39-52 in the Red River system (1997-1999).

<u>Family</u>		39	40	41	42	43	44	46	47	49	50	52
<u>Genus species</u>												
<u>Petromyzontidae</u>												
<i>Ichthyomyzon bdellium</i>									1	1		
<i>Ichthyomyzon fossor</i>												
<i>Lampetra aepyptera</i>												
<i>Lampetra appendix</i>			4						1			
<u>Lepisosteidae</u>												
<i>Lepisosteus osseus</i>												
<u>Clupeidae</u>												
<i>Dorosoma cepedianum</i>												
<u>Hiodontidae</u>												
<i>Hiodon tergisus</i>												
<u>Salmonidae</u>												
<i>Onchorhynchus mykiss</i>												
<i>Salmo trutta</i>												
<i>Salvelinus fontinalis</i>												
<u>Esocidae</u>												
<i>Esox masquinongy</i>												
<u>Cyprinidae</u>												
<i>Camptostoma anomalum</i>	18	18	6	3	10	25	1	5				14
<i>Clinostomus elongatus</i>		2									3	3
<i>Cyprinella spiloptera</i>												
<i>Cyprinella whipplei</i>								1	12	10		
<i>Cyprinus carpio</i>												
<i>Ericymba buccata</i>		3	10		6	2	1	5			5	
<i>Erimystax dissimilis</i>												
<i>Hybopsis amblops</i>												
<i>Luxilus</i>	1	3	8	6	45	54	2	3	16	27	12	
<i>chryscephalus</i>												
<i>Lythrurus fasciolaris</i>			2	1	33	7			3	6	5	
<i>Macrhybopsis</i>		1										
<i>storeriana</i>												
<i>Nocomis micropogon</i>			5					4	7	1		
<i>Notropis atherinoides</i>	4	66			1			31	34	43	101	
<i>Notropis boops</i>												
<i>Notropis ludibundus</i>								1			1	
<i>Notropis photogenis</i>											5	
<i>Notropis rubellus</i>	2	8			1		18	25	2	7	3	
<i>Notropis volucellus</i>	1						1	2	3	3		
<i>Phoxinus</i>				1								
<i>erythrogaster</i>												
<i>Pimephales notatus</i>	3	12	13	7	25	24			4	22	8	17
<i>Pimephales promelas</i>												
<i>Rhinichthys atratulus</i>												
<i>Semotilus</i>	7		3	5	4	7	2					5
<i>atromaculatus</i>												
<u>Catostomidae</u>												
<i>Catostomus commersoni</i>			1	1	1	2						
<i>Hypentelium nigricans</i>		3	1	2	3	3	2	3	2			10
<i>Ictiobus bubalus</i>												
<i>Minytrema melanops</i>					1							
<i>Moxostoma anisurum</i>												
<i>Moxostoma carinatum</i>												
<i>Moxostoma duquesnei</i>												4
<i>Moxostoma erythrurum</i>		4	2		2						15	
<i>Moxostoma</i>												
<i>macrolepidotum</i>												
<u>Ictaluridae</u>												
<i>Ameiurus natalis</i>		1	2									

Table 4d. (continued).

<u>Family</u>	39	40	41	42	43	44	46	47	49	50	52
<u>Genus species</u>											
<i>Ictalurus punctatus</i>								2			
<i>Noturus flavus</i>								1		2	1
<i>Noturus miurus</i>		5					5				
<i>Pylodictis olivaris</i>											
<u>Fundulidae</u>											
<i>Fundulus catenatus</i>											
<u>Poeciliidae</u>											
<i>Gambusia affinis</i>		1								1	
<u>Atherinidae</u>											
<i>Labidesthes sicculus</i>											
<u>Centrarchidae</u>											
<i>Ambloplites rupestris</i>		1		2	2				1		
<i>Lepomis cyanellus</i>	1	2	3		8	12		3	1		1
<i>Lepomis gulosus</i>											
<i>Lepomis macrochirus</i>	1	2	2			1	1		3		
<i>Lepomis megalotis</i>	1	6	3	3	10	14		7	3	6	8
<i>Lepomis microlophus</i>											
<i>Micropterus dolomieu</i>	2	1		1		2					2
<i>Micropterus punctulatus</i>		2									
<i>Micropterus salmoides</i>											
<i>Pomoxis annularis</i>											
<u>Percidae</u>											
<i>Ammocrypta pellucida</i>		3					10	1			
<i>Etheostoma baileyi</i>		14			3		4	8	3	4	14
<i>Etheostoma blennioides</i>		2			2			12			1
<i>Etheostoma caeruleum</i>	9	6	4	5	5	1					21
<i>Etheostoma flabellare</i>	2	7	8	5	4	1		1			7
<i>Etheostoma nigrum</i>				3	5			1		1	
<i>Etheostoma sagitta</i>											
<i>Etheostoma variatum</i>		4					4	15	1	1	6
<i>Etheostoma zonale</i>		16					10	17	2	2	2
<i>Percina caprodes</i>					2			2		1	
<i>Percina maculata</i>		2							1		
<i>Percina oxyrhyncha</i>							1	1			
<i>Percina sciera</i>		21					10	11	7	4	
<i>Percina shumardi</i>											
<i>Percina stictogaster</i>		1			2			1			
<i>Stizostedion vitreum</i>											
<u>Sciaenidae</u>											
<i>Aplodinotus grunniens</i>											
<u>Cottidae</u>											
<i>Cottus bairdi</i>											
<u>Hybrids</u>											
<i>Lepomis hybrid</i>	2										
<i>Cyprinid hybrid</i>											
<u>Larvae</u>											
<i>Lamprey ammocoetes</i>											
Total individuals	54	226	68	45	175	155	111	188	126	204	136
Total species	14	31	15	14	22	14	20	28	20	20	19

Table 4e. Species checklist and abundance data for stations 56-86 in the Red River system (1997-1999).

Family	Genus species	56	59	67	69	70	71	72	76	84	85	86	86
<u>Petromyzontidae</u>													
	<i>Ichthyomyzon bdellium</i>					1				2			1
	<i>Ichthyomyzon fossor</i>						1			1			
	<i>Lampetra aepyptera</i>												
	<i>Lampetra appendix</i>					5							
<u>Lepisosteidae</u>													
	<i>Lepisosteus osseus</i>												
<u>Clupeidae</u>													
	<i>Dorosoma cepedianum</i>												
<u>Hiodontidae</u>													
	<i>Hiodon tergisus</i>												
<u>Salmonidae</u>													
	<i>Onchorhynchus mykiss</i>								2				1
	<i>Salmo trutta</i>							6					
	<i>Salvelinus fontinalis</i>												
<u>Esocidae</u>													
	<i>Esox masquinongy</i>												
<u>Cyprinidae</u>													
	<i>Camptostoma anomalum</i>	3	34	12	19	49	5	2	6	1	2	7	
	<i>Clinostomus elongatus</i>				6	3	2				1		
	<i>Cyprinella spiloptera</i>					4	1						
	<i>Cyprinella whipplei</i>		1		33	4							
	<i>Cyprinus carpio</i>												
	<i>Ericymba buccata</i>	4		8	1		6		1	2			42
	<i>Erimystax dissimilis</i>												
	<i>Hybopsis amblops</i>						1						
	<i>Luxilus</i>	6	17	23	11	11	28	10	16	10			58
	<i>chrysocephalus</i>												
	<i>Lythrurus fasciolaris</i>			10				1	16	1			21
	<i>Macrhybopsis</i>												
	<i>storeriana</i>												
	<i>Noconis micropogon</i>				26	31	5			20			12
	<i>Notropis atherinoides</i>				58	30	4			21			
	<i>Notropis boops</i>												
	<i>Notropis ludibundus</i>				2	1	5			9			17
	<i>Notropis photogenis</i>												22
	<i>Notropis rubellus</i>		5		29	31	6			61			42
	<i>Notropis volucellus</i>				15	9	2		5				3
	<i>Phoxinus</i>	7									16		
	<i>erythrogaster</i>												
	<i>Pimephales notatus</i>	2	23	10	9	8	27	3	11	3			9
	<i>Pimephales promelas</i>												
	<i>Rhinichthys atratulus</i>							2	3				12
	<i>Semotilus</i>	5	1	6				16	3				15
	<i>atromaculatus</i>												
<u>Catostomidae</u>													
	<i>Catostomus commersoni</i>			1				1	1				
	<i>Hypentelium nigricans</i>		7	2	3	2	4	1	3	7			8
	<i>Ictiobus bubalus</i>												
	<i>Minytrema melanops</i>												
	<i>Moxostoma anisurum</i>												
	<i>Moxostoma carinatum</i>												
	<i>Moxostoma duquesnei</i>					1	5		2				
	<i>Moxostoma erythrum</i>				1	2				2			11
	<i>Moxostoma</i>				1								
	<i>macrolepidotum</i>												
<u>Ictaluridae</u>													
	<i>Ameiurus natalis</i>												

Table 4e. (continued).

