BLACK RIVER
WATERSHED INVENTORY AND ASSESSMENT

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EXECUTIVE SUMMARY

The Black River originates in Reynolds and Iron Counties, MO and flows south through Wayne and Butler Counties and into Arkansas. Due to the differences in geology, hydrology, habitat, biota, land use, and water quality, the basin is separated into two subbasins: the upper subbasin upstream of Clearwater Dam and the lower subbasin downstream of Clearwater Dam to the Arkansas state line.

The Black River drains 1,756 square miles in Missouri. The upper subbasin lies in the Ozark Plateau and the lower subbasin lies within both the Ozark Plateau and the Mississippi Alluvial Plain. The majority of the upper subbasin is forested. Soils in the upper basin are primarily suited for trees and are considered highly erodible. The lower subbasin is 55% forested and 45% rowcrop or pasture. Wetland drainage, timber clearing, and flood control projects have converted the southern and eastern sections of the lower subbasin into a vast agricultural area.

Overall, streambank erosion is not a major problem in the basin and riparian corridors are mostly forested and usually rated as good. In the upper subbasin, there are excessive amounts of gravel bedload in the stream channel. All of the streams in the south and eastern portion of the lower subbasin have been channelized and leveed, causing severe aquatic habitat problems.

Basin streams generally exhibit good water quality throughout the Ozark portion of both subbasins. Most streams are classified as full use attainment. However, there have been some water quality problems associated with a waste water treatment facility, a quarry, and a lead mine. In the southeast portion of the lower subbasin, approximately 30% of the wells exceed nitrate water quality standards.

Two reservoirs in the upper subbasin, Clearwater Lake and Lower Taum Sauk Lake, affect stream flows and fish movement. Flow in the lower Black River is primarily regulated by water released through Clearwater Lake.

Public land in the basin totals more than 298,500 acres. The U. S. Forest Service owns the majority of this land followed by the Missouri Department of Conservation and the U.S. Army Corps of Engineers.

The basin exhibits good aquatic biodiversity. One hundred thirty two fish species, 42 mussel species, 12 crayfish species have been found. Twenty-six fish, four crayfish, and nine mussel species are considered a species of concern.

Angling opportunities for black bass and shadow bass are good throughout the basin. Gigging for suckers throughout the basin is also good. In the lower Black River, angling opportunities for walleye, channel catfish, and paddlefish exist. In Tenmile Creek, also in the lower subbasin, a Special Smallmouth Bass Management Area is present.

Four major goals for the basin are:

> GOAL I: Maintain or improve aquatic habitat conditions to meet the needs of native aquatic biota while accommodating society's demands for agricultural production and economic development.
>
> GOAL II: Maintain or improve water quality throughout the basin so that it is sufficient to support diverse aquatic biota.
>
> GOAL III: Maintain diversity of native aquatic organisms and improve the quality of fishing.
>
> GOAL IV: Improve the public's knowledge and appreciation of stream resources; recreational opportunities; and proper watershed, riparian corridor, and streambank management.

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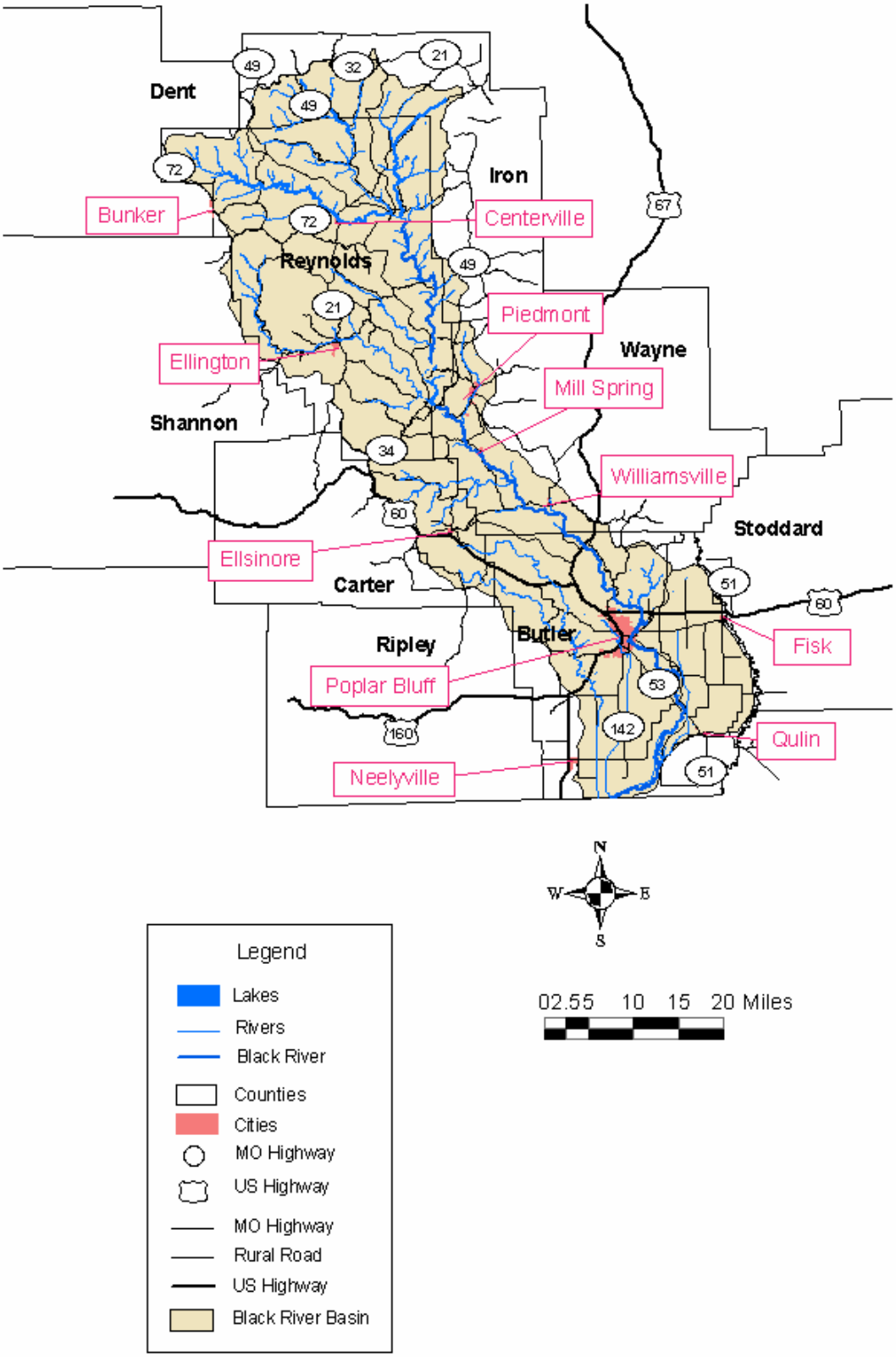
WATERSHED LOCATION

The Black River originates in Iron and Reynolds Counties, MO and flows south through Reynolds, Wayne, and Butler Counties to the state line and then southwesterly in Arkansas to empty into the White River near Newport, AR. The French were the first Caucasian people to assert territorial rights to this area (~1673) (Deems 1940). For unknown reasons, French explorers named the river "la Riviere Noir" which translates to Black River (Loughead 1987).

The Black River flows through Clearwater Reservoir near Piedmont, MO. In this Watershed Inventory and Assessment, the basin is divided into lower and upper subbasins due to the differences in geology, hydrology, habitat, biota, land use, and water quality (Figure lo). The upper subbasin is the area above Clearwater Dam and the lower subbasin is the area downstream of Clearwater Dam to the Arkansas state line.

The Black River's two largest tributaries are the Current and Eleven Point Rivers, which join the Black River in Arkansas. These rivers are not included in this document.

Figure lo. General location of the Black River Watershed, in Missouri.



GEOLOGY/GEOMORPHOLOGY

Physiographic Regions

Lower Subbasin

The lower subbasin lies within both Ozark Plateau (Salem Plateau subdivision) and the Mississippi Alluvial Plain (Missouri Department of Natural Resources (MDNR) 1986; Figure nd). The Mississippi Alluvial Plain region is commonly called "lowlands" because historically it was seasonally flooded. The Ozark portion of the subbasin (western and northern) is primarily forested, while the lowland portion (southern and eastern) is almost entirely in row crops. Elevations range from 890 feet National Geodetic Vertical Datum of 1929 (NGVD) in the McKenzie Creek watershed to 287 feet NGVD where the Black River exits Missouri.

Upper Subbasin

This subbasin lies within two subdivisions (St. Francois Mountain and the Salem Plateau) of the high relief Ozark Plateau (MDNR 1986). Land elevations range from 1,772 feet NGVD at Taum Sauk Mountain, the highest point in Missouri, to 494 feet NGVD at Clearwater Dam.

Geology

Lower Subbasin

The western and northern part of this subbasin lies in the Salem Plateau, which is formed on Cambrian and Ordovician carbonate rocks and topped by a thin layer of glacial loess (MDNR 1995; Figure ge). The southeastern part of the basin lies within the Mississippi Alluvial Plain, which is topped with a 150-foot Quaternary layer of unconsolidated gravel, sand, silt, and clay (MDNR 1995).

Upper Subbasin

The eastern part of the subbasin drains the St. Francois Mountains, which are formed on Precambrian igneous and Cambrian sedimentary rocks (MDNR 1995). Much of the Precambrian rock is weather-resistant rhyolite. Consequently, stream valleys are formed in the easily erodible Cambrian dolomite. The remaining basin drains the Salem Plateau, which is described above.

Soil Types

Lower Subbasin

Discussion of soil types in this subbasin is limited because soil surveys for Wayne County have not been completed. The soil types in northern and western sides of the subbasin are Loring-Captina-Clarksville

and Clarksville-Captina associations (United States Department of Agriculture (USDA) 1983). These soils are silty, moderately well drained, and suitable for trees. In low relief areas, these soils are suited for wheat and pasture. Maintaining fertility and overgrazing are management concerns. In high relief areas, soil erosion is a hazard.

In the Mississippi Alluvial Plain, Calhoun-Amagon and Tuckerman-Bosket associations dominate (USDA 1983) and drainage is considered poor. These soils are suited for soybeans, grain sorghum, wheat, rice, cotton, corn, vegetables, hay, and pasture. Maintaining soil fertility is the main management concern. Both of these soils are suitable for bottomland tree species (*e.g.*, bald cypress).

Upper Subbasin

Discussion of soil types is limited because the Reynolds County soil survey has not been completed. In the Salem Plateau, Goss-Viburnum and Clarksville-Wilderness associations dominate in the uplands and Delassus-Syenite associations dominate in the river valleys (USDA 1991). Goss and Clarksville soils are found on the sides of ridges and are well drained. Viburnum and Wilderness soils are located on the ridgetops. While Wilderness soils are well drained, Viburnum soils are poorly drained. The Goss-Viburnum soils are suited for either pasture or trees, while the remaining soils are best suited for trees. Both the Delassus and Syenite series are moderately well drained and best suited for northern red, white, and black oaks.

In the St. Francois Mountains, Irondale-Killarney-Knobtop associations dominate (USDA 1991). Irondale and Killarney soils are found on the side slopes and Knobtop soils are on the ridgetops. All of these soils are moderately well drained and unsuitable for row crops or pasture due to the hazard of erosion, droughts, and stones on the surface. All soils in this subbasin are considered highly erodible.

Watershed Area

The total drainage area for the basin is 1,756 square miles. The upper and lower subbasin are 906 and 850 square miles, respectively (Table 1).

Stream Order, Mileage, and Gradient

Lower Subbasin

A total of 1,856 miles of stream channel were identified, ordered, measured (by hand dividers), and classified as either intermittent or permanent as indicated on U.S. Geological Survey (USGS) 7.5 minute topographic maps (personal communication, Dennis Norman, Missouri Department of Conservation). There are 305 miles of stream 4^{th} order (4^0) or larger, including 86 miles of Black River (7^0)(Table 2). The designation of 309 miles as permanent streams on the USGS topographic maps does not agree with the 163 miles of permanent stream classified under Missouri Water Quality Standards (MDNR 1996). The Missouri Water Quality Standards are probably more accurate because USGS topographic maps show many second and third streams as permanent, which disagrees with field

observations.

In this subbasin, 399 miles of the streams are channelized and 184 miles are levied, as determined from USGS 7.5 minute topographic maps. The majority of the channelization and floodplain alterations occur south of Poplar Bluff where the primary land use is agriculture.

Big Brushy and Cane Creeks are losing streams (MDNR 1986). Water from Cane Creek flows underground and resurfaces at Keener Springs on the Black River, which is five mile northeast (Vineyard 1982). It is unknown where the flow from Big Brushy Creek goes.

As expected, due to the physiographic makeup of the subbasin, the gradient of the Black River mainstem is much lower than in the upper subbasin. The highest gradient is 5 ft/mile near Piedmont and gradually decreases to 0.6 ft/mile at the state line. Gradients of tributary streams are higher on the western side of the subbasin (*e.g.*, Big Brushy and Tenmile Creeks). In the southern part of the subbasin, stream gradients are typically 1 ft/mile (*e.g.*, Black River and Main Ditch). Gradient plots for all fourth order and larger streams are on file at the MDC Southeast Regional Office.

Upper Subbasin

The Black River is a sixth order stream which is formed by the confluence of the West and Middle Forks of the Black River. The East Fork of the Black River enters the Black River approximately 1 mile downstream of this confluence. A total of 2,171 miles of stream channel were identified on USGS 7.5 minute topographic maps (personal communication, Dennis Norman, Missouri Department of Conservation). There are 310 miles of stream $\geq 4^0$ (Table 2). The designation of 327 miles of permanent streams on the USGS topographic maps does not agree with the 123 miles of permanent stream classified under Missouri Water Quality Standards (MDNR 1996). For reasons previously stated, the Missouri Water Quality Standards are probably a more accurate estimate.

Logan Creek, Doe Run Creek, and Sinking Creek are losing streams (MDNR 1986). Logan Creek loses most of its flow underground in a section where the stream incises an area of Gasconade dolomite. This groundwater then flows south to Blue Springs on the Current River (Vineyard 1982). It is unknown where the flows from Doe Run Creek and Sinking Creek go.

The average gradient for the Black River mainstem is 6 ft/mile, while the gradient in the East, Middle, and West Forks is 35, 25, and 19 ft/mile, respectively. In all three forks, gradients up to 200 ft/mile are present. Gradient plots for all fourth order and larger streams are on file at the MDC Southeast Regional Office.

Table 1. Drainage areas of major tributaries in the Black River basin.

Stream Name	Stream Order	Watershed Area (square miles)
Lower Subbasin		
Black River	7	347
Cane Creek	5	337
East Ditch	6	166
	Total =	**850**
Upper Subbasin		
Black River	6	125
East Fork Black River	5	95
Middle Fork Black River	5	176
West Fork Black River	5	165
Sinking Creek	5	81
Logan Creek	5	200
Webb Creek	5	64
	Total =	**906**

Table 2. Major streams ($\geq 4^0$) in the Black River basin. Tributary streams are indented.

Stream	Stream Order	Total Length (miles)
Lower Subbasin		
Black River	7	86
East Ditch	6	23
Menorkenut Slough	5	15
Unnamed Ditch	4	9
Unnamed Ditch	4	9
Cane Creek*	5	55

Tenmile Creek	4	27
Black River Ditch*	5	14
Main Ditch	4	25
Indian Creek	4	12
Big Brushy Creek	4	21
Greenwood Valley Creek	4	9
	Total =	**305**
Upper Subbasin		
Black River	6	32
Webb Creek	5	11
N.F. Webb Creek	4	8
M.F. Webb Creek	4	8
Logan Creek	5	42
Dry Valley Creek	4	16
Sweet Water Creek	4	6
Sinking Creek	5	26
Harrison Valley Creek	4	6
Peola Branch	4	5
East Fork Black River	5	20
Taum Sauk Creek	4	8
Imboden Creek	4	9
Middle Fork Black River	5	25
Brushy Creek	4	15
Ottery Creek	4	10
Strother Creek	4	12
West Fork Black River	5	36
Bee Fork	4	15
	Total =	**310**

* - These streams join the Black River just south of the Missouri/Arkansas line.

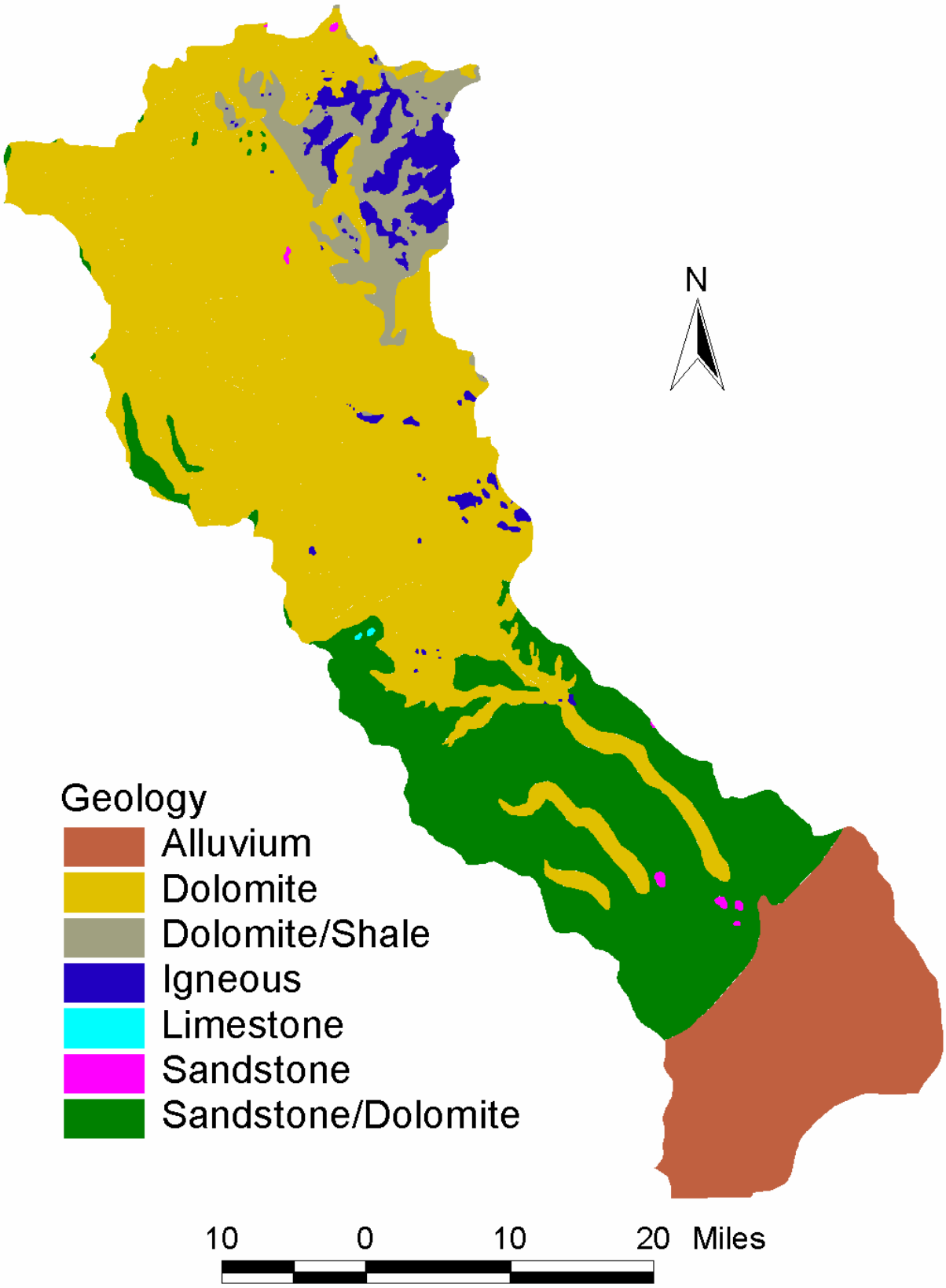


Figure ge. Geological formations in the Black River Watershed.

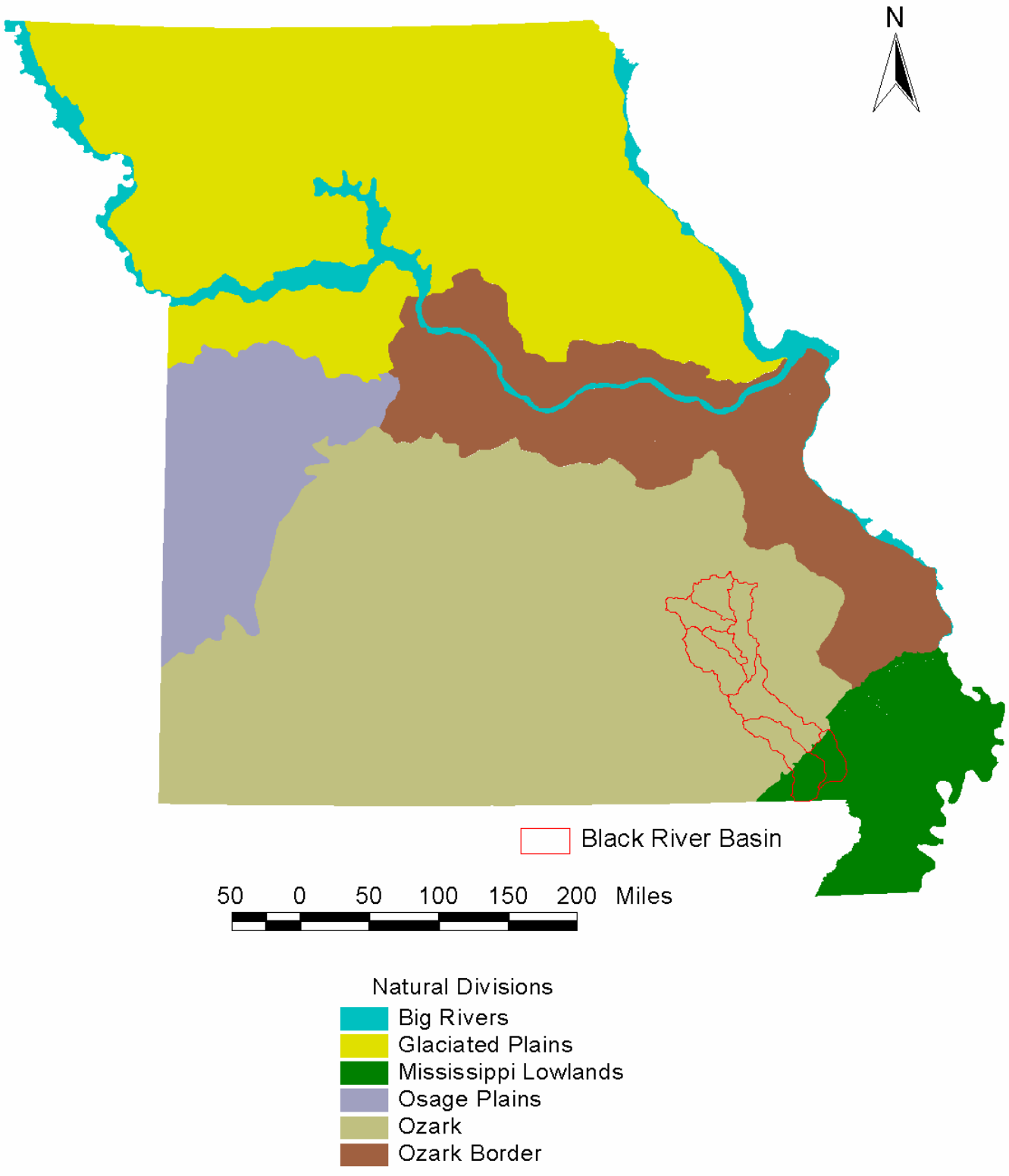


Figure nd. Location of the Black River Watershed within the natural divisions of Missouri.

LAND USE

Historical and Recent Land Uses

Lower Subbasin

The first settlers lived in the hill country along Cane Creek, which was named for the cane growing along the creek (Deems 1940). This cane was reportedly 25 feet tall and an important food source for the settlers' livestock. In the 1870's, the Iron Mountain and Southern Railroad and the Cairo and Fulton Railroad laid lines into the region. From 1872 to 1900, hundreds of sawmills sprang up. Millions of oak, cypress, ash, and gum trees were cut and rafted to Poplar Bluff or Corning, Arkansas (Deems 1940). By the early 1900's the majority of quality timber was exhausted from this subbasin.

Draining of the southern part this subbasin began in 1870 when the Butler County Court constructed a levee along the Black River and a ditch from Cane Creek to the Black River (Deems 1940). In 1906, Charles Lane designed the current system of north/south ditches at one mile intervals and a large levee along the western bank of the Black River (Deems 1940). This drainage system opened up the lands to the west of the Black River for farming. The construction of the levee along the Black River caused more flooding of the eastern part of the basin and in 1913 the Inter-River Drainage District was formed. This drainage district oversaw the construction of drainage ditches, small levees, and a large levee on the west bank of the St. Francis River. This large levee prevented floodwaters from the two basins from mixing.

Currently, the lower subbasin is 55% forest and 45% row crop or pasture (MDNR 1995; Figure lu). Soybeans, followed by rice and corn, are the three major crops in Butler County (personal communication, Ken Whitehead, Natural Resources Conservation Service, Butler County). The amount of rice planted in Butler County is rapidly increasing. In 1999, 70,000 acres were planted with rice, up from 49,000 acres in 1997 (personal communication, Bruce Beck, University of Missouri Outreach and Extension, Butler County).

Upper Subbasin

Like in the lower subbasin, the timber industry dominated in the early 1900's. The T.J. Moss Tie Company kept the three forks of the Black River full of railroad ties from early spring through late summer (Anonymous 1995). By the late 1920's, the lumber boom was over because most of the marketable timber was gone. Because of this widespread cutting, dense stands of shrubs and brush soon covered the watershed. To control this growth, large-scale burning became a common practice and consequently, the soil was laid bare to erosion (Anonymous 1995). Excessive gravel eroded from the hillsides and into the streams.

This subbasin lies within the Viburnum Trend, also known as the "new lead belt" (Smith 1988). In 1955, substantial deposits of lead, zinc, copper, and silver were discovered in this subbasin. By 1970, the new lead belt was the largest lead producing region in the world (Wixson and Tranter 1972). More information on lead mining can be found in the Water Quality and Use section.

Currently, this subbasin is 85% forest and 15% pasture (MDNR 1995), with no major urban areas.

Soil Conservation Projects

Lower Subbasin

One Public Law 83-566 project is under way in the City of Piedmont on McKenzie Creek. The goal of the project is to reduce flood damages by moving residents and businesses out of the floodplain and creating a greenway along the creek. As of February 2004, 101 properties have been purchased. Additional information pertaining to this project can be obtained by contacting the Natural Resources Conservation Service at Parkade Center, Suite 250, 601Business Loop 70 West, Columbia, Missouri, 65203.

An EARTH project in the northern one-half of McKenzie Creek watershed was started in September 1993. The project objective is to reduce erosion to "T" through the installation of erosion control structures, pasture and hayland improvement, and woodland enhancement through livestock exclusion. To date, two of the planned 56 ponds have been constructed and approximately 8,000 acres of pasture, hayland, or woodlands have been enhanced (personal communication, Tom Johnson, Natural Resources Conservation Service, Wayne County).

Upper Subbasin

There are no completed, scheduled, or on-going soil conservation projects in this subbasin.

Public Areas

Lower Subbasin

Public lands total 114,997 acres (21% of subbasin) (Figure lp, Table 3). The majority of this acreage (87%) is owned by the U. S. Forest Service (USFS). On the Black River, concrete boat ramps are located at Coon Island Conservation Area (MDC), Sportsman's Park Access (MDC), Hilliard Access (MDC), Hendrickson Access (USFS), Markham Springs (USFS), and below Clearwater Dam (U.S. Army Corps of Engineers (COE)). Only small boats or canoes can be launched from Bradley A. Hammer Memorial Conservation Area (MDC) and Highway 49 (Mill Spring City Park). A concrete boat ramp is also present at the Harviell Access (MDC) on Cane Creek.

Upper Subbasin

Lands open to the public total 188,555 acres (33% of subbasin) (Figure up, Table 3). Much of this is USFS land (69%), but the COE owns 19,000 acres around Clearwater Reservoir and the MDNR owns 9,200 acres (Johnson Shut-Ins State Park and Taum Sauk Mountain State Park). In June 1967, the Missouri Department of Conservation entered into a 25-year lease agreement with Union Electric, now called AmerenUE, to manage Lower Taum Sauk Lake and the surrounding lands (1,540 Acres). In 1992, this lease was renewed for an additional 25 years.

Three concrete boat ramps are located on Clearwater Reservoir (Piedmont Park, Webb Creek, and Bluff View). No concrete boat ramps are located on any subbasin streams. On the Black River, small boats or canoes can be launched from the Lesterville Access (MDC) and Highway K (COE). On the West Fork of the Black River, the Centerville Access (MDC) can be used to launch canoes or small boats.

Corp of Engineers Jurisdiction

The entire basin is under the jurisdiction of the Little Rock District of the U.S. Army Corps of Engineers. Permits issued under Section 404 of the Federal Clean Water Act are required to conduct many instream activities. Applications for Section 404 permits should be directed to the Little Rock office:

Little Rock District
Corps of Engineers
P.O. Box 867
Little Rock, AR 72203-0867
Phone: (501) 324-5295
http://www.swl.usace.army.mil

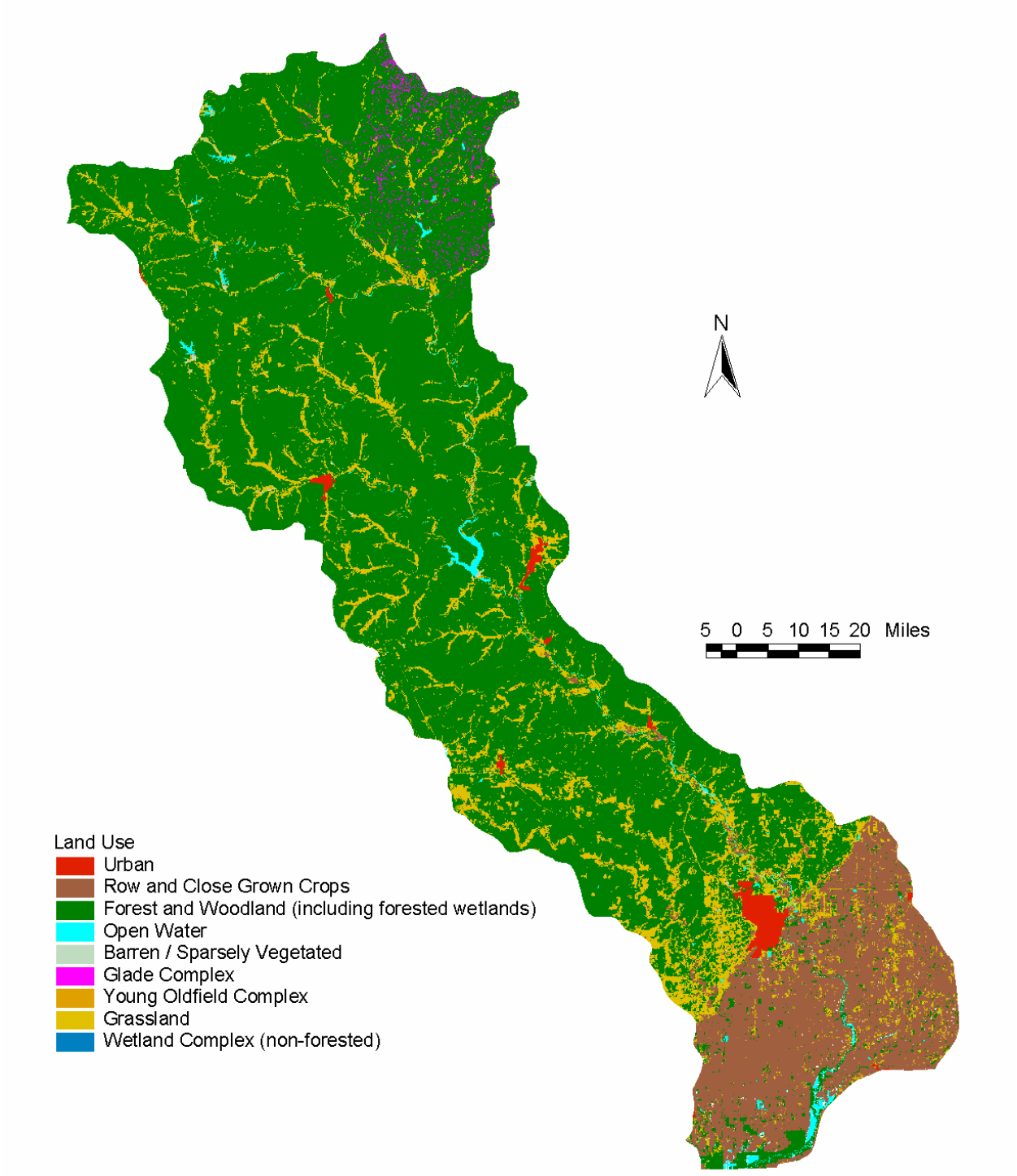


Figure lu. Land use in the Black River Watershed, in Missouri.

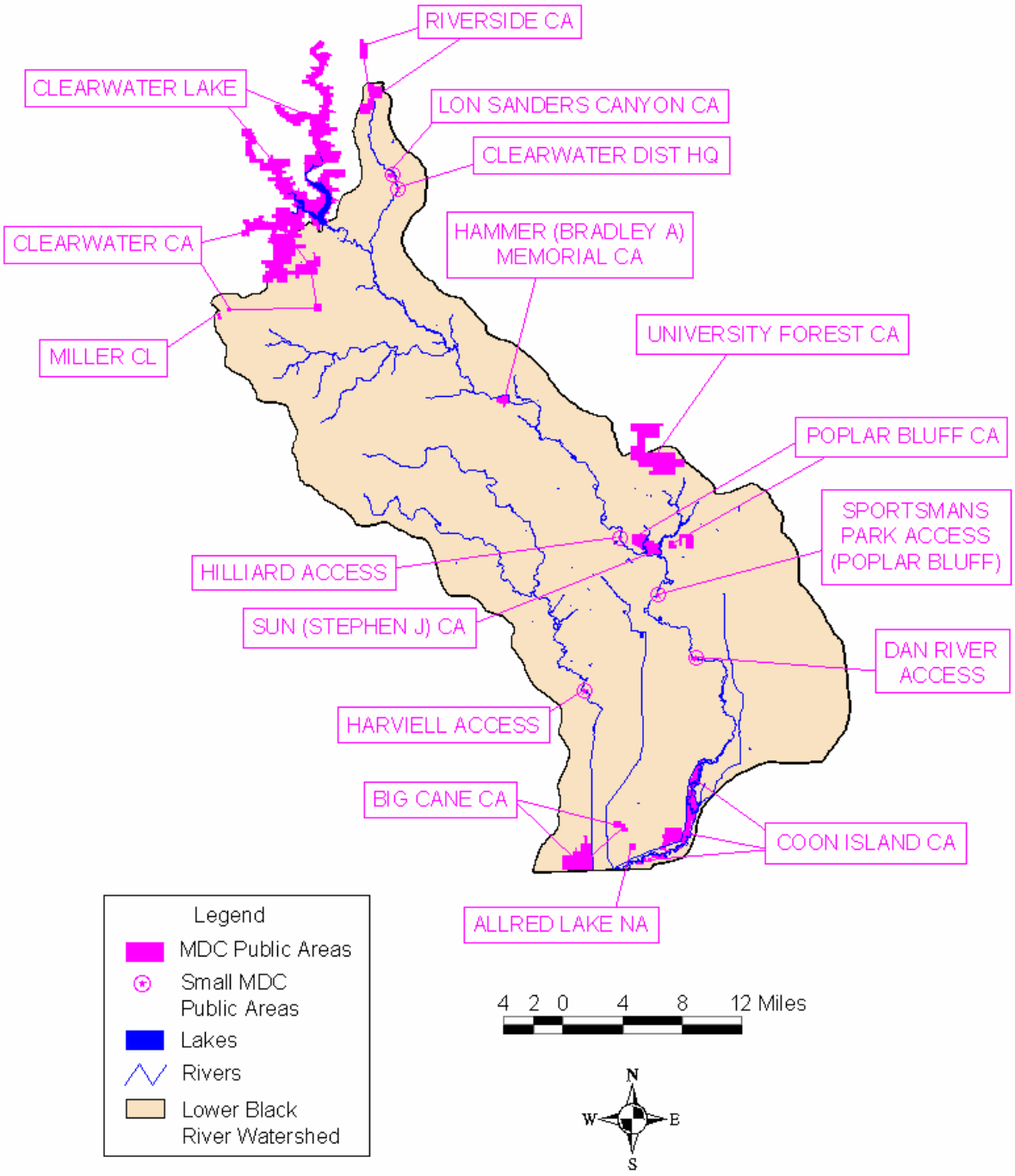


Figure Ip. Public areas in the lower Black River Watershed. CA = Conservation Area. NA = Natural Area. DIST HQ = District Headquarters.

Table 3. Land and water open for public use in the Black River basin.