<u>Family</u>		56	59	67	69	70	71	72	76	84	85	86	86
<u>Genus species</u>													
<i>Ictalurus punctatus</i>										1			
<i>Noturus flavus</i>					3	3							
<i>Noturus miurus</i>		2			2	4				2		2	1
<i>Pylodictis olivaris</i>													
<u>Fundulidae</u>													
<i>Fundulus catenatus</i>												1	
<u>Poeciliidae</u>													
<i>Gambusia affinis</i>						1							
<u>Atherinidae</u>													
<i>Labidesthes sicculus</i>													
<u>Centrarchidae</u>													
<i>Ambloplites rupestris</i>		1			1				3				
<i>Lepomis cyanellus</i>									1				
<i>Lepomis gulosus</i>													
<i>Lepomis macrochirus</i>					1	1				2			
<i>Lepomis megalotis</i>		1			7	10	7		2	7		10	
<i>Lepomis microlophus</i>													
<i>Micropterus dolomieu</i>		3					2		1	2		1	
<i>Micropterus</i> <i>punctulatus</i>					1	3				1		2	
<i>Micropterus salmoides</i>													
<i>Pomoxis annularis</i>													
<u>Percidae</u>													
<i>Ammocrypta pellucida</i>					1								2
<i>Etheostoma baileyi</i>		24	2	13	22		3	2	8			11	2
<i>Etheostoma</i> <i>blennioides</i>		1		4	4	4	2	4				3	
<i>Etheostoma caeruleum</i>		3	19	15	2	2	13	8	15	1	4	1	
<i>Etheostoma flabellare</i>		11	2	6		2		4	14				
<i>Etheostoma nigrum</i>		1		2	5	4	6	3	4	3	1	9	
<i>Etheostoma sagitta</i>													
<i>Etheostoma variatum</i>			1		22	14		3	6	2		13	
<i>Etheostoma zonale</i>			5		28	23	2			3		23	
<i>Percina caprodes</i>					3								
<i>Percina maculata</i>						1			1				
<i>Percina oxyrhyncha</i>													
<i>Percina sciera</i>					10	20						1	
<i>Percina shumardi</i>													
<i>Percina stictogaster</i>			1			5			2	1			
<i>Stizostedion vitreum</i>													
<u>Sciaenidae</u>													
<i>Aplodinotus grunniens</i>													
<u>Cottidae</u>													
<i>Cottus bairdi</i>			1	15		1	3	7	12		7	1	1
<u>Hybrids</u>													
<i>Lepomis hybrid</i>									1	2			
<i>Cyprinid hybrid</i>					3								
<u>Larvae</u>													
<i>Lamprey ammocoetes</i>					1	1		1	5				
Total individuals		42	149	112	321	309	139	73	142	175	58	332	10
Total species		9	19	13	31	33	22	17	27	26	8	26	8

Table 4f. Species checklist and abundance data for stations 87-106 in the Red River system (1997-1999).

Family	87	87	87	89	93	94	95	98	100	102	104	106
<u>Petromyzontidae</u>												
<i>Ichthyomyzon bdellium</i>												
<i>Ichthyomyzon fossor</i>												
<i>Lampetra aepyptera</i>				3						2		
<i>Lampetra appendix</i>												
<u>Lepisosteidae</u>												
<i>Lepisosteus osseus</i>												
<u>Clupeidae</u>												
<i>Dorosoma cepedianum</i>												
<u>Hiodontidae</u>												
<i>Hiodon tergisus</i>												
<u>Salmonidae</u>												
<i>Onchorhynchus mykiss</i>												1
<i>Salmo trutta</i>												
<i>Salvelinus fontinalis</i>									4			
<u>Esocidae</u>												
<i>Esox masquinongy</i>												
<u>Cyprinidae</u>												
<i>Camptostoma anomalum</i>				8	4	1	6				2	11
<i>Clinostomus elongatus</i>	8	1					10					
<i>Cyprinella spiloptera</i>										3		
<i>Cyprinella whipplei</i>				1								
<i>Cyprinus carpio</i>												
<i>Ericymba buccata</i>				1	1	4	2			1	12	10
<i>Erimystax dissimilis</i>												
<i>Hybopsis amblops</i>												
<i>Luxilus chrysocephalus</i>				22	5	3	17			2	11	3
<i>Lythrurus fasciolaris</i>					1	7	1					
<i>Macrhybopsis storeriana</i>												
<i>Nocomis micropogon</i>				13	5	2				14	5	4
<i>Notropis atherinoides</i>												
<i>Notropis boops</i>												
<i>Notropis ludibundus</i>					6	8				1	4	
<i>Notropis photogenis</i>												
<i>Notropis rubellus</i>				29	14	5				4	28	
<i>Notropis volucellus</i>							17			3		
<i>Phoxinus erythrogaster</i>	30	2		1			19	29	1			
<i>Pimephales notatus</i>				21	4	5	1			22	42	45
<i>Pimephales promelas</i>												
<i>Rhinichthys atratulus</i>	7	1	2	5			4	11	6		1	17
<i>Semotilus atromaculatus</i>	7			22	1	4	16	33	17			6
<u>Catostomidae</u>												
<i>Catostomus commersoni</i>	2			1				12				8
<i>Hypentelium nigricans</i>	1		1	3	1					3		6
<i>Ictiobus bubalus</i>												
<i>Minytrema melanops</i>												
<i>Moxostoma anisurum</i>												
<i>Moxostoma carinatum</i>												
<i>Moxostoma duquesnei</i>												
<i>Moxostoma erythrurum</i>						1						
<i>Moxostoma macrolepidotum</i>												
<u>Ictaluridae</u>												
<i>Ameiurus natalis</i>												

Table 4f. (continued).

<u>Family</u>		87	87	87	89	93	94	95	98	100	102	104	106
<u>Genus species</u>													
<i>Ictalurus punctatus</i>												1	
<i>Noturus flavus</i>													1
<i>Noturus mirus</i>						1		1			2		
<i>Pylodictis olivaris</i>													
<u>Fundulidae</u>													
<i>Fundulus catenatus</i>													
<u>Poeciliidae</u>													
<i>Gambusia affinis</i>													
<u>Atherinidae</u>													
<i>Labidesthes sicculus</i>													
<u>Centrarchidae</u>													
<i>Ambloplites rupestris</i>					2	1					2		
<i>Lepomis cyanellus</i>	1								1				
<i>Lepomis gulosus</i>													
<i>Lepomis macrochirus</i>									3		2		
<i>Lepomis megalotis</i>					5	3					15	2	
<i>Lepomis microlophus</i>													
<i>Micropterus dolomieu</i>											3		
<i>Micropterus punctulatus</i>											2		2
<i>Micropterus salmoides</i>													
<i>Pomoxis annularis</i>													
<u>Percidae</u>													
<i>Ammocrypta pellucida</i>													
<i>Etheostoma baileyi</i>	1				3	19	12	1			7	10	
<i>Etheostoma blennioides</i>					2	1	2	1			4	1	
<i>Etheostoma caeruleum</i>	4				7	7	11	27				4	
<i>Etheostoma flabellare</i>	2				1	3	3	1		1		2	6
<i>Etheostoma nigrum</i>	2		2		12	3	4	6			1		4
<i>Etheostoma sagitta</i>													2
<i>Etheostoma variatum</i>						5						3	
<i>Etheostoma zonale</i>						2					2	1	
<i>Percina caprodes</i>													
<i>Percina maculata</i>													
<i>Percina oxyrhyncha</i>													
<i>Percina sciera</i>													
<i>Percina shumardi</i>													
<i>Percina stictogaster</i>	4				2	1				1			
<i>Stizostedion vitreum</i>													
<u>Sciaenidae</u>													
<i>Aplodinotus grunniens</i>													
<u>Cottidae</u>													
<i>Cottus bairdi</i>	4		4		9	3	3	5		8		1	
<u>Hybrids</u>													
<i>Lepomis hybrid</i>													
<i>Cyprinid hybrid</i>			1										
<u>Larvae</u>													
<i>Lamprey ammocoetes</i>	1				2					1			
Total individuals	74	5	9	175	91	92	118	89	39	95	130	125	
Total species	14	4	4	23	22	17	16	6	8	20	17	14	

Table 4g. Species checklist and abundance data for stations 107-124 in the Red River system (1997-1999).

Family	107	108	109	110	114	116	117	119	120	121	123	124
<u>Genus species</u>												
<u>Petromyzontidae</u>												
<i>Ichthyomyzon bdellium</i>												
<i>Ichthyomyzon fossor</i>												
<i>Lampetra aepyptera</i>								1				
<i>Lampetra appendix</i>												
<u>Lepisosteidae</u>												
<i>Lepisosteus osseus</i>												
<u>Clupeidae</u>												
<i>Dorosoma cepedianum</i>												
<u>Hiodontidae</u>												
<i>Hiodon tergisus</i>												
<u>Salmonidae</u>												
<i>Onchorhynchus mykiss</i>												
<i>Salmo trutta</i>												
<i>Salvelinus fontinalis</i>												
<u>Esocidae</u>												
<i>Esox masquinongy</i>												
<u>Cyprinidae</u>												
<i>Camptostoma anomalum</i>			18	1		1	3	8	18	2	12	14
<i>Clinostomus elongatus</i>					3	4	2	37	1	1	12	6
<i>Cyprinella spiloptera</i>								2				
<i>Cyprinella whipplei</i>												
<i>Cyprinus carpio</i>												
<i>Ericymba buccata</i>	2	2		7	28	20	12	6	5	14	9	30
<i>Erimystax dissimilis</i>												
<i>Hybopsis amblops</i>												
<i>Luxilus</i>		1	1	9	9	14	15	1	1	23	1	13
<i>chrysocephalus</i>												
<i>Lythrurus fasciolaris</i>				3								
<i>Macrhybopsis</i>												
<i>storeriana</i>												
<i>Nocomis micropogon</i>						18	8	9		19	7	
<i>Notropis atherinoides</i>				15							1	
<i>Notropis boops</i>												
<i>Notropis ludibundus</i>											10	
<i>Notropis photogenis</i>												
<i>Notropis rubellus</i>				106	25	21	54	2		51	23	2
<i>Notropis volucellus</i>				26						7		5
<i>Phoxinus</i>		2			5	1			1			
<i>erythrogaster</i>												
<i>Pimephales notatus</i>		2	51	12	6	13	57	23	7	4	15	96
<i>Pimephales promelas</i>												
<i>Rhinichthys atratulus</i>	1	3	1	1	6	3						
<i>Semotilus</i>	3	1	27	9	10	5	2	3	27	2	2	23
<i>atromaculatus</i>												
<u>Catostomidae</u>												
<i>Catostomus commersoni</i>			13				3	2			1	
<i>Hypentelium nigricans</i>		1				3	1	4		2	3	2
<i>Ictiobus bubalus</i>												
<i>Minytrema melanops</i>												
<i>Moxostoma anisurum</i>												
<i>Moxostoma carinatum</i>												
<i>Moxostoma duquesnei</i>							2					
<i>Moxostoma erythrurum</i>												
<i>Moxostoma</i>												
<i>macrolepidotum</i>												
<u>Ictaluridae</u>												
<i>Ameiurus natalis</i>												

Table 4g. (continued).