Lower Subbasin		Upper Subbasin	
Area Name*	**Acres**	**Area Name***	**Acres**
Aldred Lake NA	167	Centerville Access	46
Big Cane CA	1,929	Champion Springs CA	165
Mac and Zelma Carmichael SF	38	Clearwater CA	7,474
Clearwater CA	3,313	Current River CA	4,394
Clearwater District Office	4	Funk Memorial SF	449
Coon Island CA	3,199	Ketcherside Mountain CA	1,622
Crane Roost Access	18	Lesterville Access	42
Dan River Access	75	Lily Pond NA	8
Bradley A. Hammer Memorial CA	333	Logan Creek CA	10,808
Harviell Access	37	Riverside CA	937
Hilliard Access	1	Rock Creek CA	366
Lon Sanders Canyon CA	143	AmerenUE (Lower Taum Sauk Lake)	1,540
Miller Community Lake	62	MO Dept. of Natural Resources	9,208
Mussel Boat Landing Access	12	U.S. Corps of Engineers	19,317
Otter Slough CA	49	USFS - Mark Twain National Forest	127,179
Riverside CA	983	**Total =**	**183,555**
Sportsman's Park Access	8		
Poplar Bluff/Stephen J. Sun CA	1,699		
University Forest CA	2,483		
U.S. Corps of Engineers	271		
USFS - Mark Twain National Forest	100,094		
Total =	**114,997**		

* - CA = Conservation Area, SF = State Forest, NA = Natural Area, USFS = United States Forest Service

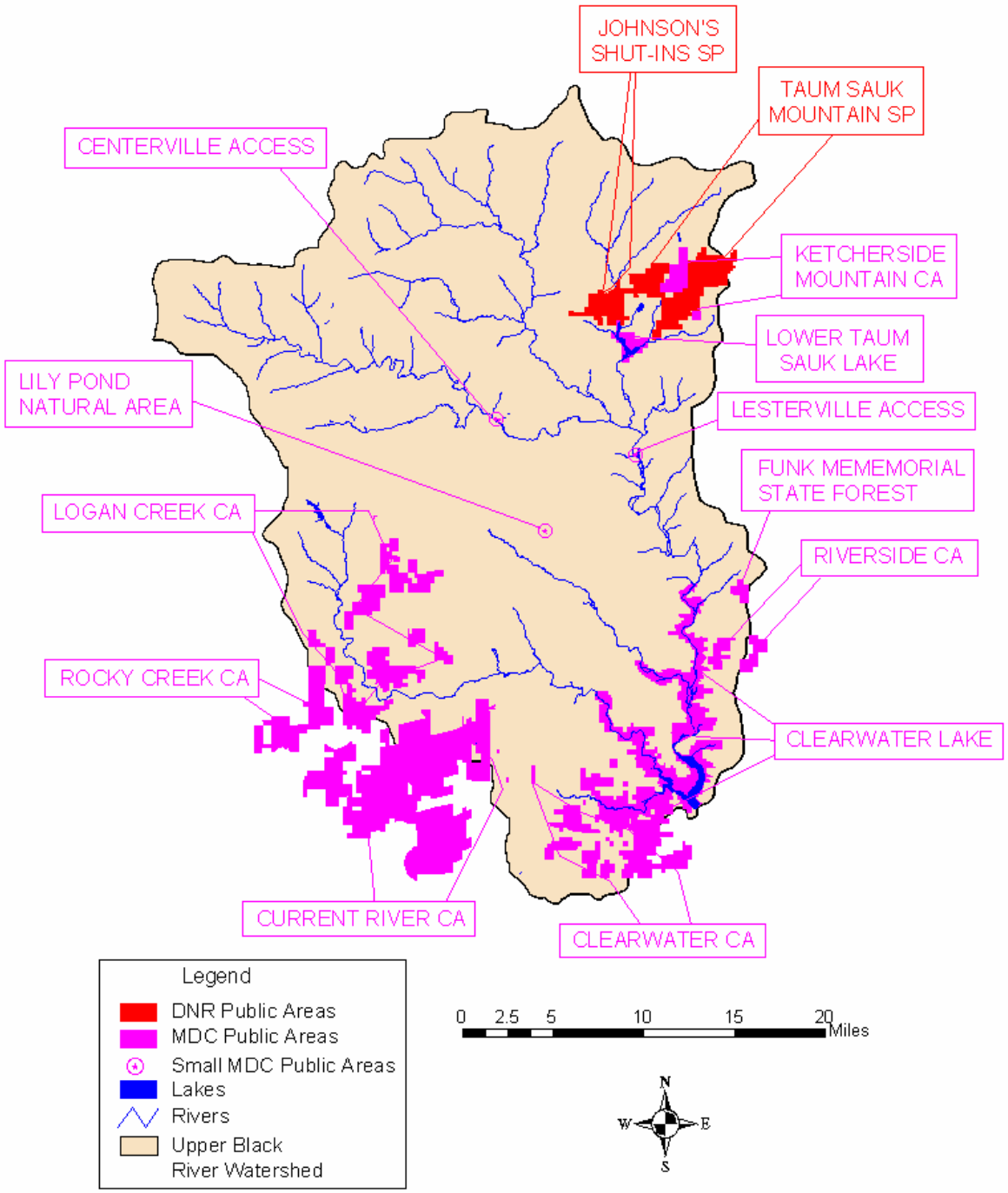


Figure up. Public areas in the upper Black River Watershed.
CA = Conservation Area. SP = State Park.

HYDROLOGY

Precipitation

In the lower and upper subbasins, the annual average precipitation is 46 inches and 42 inches, respectively (MDNR 1986). In the upper subbasin, the average annual run off is 16.6 inches and in the lower subbasin, runoff averages 14.5 inches per year (Vandike 1995).

Gaging Stations

Currently, there are four United States Geological Survey (USGS) streamflow stations operating in the basin. Three stations are located in the upper subbasin (Logan Creek at Ellington, East Fork of the Black River at Highway 72, and Black River at Highway K, just upstream of Clearwater Reservoir). In the lower subbasin, the flow station is located on the Black River at Poplar Bluff. For additional information regarding streamflow (*e.g.*, site map, real time gage height and discharge, or annual streamflow statistics) go to http://waterdata.usgs.gov/mo/nwis/current/?type=flow.

Stream Flow

Ozark streams have the highest, most well-sustained base flows in the state because of the high permeability of the carbonate rocks, which store and transmit large quantities of groundwater (Kratzer and Jenkins 1985). The lowland streams, located in Mississippi Alluvial Plain are sustained by ground water contributions from the extensive alluvial deposits.

Lower Subbasin

The average discharge of the Black River at Popular Bluff is 1,330 cubic foot per second (cfs) (Vandike 1995). The 1984 water year (October through September) had the highest average discharge (2,858 cfs). The 1954 water year was the driest with an average discharge of 564 cfs. The maximum and minimum instantaneous discharges ever recorded were 65,000 cfs (12/4/82) and 180 cfs (9/25/66).

Upper Subbasin

In the upper subbasin, the average discharge of the Black River at Highway K is 591 cfs (Vandike 1995). The highest and lowest yearly averages were 1,420 cfs in water year 1985 and 244 cfs in water year 1954. The highest recorded instantaneous discharge was 98,500 cfs on November 11, 1985. On August 12, 1965, the lowest instantaneous discharge (67 cfs) was recorded.

Springs

In the upper and lower subbasins there are 17 and 11 springs, respectively (Table 4). Pittman (20 million gallons/day) and Keener (14 million gallons/day) are the largest springs in the lower subbasin (Vandike 1995). Warner Bay Spring (11 million gallons/day) is the largest spring in the upper subbasin (Vineyard 1982). For additional information on springs, visit http://www.umsl.edu/~joellaws/ozark_caving/springs/jspring.html.

Dam and Hydropower Influences

Two reservoirs exist in the basin and both of these are located in the upper subbasin. Clearwater Reservoir (1650 acres) is located on the Black River and Lower Taum Sauk Lake (200 acres) is located on the East Fork of the Black River (Figure 3).

Clearwater Dam is in Wayne County, but nearly all of the reservoir is in Reynolds County. Clearwater Reservoir was authorized by the Flood Control Act of 1938. Construction was initiated in May 1940 and was completed in 1951. This reservoir is operated by the Corps of Engineers for the primary purpose of flood control, with conservation of fish and wildlife and recreation as other purposes.

Water releases from Clearwater Reservoir are dictated by river stages at the Popular Bluff gage. The authorized regulating plan calls for a maximum river stage of 11½ feet from December 1 through March 31 and a maximum river stage of 10½ feet from April 1 through November 30.

An environmental assessment is being conducted on proposed changes to the Clearwater Reservoir water control plan. The proposed plan calls for discharge to be regulated both by the Poplar Bluff river stage and Clearwater Reservoir level (Figure 4). In the proposal, the conservation pool would be held at 498 NGVD from April 15 through October 14. Starting the October 15th, the conservation pool elevation would be lowered to 494 NGVD.

At an elevation of 494 NGVD, the Reservoir covers 1,650 acres (22,000 acre-feet of water). At the top of the flood pool (567 NGVD), the Reservoir covers 10,250 acres (413,000 acre-feet of water). Approximately 95% of the Reservoir volume (391,000 acre-feet) is for flood control purposes, an extremely high proportion when compared to the other reservoirs. The highest water level ever recorded (566.6') occurred on May 20, 2002.

An AmerenUE dam on the East Fork of the Black River forms Lower Taum Sauk Lake (LTS), the lower lake of a two lake pump-storage hydroelectric plant. The upper reservoir is located on Proffit Mountain, approximately 800 feet higher than the lower reservoir. During peak electrical demand periods, water is released from the upper reservoir through a 6,500-foot tunnel and into the lower reservoir. During low electrical demand periods, water is pumped back into the upper reservoir.

The LTS dam was designed to allow the same amount of water entering the lake from the East Fork of the Black River to exit the lake at the base of the dam. Because the facility is a peak hydroelectric

facility, water levels in the lower lake can fluctuate greatly in a short time period. Water levels can rise 15 feet in eight hours during power generation or fall 15 feet in 12 hours during the pumpback process.

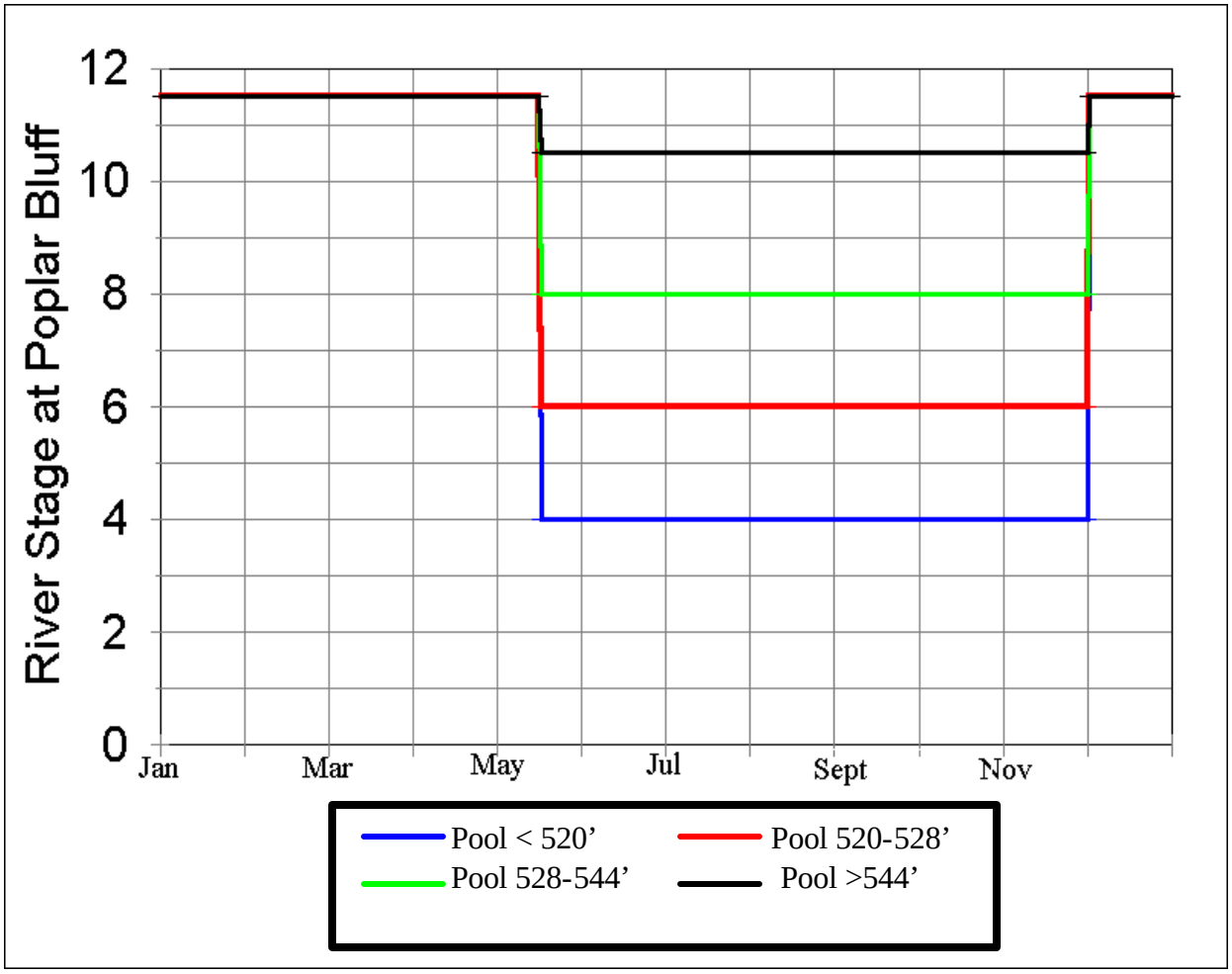
To keep river-borne sediment from reducing LTS's storage capacity or blocking the canal between the power plant and the lake, a dam to trap gravel was constructed across the East Fork of the Black River just upstream of the reservoir. In the past 30 years, this gravel trap has been cleaned out five times. Each time approximately 30,000 cubic yards of material were removed.

Table 4. Springs in the Black River basin.

Spring Name	Nearest Town	County	T R S
Lower Subbasin			
Bay	Poplar Bluff	Butler	24N 5E SE¼ SE¼ S5
Branscum	Poplar Bluff	Butler	25N 4E SW¼ NE¼ S13
Brewer Bay	Piedmont	Wayne	28N 3E SW¼ NW¼ S5
Bunyard #1	Mill Spring	Wayne	27N 4E SW¼ NW¼ S6
Bunyard #2	Mill Spring	Wayne	27N 4E SE¼ NW¼ S6
Keener	Williamsville	Wayne	26N 5E SE¼ SE¼ S4
Leeper	Leeper	Wayne	28N 3E SE¼ NE¼ S27
Lord	Williamsville	Wayne	27N 5E NE¼ SE¼ S27
Markham	Williamsville	Wayne	27N 4E SW¼ NW¼ S23
Mill	Mill Spring	Wayne	28N 3E NE¼ NW¼ S8
Pittman	Piedmont	Wayne	28N 3E NW¼ NW¼ S8
Upper Subbasin			
Ansden	Centerville	Reynolds	31N 1E SE¼ SE¼ S19
Carter #1	Piedmont	Reynolds	29N 2E SE¼ SW¼ S34
Carter #2	Piedmont	Reynolds	28N 2E SW¼ NW¼ S3
Champion	Annapolis	Reynolds	31N 3E SE¼ NW¼ S19
Cook	Centerville	Reynolds	32N 1W NE¼ SW¼ S3
Faulkenberry	Lesterville	Reynolds	32N 1E NE¼ NW¼ S16
January	Centerville	Reynolds	32N 1E SE¼ SE¼ S29

Spring Name	Nearest Town	County	T R S
John Beck	Corridon	Reynolds	31N 2W NW¼ SW¼ S36
Joe Beck	Corridon	Reynolds	31N 2W SE¼ NE¼ S26
Keith	Bixby	Iron	34N 1E NE¼ NE¼ S8
Morris	Ellington	Reynolds	30N 1E SE¼ NW¼ S36
Randolph	Ellington	Reynolds	30N 1E SW¼ SW¼ S20
Reeds	Centerville	Reynolds	32N 1E NE¼ SW¼ S28
Ringo	Black	Reynolds	33N 1E NE¼ NW¼ S33
Spout	Corridon	Reynolds	31N 2W SE¼SW¼ S13
Unnamed	Lesterville	Reynolds	31N 2E NW¼ NE¼ S9
Warner Bay	Lesterville	Reynolds	31N 2E NW¼ NW¼ S9

Figure 4. Proposed discharge plan for Clearwater Lake.



WATER QUALITY AND USE

Beneficial Use Attainment

The Missouri Department of Natural Resources and the Clean Water Commission are responsible for setting and enforcing the water quality standards for Missouri. These standards have specific acceptable ranges for several indicators of water quality, such as pH range of 6 to 9, fecal coliform levels not to exceed 1,000 colonies per milliliter, and nitrate levels of 10mg/l or less for drinking water supplies. Dissolved oxygen concentrations for cool and warmwater fisheries should not fall below 6 parts per million (MDNR 1996)

In the lower subbasin, the Black River and Cane Creek are classified for whole-body contact recreation (MDNR 1986). Whole-body contact recreation includes activities such as swimming, water skiing, and skin diving, where raw water may be accidentally ingested and sensitive organs, such as the eyes, ears, and nose, will be exposed to it. In the upper subbasin, Logan Creek, Clearwater Lake, the Black River, and all three forks of the Black River are classified as whole-body contact.

Section 303(d) of the Federal Clean Water Act requires states to list waters not expected to meet established state water quality standards (MDNR 1998). There are three listed streams in the Black River basin. In the lower subbasin, the Poplar Bluff waste water treatment plant degrades approximately five miles of Main Ditch, where both biological oxygen demand and non-filterable residue standards are not met. In McKenzie Creek, low pH waters from the Gads Hill Quarry degrade approximately ½ mile of creek. In the upper subbasin, nutrients from the Doe Run West Fork Mine degrade 0.2 miles of the West Fork of the Black River. For additional information on 303(d) streams in Missouri go to: http://www.dnr.state.mo.us/wpscd/wpcp/nps/index.html

Water Quality

Good water quality is generally shared throughout the Ozark portions of both subbasins. However, approximately 30% of the wells in the lowlands exceed water quality standards for nitrates (MDNR 1995). One percent of the wells also exceed pesticides standards (MDNR 1995).

Fish Kills and Pollution Incidents

There have been fourteen confirmed pollution incidents in the Black River basin since 1989 (Table 5). The incident causing the largest recorded fish kill occurred in McKenzie Creek, where 27,000 fish, primarily minnows, died.

MDC has collected fish for contaminant analysis from several locations in the watershed. The Missouri Department of Health reviews the contaminant analyses and, if necessary, issues consumption advisories. There have been no advisories issued for any particular streams or lakes in the basin. However, because of mercury contamination, the Department of Health has issued an advisory for all lakes and streams in Missouri stating that women who are pregnant, or may become pregnant or whom

are nursing and children 12 years of age or younger should not eat any largemouth bass more than 12 inches (MDC 2003).