<u>Family</u>	107	108	109	110	114	116	117	119	120	121	123	124
<u>Genus species</u>												
<i>Ictalurus punctatus</i>												
<i>Noturus flavus</i>												
<i>Noturus miurus</i>												
<i>Pylodictis olivaris</i>												
<u>Fundulidae</u>												
<i>Fundulus catenatus</i>												
<u>Poeciliidae</u>												
<i>Gambusia affinis</i>												
<u>Atherinidae</u>												
<i>Labidesthes sicculus</i>												
<u>Centrarchidae</u>												
<i>Ambloplites rupestris</i>							1		1		1	
<i>Lepomis cyanellus</i>			1				1	1		1	5	2
<i>Lepomis gulosus</i>												
<i>Lepomis macrochirus</i>			1	5			3	2			1	2
<i>Lepomis megalotis</i>						1	2	7	7		14	12
<i>Lepomis microlophus</i>												
<i>Micropterus dolomieu</i>					1		1			1		
<i>Micropterus</i>			2				1				1	2
<i>punctulatus</i>												
<i>Micropterus salmoides</i>		1										
<i>Pomoxis annularis</i>												
<u>Percidae</u>												
<i>Ammocrypta pellucida</i>												
<i>Etheostoma baileyi</i>				2		36	5	10	1	31	15	4
<i>Etheostoma</i>						1	6			6	6	
<i>blennioides</i>												
<i>Etheostoma caeruleum</i>												
<i>Etheostoma flabellare</i>	4	1	2		1	2	1	7	3		8	6
<i>Etheostoma nigrum</i>	4	1		3	5	14	15	18		4	16	3
<i>Etheostoma sagitta</i>												
<i>Etheostoma variatum</i>												2
<i>Etheostoma zonale</i>						20	4	8		18	7	
<i>Percina caprodes</i>												
<i>Percina maculata</i>						1						
<i>Percina oxyrhyncha</i>												
<i>Percina sciera</i>												
<i>Percina shumardi</i>												
<i>Percina stictogaster</i>												
<i>Stizostedion vitreum</i>												
<u>Sciaenidae</u>												
<i>Aplodinotus grunniens</i>												
<u>Cottidae</u>												
<i>Cottus bairdi</i>				2								
<u>Hybrids</u>												
<i>Lepomis hybrid</i>												1
<i>Cyprinid hybrid</i>												
<u>Larvae</u>												
<i>Lamprey ammocoetes</i>												
Total individuals	14	15	117	201	99	178	199	151	75	186	173	222
Total species	5	10	10	14	11	18	22	19	12	16	24	16

Table 4h. Species checklist and abundance data for stations 125-138 in the Red River system (1997-1999).

<u>Family</u>		125	127	129	132	133	134	135	137	137	138	Totals
<u>Genus species</u>												
<u>Petromyzontidae</u>												
<i>Ichthyomyzon bdellium</i>												2
<i>Ichthyomyzon fossor</i>						1						8
<i>Lampetra aepyptera</i>			5		2			6				21
<i>Lampetra appendix</i>												14
<u>Lepisosteidae</u>												
<i>Lepisosteus osseus</i>												1
<u>Clupeidae</u>												
<i>Dorosoma cepedianum</i>												568
<u>Hiodontidae</u>												
<i>Hiodon tergisus</i>												1
<u>Salmonidae</u>												
<i>Onchorhynchus mykiss</i>												3
<i>Salmo trutta</i>												6
<i>Salvelinus fontinalis</i>												4
<u>Esocidae</u>												
<i>Esox masquinongy</i>												2
<u>Cyprinidae</u>												
<i>Campostoma anomalum</i>	2			1	1	5		3	2	11	1	587
<i>Clinostomus elongatus</i>												9
<i>Cyprinella spiloptera</i>	1	7						1				146
<i>Cyprinella whipplei</i>		3	9									147
<i>Cyprinus carpio</i>												3
<i>Ericymba buccata</i>	7	31			12	30	14	36		15		561
<i>Erimystax dissimilis</i>												3
<i>Hybopsis amblops</i>												1
<i>Luxilus chrysocephalus</i>	14	3	22	12	12	11	25	9	17			732
<i>Lythrurus fasciolaris</i>												367
<i>Macrhybopsis storeriana</i>												16
<i>Nocomis micropogon</i>					1							296
<i>Notropis atherinoides</i>								1				1391
<i>Notropis boops</i>												428
<i>Notropis ludibundus</i>					1							56
<i>Notropis photogenis</i>												28
<i>Notropis rubellus</i>		2			14					3		669
<i>Notropis volucellus</i>												176
<i>Phoxinus erythrogaster</i>						2						88
<i>Pimephales notatus</i>	6	13	26	13	28	11	40		28	2		1778
<i>Pimephales promelas</i>												1
<i>Rhinichthys atratulus</i>						13	2	4			14	98
<i>Semotilus atromaculatus</i>	2	6	7	24	26	4	26	1	4	14		547
<u>Catostomidae</u>												
<i>Catostomus commersoni</i>	8		2				13	3		1		80
<i>Hypentelium nigricans</i>	1	3	3	7	5			4		2		169
<i>Ictiobus bubalus</i>												2
<i>Minytrema melanops</i>												5
<i>Moxostoma anisurum</i>												3
<i>Moxostoma carinatum</i>												3
<i>Moxostoma duquesnei</i>	1		1									22
<i>Moxostoma erythrurum</i>			1									83
<i>Moxostoma macrolepidotum</i>												3
<u>Ictaluridae</u>												
<i>Ameiurus natalis</i>							2					14

Table 4h. (continued).

Family	125	127	129	132	133	134	135	137	137	138	Totals
<u>Genus species</u>											
<i>Ictalurus punctatus</i>											3
<i>Noturus flavus</i>											43
<i>Noturus miurus</i>											43
<i>Pylodictis olivaris</i>											1
<u>Fundulidae</u>											
<i>Fundulus catenatus</i>											1
<u>Poeciliidae</u>											
<i>Gambusia affinis</i>											6
<u>Atherinidae</u>											
<i>Labidesthes sicculus</i>											13
<u>Centrarchidae</u>											
<i>Ambloplites rupestris</i>	1			1	1	3			1		32
<i>Lepomis cyanellus</i>	5	1	10	5	1				1		133
<i>Lepomis gulosus</i>											3
<i>Lepomis macrochirus</i>	5		2						2	3	120
<i>Lepomis megalotis</i>	7	6	18	3	11	7	3		1	4	374
<i>Lepomis microlophus</i>											1
<i>Micropterus dolomieu</i>	3					2					33
<i>Micropterus punctulatus</i>		1	6	5		2	1		1		86
<i>Micropterus salmoides</i>											8
<i>Pomoxis annularis</i>											2
<u>Percidae</u>											
<i>Ammocrypta pellucida</i>											36
<i>Etheostoma baileyi</i>		6	1	2	2		12	2	8		300
<i>Etheostoma blennioides</i>		2		1			1		1		126
<i>Etheostoma caeruleum</i>											213
<i>Etheostoma flabellare</i>	1	11		2	7	1	5	4	3	2	454
<i>Etheostoma nigrum</i>	1	12	9	7	11	6	9		7		258
<i>Etheostoma sagitta</i>											2
<i>Etheostoma variatum</i>		1									145
<i>Etheostoma zonale</i>		5									325
<i>Percina caprodes</i>						1					22
<i>Percina maculata</i>		1			1	2	1				14
<i>Percina oxyrhyncha</i>											2
<i>Percina sciera</i>											175
<i>Percina shumardi</i>											1
<i>Percina stictogaster</i>											21
<i>Stizostedion vitreum</i>											1
<u>Sciaenidae</u>											
<i>Aplodinotus grunniens</i>											4
<u>Cottidae</u>											
<i>Cottus bairdi</i>											71
<u>Hybrids</u>											
<i>Lepomis hybrid</i>	1		15								28
<i>Cyprinid hybrid</i>		2									9
<u>Larvae</u>											
Lamprey ammocoetes								1			15
Total individuals	66	121	133	113	156	81	181	19	106	40	12262
Total species	17	20	15	18	16	15	18	6	17	7	87

Table 5. Species checklist and total abundance for all collections from the Red River system (1948-1999).

Species	Quantity	Species	Quantity
<i>Ichthyomyzon bdellium</i>	2	<i>Ameiurus natalis</i>	18
<i>Ichthyomyzon fossor</i> - ST	15	<i>Ictalurus punctatus</i>	33
<i>Ichthyomyzon unicuspis</i>	6	<i>Noturus flavus</i>	58
<i>Lampetra aepyptera</i>	54	<i>Noturus miurus</i>	121
<i>Lampetra appendix</i> - ST	23	<i>Pylodictis olivaris</i>	11
<i>Lepisosteus osseus</i>	29	<i>Fundulus catenatus</i>	1
<i>Anguilla rostrata</i>	7	<i>Gambusia affinis</i>	14
<i>Dorosoma cepedianum</i>	736	<i>Labidesthes sicculus</i>	17
<i>Hiodon tergisus</i>	10	<i>Morone chrysops</i>	6
<i>Onchorhynchus mykiss</i>	12	<i>Ambloplites rupestris</i>	298
<i>Salmo trutta</i>	21	<i>Lepomis cyanellus</i>	224
<i>Salvelinus fontinalis</i>	40	<i>Lepomis gulosus</i>	8
<i>Esox masquinongy</i>	7	<i>Lepomis macrochirus</i>	368
<i>Camptostoma anomalum</i>	2790	<i>Lepomis megalotis</i>	1261
<i>Clinostomus elongatus</i>	75	<i>Lepomis microlophus</i>	9
<i>Cyprinella spiloptera</i>	405	<i>Micropterus dolomieu</i>	211
<i>Cyprinella whipplei</i>	219	<i>Micropterus punctulatus</i>	201
<i>Cyprinus carpio</i>	48	<i>Micropterus salmoides</i>	38
<i>Ericymba buccata</i>	1675	<i>Pomoxis annularis</i>	23
<i>Erimystax dissimilis</i>	18	<i>Pomoxis nigromaculatus</i>	0
<i>Hypopsis amblops</i>	48	<i>Ammocrypta pellucida</i> - SS,C2	107
<i>Luxilus chrysocephalus</i>	3556	<i>Etheostoma baileyi</i>	817
<i>Lythrurus fasciolaris</i>	1612	<i>Etheostoma blennioides</i>	559
<i>Macrhybopsis storeriana</i>	70	<i>Etheostoma caeruleum</i>	1143
<i>Nocomis micropogon</i>	918	<i>Etheostoma flabellare</i>	1147
<i>Notropis atherinoides</i>	2082	<i>Etheostoma nigrum</i>	1001
<i>Notropis boops</i>	506	<i>Etheostoma sagitta</i> - SS	11
<i>Notropis ludibundus</i>	148	<i>Etheostoma variatum</i>	545
<i>Notropis photogenis</i>	324	<i>Etheostoma zonale</i>	836
<i>Notropis rubellus</i>	3247	<i>Percina caprodes</i>	207
<i>Notropis volucellus</i>	456	<i>Percina copelandi</i>	1
<i>Phoxinus erythrogaster</i>	561	<i>Percina maculata</i>	249
<i>Pimephales notatus</i>	5223	<i>Percina oxyrhyncha</i>	12
<i>Pimephales promelas</i>	38	<i>Percina sciera</i>	245
<i>Rhinichthys atratulus</i>	257	<i>Percina shumardi</i>	18
<i>Semotilus atromaculatus</i>	2709	<i>Percina stictogaster</i>	111
<i>Carpiodes cyprinus</i>	3	<i>Stizostedion vitreum</i>	1
<i>Catostomus commersoni</i>	231	<i>Aplodinotus grunniens</i>	37
<i>Hypentelium nigricans</i>	615	<i>Cottus bairdi</i>	495
<i>Ictiobus bubalus</i>	16		
<i>Minytrema melanops</i>	33	<i>Lepomis hybrid</i>	36
<i>Moxostoma anisurum</i>	232	<i>Cyprinid hybrid</i>	12
<i>Moxostoma carinatum</i>	16	<i>Moxostoma sp.</i>	12
<i>Moxostoma duquesnei</i>	200	<i>lamprey ammocoetes</i>	40
<i>Moxostoma erythrurum</i>	833		
<i>Moxostoma macrolepidotum</i>	72	Total species	86
<i>Ameiurus melas</i>	6	Total individuals	40766

ST = State threatened, SS = State special concern, C2 = Federal category 2

Table 6. Index of Biotic Integrity scoring sheet for station 127 20 November 1998.

Species	Indiv	Darters	Sunfish	Suckers	Intol	Tol	Omni	Insect	Carni	Lith	DELT
<i>Lampetra aepyptera</i>	5										
<i>Cyprinella spiloptera</i>	7							7			
<i>Cyprinella whipplei</i>	3			1				3			
<i>Ericymba buccata</i>	31					31					
<i>Luxilus chrysocephalus</i>	3					3				1	
<i>Notropis rubellus</i>	2			1				2		1	
<i>Pimephales notatus</i>	13				13						
<i>Semotilus atromaculatus</i>	6				6						
<i>Hypentelium nigricans</i>	3			1				3		1	
<i>Lepomis cyanellus</i>	1				1			1			
<i>Lepomis megalotis</i>	6							6			
<i>Micropterus punctulatus</i>	1								1		
<i>Etheostoma baileyi</i>	6	1						6		1	
<i>Etheostoma blennioides</i>	2	1						2		1	
<i>Etheostoma flabellare</i>	11	1						11			
<i>Etheostoma nigrum</i>	12	1						12			
<i>Etheostoma variatum</i>	1	1						1		1	
<i>Etheostoma zonale</i>	5	1						5		1	
<i>Percina maculata</i>	1	1						1		1	
<i>Cyprinid hybrid</i>	2										
Total	121	7	2	1	9	20	53	60	1	8	0
Indiv	121										
Darters	7				9				1	8	0
Suckers	1			1	5				3	5	5
Sunfish	2		5	3							
Intol	9										
Tol	17%										
Omni	44%										
Insect	50%										
Carni	3										
Lith	5										
Spp	19										
DELT	0										
Total Score											
IBI = 52 (Good)											
Drainage area = 71.5 km											
(wading)											

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∞

APPENDIX B.

Site locality, stream drainage, stream order, and drainage
area for 138 sites in the Red River drainage.

Appendix B. Site location information all stations in the Red River system (1948-1999).

SITE	STREAM	DRAINAGE	LOCATION	COUNTY	DA
1	Red River	Kentucky R	at confluence with Kentucky River	Estill	780
2	Red River	Kentucky R	2.4 km NW Palmer halfway between mouth and Hwy 89	Estill	775
3	Red River	Kentucky R	0.8 km N Palmer @ Hwy 89	Estill	772
4	Log Lick Cr	Red R	2.7 km SW Log Lick @ 1028	Clark	5.6
5	Red River	Kentucky R	just above Log Lick Cr to just below Woodward Cr	Clark	756
6	Woodward Cr	Red R	0.8 km N Cressy 300 yds below Parvis Rd	Estill	6.9
7	Twin Creek	Red R	1.9 km NE Cressy @ mouth	Estill	8.2
8	Red River	Kentucky R	3.2 km SE Log Lick @ Lillies Ferry Rd	Estill	736
9	Lulbegrud Cr	Red R	2.9 km SE Log Lick @ Lillies Ferry Rd	Powell	87
10	Lulbegrud Cr	Red R	1.6 km SE Log Lick ca 0.75 mi upstream of mouth	Powell	85
11	Snow Cr	Lulbegrud Cr	4.8 km SW Powell Valley @ Hwy 1082	Powell	3.7
12	Lulbegrud Cr	Red R	Log Lick @ CR 1028	Powell	78
13	Lulbegrud Cr	Red R	at Falls Br confl.	Powell	67
14	Lulbegrud Cr	Red R	1.4 km stream km upstream of Falls Br	Powell	64
15	Lulbegrud Cr	Red R	2.1 stream km upstream of Falls Br	Powell	62
16	Lulbegrud Cr	Red R	1.8 km SE Goffs Corner @ Hwy 15	Clark	56
17	N Br Lulbegrud Cr	Lulbegrud Cr	4.5 km W Levee along Hwy 646 near mouth	Montgomery	15
18	unnamed creek	N Br Lulbegrud	4.3 km NW Levee along Hwy 646 near mouth	Montgomery	1.6
19	Lulbegrud Cr	Red R	Levee @ Hwy 11 @ confl with Hog Cr	Montgomery	20
20	Plum Cr	Red R	3.1 km SW Powell Valley @ Hwy 82	Powell	4.0
21	Red River	Kentucky R	1.6 km S Powell Valley @ 82	Powell	651
22	Hardwick Cr	Red R	1.6 km N Vaughn's Mill @ 1057	Powell	40
23	Hardwick Cr	Red R	2.1 km SE Vaughn's Mill along Hwy 1057	Powell	21
24	Red River	Red R	1.6 km S Clay City @ Bert C Combs Mtn Pkwy	Powell	603
25	Brushy Cr	Red R	Waltersville @ Hwy 3030 (Adam's Ridge Rd)	Powell	8.0
26	Red River	Kentucky R	Waltersville @ Hwy 11/15	Powell	591
27	Black Cr	Red R	2.4 km NW Clay City, 200 yds above mouth, along Hwy 11	Powell	6.9
28	Red River	Kentucky R	2.4 km NW Clay City, 300 yds below Black Creek	Powell	587
29	Red River	Kentucky R	just below Pompeii rd to just above Pompeii Br	Powell	576
30	Red River	Kentucky R	1.9 km W Stanton along Hwy 11/15 @ mouth of Hatton Cr	Powell	571
31	Hatton Cr	Red R	1.9 km W Stanton @ Hwy 11/15	Powell	8.0
32	Hatton Cr	Red R	3.5 km SW Stanton @ Hatton Cr School Rd	Powell	2.9
33	Red River	Kentucky R	just above Hatton Cr to just above Beech Fk	Powell	562
34	Red River	Kentucky R	3.2 km NW Stanton at CR 2026	Powell	557
35	Judy Cr	Red R	Stanton @ CR 2026	Powell	3.2
36	Morris Cr	Red R	4.3 km N Stanton @ Hwy 615	Powell	2.9

Appendix B. (continued).