Water Use

In the basin, 190 million gallons per day of water, primarily from groundwater sources (96%), are used for public consumption, irrigation, livestock, industry, or mining (http://water.usgs.gov/cgi-bin/wuhuc?huc=11010007). The majority of water is used for irrigation (86%) and mining (9%) purposes. Approximately 102,000 acres of land are irrigated.

Nonpoint and Point Source Pollution

In both subbasins, soil erosion rates have been significantly reduced during the past 15 years (personal communication, Mark Nussbaum, Natural Resources Conservation Service). The basin's sheet erosion (½ to 1½ tons/A/year) and gully erosion (0 to 0.16 ton/A/year) are not considered a serious problem (MDNR 1995). In the lowland section of the subbasin, nutrient and pesticide runoff from agricultural lands are more likely to impact water quality than point sources (MDNR 1995).

Point sources are those which discharge waste water into waters of the state and must obtain a National Pollution Discharge Elimination System (NPDES) permit. The MDNR issues and monitors these permits throughout Missouri.

In the basin, there are 16 public and 29 private wastewater treatment plants. The largest wastewater treatment plant is at Poplar Bluff with an estimated discharge of 2.9 million gallons per day. For information regarding the location and discharge of other NPDES permits, go to http://www.dnr.state.mo.us/wpscd/wpcp/permits/reports/wpcpermits-reports.htm

Six active lead mines are present in the watershed, all of which are located in the upper subbasin (Table 6) (http://www.dnr.state.mo.us/wpscd/wpcp/permits/reports/wqcounty.pdf). These mines discharge a combination of groundwater that has seeped into the mine and mill water, which is used to separate lead ore from the surrounding rock. Typically, some of the mine water is discharged directly into streams and may contain elevated nitrogen levels due to use of explosives in the mines. Remaining mine water is diverted into mill ponds and used in the milling process. During the milling process, rock is crushed and the lead is removed by a series of flotation process using water and organic chemicals. Mill waters are usually recycled but there is some discharge into the streams. This discharge is rich in nitrogen and phosphorous, which causes excess algae growth downstream of the mill pond.

The presence of enormous amounts of tailings (finely ground rock) stored behind dams in several basin streams represents a substantial threat in the form of sediment pollution and lead contamination to aquatic life. Failure of these dams would allow large quantities of tailings to quickly enter basin streams.

Table 5. Summary of pollution incidents in the Black River basin.

Stream	Date	County	Severity	Est. Number of Fish Killed	Monetary Value	Cause
Lower Subbasin						
McKenzie Creek	6/19/90	Wayne	Severe	27,253	$6,433.13	Ammonia
McKenzie Creek	2/8/91	Wayne	Light	None	---	Diesel Fuel
Tenmile Creek	6/10/91	Butler	Moderate	4,490	$2878.30	Unknown
McKenzie Creek	3/4/92	Wayne	Light	Unknown	---	Unknown
Black River	10/15/92	Butler	Heavy	Unknown	---	Organic
Black River	6/7/94	Butler	Unknown	Unknown	---	Diesel Fuel
Black River	10/6/94	Butler	Unknown	Unknown	---	Enriched water
Cane Creek Trib.	6/26/96	Butler	Light	Unknown	---	Dewatering
Cane Creek	6/18/98	Butler	Unknown	Unknown	---	Unknown
Upper Subbasin						
WF Black River	5/5/89	Reynolds	Light	115	$15.50	Spawning stress
Doe Run Creek	3/18/92	Reynolds	Unknown	Unknown	---	Creosote
WF Black River	6/16/92	Reynolds	Unknown	Unknown	---	Mining effluent
Clearwater Lake	5/22/97	Reynolds	Light	400	$982.68	Spawning stress
EF Black River	8/15/98	Reynolds	Light	Unknown	---	Turbid water

Source: MDC files

Table 6. Lead mines in the Black River basin.

Facility Name	MDNR Facility ID Number	Stream Discharge
Doe Run Sweetwater Mine	MO0001881	Adair Creek
Doe Run Brushy Creek Mine	MO0001848	Bills Creek
Doe Run Buick Mine	MO0002003	Strother Creek
Doe Run Fletcher Mine	MO0001856	Bee Fork Creek
Doe Run West Fork Unit	MO0100218	West Fork Black River
Cominco Magmont Mine	MO0001872	Neals Creek

HABITAT CONDITIONS

Channel Alterations

Lower Subbasin

Streams in the southeast portion of this subbasin has been completely channelized and leveed. Aquatic habitat problems include unstable streambed substrates, loss of deep water habitat, and lack of riparian corridor.

In the western and northern portions of the subbasin, no major channelization projects have occurred. Small channelization projects, gravel pushing, and poor gravel removal methods are widespread and relatively common. The detrimental effects of these activities on the stream health are significant, but localized. It is difficult to quantify the cumulative effects on the streams.

Instream gravel mining formed both the Hendrickson and the Keener Springs pools in the Black River (mining has since ceased). The expected bank failures upstream of these pools due to headcuts have not occurred. However, local residents indicate that the Keener Springs pool is rapidly filling in with gravel.

Upper Subbasin

No large channelization projects have occurred. As in the lower subbasin, small channelization projects, gravel pushing, and poor gravel removal methods are relatively common.

Stream Habitat Assessment

The MDC Stream Habitat Assessment Device (SHAD) was used to describe the quality of streambank, corridor, and channel habitat conditions in the basin. SHAD uses objective measurements and subjective ratings to rank particular habitat parameters into categories. Forty-five and 29 SHADs were conducted in the lower and upper subbasins, respectively.

Lower Subbasin

Excluding the Lowland ditches, the majority (62-92%) of the riparian corridors surveyed was classified as “good” (Table 17). Only 4% of the corridors on the ditches were rated “good”.

Excluding the Lowland ditches, the riparian corridor averaged 60 -75 feet. Along the lowland ditches, the riparian corridor averaged only 11 feet.

Streambank erosion is not a major problem in this subbasin. Only 1% of the 8.5 miles of stream surveyed had severe erosion problems (Table 18). The streambank erosion problems which were noted, were all associated with missing riparian corridors. Severe bank erosion is not occurring on the lowland ditches because of soil composition and low stream gradients (~1ft/mile). However, instream woody habitat is completely missing from most ditches.

Upper Subbasin

Of the approximately 18 miles of riparian corridors surveyed, 50-100% were classified as "good" (Table 17). Only 0-12% of the riparian corridors were classified as "poor. The average riparian corridor range was 58-100 feet (Table 17). However, some streams that were not part of the survey, such as the North Fork of Webb Creek, Doe Run Creek, and Dickson Valley Creek have several miles of corridor that are nonexistent or consists of one row of trees.

While few severely eroding streambanks were noted (Table 18), many streambanks were classified as "moderately eroding". Many streams, such as the Black River, are experiencing moderate erosion even with an excellent riparian corridor. This erosion can be attributed to the excessive amounts of gravel bedload in the stream channel. Almost all SHAD surveys had comments regarding large amounts of unconsolidated gravel in the stream channel.

Improvement Projects

As in most river basins, there have been a variety of unsuccessful attempts by private landowners to stabilize streambanks. These attempts include channelization, hard points, bank armoring using a variety of materials including rock, gravel, car bodies, and construction debris. MDC personnel have not installed any improvement projects (*e.g.*, cedar tree revetments) in either subbasin.

Unique Habitats

The state's terrestrial natural resources have been classified into six major categories– Forest, Savanna, Prairie, Primary, Wetland, and Cave communities. These communities have been further divided based on characteristic features such as topography, size, distribution, and characteristic plants (Nelson 1987). The Missouri Department of Conservation's Natural Heritage Program (NHP) has identified 64 high-quality communities in the Black River basin (Table 19).

Lower Subbasin

Seventeen high-quality natural communities, representing Forest, Savanna, and Wetland categories, have been identified (Table 19). In the Forest category, Dry-Mesic Igneous Forest, Wet Bottomland Forest, and Wet-Mesic Bottomland Forest are present. The only high-quality Savanna community identified is a 60-acre igneous savanna. The Wetland category is represented by Deep Muck Fen, Forested Acid Seep, Forested Fen, Oxbows and Sloughs, Pond Shrub Swamp, and Swamp communities.

Upper Subbasin

The NHP has identified 47 high-quality natural communities (Table 19). This subbasin contains both upland and bottomland forest. The upland forest habitats include Dry-Mesic Forest, Mesic Limestone/Dolomite Forest, Dry Igneous Forest, Dry Mesic Igneous Forest, and Mesic Igneous Forest. The bottomland forest type is the Dry-Mesic Bottomland Forest. The Primary communities include the Dry Limestone/Dolomite Cliff, Dolomite Glade, and Igneous Glade. Five Wetland community types (Acid Seep, Deep Muck Fen, Prairie Fen, Forested Fen, and Pond Shrub Swamp) are also present.

There is only one Cave community type identified, the Effluent Cave.

Table 17. Riparian corridor conditions in the Black River basin as determined by SHAD surveys.

			Corridor Quality Ranking (%)[a]			Ave Width (ft) Forested Corridor
Stream	No. of SHADS	Total SHAD Length (feet)	Good	Fair	Poor	
Lower Subbasin (data collected 1988- 1995)						
Black River Mainstream	13	16,904	75	14	11	75
Brushy Creek	5	2,585	92	8	0	72
Cane and Tenmile Creeks	10	9,814	62	35	3	70
West Flowing Streams [b]	4	1,517	72	28	0	60
Lowland Ditches [c]	13	13,900	4	17	79	11
Upper Subbasin (data collected in 1988)						
Black River Mainstream	5	15,922	100	0	0	100
West Fork Black River	7	15,874	93	0	7	78
Middle Fork Black River	3	3,989	100	0	0	98
East Fork Black River	1	497	50	38	12	58
Webb, Logan, & Sinking Creeks	7	5,580	95	4	1	94
Miscellaneous Streams [d]	6	5,556	94	3	3	93

[a] - Good = dense stand of un-even aged trees and shrubs, Fair = moderately dense stand of un-even aged trees and shrubs or dense stand of mature trees with sparse understory, Poor = sparse trees and understory or heavily grazed grasses.

[b] - Indian Creek, Greenwood Valley Creek, and McKenzie Creek

[c] - East Ditch, Ditches 16 & 17, Lake Slough Ditch, Brosley Ditch, Menorkenut Cutoff, Menorkenut Slough, Cane Creek Ditch, & Main Ditch

[d] - Bee Fork, Brushy Creek, Dry Valley Creek, Ottery Creek, & Strother Creek

Table 18. Streambank erosion ratings in the Black River basin as determined by SHAD surveys.

Stream	Streambank Erosion Rating (%)[a]		
	None	Moderate	Severe
Lower Subbasin (data collected 1988-1995)			
Black River Mainstream	98	trace	1
Brushy Creeks	99	0	1
Cane and Tenmile Creeks	97	0	3
West Flowing Streams [b]	100	0	0
Lowland Ditches [c]	100	0	0
Upper Subbasin (data collected in 1988)			
Black River Mainstream	8	92	0
West Fork Black River	38	62	0
Middle Fork Black River	70	30	0
East Fork Black River	100	0	0
Webb, Logan, and Sinking Creeks	76	17	7
Miscellaneous Streams [d]	89	7	4

[a] - Streambank Erosion Rating: None = Streambank well vegetated and < 45^0 slope, Moderate = streambank with little vegetation and 45-90^0 slope, Severe = no streambank vegetation and bank nearly vertical.

[b] - Indian Creek, Greenwood Valley Creek, and McKenzie Creek

[c] - East Ditch, Ditches 16 & 17, Lake Slough Ditch, Brosley Ditch, Menorkenut Cutoff, Menorkenut Slough, Cane Creek Ditch, & Main Ditch

[d] - Bee Fork, Brushy Creek, Dry Valley Creek, Ottery Creek, & Strother Creek

Table 19. High-quality natural communities in the Black River basin.

Community Name	Area Name[a]	Size (Acres)	Ownership[a]
Lower Subbasin			
Deep Muck Fen	MTNF Poplar Bluff District	1	USFS
Dry-Mesic Igneous Forest	----	80	Private
Forested Acid Seep	Poplar Bluff CA	1	MDC
Forested Acid Seep	MTNF Poplar Bluff District	38	USFS
Forested Fen	MTNF Poplar Bluff	10	USFS
Igneous Savanna	----	60	Private
Oxbows and Sloughs	Sun Stephen J. CA	10	MDC
Oxbows and Sloughs	Allred Lake NA	7	MDC
Pond Shrub Swamp	MTNF Poplar Bluff District	1	USFS
Pond Shrub Swamp	----	2	Private
Swamp	----	8	Private
Swamp	----	24	Private
Swamp	Allred Lake NA	27	MDC
Wet Bottomland Forest	Allred Lake NA	21	MDC
Wet-Mesic Bottomland Forest	Allred Lake NA	21	MDC
Wet-Mesic Bottomland Forest	Big Cane CA	920	MDC
Wet-Mesic Bottomland Forest	Poplar Bluff CA	53	MDC
Upper Subbasin			
Acid Seep	Taum Sauk Mountain SP	0.25	MDNR
Acid Seep	Ketcherside Mountain CA	0.25	MDC
Cave	----	----	Private
Creeks & Small Rivers	Lesterville Access	---	MDC
Deep Muck Fen	----	4	Private
Deep Muck Fen	----	4	Private
Deep Muck Fen	----	1	Private
Deep Muck Fen	Clearwater CA	1	MDC
Deep Muck Fen	Grasshopper Hollow NA	9	USFS

Deep Muck Fen	Johnson's Shut-ins SP	1	MDNR
Deep Muck Fen	MTNF- Salem District	1	USFS
Deep Muck Fen	----	0.3	Private
Dolomite Glade	Johnson's Shut-ins SP	13	MDNR
Dry Igneous Cliff	Taum Sauk Mountain SP	----	MDNR
Dry Igneous Forest	Johnson's Shut-ins SP	5,200	MDNR
Dry Limestone/Dolomite Cliff (1)	MTNF- Salem District	----	USFS
Dry Limestone/Dolomite Cliff (2)	MTNF- Salem District	----	USFS
Dry-Mesic Forest	Bell Mountain WA	81	USFS
Dry-Mesic Bottomland Forest	Taum Sauk Mountain SP	215	MDNR
Dry-Mesic Igneous Forest	St. Francois Mountain NA	1,105	MDNR
Fen	Grasshopper Hollow NA	2	USFS
Fen	Husman Fen NA	1	Private
Fen	MTNF-Salem District	0.1	USFS
Flatwoods	Taum Sauk Mountain SP	15	MDC
Forested Fen	Grasshopper Hollow NA	4	USFS
Forested Fen	Johnson's Shut-ins NA	8	MDNR
Forested Fen	MTNF-Salem District	3	USFS
Gravel Wash	Taum Sauk Mountain SP	15	MDNR
Headwater Streams	Taum Sauk Mountain SP	---	MDNR
Igneous Glade	Bell Mountain WA	106	USFS
Igneous Glade	Bell Mountain WA	7	USFS
Igneous Glade	Bell Mountain WA	321	USFS
Igneous Glade	Taum Sauk Mountain SP	130	MDNR
Igneous Glade	Taum Sauk Mountain SP	184	MDNR
Igneous Glade	Ketcherside Mountain CA	228	USFS
Mesic Igneous Forest	Taum Sauk Mountain SP	35	MDNR
Mesic Limestone Forest	MTNF Potosi District	48	USFS
Pond Shrub Swamp	----	1	Private
Pond Shrub Swamp	Bowles Pond	1	Private
Pond Shrub Swamp	Lily Pond NA	2	TNC

Pond Shrub Swamp	Logan Creek CA	1	MDC
Prairie Fen	Grasshopper Hollow NA	13	USFS
Prairie Fen	MTNF-Salem District	5	USFS
Prairie Fen	MTNF-Salem District	2	USFS
Prairie Fen	MTNF-Salem District	1	USFS
Prairie Fen	MTNF-Salem District	1	USFS
Springs	MTNF-Salem District	----	USFS

[a] - CA= Conservation Area, MDNR= Missouri Department of Natural Resources, MDC= Missouri Department of Conservation, MTNF= Mark Twain National Forest, NA= Natural Area, SP= State Park, TNC= The Nature Conservancy, USFS= U.S. Forest Service, WA= Wilderness Area

BIOTIC COMMUNITY

Fish Community Information

Since the late 1930's, the fishes of the Black River basin have been sampled with seines and electrofishing equipment. Fish distribution data is available from 91 seine sites in the lower subbasin and 45 seine sites in the upper subbasin (Table 7). Seine samples provide the qualitative and quantitative indicators that can best define fish communities. Electrofishing has been used at ten sites in the lower subbasin and five sites in the upper subbasin (Table 7). Electrofishing emphasized the collection of "sport" fishes such as the black basses, suckers, and sunfishes, with little attempt to collect nektonic or benthic fish species. Locations of sample sites in Table 7 are identified by "river mile", which can be found at MDC Southeast Regional Office.

Combining all sampling methods, a total of 132 fish species representing 20 families have been collected in the Black River basin (Table 8). In the lower subbasin, 130 fish species have been collected. In the upper subbasin, 64 fish species have been collected. The difference in the number of species in each basin is due to physiographic location of the subbasins. The lower subbasin lies in both the Ozark and Lowland Faunal Regions, while the upper subbasin lies only in the Ozark Faunal Region. Both faunal regions have species unique to each region (Pflieger 1997).

Lower Subbasin

Seine Data

One hundred twenty eight species representing 20 families have been collected (Table 9). Blackspotted topminnow, green sunfish, and longear sunfish are the most widely distributed fish species (Table 9). They were collected at 80%, 74%, and 71% of the sites, respectively.

The cypress minnow and the pallid shiner haven't been collected since 1941and should be considered extirpated (Table 10). Both of these species are considered lowland species (Pflieger 1997) and their absence is probably due to habitat degradation associated with channelization of the lowland streams. The goldstripe darter should also be considered extirpated from the subbasin (personal communication, Matt Winston, MO Dept. of Conservation). Eight species collected earlier have not been collected since 1975 (Table 10). Of these eight, inadequate sampling is probably the explanation for the absence of the southern redbelly dace, Johnny darter, chestnut lamprey, American brook lamprey, and river darter. These species have sporadic distribution in Ozark streams or live in habitats difficult to seine (Pflieger 1997). The goldfish and fathead minnow are not native to this area and were probably introduced via bait bucket.

Electrofishing Data

From 1974 to 1996, 30 electrofishing surveys were conducted on the Black River, Cane Creek, and Tenmile Creek (Table 7). Overall, 45 species in 13 families have been collected by electrofishing (Table 11). Of these 45 species, only the flier hasn't been collected in Black River. In Cane and

Tenmile Creeks, 22 and 16 species were collected, respectively. Centrarchids (primarily longear sunfish) and catostomids (primarily golden redhorse) comprised the majority of the fish samples (Table 11). In the Black River and Cane Creek, spotted bass were the most abundant black bass. In Tenmile Creek, smallmouth bass were the dominant black bass.

Upper Subbasin

Seine Data

Sixty four fish species in 14 families have been collected (Table 9). Bleeding shiners and rainbow darter were the most widely distributed species (Table 9). They were collected at 73% and 69% of the sample sites, respectively. Eleven species were collected from at least 50% of the sites. Only two fish species (Ozark shiner and the least brook lamprey) were found exclusively in this subbasin. The southern redbelly dace is also found primarily in this subbasin.

The freckled madtom, brindled madtom, eastern redfin shiner, and speckled darter have not been collected since 1945 and should be considered extirpated (Table 10). The walleye and American eel should be considered extirpated because Clearwater Dam inhibits their access to these streams. An additional nine species have not been collected since 1976. Of these nine, the freshwater drum and chestnut lamprey probably were not captured due to sampling inefficiencies of seines. Pflieger (1997) lists the gilt darter and Ozark shiner rare, if not extirpated from the Black River basin. The bullhead minnow is a lowland species and prefers sluggish pools and low gradient streams - a rare habitat in this subbasin (Pflieger 1997). The absence of brook silverside and golden shiner from recent samples is puzzling because these species are relative common in Ozark streams.

Electrofishing Data

From 1988 to 1997, 10 electrofishing surveys were conducted on the Black River, East Fork of the Black River, Middle Fork of the Black River, and the West Fork of the Black River. Twenty-one species in six families have been collected (Table 12). In all rivers, centrarchids dominated the samples. The most abundant centrarchids were longear sunfish, shadow bass, and smallmouth bass (Table 12). Excluding the East Fork of the Black River, smallmouth bass were the most abundant black bass. The fish community in the East Fork may be influenced by Lower Taum Sauk Lake. Largemouth bass were the dominant black bass and bluegill were abundant in the East Fork.

Aquatic Invertebrates

Crayfish

As expected, due to the physiographic location of the subbasins, species richness is higher in the lower subbasin. In the lower subbasin, 12 crayfish species have been collected (Table 13). In the upper basin, only three species (woodland, Hubbs, and spothanded) have been collected. The woodland crayfish is the dominant crayfish in the basin (Pflieger 1996). The northern crayfish was probably introduced into the basin via bait bucket (Pflieger 1996). Habitat loss due to channelization in the in the lower subbasin is likely responsible for the decline of several lowland species, such as shield, cajun,

Shufeldt's dwarf, and vernal crayfish (Pflieger 1996).

Insects

The development of mines, mills, and smelters to process minerals in the New Viburnum trend impacted several streams in the upper subbasin. Benthic invertebrates are good indicators of water quality because most species, especially mayflies and stoneflies, cannot tolerate poor water quality. To document the changes in water quality, the benthic invertebrate communities in Strother Creek, Bee Fork, Neals Creek, Logan Creek, Bills Creek, Brushy Creek (control stream) and the West Fork of the Black River have been intensively sampled since the 1960s. As of 1981, aquatic invertebrate diversity and densities in Strother Creek, Bee Fork, and Neals Creek have improved, but not to premining levels (Trial 1983). In Bills Creek and the West Fork of the Black River, diverse benthos populations above and below the mines indicated good water quality.

Mussels

Mussels are excellent environmental indicators. Therefore, the presence of a diverse mussel community may indicate stable conditions, low siltation, and good water quality and habitat.

In the lower subbasin, a diverse mussel community exists (Table 14). Forty species of mussels have been found in the Black River. Mussel surveys have also been conducted in Cane Creek (23 species) and Tenmile Creek (3 species).

In the upper subbasin, only five species (giant floater, fatmucket, northern broken-ray, squawfoot, and Asiatic clam) have been collected (Buchanan 1996). Buchanan (1996) attributed the poor mussel diversity due to unstable substrate in these streams.

Federal and State Listed Species

Fish

No federally endangered fish are present in the basin (Table 15). Since the settlement of Missouri, many species have declined to levels of concern and some have disappeared entirely (Missouri Natural Heritage Program 2000). Twenty-six fish species found in the Black River basin are of particular concern due to population declines or apparent vulnerability from a statewide perspective (Table 15). The status of each of these species in the basin is discussed below. For additional information regarding Missouri animals of concern, go to http://www.mdc.state.mo.us/documents/nathis/endangered/animals_concern.pdf.

> cypress minnow: According to Pflieger (1997), historically this Lowland species was common in the lower Black River. However, according to MDC files only 28 individuals have ever been collected in the basin and these came from one site in 1941 (Table 8).
>
> Mississippi silvery minnow: This minnow is common throughout the lower Black River subbasin (Tables 8 and 9) and has been collected as recently as 1994.

pallid shiner: Once common in the Lowlands, this species has declined, and is probably extirpated from Missouri (Pflieger 1997). Increased siltation associated with land use practices is the suspected cause of its decline.

taillight shiner: Pflieger (1997) describes this minnow as one of the rarest Missouri minnows and may soon be extirpated in the state. In the lower Black River subbasin, this minnow was found at seven locations in the late 1990's (Table 8).

Ozark shiner: This species should be considered extirpated because no individuals have been captured in 40 years (Tables 6 and 8). Pflieger (1997) attributes the construction of large reservoirs, resulting in habitat loss and range fragmentation as the likely cause for the decline of the Ozark shiner.

sabine shiner: In Missouri, the sabine shiner has been collected only from the Black River in Butler County (Pflieger 1997). In the 1990's, this shiner was collected at 13 locations (Table 8).

pugnose minnow: Primarily a Lowland species, this minnow may have increased in numbers in recent decades (Pflieger 1997). Pugnose minnows are widely distributed in the lower subbasin (Table 8).

eastern slim minnow: This rare minnow has been recently collected from only the Black River and Castor River (Pflieger 1997). Reservoir construction is the suspected cause of the extirpation of this species from the St. Francis River and White River basins (Pflieger 1997). In 1999, this minnow was collected from three sites on the lower Black River (Table 8).

mountain madtom: This species is naturally rare in Missouri (Pflieger 1997), but in the 1990's it was collected at five locations in the lower Black River (Table 8)

western sand darter: Pflieger (1997) noted that this darter is common in the Lowland ditches, but not abundant anywhere in Missouri and may be declining in numbers. In 1999, 32 individuals were collected from nine sites in the lower Black River (Table 8).

scaly sand darter: The scaly sand darter is primarily a Lowland species, but exists in adjacent Ozark sections and has apparently declined in recent decades (Pflieger 1997). This species is relatively common in the lower subbasin (Table 9). It is primarily found in the Black River, but it has also been found in Cane Creek (1999) and Menorkenut Slough (1998) (Table 8).

crystal darter: Although never common, this Lowland darter has been collected during the 1990's at nine sites in the lower subbasin (Table 8).

swamp darter: According to Pflieger (1997), this Lowland darter exists in Missouri only in the lower Black River subbasin. During the 1990's, it was collected at seven locations (Table 8).

harlequin darter: This Lowland species is one of the rarest darters in Missouri (Pflieger 1997).

In 1999, this darter was collected at 12 sites on the lower Black River.

goldstripe darter: This rare darter has only been collected from Romine Spring (Pflieger 1997). Recent sampling of Romine Spring (1995), indicate that this darter is probably extirpated from Black River basin.

longnose darter: According to Pflieger (1997), this rare darter exists only in the White River and the upper St. Francis River subbasin. In 1999, Matt Winston (MDC Fisheries Research Biologist) collected a longnose darter in the lower Black River (Table 8).

river darter: Historically, this darter was common in large ditches and Lowland streams (Pflieger 1997). In the Black River basin, only one specimen has been collected in the lower subbasin (Table 8).

stargazing darter: This darter is one of the rarest fishes in Missouri, having been collected on a few occasions from the Current River and the lower Black River (Pflieger 1997). During the 1990's, this darter was collected at three locations on the lower Black River (Table 8).

blue sucker: This species is fairly common in the lower Black River as documented by electrofishing surveys.

flier: Fliers occur almost exclusively in the Lowlands and are naturally uncommon and sporadic in distribution (Pflieger 1997). However, this species was probably more common prior to the draining of the Lowlands. The most recent collection occurred in 1999 on Big Cane Creek, where 17 individuals were collected (Table 8).

dollar sunfish: This Lowland species is quite similar to longear sunfish and is probably overlooked during sampling (Pflieger 1997). In the late 1990's, dollar sunfish were collected at four sites in the lower subbasin (Table 8).

bantam sunfish: Pflieger (1997), found bantam sunfish only in the Mingo Swamp, which is in the St. Francis River basin. In 1999, Matt Winston (MDC Fisheries Research Biologist) collected 13 individuals in Big Cane Creek in the lower Black River subbasin (Table 8).

starhead topminnow: Pflieger (1997), only found this topminnow in the St. Francis River basin. In 1999, 20 starhead topminnows were collected in Big Cane Creek and 10 in Little Cane Creek (Table 8). Both of these streams are lowland streams located in the lower Black River subbasin.

American brook lamprey: This is the rarest of the brook lampreys found in Missouri (Pflieger 1997). In the Black River basin, only one specimen has ever been collected (Table 8).

mooneye: Mooneye have been collected in the lower Black River during electrofishing surveys (Tables 8 and 11). Pflieger (1997) noted that it has never been common in Missouri and may be declining.

paddlefish: This species is fairly common in the lower Black River as documented by MDC fish population surveys.

Crayfish

All of the listed crayfish (Table 15) are considered Lowland species and the probable cause for their decline is habitat degradation due to channelization and drainage of wetlands.

Mussels

The Curtis pearlymussel and pink mucket are Federally Endangered (Table 15). Because no fresh materials of the Curtis pearlymussel have been found since 1971, Buchanan (1996) considers this species extirpated from the Black River. Altered stream flows due to the construction of Clearwater Dam is a possible reason for this species decline. In 2000, Sue Bruenderman (MDC Fisheries Research Biologist) found two live pink muckets in the Black River near Poplar Bluff. The southern hickorynut is one of the rarest mussels in Missouri and has been collected in Cane Creek (Oesch 1984).

Angler Survey Data

The Missouri Statewide Angler Survey (Weithman 1991) is the main source of creel information for the basin streams (Table 16). Accurate estimates of angler pressure, catch, and harvest can not be made where the number of angler interviews is low. However, raw survey data which partitions angler species preference, effort, success, and satisfaction can help describe angler utilization.

During the period 1983 to 1988, 698 Black River basin anglers were surveyed. The most common angler preference was black bass, followed by "anything" and catfish. The fishing quality rating ranged from 2 to 8 with an average of 5 (10=best).

To determine angler harvest rates of Black River walleye, MDC personnel tagged 406 walleye with reward tags between 1995 and 1998. As of October 2000, 75 tags have been returned for payment. Several additional tags were reported, but not returned. Angler exploitation, assuming angler compliance and tag retention are 80%, was estimated to be 12% per year (range 4-17%).

Based upon angler tag returns, walleye are quite mobile. Only 50% of the walleye were caught at the original tagging site. Anglers reportedly caught three walleye in the Current River and one walleye in the Little Red River in Arkansas (100+ river miles). Based upon angler tag returns and MDC sampling, walleye densities appear to be the highest in a two mile section of river downstream of Clearwater Dam.

In 1996 and 1997, MDC personnel interviewed paddlefish snaggers on opening weekend of the snagging season. The survey was conducted on the Lower Black River, just downstream of Clearwater Dam. Catch rates in 1996 and 1997 were 0.4 and 0.1 paddlefish/hour, respectively.

Fish Introductions

From 1944 to 1948, a total of 112,312 largemouth bass, 35,590 smallmouth bass, 92,400 bluegill, 56,500 green sunfish, 24,000 rock bass, 2,750 black crappie, 38,000 channel catfish, 15,000 bullheads, and 17,000 minnows were stocked in basin streams (Funk 1953). The majority of these fish were fingerlings size. The goal of these stockings was to increase fish densities, thus increase angler catch rates. These stocking had little, if any effect upon the fish populations (Funk 1953). Since then, numerous private ponds throughout the basin have been stocked with largemouth bass, bluegill, grass carp, crappie, channel catfish, and other species.

In 1965 and 1967, an unknown number of striped bass fry and fingerlings were stocked into Lower Taum Sauk Lake, but a striped bass fishery did not develop there. Conservation agents documented anglers catching striped bass in the Clearwater Dam tailwater.

In 1998 and 2001, 200 muskellunge were stocked into Lower Taum Sauk Lake. This stocking program was cancelled in 2003 because an adequate muskellunge population did not develop. Between 1996 and 2000, 1.3 million walleye fry were stocked into the lower Black River just downstream from Clearwater Dam. These were surplus walleye fry from the St. Francis River and Eleven Point River walleye restoration projects. In 1999, a three year lower Black River walleye stocking program was initiated. The goal was to determine if supplemental stockings in a river system is a feasible method to increase walleye densities. A total of 30,000 walleye (2")

were to be released at six sites between Clearwater Dam and Poplar Bluff (~45RM). Due to production problems, walleye have only been stocked in 2000 (7,719 fingerlings) and in 2003 (41,490 fingerlings).

Between 1998 and 2000, 1,507 paddlefish (12-14") were stocked downstream of Clearwater Dam. All of these fish have a coded wire tag in their rostrum to determine movement, growth, and impact on the local fishery. Some of these paddlefish have been captured in subsequent years by MDC personnel and anglers below Clearwater Dam.

Present Regulations

Excluding Tenmile Creek, statewide fishing regulations apply to all streams in the basin. In Tenmile Creek, a Special Smallmouth Bass Management Area was established in 2000 from Highway B in Carter County downstream its confluence with Cane Creek in Butler County. In this section, all smallmouth bass less than fifteen inches (15") must be released immediately. The daily black bass limit is six (6), but only one (1) may be a smallmouth bass.

Table 7. Fish sampling sites and the number of species collected in the Black River basin.

Site #	Stream	County	River Mile	Stream Order	Year(s) Sampled	# of species collected per sample
seine sites in the lower subbasin						
1	Black River	Butler	172	6	1941	37
2	Black River	Butler	179	6	1964	22
3	Black River	Butler	198	6	1964,1970,1999	32[a],29
4	Black River	Butler	200	6	1999	32
5	Black River	Butler	203	6	1999	21
6	Black River	Butler	204	6	1999	23
7	Black River	Butler	206	6	1999	29
8	Black River	Butler	208	6	1999	28
9	Black River	Butler	210	6	1999	22
10	Black River	Butler	211	6	1999	22
11	Black River	Butler	213	6	1999	32
12	Black River	Butler	216	6	1941,1995	30,33
13	Black River	Butler	217	6	1999	32
14	Black River	Butler	218	6	1937,1999	15,41
15	Black River	Butler	219	6	1937,1957,1992,1999	40,77,23,28
16	Black River	Butler	220	6	1999	37
17	Black River	Butler	221	6	1937,1964,1999	29,33,48
18	Black River	Butler	225	6	1937,1992,1994	25,37,16
19	Black River	Butler	227	6	1937,1999	26,28
20	Black River	Butler	229	6	1937,1964,1999	26,36,36
21	Black River	Butler	230	6	1937,1999	26,38
22	Black River	Butler	232	6	1937,1941,1995	51[b],32
23	Black River	Wayne	233	6	1937	14
24	Black River	Wayne	234	6	1937	24
25	Black River	Wayne	236	6	1937,1964,1995	17,5,29
26	Black River	Wayne	238	6	1937	27
27	Black River	Wayne	241	6	1941,1984,1992	41,29,31

28	Black River	Wayne	242	6	1937	31
29	Black River	Wayne	243	6	1937	25
30	Black River	Wayne	244	6	1937	26
31	Black River	Wayne	247	6	1937,1992	26,5
32	Black River	Wayne	254	6	1964,1992	29,19
33	Cane Creek	Butler	13	5	1941,1986	33,8
34	Cane Creek	Butler	14	5	1999	25
35	Cane Creek	Butler	17	5	1992	17
36	Cane Creek	Butler	19	5	1999	27
37	Cane Creek	Butler	20	5	1999	26
38	Cane Creek	Butler	22	5	1999	21
39	Cane Creek	Butler	23	5	1999	27
40	Cane Creek	Butler	27	4	1941,1992	27,22
41	Cane Creek	Butler	29	4	1932	14
42	Little Cane Creek	Butler	0	1	1999	16
43	Little Cane Creek	Butler	3	1	1999	17
44	Little Cane Creek	Butler	4	1	1999	4
45	Big Cane Creek	Butler	2	3	1999	15
46	Big Cane Creek	Butler	3	3	1999	13
47	Big Cane Creek	Butler	4	3	1999	7
48	Big Cane Creek	Butler	5	3	1999	17
49	Big Cane Creek	Butler	7	3	1999	19
50	Big Cane Creek	Butler	10	1	1999	18
51	Big Cane Creek	Butler	12	1	1999	10
52	Big Cane Oxbow	Butler	N/A	N/A	1999	7
53	Fletcher Branch	Butler	1	3	1999	12
54	Tenmile Creek	Butler	3	4	1960	9
55	Tenmile Creek	Carter	14	4	1960	6
56	Hickory Creek	Butler	2	2	1986,1995	8,19
57	Brush Creek	Wayne	1	3	1937,1964	22,8
58	McKenzie Creek	Wayne	1	3	1941,1992	22,19
59	McKenzie Creek	Wayne	3	3	1960, 2000	6,12

60	Indian Creek	Butler	1	4	1998	16
61	Happy Hollow	Butler	0	2	2000	14
62	Hockinberry Hollow	Butler	0	2	2000	5
63	Knox Branch	Wayne	1	2	1999	11
64	Ligett Creek	Butler	0	3	1999	15
65	Mill Creek	Wayne	1	2	1999	8
66	Blue Spring	Butler	0	1	1998	9
67	Blue Spring	Butler	1	1	1998	4
68	Caney Creek	Butler	0	2	1998	11
69	Cattail Creek	Butler	0	2	1998	12
70	Cattail Creek	Butler	1	2	1998	7
71	Dooley Creek	Butler	1	2	1998	12
72	Hoffman Hollow	Butler	0	2	1998	10
73	Stephenson Creek	Butler	0	2	1998	10
74	Un-named Tributary	Butler	0	2	1998	7
75	Un-named Tributary	Butler	1	1	1998	5
76	Black River Ditch	Butler	7	3	1986	11
77	Big Hunting Slough	Butler	3	3	1999	14
78	Big Hunting Slough	Butler	8	2	1999	7
79	Big Hunting Sl Tributary	Butler	1	1	1999	7
80	Aldred Lake	Butler	1	2	1981,1982	20[c]
81	Stillcamp Ditch	Butler	14[d]	1	1963	6
82	Caney Creek Ditch	Butler	8	5	1964, 1992	17,27
83	Romine Spring	Butler	1	1	1971,1995	8,10
84	Menorkenut Slough	Butler	2	5	1998	22
85	Ditch #21	Butler	5	3	1998	12
86	Ditch #22	Butler	4	3	1998	16
87	Blue Spr Slough Trib.	Butler	5	3	1998	12
88	Snyder Ditch	Butler	6	2	1998	14
89	Swan Pond Ditch	Butler	2	2	1998	9
90	East Ditch	Butler	11	4	1999	15