37	Red River	Kentucky R	1.9 km N Stanton @ Hwy 213	Powell	542
38	Red River	Kentucky R	just below Hwy 213 to just below Ewen Br	Powell	541
39	Hatcher Cr	Red R	2.9 km NE Stanton @ Hwy 615	Powell	6.3
40	Red River	Kentucky R	4 km E Stanton along Hwy 11/15 @ mouth of Pecks Cr	Powell	528
41	Cat Cr	Red R	3.7 km W Bowen @ Hwy 11/15	Powell	11
42	Cat Cr	Red R	4.8 km SW Bowen @ Hwy 3354	Powell	10
43	Cane Cr	Red R	1.6 km NW Bowen @ Hwy 599	Powell	22
44	Lower Cane Cr	Cane Cr	2.4 km N Bowen @ Hwy 599	Powell	7.2
45	Anders Br	Lower Cane Cr	7.1 km NE Stanton @ Hwy 599	Powell	1.6
46	Red River	Kentucky R	0.8 km W Bowen along Hwy 11/15	Powell	475
47	Red River	Kentucky R	Bowen @ Hwy 613	Powell	473
48	Red River	Kentucky R	0.8 km E Bowen @ mouth of Middle Fork	Powell	471
49	Middle Fk	Red R	1.6 km SE Bowen just above mouth of Cow Cr	Powell	85
50	Middle Fk	Red R	2.4 km SE Bowen @ mouth of South Fk @ Hwy 11/15	Powell	83
51	South Fk	Middle Fk	along Hwy 1639 near South Fk Church	Powell	31
52	South Fk	Middle Fk	John Knox Hollow along CR 1639	Powell	28
53	Sand Lick	South Fk	Tin Town Church along FR 212 ca 200 m above mouth	Powell	9.2
54	South Fk	Middle Fk	Halls Grocery just below Stump Cave Br along Hwy 1639	Powell	16
55	South Fk	Middle Fk	5 km SW Slade @ Stump Cave Br	Powell	15
56	South Fk	Middle Fk	Roger's Chapel @ Hwy 1057 (High Rock Rd)	Powell	6.1
57	Middle Fk	Red R	just above mouth of South Fk @ Hwy 11/15	Powell	46
58	Middle Fk	Red R	0.8 km NW Nada @ Hwy 11/15	Powell	43
59	Middle Fk	Red R	Nada @ Hwy 77	Powell	41
60	Middle Fk	Red R	1.4 km SE Slade along Hwy 11	Powell	31
61	Middle Fk	Red R	Natural Bridge SP above impoundment	Powell	24
62	Middle Fk	Red R	Natural Bridge SP @ confl. Mill Cr	Powell	24
63	Mill Creek Lake	Middle Fk	NE Glencairn	Wolfe	8.4
64	Mill Creek	Middle Fk	3.2 km SW Pine Ridge	Wolfe	5.1
65	Tight Hollow	Mill Cr	2 km SW Pine Ridge	Wolfe	1.6
66	unnamed creek	Tight Hollow	1.6 km S Pine Ridge	Wolfe	0.8
67	Middle Fk	Red R	Glencairn along Hwy 11	Wolfe	14
68	Red River	Kentucky R	0.8 km E Bowen at Mt Pkwy up 1.3 km to Catron's Ford	Powell	377
69	Red River	Kentucky R	4.8 km NE Bowen along Hwy 613	Powell	375
70	Red River	Kentucky R	3.2 km NE Bowen @ mouth of Short Cr	Powell	372
71	Indian Cr	Red R	Red R Gorge @ Hwy 613	Powell	46
72	Indian Cr	Red R	Red R Gorge @ confl with Leatherwood Fk	Meniffee	19
73	Leatherwood Fk	Indian Cr	Red R Gorge along FR 9A	Meniffee	4.5
74	Indian Cr	Red R	Red R Gorge 100 m above Leatherwood Fk	Meniffee	14
75	Indian Cr	Red R	Red R Gorge 200 m above Leatherwood Fk	Meniffee	12

Appendix B. (continued).

76	East Fk Indian Cr	Indian Cr	Red R Gorge ca 1.4 km upstream of mouth along FR 9B	Meniffee	22
77	Powell Br	E Fk Indian Cr	Red R Gorge above mouth along FR 9B	Meniffee	1.6
78	East Fk Indian Cr	Indian Cr	Red R Gorge 0.8 km above Powell Br along FR 9B	Meniffee	19
79	East Fk Indian Cr	Indian Cr	Red R Gorge 1.6 km below Big Amos Creek	Meniffee	16
80	Big Amos Cr	E Fk Indian Cr	Red R Gorge 4.8 km SW Frenchburg	Meniffee	4.8
81	Little Amos Cr	Big Amos Cr	Red R Gorge 5.3 km SW Frenchburg	Meniffee	1.6
82	East Fk Indian Cr	Indian Cr	Red R Gorge 1.6 km above Big Amos Creek	Meniffee	8.0
83	East Fk Indian Cr	Indian Cr	Red R Gorge 3.2 km above Big Amos Creek	Meniffee	4.7
84	Red River	Kentucky R	1.6 km above Indian Cr @ ford off of Hwy 613	Powell	302
85	Edward Br	Red R	9.3 km E Bowen @ Hwy 613	Meniffee	2.3
86	Red River	Kentucky R	5.5 km NE Nada @ Hwy 77	Powell	302
87	Wolfpen Cr	Red R	7.2 km NE Pine Ridge @ Hwy 715	Meniffee	3.7
88	Red River	Kentucky R	just above Wolfpen Cr @ ford along Hwy 715	Wolfe	275
89	Chimney Top Cr	Red R	6.4 km N Pine Ridge @ mouth	Wolfe	10
90	Chimney Top Cr	Red R	Red R Gorge 0.8 km above mouth	Wolfe	9.3
91	Rt Fk Chimney Top	Chimney Top Cr	Red R Gorge @ 226 trail	Wolfe	3.7
92	Chimney Top Cr	Red R	Red R Gorge @ 221 trail	Wolfe	8.2
93	Gladie Cr	Red R	Red R Gorge @ Hwy 715	Meniffee	33
94	Gladie Cr	Red R	1.6 km above Hwy 715 @ small trail crossing	Meniffee	31
95	Salt Fork	Gladie Cr	6.6 km W Pomeroyton @ Sheltoewe Trace Trail near mouth	Meniffee	5.3
96	Dry Fork	Gladie Cr	5.3 km W Pomeroyton ca 100 m above mouth	Meniffee	4.2
97	Laurel Fork	Gladie Cr	3.2 km W Pomeroyton ca 100 m above mouth	Meniffee	5.5
98	Gladie Cr	Red R	0.8 km W Pomeroyton @ Hwy 746	Meniffee	5.0
99	Red River	Kentucky R	7.4 km N Pine Ridge along Hwy 715	Meniffee	230
100	Parched Corn Cr	Red R	5.6 km N Pine Ridge ca 100 m upstream of mouth	Wolfe	2.9
101	Parched Corn Cr	Red R	4.5 km NE Pine Ridge @ 221 trail	Wolfe	1.6
102	Red River	Kentucky R	just below Swift Camp Cr along Hwy 715	Meniffee	223
103	Red River	Kentucky R	6.9 km NE Pine Ridge @ Hwy 715 bridge	Meniffee	221
104	Swift Camp Cr	Red R	just above mouth @ old campground rd	Wolfe	30
105	Dog Fork	Swift Camp Cr	4.5 km NE Pine Ridge @ Swift Camp Trail	Wolfe	3.5
106	Swift Camp Cr	Red R	Red River Gorge ca 400 m below Rockbridge Cr	Wolfe	21
107	Rockbridge Fk	Swift Camp Cr	Red River Gorge ca 0.6 km above mouth	Wolfe	3.2
108	Swift Camp Cr	Red R	ca 100 m above Rockbridge Cr	Wolfe	14
109	Swift Camp Cr	Red R	1.2 km N Campton beneath Bert C Combs Mtn Pkwy	Wolfe	5.1
110	Clifty Cr	Red R	4 km E Valeria @ mouth	Wolfe	12
111	Clifty Cr	Red R	3.2 km E Valeria ca 100 m above mouth	Wolfe	12
112	Osborne Br	Clifty Cr	5.6 km SW Pomeroyton ca 75 m above mouth	Meniffee	4.8
113	Clifty Cr	Red R	3.2 km E Valeria ca 200 m above Osborne Br	Wolfe	6.9
114	Big Calaboose Cr	Red R	10 km W Hazel Green @ mouth	Wolfe	2.9

Appendix B. (continued).