91	East Ditch Tributary	Butler	3	3	1999	13
seine sites in the upper subbasin						
92	Black River	Reynolds	Lake[e]	6	1941	27
93	Black River	Reynolds	273	6	1941,1992	27,20
94	Black River	Reynolds	275	6	1941,1992	14,31
95	Black River	Reynolds	288	6	1957,1960,1992	52[f],21
96	Hyatts Creek	Reynolds	2	3	2000	6
97	West Fork Black River	Reynolds	300	4	1941	11
98	West Fork Black River	Reynolds	301	4	1992	13
99	West Fork Black River	Reynolds	312	4	1941,1992	17,12
100	West Fork Black River	Reynolds	319	4	1968,1995	12,20
101	Bills Creek	Reynolds	1	3	2000	6
102	Cave Spring	Reynolds	N/A	N/A	2000	3
103	Cooks Creek	Reynolds	0	2	1999	2
104	Cooks Spring	Reynolds	N/A	N/A	1999	1
105	Crossville Branch	Reynolds	2	3	2000	12
106	Ellington Hollow	Reynolds	0	2	2000	3
107	Henpeck Creek	Reynolds	0	3	2000	9
108	Reeds Spring	Reynolds	N/A	N/A	1999	3
109	Middle Fork Black River	Reynolds	1	5	1941	15
110	Middle Fork Black River	Reynolds	9	5	1941,1992	15,12
111	Middle Fork Black River	Iron	18	4	1978	16
112	Webb Creek	Reynolds	4	4	1941,1963	16,11
113	NF Webb Creek	Reynolds	2	4	1984,1999	17,13
114	NF Webb Creek	Reynolds	3	4	2000	10
115	Doe Run Crk	Reynolds	2	3	1941,1992	18,14
116	Logan Creek	Reynolds	lake[e]	5	1941	22
117	Logan Creek	Reynolds	15	5	1941,1992	16,13
118	Logan Creek	Reynolds	33	4	1967	15
119	Adair Creek	Reynolds	0	3	2000	9
120	Mill Creek	Reynolds	1	3	1933	12

121	Paynes Branch	Reynolds	1	2	1999	10
122	Pyrtle Spring	Reynolds	N/A	N/A	1999	7
123	Cape Hollow	Reynolds	1	3	1964,1995	8,9
124	Taum Sauk Crk	Iron	7	2	1991	8
125	Ottery Creek	Iron	5	4	1981	16
126	Strothers Creek	Reynolds	6	4	1967,1978	12,17
127	Neals Creek	Iron	3	3	1967	12
128	Clayton Creek	Iron	3	3	1981,1999	8,5
129	Clayton Creek	Iron	5	1	1981	6
130	Un-named	Reynolds	0.1	1	1941	15
131	Bee Fork Creek	Reynolds	1	4	1941	15
132	Bee Fork Creek	Reynolds	7	4	1967	7
133	Bee Fork Creek	Reynolds	9	4	1963	8
134	Jayhawker Hollow	Reynolds	1	1	1999	1
135	Grasshopper Creek	Reynolds	1	2	1986,2000	5,8
136	Grasshopper Creek	Reynolds	2	1	1999	1
electrofishing sites in the lower subbasin						
A	Black River	Butler	186	6	1974,1982,1983,1989,1991, 1994	20,25,21,27, 28,30
B	Black River	Butler	220	6	1974,1982,1983,1989, 1991,1994, 1995	18,24,24,21,27,26,25
C	Black River	Wayne	229	6	1994	28
D	Black River	Wayne	240	6	1974,1982,1983,1989,1991 1994,1995	20,26,27,28,25,31,32[g]
E	Black River	Wayne	257	6	1994,1995	28,29
F	Cane Creek	Butler	23	5	1993	22
G	Cane Creek	Butler	30	4	1992,1994	12,15
H	Cane Creek	Butler	37	4	1994	14
I	Tenmile Creek	Butler	3	4	1994,1996	13,13
J	Tenmile Creek	Butler	6	4	1992	9
electrofishing sites in the upper subbasin						
K	Black River	Reynolds	275	6	1988,1989	17,15
L	Black River	Reynolds	286	6	1986,1988,1989 1997	13,19,13,16

M	West Fork Black River	Reynolds	298	6	1989,1997	15,11
N	East Fork Black River	Reynolds	1	5	1997	15
O	Middle Fork Black River	Reynolds	9	5	1997	9

[a] :1964 and 1970 seine data combined [b] :1937 and 1941 seine data combined

[c] :1981 and 1982 seine data combined [d] :in old river channel

[e] :pre-Clearwater Lake impoundment [f] :1957 and 1960 seine data combined

[g] :during the 1974, 1982, and 1983 electrofishing surveys, redhorse suckers were not identified to species

Table 8. Distribution of fishes in the Black River basin.

CYPRINIDAE (MINNOWS)		**Capture Location (Site Number from Table 7)**
Campostoma oligolepis	Largescale stoneroller	3,8,9,11-32,34,36-40,54,55,57-59,61-64,92-95, 99,100,110-113,115-120,122,123,125-128,131,133
C. pullum	Central stoneroller	12,15,17-22,24-30, 41,53,55,57-59,63,6595,97-102, 105-107,109,110, 112-115,117,118,121,123, 124,126, 127,129,130,133
Carassius auratus	Goldfish	15
Ctenopharyngodon idella	Grass carp	42
Cyprinella galactura	Whitetail shiner	3,7,9,11-32,57,58,61,92-95,97,99,109,110,116
C. venusta	Blacktail shiner	1-22,24,25,27-29,31,39,40,58,72,82,84,90
Cyprinus carpio	Common carp	15,32,56,94,126,A-F,K-O
Erimystax harryi	Ozark chub	16,17,19,20,22,27,3093-95,100
Hybognathus hayi	Cypress minnow	1
H. nuchalis	Mississippi silvery minnow	1-4,6,7,9-22,24,25,27-29,31,39,40,58,60,72,82, 84,90
Luxilus chrysocephalus	Striped shiner	15,17-19,21-29,32-34,36-40,53,57,58,64,94,95, 99,110,112,115-118,130,131
L. zonatus	Bleeding shiner	13-17,19-29,31,32,36-39,41,57-59,64,92-101,105,107,125-128,131-133,135
Lythrurus u.cyanocephalus	Eastern redfin shiner	12,14,15,17,18,20-22,28,36-38,40,53,57,58,60, 61,68-70,72,80,87,88,130
L. fumeus	Ribbon shiner	1-3,12,15,20,34,82
Nocomis biguttatus	Hornyhead chub	27,40,54,58,64,93-95,97-100,110-113,115-120, 125-127,130-132
Notemigonus crysoleucas	Golden shiner	1,4,21-23,28,33,42,43,46,48-52,59,61,68,69,73, 74,77,78,81,85-88, 91,95,126,130
Notropis amblops	Bigeye chub	12,15,17-22,26-33,40,41,54,58,93-95,116

N. amnis	Pallid shiner	1,33
N. atherinoides	Emerald shiner	2,3,5,6,10,12,14-20,22,25-29,31,33,38
N. boops	Bigeye shiner	12,15-33,35-37,39-41,55,58,60,61,64,93-95,116,130
N. greenei	Wedgespot shiner	15,17-22,27,92-95,97,99,100,109
N. maculatus	Taillight shiner	1,4,42,45,48,56,77,84
N. nubilus	Ozark minnow	15,17,22,27,37,39-41,54,55,57-60,63,64,92-95, 98-100,110-113,115-118,120,125,130,131
Notropis ozarcanus	Ozark shiner	93,95
N. rubellus	Rosyface shiner	8,12,14-16,18-22,25,27,28,30,32,92-95,99,109, 110,116
N. sabinae	Sabine shiner	3-7,9,11-15,17,18
N. telescopus	Telescope shiner	12,15,18,22-28,30,32,34,36-40,57,58,92-95,97-100,109-111,117,120, 123,125,126
N. texanus	Weed shiner	1-9,11-15,18,20,33,34,56,60,76,82,84,86,88,90, 91
N. volucellus	Mimic shiner	3,8,10,12,14,15,17-20,22,26,28-31,82,84,86
Opsopoedus emiliae	Pugnose minnow	3,4,15,22,31,33-37,42,43,45,48,49,51,76,77,82, 86
Phoxinus erythrogaster	Southern redbelly dace	57,99,100,102,105,107,110,113-115,121,123,124,126,128,129,131,134, 135
Pimephales notatus	Bluntnose minnow	1,4,6,7,9-23,25-34,36-41,57,58,60,61,76,82,90-95, 113,115-117,120,130
P. promelas	Fathead minnow	15
P. tenellus parviceps	E. slim minnow	4,7,8,12,14,15,17-20,24,31
P. vigilax	Bullhead minnow	2-20,31,33,34,76,82,83,95
Semotilus atromaculatus	Creek chub	16,17,22,25,36,39-41,53,57-59,63-65,68,70-73,80,83,100,105,107,113, 115,121,123,124,126, 128,129,135,136
ICTALURIDAE (CATFISHES)		
Ameiurus melas	Black bullhead	1,15,26,46,47,50,66,70,74,79,81,83,85,86,95,A,D,K-M
A. natalis	Yellow bullhead	13,17,18,21,22,27,31,37,39,48,49,58,73,75,79, 80,84,86,91-93,95,109, 111,112,115,118,124, 126, D,F-O
Ictalurus punctatus	Channel catfish	4,8,10,13-15,32,82,90,95, A-G,K,L,N
Noturus albater	Ozark madtom	17,18,21-22,25,27,32,93,94,99-101,105,110, 117,125-127,132,133
N. eleutherus	Mountain madtom	3,8,12,14,17
N. gyrinus	Tadpole madtom	1,3,43,49,76,89
N. miurus	Brindled madtom	3,5-9,11,13-18,20,22,27,36,39,55,92
N. nocturnus	Freckled madtom	3,5-8,12,14,16,17,27,33,34,36,82,93,116
Pylodictis olivaris	Flathead catfish	1,15,32,33,A-F

PERCIDAE (PERCHES)		
Ammocrypta clara	Western sand darter	3-5,7-11,17
A. vivax	Scaly sand darter	1,3-5,7,8,10-15,17,21,22,27,34,82
Crystallaria asprella	Crystal darter	2,6,7,11,12,15,17,18,20,22
Etheostoma asprigene	Mud darter	2,3,7,8,56,76,82
E. blennioides	Greenside darter	8,12-17,19-22,24-30,33,34,36-40,54,57,58,60, 65,92-95,116
E. burri	Brook darter	17,22,23,31,59,62-65,95,96,102,105-107,112-115, 119,121-125,129,131,135
E. caeruleum	Rainbow darter	12,14,16-22,25,27,32,34,36,38-41,53-55,57-59, 61,64,92-96,98-101, 105,107,109-114,117,119-123, 125-128,131-133,135
E. chlorosomum	Bluntnose darter	1,2,10,12,14,15,17,35,45,46,56,69,73,76,77,82, 84,86-88
E. f. flabellare	Barred fantail darter	24,53,57,59,63,65,95,96,99-101,105,107,112-115,117-119,122,123,125-129,133,135
E. fusiforme	Swamp darter	35,42-45,50,56
E. f. lineolatum	Striped fantail darter	36,39,40,54
E. gracile	Slough darter	14,16,35,37,40,42,43,46,47,56,71,72,79,80,84-86
E. histrio	Harlequin darter	1-9,13,14,16,17,19,33
E. nigrum	Johnny darter	33,40,54
E. parvipinne	Goldstripe darter	83
E. proeliare	Cypress darter	2,4,11,12,15-17,20,33-38,40,60,61,66-68,71-73, 75,76,80,82,83
E. stigmaeum	Speckled darter	2-20,22-24,26,27,30,32-34,36-40,92
E. uniporum	Current River Orangethroat	27,41,53
E. zonale	Banded darter	12-22,25,27,29,32,92,93,95,116
Percina c. caprodes	Ohio logperch	1-5,12,14,15,17,18,20-22,25-27,32,33,38,40,57, 82, 93-95,116
P. c. fulvitaenia	Ozark logperch	3,7,9,10,17,19,20
P. evides	Gilt darter	3,11,13,14,16,17,19-22,25,27,32,92,95
P. maculata	Blackside darter	1,4,5,7-9,11,12,15,16,19,20,33,36,39,40,60,82
Percina nasuta	Longnose darter	13
P. sciera	Dusky darter	1-8,11-19,22,27,33,34,36,37,40
P. shumardi	River darter	15
P. uranidea	Stargazing darter	15-18
P. vigil	Saddleback darter	1-3,5,6,10-18,22,34,40
Stizostedion canadense	Sauger	12,15,B,D

S. vitreum	Walleye	15,22,32,95,A-E
CATOSTOMIDAE (SUCKERS)		
Carpiodes carpio	River carpsucker	9,12,15,A,B
Cycleptus elongatus	Blue sucker	15,B,D,E
Erimyzon oblongus	Creek chubsucker	15,20-23,25,26,28,31,39,40,53,57,62,63,65,70,71,73,80,83,95,112,113, 115,124,126,130,131,135
Hypentelium nigricans	Northern hogsucker	3,5,7,8,13-22,24,25,27-30,37,39-41,54,57,58,92-95, 97,100,101,111-113, 115,117,118,121,125, 127, B-O
Ictiobus bubalus	Smallmouth buffalo	1,49,84-86,A-E
I. cyprinellus	Bigmouth buffalo	1,15,A-E
I. niger	Black buffalo	15,20,82,A-E
Minytrema melanops	Spotted sucker	1,4,15,17,43,45,49,69,80,87,A-F,I,J
Moxostoma anisurum	Silver redhorse	3,15,B,D
M. carinatum	River redhorse	3,12,15,20,22,33,40,A-F
M. duquesnei	Black redhorse	3,6-8,12,14,15,17-22,24-30,38,39,41,57,58,64,92,95,115-117,A-F,H,I,L,M
M. erythrurum	Golden redhorse	2,9-17,19-22,24-31,37,40,95,116,A-F,H-O
M. macrolepidotum	Shorthead redhorse	3,15,20,A,B,D,E
CENTRARCHIDAE (SUNFISHES)		
Ambloplites ariommus	Shadow bass	12,15,17,21,22,27,31,33,36,37,39,40,58,92-95,97,99,100,109,111,126, 132,A-O
Centrarchus macropterus	Flier	33,47,F
Elassoma zonatum	Banded pygmy sunfish	10,14,37,42,43,46,48-50,56,66,67,71,75,80,81, 83,84
Lepomis cyanellus	Green sunfish	1,3,4,6-9,11,13-17,19-22,25,26,28,30-34,36,37, 39,40,42,43,46-48,50-52, 56-58,60,61,65-76,79-93,95,98,99,109,111-113,115,116,118-120, 124,126,130,131,135, A-O
L. gulosus	Warmouth	1,4,13,15,17,18,21,26,27,31-36,42-46,48-50,52,56,61,68,69,77,78,80, 82-87,89,93-95, A,B,D,F-H,M
L. humilis	Orangespotted sunfish	4,11,15,20,33,45,48-51,56,77,85, A,D
L. macrochirus	Bluegill	1-4,6,10-12,15,17,18,20-22,24,25,27-30,32,33 35,37,42-46,48-52,56, 57,69,71,74,77,78,80,82-84,86-95,97,100,121,125,126,130, A-O
L. marginatus	Dollar sunfish	50-52,66
L. megalotis	Longear sunfish	1-22,24-41,45,50-53,57-61,63,64,68,69,71,78-80,82,84,85,87,88,90,91-95,97-100,109,111-113,115-118,120,124-127,130,131,A-O
L. microlophus	Redear sunfish	4,6,11,15,20,33,48-50,78,95,A,C,D,E,M-O

L. miniatus	Red spotted sunfish	1,3,15,17,20,21,26,27,29,31,34,36,38,42,45,48,68,69,72,80,87,88,91, 92,94,95,97,98,114,126 A-G,I,K-O
L. symmetricus	Bantam sunfish	46
Micropterus dolomieu	Smallmouth bass	15,17-22,24-30,32,40,58,92-95,97-100,109-112,116-118,125-127,131, A,B,D-O
M. punctulatus	Spotted bass	1-25,27,30-34,37-40,82,95,130,A-J
M. salmoides	Largemouth bass	1,4,11-13,15-22,25,27-32,35,38,40,43,48-50,56-58,60,63,66,74,77,80, 82,84,88-91,93-95,100, 117,A-N
Pomoxis annularis	White crappie	1,4,15,18,20,22,27,32,35,45,48-50,56,77,78,84, 86, 89,95, A,B,D,E,K,L
P. nigromaculatus	Black crappie	1,15,33,35,45,49,50,56,78,82,88,A-F
CYPRINODONTIDAE (KILLFISHES)		
Fundulus catenatus	Northern studfish	12,155-21,22,24-32,57-59,93-95,98-100,105, 107,109-115,117-120,122, 123,125,126,130-133
F. dispar	Starhead topminnow	42,43,46-48,81
F. notatus	Blackstripe topminnow	56,82,84,85,90
F. olivaceus	Blackspotted topminnow	1-43,45,48-51,53,56-58,60-65,68-74,77,79,80, 82-85, 87,88,90-95,98-100, 109-113,115-117, 119-121,125, 126,130,131,135
PETROMYZONTIDAE (LAMPREYS)		
Ichthyomyzon castaneus	Chestnut lamprey	15,95
Lampetra appendix	American brook lamprey	15
L. aepyptera	Least brook lamprey	96,105,113,135
LEPISOSTEIDAE (GARS)		
Lepisosteus oculatus	Spotted gar	15,18,35,49,82,89,A-E
L. osseus	Longnose gar	1,3,11,12,15,20,27,28,82,90,94, A-E
L. platostomus	Shortnose gar	A,B,D
CLUPEIDAE (HERRINGS)		
Alosa chrysochloris	Skipjack herring	A,B,D
Dorosoma cepedianum	Gizzard shad	1-3,5,7,12,15-17,20-22,25,32,42,74,77,82,84-86, 89,94,95,A-F,K-N
PERCICHTHYIDAE (SEA BASSES)		
Morone chrysops	White bass	18,32,A-E
M. saxatilis	Striped bass	63
COTTIDAE (SCULPINS)		
Cottus carolinae	Banded sculpin	12-14,17-22,27,32,57-59,64,92-95,99,103,108-112,115,116,121,127,128, 131,132,135

C. hypselurus	Ozark sculpin	22,27,93,95,96,99,100,103-108,110,112-114,116,117,120-122,125,127-129,133
POECILIDAE (LIVE BEARERS)		
Gambusia affinis	Western mosquitofish	1,3,4,6-21,25,27,31,32,34,36-40,42,43,46-48,50-52,56,58,59,64,66-72,75, 77,79-91
ATHERINIDAE (SILVERSIDES)		
Labidesthes sicculus	Brook silversides	1,3,5-22,24,25,27-40,42-45,48-51,53,56-58,60, 66,69,73,77,80,82,87,88, 90 ,91,93,95
ESOCIDAE (PIKES)		
Esox americanus	Grass pickerel	1,15,20,21,23-25,28,30,31,33,43,46,47,56-58,60,71,80,83,95,108,111, 117,B,D,E-I,K-M,O
E. niger	Chain pickerel	27,31,57,94,95,118,A-D
APHRIDODERIDAE (PIRATE PERCHES)		
Aphredoderus sayanus	Pirate perch	2,3,11,14,15,17,22,26,27,33,40,41,43,50,61,62, 71,73,76,80,83,84
AMIDAE (BOWFINS)		
Amia calva	Bowfin	15,32,45,56,A,B,E
ANGUILLIDAE (EELS)		
Anguilla rostrata	American eel	15,93,95
SCIAENIDAE (DRUMS)		
Aplodinotus grunniens	Freshwater drum	7,15,27,32,82,84,126,A-E
HIODONTIDAE (MOONEYES)		
Hiodon alosoides	Goldeye	15
H. tergisus	Mooneye	3,15,A-E
POLYODONTIDAE (PADDLEFISHES)		
Polydon spathula	Paddlefish	32,E

Table 9. Fish species frequency of occurrence in seine samples from the Black River basin. (Percent of sites in each subbasin where a species was collected).