115	Red River	Kentucky R	4 km S Valeria off Lawson Ridge Rd	Wolfe	166
116	Stillwater Cr	Red R	Red River Gorge @ mouth	Wolfe	48
117	Stillwater Cr	Red R	2.6 km NW Stillwater @ Hwy 746	Wolfe	45
118	Trace Fk	Stillwater Cr	2.4 km SW Stillwater along Hwy 191	Wolfe	2.9
119	Stillwater Cr	Red R	1.6 km SE Stillwater @ Hwy 3036	Wolfe	29
120	Stillwater Cr	Red R	Malaga along Hwy 1812 across from Hwy 1010	Wolfe	5.5
121	Red River	Kentucky R	4.8 km N Stillwater @ Hwy 746	Wolfe	113
122	Red River	Kentucky R	USGS gaging station 4.8 km NW Hazel Green	Wolfe	101
123	Red River	Kentucky R	3.4 km NW Hazel Green along CR 1010	Wolfe	98
124	Lacy Cr	Red R	1.9 km S Hazel Green @ Hwy 191	Wolfe	19
125	Lacy Cr	Red R	4.3 km S Hazel Green along Hwy 1010 @ Hwy 1953	Wolfe	6.1
126	Lacy Cr	Red R	0.8 km N Lexie along Hwy 1010	Wolfe	1.8
127	Red River	Kentucky R	1.6 km E Hazel Green @ Neff Rd	Wolfe	71
128	Gillmore Cr	Red R	1.6 km S Daysboro along Hwy 1419	Wolfe	14
129	Gillmore Cr	Red R	1.8 km N Gilmore @ Bert C Combs Mtn Pkwy	Wolfe	11
130	Gillmore Cr	Red R	Gilmore along Hwy 1419 just above Straight Cr	Wolfe	7.9
131	Red River	Kentucky R	Daysboro @ Hwy 1419	Wolfe	50
132	Red River	Kentucky R	1.6 km SE Daysboro along Hwy 191	Wolfe	48
133	State Road Fork	Red R	2.9 km N Lee City @ Hwy 205	Wolfe	7.4
134	Rose Fk	Red R	1.6 km S Lee City @ Hwy 205	Wolfe	13
135	Red River	Kentucky R	2.1 km NW Lee City @ 8th Br Rd along Hwy 205	Wolfe	39
136	Red River	Kentucky R	0.8 km above Lee City along Hwy 1094	Wolfe	35
137	Red River	Kentucky R	2.1 km SE Lee City @ Hwy 1094	Wolfe	15
138	Red River	Kentucky R	1.2 km SE Burkhart along Hwy 1094	Wolfe	3.5

APPENDIX C.

Figures 1-6.

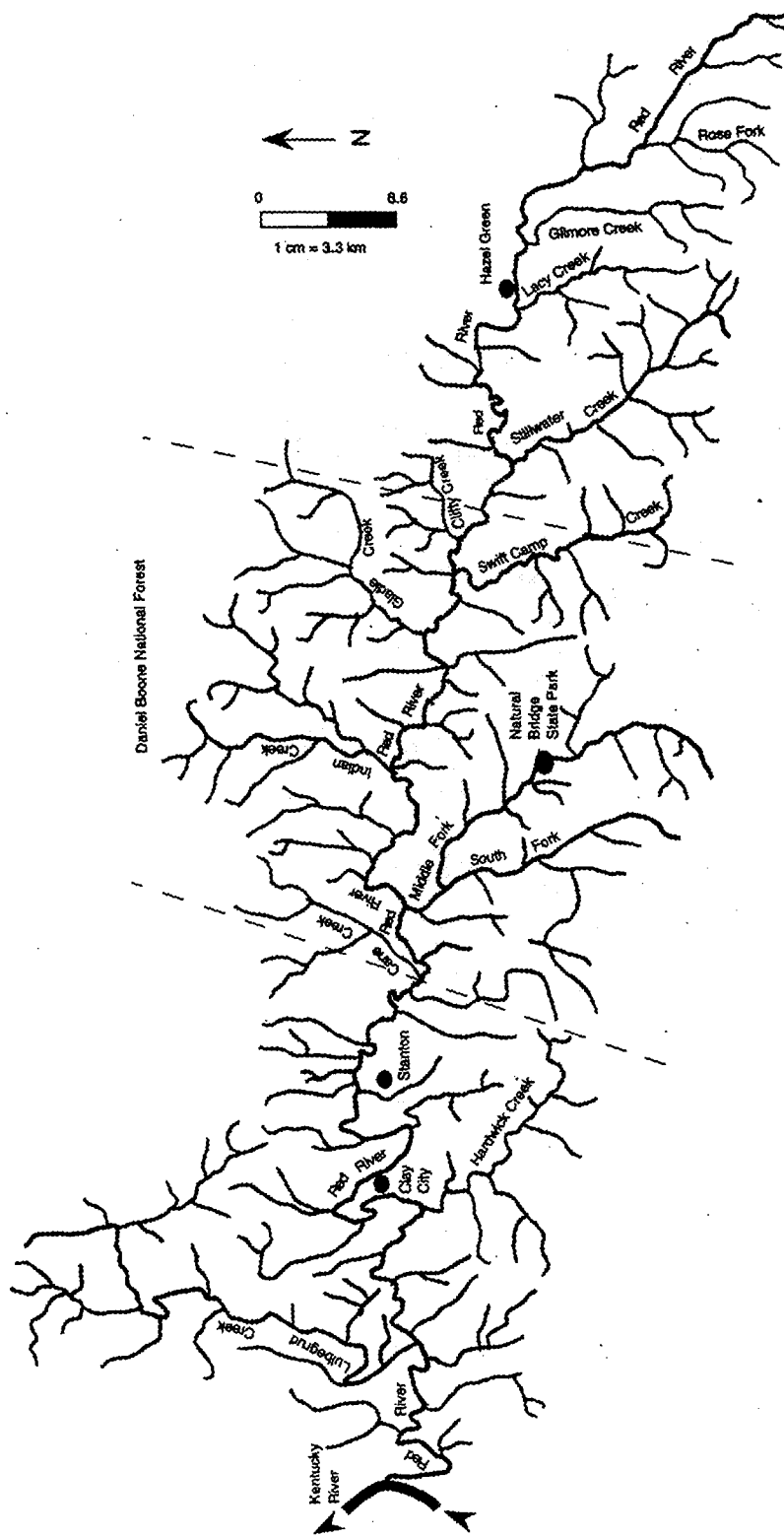


Figure 1. The Red River system in the Kentucky River.

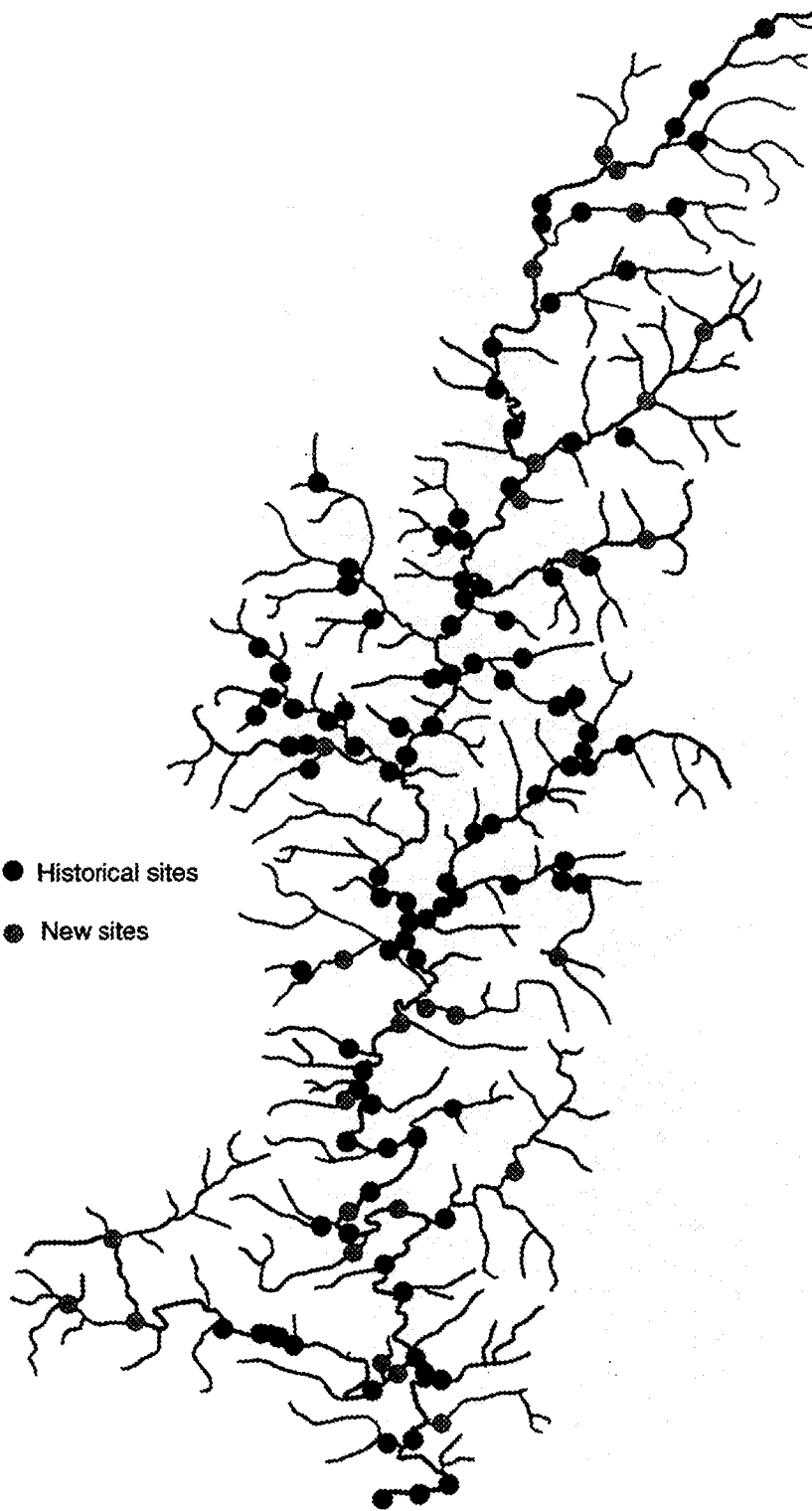
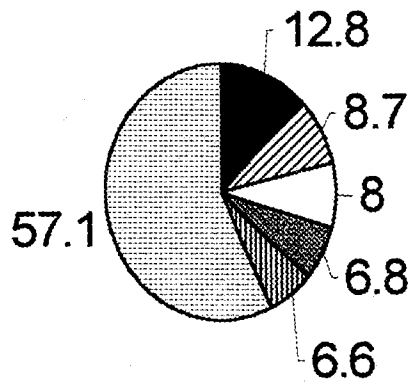


Figure 2. 138 Red River collection locations (1948-1999).



- | | |
|----------------------------------|---------------------------------|
| ■ <i>Pimephales notatus</i> | ▨ <i>Luxilus chrysocephalus</i> |
| □ <i>Notropis rubellus</i> | ■ <i>Campostoma anomalum</i> |
| ▨ <i>Semotilus atromaculatus</i> | ▨ Other |

Figure 3. The five most abundant species in the Red River system from 1948-1999 (percent catch).

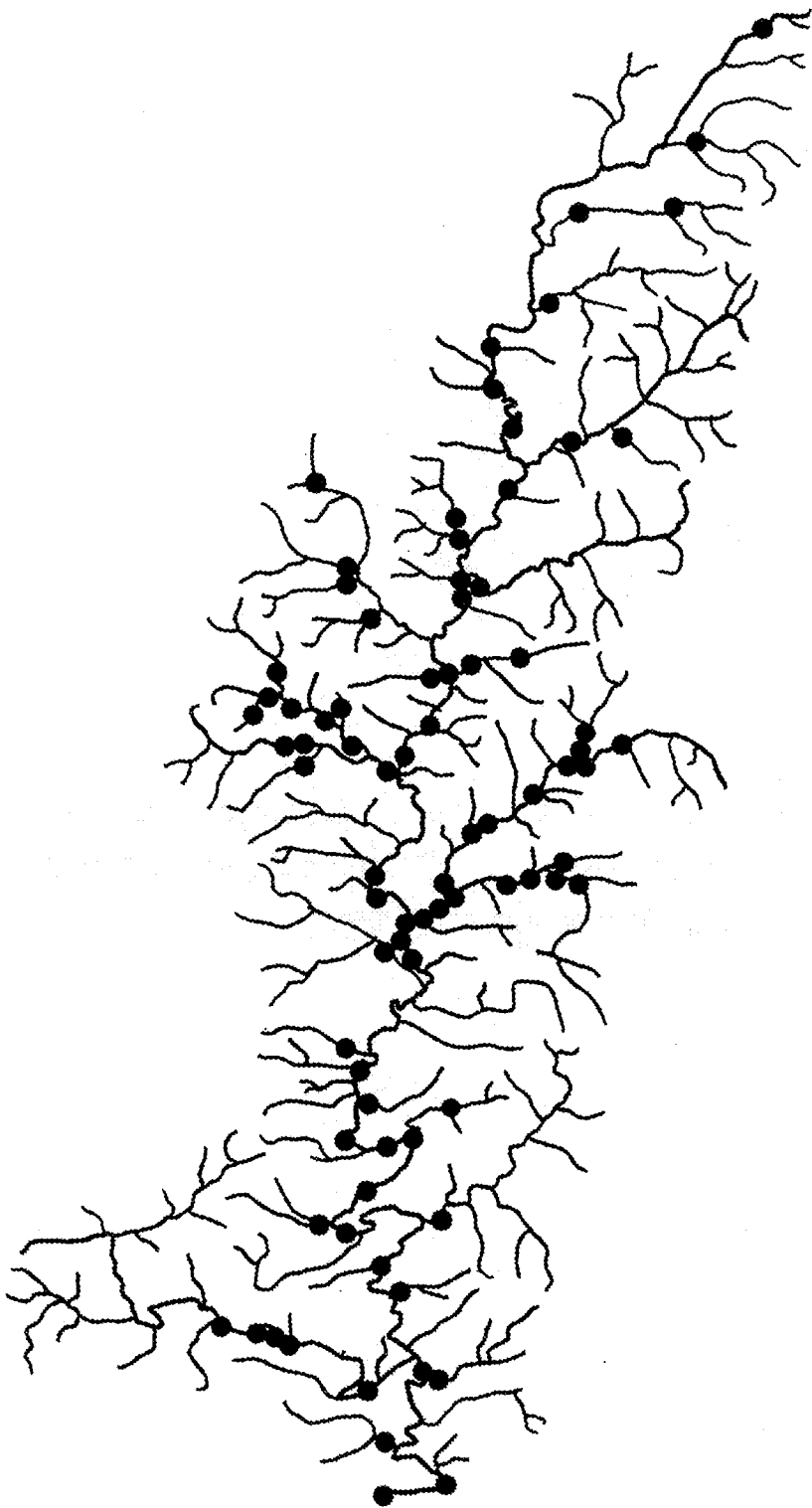


Figure 4. Distribution of *Campostoma anomalum*.

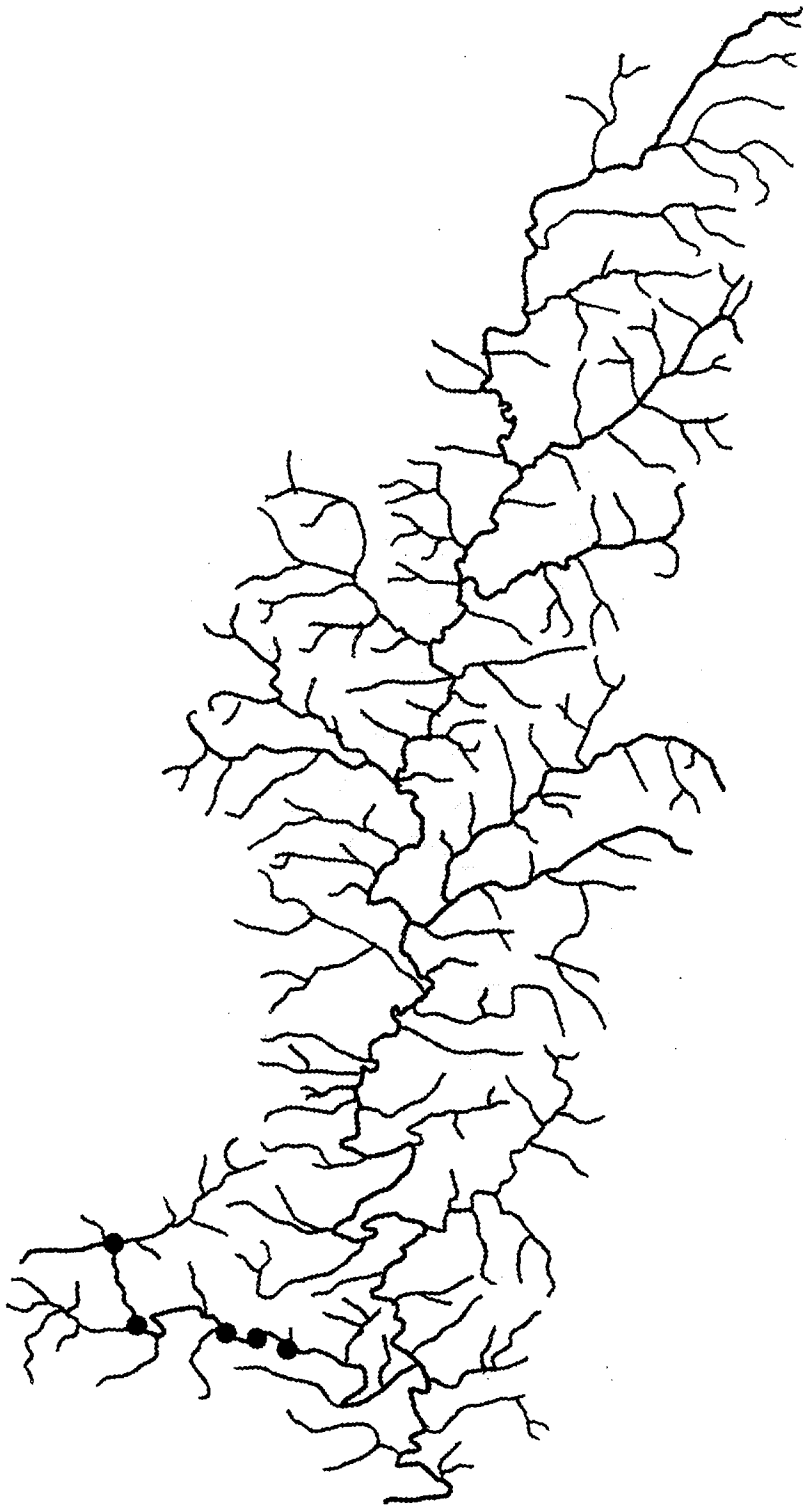


Figure 5. Distribution of *Notropis boops*.