Common Name	Lower Subbasin	Upper Subbasin
CYPRINIDAE (MINNOWS)		
Largescale stoneroller	44	53
Central stoneroller	44	58

Goldfish	1	0
Grass carp	1	0
Whitetail shiner	31	20
Blacktail shiner	43	0
Common carp	3	4
Ozark chub	8	9
Cypress minnow	1	0
Mississippi silvery minnow	37	0
Striped shiner	23	27
Bleeding shiner	30	73
E. redfin shiner	27	2
Ribbon shiner	9	0
Hornyhead chub	5	51
Golden shiner	34	7
Bigeye chub	22	9
Pallid shiner	2	0
Emerald shiner	24	0
Bigeye shiner	34	11
Wedgespot shiner	9	18
Taillight shiner	10	0
Ozark minnow	18	58
Ozark shiner	0	4
Rosyface shiner	16	18
Sabine shiner	14	0
Telescope shiner	23	36
Weed shiner	30	0
Mimic shiner	21	0
Pugnose minnow	22	0
S. redbelly dace	1	40
Bluntnose minnow	47	22
Fathead minnow	1	0
E. slim minnow	13	0

Bullhead minnow	27	2
Creek chub	24	31
ICTALURIDAE (CATFISHES)		
Black bullhead	15	2
Yellow bullhead	21	22
Channel catfish	10	2
Ozark madtom	9	29
Mountain madtom	5	0
Tadpole madtom	7	0
Brindled madtom	21	2
Freckled madtom	15	4
Flathead catfish	4	0
PERCIDAE (PERCHES)		
Western sand darter	10	0
Scaly sand darter	20	0
Crystal darter	12	0
Mud darter	8	0
Greenside darter	33	11
Brook darter	11	42
Rainbow darter	29	69
Bluntnose darter	23	0
Barred fantail darter	7	51
Swamp darter	8	0
Striped fantail darter	4	0
Slough darter	21	0
Harlequin darter	16	0
Johnny darter	3	0
Goldstripe darter	1	0
Cypress darter	32	0
Speckled darter	36	2
Current River darter	3	0
Banded darter	16	9

Ohio logperch	24	9
Ozark logperch	8	0
Gilt darter	14	4
Blackside darter	20	0
Longnose darter	1	0
Dusky darter	26	0
River darter	1	0
Stargazing darter	4	0
Saddleback darter	19	0
Sauger	2	0
Walleye	3	2
CATOSTOMIDAE (SUCKERS)		
River carpsucker	3	0
Blue sucker	1	0
Creek chubsucker	23	20
N. hogsucker	30	36
Smallmouth buffalo	5	0
Bigmouth buffalo	2	0
Black buffalo	3	0
Spotted sucker	11	0
Silver redhorse	2	0
River redhorse	8	0
Black redhorse	30	11
Golden redhorse	26	4
Shorthead redhorse	3	0
CENTRARCHIDAE (SUNFISHES)		
Shadow bass	14	24
Flier	2	0
Banded pygmy sunfish	21	0
Green sunfish	74	42
Warmouth	42	7
Orangespotted sunfish	14	0

Blugill	56	22
Dollar sunfish	4	0
Longear sunfish	71	51
Redear sunfish	11	2
Red spotted sunfish	25	16
Bantam sunfish	1	0
Smallmouth bass	19	42
Spotted bass	40	4
Largemouth	46	11
White crappie	22	2
Black crappie	12	0
CYPRINODONTIDAE (KILLFISHES)		
Northern studfish	23	60
Starhead topminnow	7	0
Blackstripe topminnow	5	0
Blackspotted topminnow	80	51
PETROMYZONTIDAE (LAMPREYS)		
Chestnut lamprey	1	2
American brook lamprey	1	0
Least brook lamprey	0	9
LEPISOSTEIDAE (GARS)		
Spotted gar	7	0
Longnose gar	11	2
CLUPEIDAE (HERRINGS)		
Gizzard shad	24	4
MORONIDAE (SEA BASSES)		
White bass	2	0
Striped bass	1	0
COTTIDAE (SCULPINS)		
Banded sculpin	16	42
Ozark sculpin	2	56
POECILIIDAE (LIVE BEARERS)		

Mosquitofish	69	0
ATHERINIDAE (SILVERSIDES)		
Brook silversides	66	4
ESOCIDAE (PIKES)		
Grass pickerel	23	9
Chain pickerel	3	7
APHREDODERIDAE (PIRATE PERCHES)		
Pirate perch	24	0
AMIIDAE (BOWFINS)		
Bowfin	4	0
ANGUILLIDAE (EELS)		
American eel	1	4
SCIAENIDAE (DRUMS)		
Freshwater drum	7	2
HIODONTIDAE (MOONEYES)		
Goldeye	1	0
Mooneye	2	0
POLYODONTIDAE (PADDLEFISHES)		
Paddlefish	1	0

Table 10. Fish species collected by seining in three time periods in the Black River Basin (x species collected; - species not collected).

Common Name	Lower subbasin			Upper subbasin		
	Prior to 1945	1945-1975	1976-2000	Prior to 1945	1945-1975	1976-2000
CYPRINIDAE (MINNOWS)						
Largescale stoneroller	x	x	x	x	x	x
Central stoneroller	x	x	x	x	x	x
Goldfish	-	x	-	-	-	-
Grass carp	-	-	x	-	-	-
Whitetail shiner	x	x	x	x	x	x

Blacktail shiner	x	x	x	-	-	-
Common carp	-	x	x	-	-	x
Ozark chub	x	x	x	-	x	x
Cypress minnow	x	-	-	-	-	-
Mississippi silvery minnow	x	x	x	-	-	-
Striped shiner	x	-	x	x	x	x
Bleeding shiner	x	x	x	x	x	x
Eastern redfin shiner	x	x	x	x	-	-
Ribbon shiner	x	x	x	-	-	-
Hornyhead chub	x	x	x	x	x	x
Golden shiner	x	x	x	x	x	-
Bigeye chub	x	x	x	x	x	x
Pallid shiner	x	-	-	-	-	-
Emerald shiner	x	x	x	-	-	-
Bigeye shiner	x	x	x	x	x	x
Wedgespot shiner	x	x	x	x	x	x
Taillight shiner	x	-	x	-	-	-
Ozark minnow	x	x	x	x	x	x
Ozark shiner	-	-	-	x	x	-
Rosyface shiner	x	x	x	x	x	x
Sabine shiner	-	x	x	-	-	-
Telescope shiner	-	-	x	x	x	x
Weed shiner	x	x	x	-	-	-
Mimic shiner	x	x	x	-	-	-
Pugnose minnow	x	x	x	-	-	-
Sourthern redbelly dace	-	x	-	x	x	x
Bluntnose minnow	x	x	x	x	x	x
Fathead minnow	-	x	-	-	-	-
Eastern slim minnow	x	x	x	-	-	-
Bullhead minnow	x	x	x	-	x	-
Creek chub	x	x	x	x	x	x
ICTALURIDAE (CATFISHES)						

Black bullhead	x	x	x	-	x	x
Yellow bullhead	x	-	x	x	x	x
Channel catfish	-	x	x	-	x	x
Ozark madtom	x	x	x	x	x	x
Mountain madtom	-	x	x	-	-	-
Tadpole madtom	x	x	x	-	-	-
Brindled madtom	x	x	x	x	-	-
Freckled madtom	x	x	x	x	-	-
Flathead catfish	x	x	x	-	-	-
PERCIDAE (PERCHES)						
Western sand darter	-	x	x	-	-	-
Scaly sand darter	x	x	x	-	-	-
Crystal darter	-	x	x	-	-	-
Mud darter	-	x	x	-	-	-
Greenside darter	x	x	x	x	x	x
Brook darter	-	-	x	x	x	x
Rainbow darter	x	x	x	x	x	x
Bluntnose darter	x	x	x	-	-	-
Barred fantail darter	x	x	x	x	x	x
Swamp darter	-	-	x	-	-	-
Striped fantail darter	x	x	x	-	-	-
Slough darter	-	-	x	-	-	-
Harlequin darter	x	x	x	-	-	-
Johnny darter	x	x	-	-	-	-
Goldstripe darter	-	x	-	-	-	-
Cypress darter	x	x	x	-	-	-
Speckled darter	x	x	x	x	-	-
Current River Orangethroat	x	x	x	-	-	-
Banded darter	x	x	x	x	x	x
Ohio logperch	x	x	x	x	x	x
Ozark logperch	-	-	x	-	-	-
Gilt darter	x	x	x	x	x	-

Blackside darter	x	x	x	-	-	-
Longnose darter	-	-	x	-	-	-
Dusky darter	x	x	x	-	-	-
River darter	-	x	-	-	-	-
Stargazing darter	-	x	x	-	-	-
Saddleback darter	x	x	x	-	-	-
Sauger	x	x	x	-	-	-
Walleye	x	x	x	-	x	-
CATOSTOMIDAE (SUCKERS)						
River carpsucker	-	x	x	-	-	-
Blue sucker	-	x	x	-	-	-
Creek chubsucker	x	x	x	x	x	x
Northern hogsucker	x	x	x	x	x	x
Smallmouth buffalo	x	x	x	-	-	-
Bigmough buffalo	x	x	x	-	-	-
Black buffalo	-	x	x	-	-	-
Spotted sucker	x	x	x	-	-	-
Silver redhorse	x	x	x	-	-	-
River redhorse	x	x	x	-	-	-
Black redhorse	x	x	x	x	x	x
Golden redhorse	x	x	x	x	x	x
Shorthead redhorse	-	x	x	-	-	-
CENTRARCHIDAE (SUNFISHES)						
Shadow bass	x	x	x	x	x	x
Flier	x	-	x	-	-	-
Banded pygmy sunfish	-	x	x	-	-	-
Green sunfish	x	x	x	x	x	x
Warmouth	x	x	x	x	x	x
Orangespotted sunfish	x	x	x	-	-	-
Bluegill	x	x	x	x	x	x
Dollar sunfish	-	-	x	-	-	-
Longear sunfish	x	x	x	x	x	x

Redear sunfish	-	x	x	-	x	x
Red spotted sunfish	x	x	x	x	x	x
Bantam sunfish	-	-	x	-	-	-
Smallmouth bass	x	x	x	x	x	x
Spotted bass	x	x	x	x	x	x
Largemouth bass	x	x	x	-	x	x
White crappie	x	x	x	-	x	x
Black crappie	x	x	x	-	-	-
CYPRINODONTIDAE (KILLFISHES)						
Northern studfish	x	x	x	x	x	x
Starhead topminnow	-	x	x	-	-	-
Blackstripe topminnow	-	x	x	-	-	-
Blackspotted topminnow	x	x	x	x	x	x
PETROMYZONTIDAE (LAMPREYS)						
Chestnut lamprey	-	x	-	-	x	-
American brook lamprey	-	x	-	-	-	-
Least brook lamprey	-	-	-	-	-	x
LEPISOSTEIDAE (GARS)						
Spotted gar	-	x	x	-	-	-
Longnose gar	x	x	x	-	-	x
Shortnose gar	-	x	x	-	-	-
CLUPEIDAE (HERRINGS)						
Skipjack herring	-	-	x	-	-	-
Gizzard shad	x	x	x	-	x	x
PERCICHTHYIDAE (SEA BASSES)						
White bass	-	x	x	-	-	-
Striped bass	-	-	x	-	-	-
COTTIDAE (SCULPINS)						
Banded sculpin	x	x	x	x	x	x
Ozark sculpin	x	-	x	x	x	x
POECILIDAE (LIVE BEARERS)						
Mosquitofish	x	x	x	-	-	-

ATHERINIDAE (SILVERSIDES)						
Brook silversides	x	x	x	x	x	-
ESOCIDAE (PIKES)						
Grass pickerel	x	x	x	x	x	x
Chain pickerel	x	x	x	-	-	x
APHRIDODERIDAE (PIRATE PERCHES)						
Pirate perch	x	x	x	-	-	-
AMIIDAE (BOWFINS)						
Bowfin	-	x	x	-	-	-
ANGULLIDAE (EELS)						
American eel	-	x	x	x	x	-
SCIAENIDAE (DRUMS)						
Freshwater drum	-	x	x	-	x	-
HIODONTIDAE (MOONEYES)						
Goldeye	-	-	x	-	-	-
Mooneye	-	x	x	-	-	-
POLYODONTIDAE (PADDLEFISHES)						
Paddlefish	-	x	x	-	-	-

Table 11. Electrofishing summary for the lower Black River subasin.

	Number Captured (Catch Rate (No./hr))		
Fish Species	**Black River Mainstem**	**Cane Creek**	**Tenmile Creek**
Centrachidae (Sunfishes)			
Longear sunfish	1,977 (31)	1,106 (221)	1,110 (218)
Bluegill sunfish	1,447 (23)	87 (17)	37 (7)
Redear sunfish	23 (<1)	0 (0)	0 (0)
Warmouth Sunfish	118 (2)	30 (6)	0 (0)
Green Sunfish	41 (1)	99 (20)	32 (6)
Spotted Sunfish	39 (1)	20 (4)	20 (4)
Flier	0 (0)	1 (<1)	0 (0)

Orange Spotted Sunfish	23 (<1)	0 (0)	7 (1)
Shadow Bass	177 (3)	68 (14)	209 (41)
White Crappie	143 (2)	0 (0)	0 (0)
Black Crappie	112 (2)	8 (2)	0 (0)
Spotted Bass	1,070(17)	52 (10)	10 (2)
Largemouth Bass	281 (4)	22 (4)	32 (6)
Smallmouth Bass	70 (1)	10 (2)	119 (23)
Ictaluridae (Catfishes)			
Channel Catfish	328 (5)	2 (<1)	0 (0)
Flathead Catfish	30 (<1)	1 (<1)	0 (0)
Black Bullhead	12 (<1)	0 (0)	0 (0)
Yellow Bullhead	2 (<1)	23 (5)	71 (14)
Catostomidae (Suckers)			
Spotted Sucker	108 (2)	24 (5)	26 (5)
Northern Hogsucker	777 (12)	53 (11)	77 (14)
Blue Sucker	20 (<1)	0 (0)	0 (0)
Black Redhorse	131(2)	22(4)	6(1)
Golden Redhorse	1091(17)	228(46)	388(76)
River Redhorse	543 (9)	4 (1)	0 (0)
Shorthead Redhorse	100(2)	0(0)	0(0)
Silver Redhorse	17 (<1)	0 (0)	0 (0)
Redhorse spp.[a]	1,930 (30)	0 (0)	0 (0)
Smallmouth Buffalo	398 (6)	0 (0)	0 (0)
Bigmouth Buffalo	94 (1)	0 (0)	0 (0)
Black Buffalo	62 (1)	0 (0)	0 (0)
River Carpsucker	10 (<1)	0 (0)	0 (0)
Lepisosteidae (Gars)			
Spotted Gar	147 (2)	0 (0)	0 (0)
Shortnose Gar	89 (1)	0 (0)	0 (0)
Longnose Gar	57 (1)	0 (0)	0 (0)
Sciaenidae (Drums)			

Freshwater Drum	245 (4)	0 (0)	0 (0)
Cyprinidae (Minnows)			
Carp	426 (7)	3 (1)	0 (0)
Subtotal	426 (7)	3 (1)	0 (0)
Percidae (Perches)			
Walleye	71 (1)	0 (0)	0 (0)
Sauger	11 (<1)	0 (0)	0 (0)
Subtotal	82 (1)	0 (0)	0 (0)
Percichthyidae (Sea Basses)			
White Bass	16 (<1)	0 (0)	0 (0)
Subtotal	16 (<1)	0 (0)	0 (0)
Esocidae(Pikes)			
Chain Pickerel	14 (<1)	0 (0)	2 (<1)
Grass Pickerel	2 (<1)	7 (1)	3 (1)
Subtotal	16 (<1)	7 (1)	5 (1)
Amiidae (Bowfins)			
Bowfins	38 (1)	0 (0)	0 (0)
Subtotal	38 (1)	0 (0)	0 (0)
Anguillidae (Eels)			
American Eel	3 (<1)	0 (0)	0 (0)
Hiodontidae (Mooneyes)			
Mooneye	75 (1)	0 (0)	0 (0)
Clupeidae (Herrings)			
Skipjack	14 (<1)	0 (0)	0 (0)
Gizzard Shad	2,896 (46)	1 (<1)	0 (0)
Total	15,278(241)	1,871(374)	2,149(421)
Effort (hrs)	63.5	5.0	5.1
#EF Samples	23	4	3

[a]: In 1974, 1982, and 1983, redhorse suckers were not separated to species level.

Table 12. Electrofishing summary for the upper Black River subbasin.