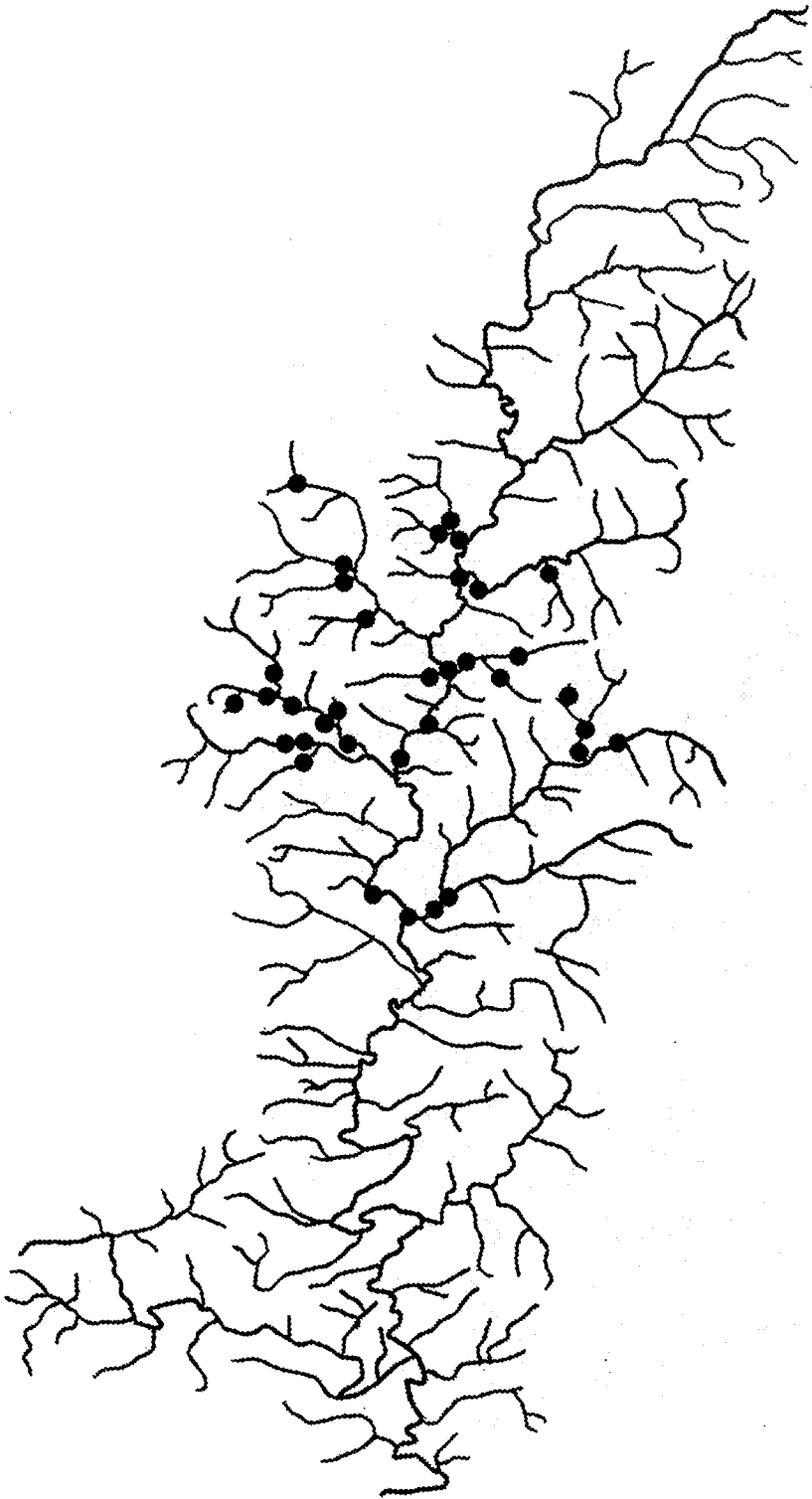


Figure 6. Distribution of *Cottus bairdi*.

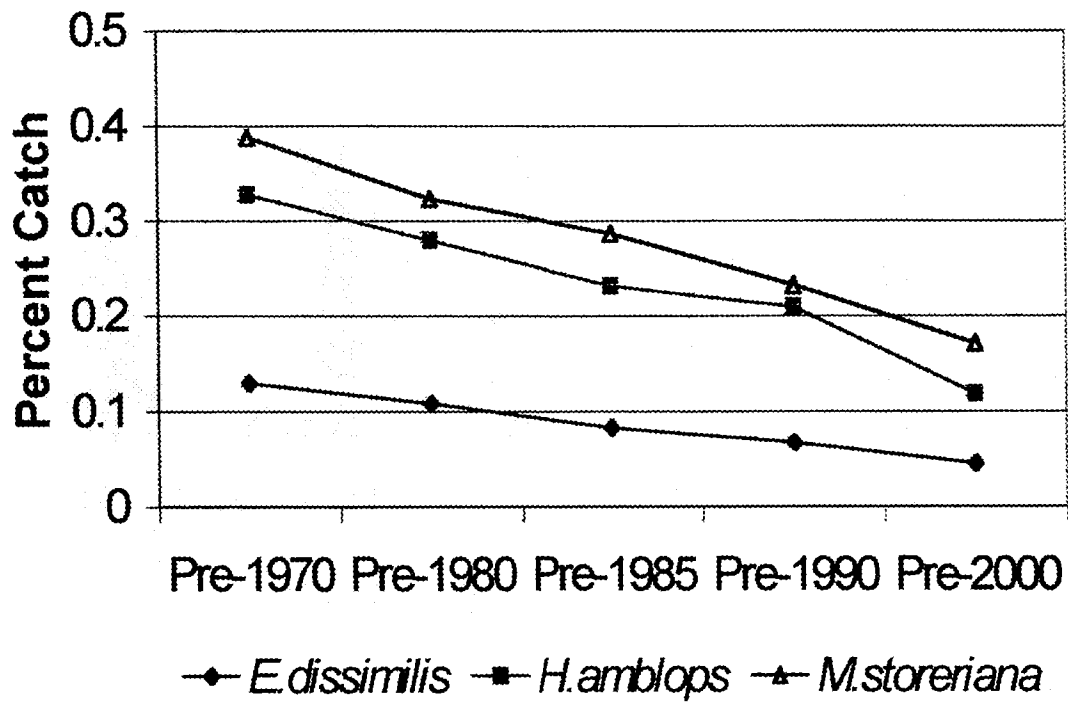


Figure 7. Percent catch for three species in the Red River system from 1948 to 1999.

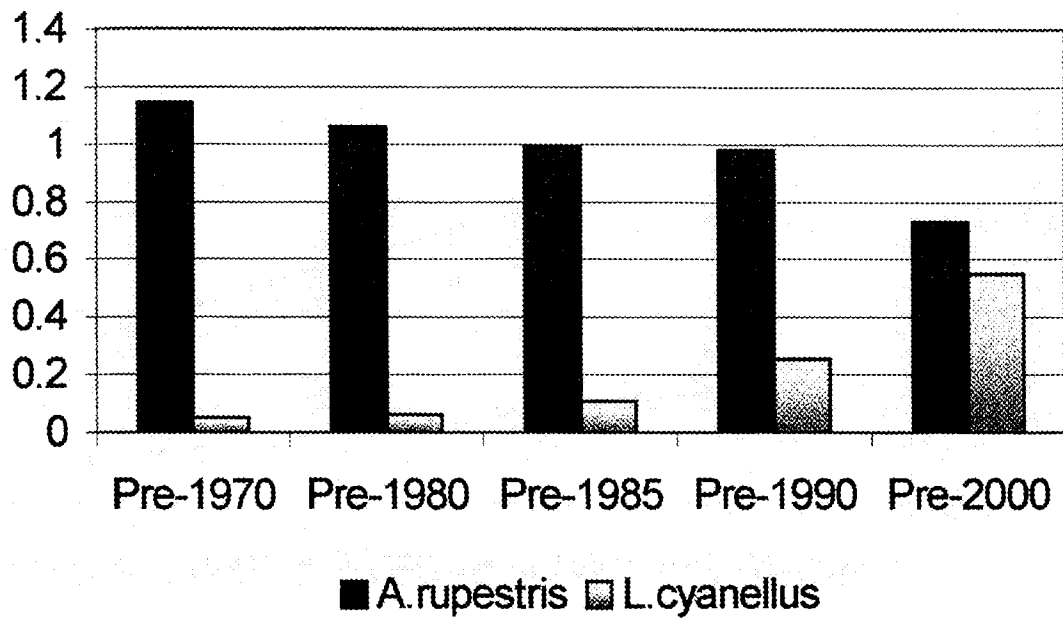


Figure 8. Percent catch of two sunfish species in the Red River system from 1948 to 1999.