Number Captured (Catch Rate)				
Fish Species	**Black River Mainstem**	**East Fork Black River**	**Middle Fork Black River**	**West Fork Black River**
Centrachidae (Sunfishes)				
Longear sunfish	633 (35)	248 (207)	26 (20)	298 (53)
Bluegill sunfish	126 (7)	157 (131)	6 (5)	15 (3)
Redear sunfish	4 (<1)	2 (2)	0 (0)	0 (0)
Warmouth sunfish	0 (0)	0 (0)	0 (0)	2 (<1)
Green Sunfish	9 (1)	75 (63)	12 (9)	29(5)
Red Spotted Sunfish	20 (1)	1 (1)	1 (1)	10(tr)
Shadow Bass	545 (30)	27 (23)	73 (23)	378 (68)
White Crappie	6 (<1)	0 (0)	0 (0)	0 (0)
Spotted Bass	89 (5)	0 (0)	0 (0)	0 (0)
Largemouth Bass	160 (9)	18 (15)	0 (0)	5 (1)
Smallmouth Bass	438 (24)	5 (4)	65 (50)	329 (59)
Ictaluridae (Catfishes)				
Channel Catfish	13 (1)	1 (1)	0 (0)	0 (0)
Black Bullhead	60 (<1)	0 (0)	0 (0)	1 (<1)
Yellow Bullhead	31 (2)	1 (1)	3 (2)	24 (24)
Catostomidae (Suckers)				
Northern Hogsucker	232 (13)	3 (3)	49 (38)	95 (17)
Golden Redhorse	117 (7)	1 (1)	0 (0)	18 (3)
Black Redhorse	210 (12)	3 (3)	0 (0)	10 (2)
Cyprinidae (Minnows)				
Carp	81 (5)	2 (2)	0 (0)	16 (3)
Esocidae (Pikes)				
Chain Pickerel	1 (<1)	0 (0)	0 (0)	0 (0)
Grass Pickerel	5 (<1)	0 (0)	3 (2)	4 (1)
Clupeidae (Herrings)				
Gizzard Shad	259 (14)	16 (13)	0 (0)	0(0)

Total	2,985 (166)	560 (467)	238 (183)	1,234 (220)
Effort (hrs)	18.0	1.2	1.3	5.6
#EF Samples	7	1	1	2

Table 13. Crayfish distribution in the Black River basin (X species collected, - not collected).

Scientific Name	Common Name	Upper Subbasin	Lower Subbasin
Cambarellus puer	cajun dwarf crawfish	-	X
C. shufeldtii	Shufeldt's dwarf crawfish	-	X
Cambarus diogenes	cevil crawfish	-	X
C. hubbsi	Hubb's crawfish	X	X
Faxonella clypeata	shield crayfish crawfish	-	X
Orconectes hylas	woodland crawfish	X	X
O. palmeri	gray-speckled crawfish	-	X
O. punctimanus	spothanded crawfish	X	X
O. virilis	northern crawfish	-	X
Procambarus acutus	White River crawfish	-	X
P. clarkii	red swamp crawfish	-	X
P. viaeveridus	vernal crawfish	-	X

Table 14. Freshwater mussel species found in the lower Black River subbasin. Data obtained from Buchanan (1996) = 1, Oesch (1984) = 2, and Bernard Sietman (personal communication) = 3.

Scientific Name	Common Name	Cane Creek	Tenmile Creek	Black River Mainstem
Actinonaias ligamentina	Mucket	1,2,3	-	1,2
Alasmidonta marginata	Elktoe	-	-	1,2
A. viridis	Slippershell mussel	-	-	2

Amblema plicata plicata	Threeridge	1,2,3	-	1,2
Anodonta grandis	Giant floater	1,3	-	1
A. imbecillis	Paper pondshell	3	-	1
Cyclonaias tuberculata	Purple wartyback	1	-	1,2
Cyprogenia aberti	Western fanshell	1,2,3	-	1,2
E. dilatata	Spike	1,2,3	-	1,2
Epioblasma f. curtisi	Curtis pearlymussel	-	-	1,2
Fusconaia flava	Wabash pigtoe	1,2,3	-	1,2
F. ozarkensis	Ozark pigtoe	-	-	2
Lampsilis abrupta	Pink mucket	-	-	1,2
L. cardium	Plain pocketbook	3	-	-
L. ovata	Pocketbook	1,2	-	1,2
L. reeviana brevicula	Ozark broken-ray	3	3	1
L. siliquoidea	Fatmucket	1,2,3	-	1,2
L. reeviana brittsi	Northern broken-ray	1,2	1	1,2
L. teres	Yellow sandshell	-	-	2
Lasmigona c. complanata	White heelsplitter	-	-	1,2
L. costata	Fluted-shell	1,2,3	-	1,2
Leptodea fragilis	Fragile papershell	-	-	1,2
Ligumi recta	Black sandshell	1,3	-	1,2
L. subrostrata	Pondmussel	1,3	-	1
Obliquaria reflexa	Threehorn wartyback	-	-	1,2
Obovaria jacksoniana	Southern hickorynut	2	-	-
Plectomerus dombeyanus	Bankclimber	-	-	1
Pluerobema coccineum	Round pigtoe	1,2,3	-	1,2
Potamilus purpuratus	Bleufer	1	-	1,2
Ptychobranchus occidentalis	Ouachita kidneyshell	-	-	2
Quadrula cylindrica cylindrica	Rabbitsfoot	-	-	2
Quadrula metanevra	Monkeyface	-	-	1,2
Q. pustulosa pustulosa	Pimpleback	-	-	1,2
Strophitus undulatus	Squawfoot	1,3	-	1,2

Toxolasma parvus	Lilliput	-	-	1
Toxolasma lividus glans	Little purple	-	-	2
Tritogonia verrucosa	Pistolgrip	1	-	1,2
Truncilla donaciformis	Fawnsfoot	-	-	1,2
T. truncata	Deertoe	-	-	1,2
Venustaconcha e. pleasi	Pleas mussel	-	-	2
Villosa iris	Rainbow	-	-	1,2
V. lienosa	Little spectaclecase	1,2	-	1,2
Corbicula fluminea	Aisatic clam	1,2,3	1	1,2
Number of Species		**23**	**3**	**40**

Table 15. Threatened and endangered aquatic species in the Black River basin.

Common Name	Federal Status	State Status	Global Rank	State Rank
Fishes				
Cypress minnow		E	G5	S1
Mississippi silvery minnow			G5	S3 S4
Pallid shiner			G4	SX
Taillight shiner		E	G5	S1
Ozark shiner			G3	S2
Sabine shiner		E	G2 G3	S1
Pugnose minnow			G5	S4
E. slim minnow			G5 T4	S2 S3
Mountain madtom		E	G4	S1 S2
Western sand darter			G3	S2 S3
Scaly sand darter			G5	S3
Crystal darter		E	G3	S1
Swamp darter		E	G5	S1
Harlequin darter		E	G5	S2
Goldstripe darter		E	G4 G5	S1
Longnose darter		E	G3	S1

River darter			G5	S3
Stargazing darter			G3	S2
Blue sucker			G4	S3
Flier			G5	S3
Dollar sunfish			G5	SU
Bantam sunfish			G5	S2
Starhead topminnow			G4	S2
American brook lamprey			G4	S2
Mooneye			G5	S3
Paddlefish			G4	S3
Crayfish				
Cajun dwarf crayfish			S3?	G4 G5
Shufeldt's dwarf crayfish			S3?	G5
Shield crayfis h			S2 S3	G5
Vernal crayfish			S3?	G5
Mussels				
Elktoe			S2?	G4
Western fanshell			S1 S2	G2
Curtis pearlymussel	E	E	S1	G1 T1
Pink mucket	E	E	S2	G2
Black sandshell			S1 S2	G5
Southern hickorynut			S1	G2 G3
Bankclimber			S3	G4 G5
Ouachita kidneyshell			S2 S3	G3 G4
Rabbitsfoot			S1	G3 T3

Federal Status: E = endangered

State Status: Rule 3CSR10-4.111 of the *Wildlife Code of Missouri* and certain state statutes apply to state Code listed species. The state status "Endangered" is determined by the Department of Conservation under constitutional authority.

Global Rank: G1= Critically imperiled globally, G2 = Imperiled globally, G3 = Either very rare or in a restricted range, G4 = Widespread, abundant, and apparently secure globally, though it may be quite rare in parts of its range. Thus the element is of long-term concern. G5 = demonstrably widespread, abundant, and secure globally, though it may be quire rare in parts of its range, especially at the periphery.

State Rank: S1 = Critically imperiled in the state because of rarity or because some factor (s) making it very vulnerable to extirpation, S2 - Imperiled in the state because of rarity or because some factor (s) making it very vulnerable to extirpation, S3 = Rare and uncommon in the state, S4 = Widespread, abundant, and apparently secure in state, but the species is of long-term concern, SU = unrankable. Possibly in peril in the state, but status uncertain. Need more information, SX = Extirpated.

Table 16. Summary of select creel parameters reported in the Missouri Statewide Angler Survey (1983-1988) for the Black River. Because of limited angler contacts (698 anglers surveyed during the 6-year period), all data for all years were combined.

Species Preference	No. Anglers	% of Anglers	% of Hours	Catch Rate (No./hr)	Harvest Rate (No./hr)	Fishing Quality Rating 10=Best	Ave. Trip Length (hrs)
Black Bass	197	28	23	0.9	0.2	3.6	5.4
Anything	172	25	25	1.0	0.5	3.8	4.7
Catfishes	161	23	21	0.4	0.2	5.0	5.5
Sunfishes	96	14	26	2.2	1.0	2.8	4.8
Shadow Bass	30	4	2	0.8	0.5	3.7	6.8
Crappies	21	3	2	0.7	0.6	4.4	4.8
Walleye	14	2	1	0.3	0.2	5.8	4.1
Buffalo	4	1	<1	0.4	0.4	8.0	10.0
Carp	3	<1	<1	0.3	0.3	8.0	12.0
Drum	-	-	-	-	-	-	-
Gars	-	-	-	-	-	-	-
Pickerel	-	-	-	-	-	-	-
Trout	-	-	-	-	-	-	-
Suckers	-	-	-	-	-	-	-
Shad	-	-	-	-	-	-	-
Average				1.1	0.5	5.1	3.9

MANAGEMENT PROBLEMS AND OPPORTUNITIES

The management goals, objectives, and strategies for the Black River Watershed were developed using information collected for the Black River Watershed Inventory and Assessment and direction provided by the Southeast Regional Management Guidelines (MDC 1999), Missouri Department of Conservation Strategic Plan, and the Fisheries Division Five Year Strategic Plan. All goals are of equal importance, with objectives listed in prioritized order whenever possible. This plan includes only those activities and results that can reasonably be expected to be achieved or influenced by MDC during the next 25 years. Completion of these objectives will depend upon their status in overall regional and division priorities and the availability of human resources and funds.

GOAL I: Maintain or improve aquatic habitat conditions to meet the needs of native aquatic biota while accommodating society's demands for agricultural production and economic development.

Status: Aquatic habitats, riparian areas, and the watershed are mostly in good condition throughout the basin. However, land management can be improved both on public and private land.

Objective 1: Maintain, expand, and restore riparian corridors; enhance watershed management; improve in-stream habitat; and reduce streambank erosion throughout the basin.

Strategies

Provide technical assistance and recommendations about streams to all landowners, public agencies, and private contractors that request it.

Ensure that all MDC conservation areas are examples of good watershed, riparian corridor, and stream management by including appropriate recommendations and prescriptions in area plans.

Encourage and assist other government agencies to use proper watershed, riparian corridor, and stream management on their lands.

Improve landowner stream stewardship by promoting and implementing MDC's incentive programs.

Work with the Natural Resource Conservation Service, Farm Service Agency, and Soil and Water Conservation Districts to provide and promote landowner incentive programs that will improve watershed, riparian corridor, and stream stewardship (*e.g.* fencing, corridor tree planting, livestock watering systems, pond construction).

Promote and participate in SALT and EARTH projects so that appropriate practices are available to landowners to improve watershed, riparian corridor, and stream stewardship.

Review Section 404 and other permit applications, comment on anticipated adverse impacts, and recommend measures to protect watershed and aquatic environments.

Periodically monitor habitat conditions; methods may include, GIS technology, aerial photography, or helicopter reconnaissance.

Objective 2: In the channelized streams of the lower subbasin, reduce channel instability, sedimentation, and streambank sloughing and increase instream woody habitat.

Strategy

Encourage drainage districts and landowners to leave vegetated strips, preferably trees, along ditches and streams.

GOAL II. Maintain or improve water quality throughout the basin so that it is sufficient to support diverse aquatic biota.

Status: Water quality is generally good throughout the basin. However, mines, tailing ponds, and waste water treatment facilities can degrade water quality. In addition, the effects of the AmerenUE hydropower facility on water quality and biota of the East Fork of the Black River and Lower Taum Sauk Lake unknown. This facility is operated under the auspices of the Federal Energy Regulatory Commission and the current license which expires in 2010. A new license is scheduled to be issued in 2010. The new license will be in effect for a minimum of 30 years.

Objective 1: Ensure that basin streams meet state water quality standards.

Strategies

Review NPDES, Section 404, and other permit applications; assist with the enforcement of existing water quality laws; and recommend measures to protect aquatic communities.

Encourage Missouri Department of Natural Resources (MDNR) to implement best reclamation techniques for mines, tailing dams and ponds, and chat piles.

Oppose the establishment of landfills in areas that may contaminate basin streams. Cooperate with other state and federal agencies to investigate pollution events and fish kills.

Work with the Missouri Department of Health and MDNR to reduce contaminant levels in fish by collecting fish for contaminant analysis, advising the public about contaminants, and identifying sources of contamination.

Encourage and assist the MDNR to monitor construction sites to ensure that best management practices are used to limit erosion and sediment input into streams.

Encourage and assist other government agencies to use proper watershed, riparian corridor, and stream management practices on their lands.

Improve landowner stream stewardship by promoting and implementing MDC's incentive programs.

Work with the Natural Resource Conservation Service, Farm Service Agency, and Soil and Water Conservation Districts to provide and promote landowner incentive programs that will improve watershed, riparian corridor, and stream stewardship (e.g. fencing, corridor tree planting, livestock watering systems, pond construction).

Promote and participate in SALT and EARTH projects so that appropriate practices are available to landowners to improve watershed, riparian corridor, and stream stewardship.

Educate livestock producers by providing them with technical information about management practices (*e.g.* alternative watering systems, management intensive grazing) to keep livestock waste from entering streams..

Objective 2: Encourage the public to become advocates for high-quality water.

Strategies

Encourage formation of additional STREAM TEAMs and STREAM TEAM associations within the basin.

Encourage STREAM TEAMs to participate in the Volunteer Water Quality Monitoring Program and to report pollution, other water quality problems, and illegal trash dumping to the proper authorities.

Encourage and assist STREAM TEAMs in removing trash from all major basin streams.

Use media contacts, presentations, special events, and literature distribution to reach people throughout the basin to enhance their awareness of water quality problems and viable solutions.

Serve in an advisory role to STREAM TEAMs and other citizen organizations and local governments on water resource issues.

Objective 3: Work with AmerenUE and other stakeholders to determine the impacts of the Taum Sauk hydropower facility on the aquatic resources and to develop mitigation measures which benefit natural resources and recreation.

Strategies

Collect baseline data (*e.g.*, water quality, fish, macroinvertebrate, and physical habitat), which will be used during the relicensing process.

Participate in the FERC relicensing effort by attending stakeholder and subcommittee meetings.

Take the lead with other fish and wildlife and environmental agencies to work through the FERC relicensing effort. Develop conditions to the new license which will enhance, protect, and mitigate for aquatic resources.

Encourage Stream Teams and other stakeholders to adopt streams, especially downstream of Lower Taum Sauk Lake, to help with monitoring biota, water quality, and habitat.

GOAL III. Maintain diversity of native aquatic organisms and improve the quality of fishing.

Status: The basin supports a diverse aquatic biota, including 132 fish species, 42 mussel species, and 12 crayfish species. Most streams support a diverse benthic invertebrate fauna.

Objective 1: Monitor, assess, and protect aquatic populations and communities.

Strategies

Encourage STREAM TEAMs to participate in the Volunteer Water Quality Monitoring Program to monitor aquatic invertebrates and water quality.

Encourage and support Protection Division personnel with the protection of mussels from illegal harvest.

Maintain proper habitat conditions (*e.g.* improved water quality, reduced siltation) through improved watershed, riparian corridor, and streambank management.

Objective 2. Provide diverse, high-quality angling opportunities.

Strategies

Evaluate the status of the sport fish community by conducting periodic electrofishing surveys and tagging studies.

Propose and implement regulations or stock fish, as needed, that might improve the quality of fishing for a variety of species (e.g. paddlefish, smallmouth bass, spotted bass, shadow bass, walleye, channel catfish).

Identify critical habitat areas (e.g. nursery areas) for sportfish species and maintain or enhance these areas as needed.

Determine angler preferences through creel or angler opinion (mail-in or phone) surveys.

Determine the impacts of stocking walleye and paddlefish fingerlings in the Black River.

Objective 3. Improve access to basin streams.

Strategies

Acquire and develop public access and frontage sites for boating, canoeing, and bank fishing at strategic points.

Improve bank fishing and other aquatic wildlife-based recreational opportunities on public lands.

GOAL IV. Improve the public's knowledge and appreciation of stream resources; recreational opportunities; and proper watershed, riparian corridor, and streambank management.

Status: Public education will continue through a variety of avenues. Stream management workshops for landowners, classes for teachers, seminars at Sports Shows and other events, and contacts with the news media will provide a variety of means to educate the public.

Objective 1. Educate the public on the value of healthy stream ecosystems and encourage advocacy on behalf of basin streams.

Strategies

Assist with the University of Missouri's project, Sustaining Natural Resources on Private Lands in the Central Hardwood Region. This project will be conducted in the St. Francis River and Black River basins in Missouri.

Conduct aquatic education programs in cooperation with MDC Outreach and Education Division and local area schools.

Encourage basin STREAM TEAMs to promote the value and opportunities associated with basin streams.

Encourage formation of additional STREAM TEAMs and STREAM TEAM associations within the basin.

Provide technical assistance and recommendations about streams to all landowners, public agencies, and private contractors that request it.

Cooperate with other agencies to promote landowner participation in watershed and stream incentive programs and SALT or EARTH programs.

Work with MDC's Outreach and Education Division staff to conduct stream management workshops for school teachers.

Work with MDC's Private Land Services (PLS) staff to promote good stream stewardship through workshops and one-on-one contacts with landowners.

Work with PLS staff to present workshops and programs to local government officials about stream dynamics and the importance of good watershed management and healthy riparian corridors.

Objective 2. Educate the public about aquatic-related recreational opportunities in the basin.

Strategies

Promote angling opportunities through MDC's Fishing Prospects, media, presentations, and special events.

Increase awareness of the angling opportunities for non-game fishes (e.g. buffalo, gar, carp, drum).

Promote aquatic-related activities (e.g. angling, snorkeling, canoeing, sight-seeing) through the media, presentations, and special events.

ANGLER GUIDE

Lower Subbasin

In the Black River, spotted bass (76%) are more numerous than either largemouth bass (20%) or smallmouth bass (4%). Spotted bass up to 14" are fairly common throughout the river. Anglers trying to catch a memorable size spotted bass (≥17") should fish just downstream of Clearwater Dam or near the Coon Island CA.

Because Tenmile Creek supports a good smallmouth bass population, additional electrofishing surveys were conducted (these data not included in Tables 7 and 11). Smallmouth bass densities, size structure, and growth rates are good (Figure sb), thus a Special Smallmouth Bass Management Area (SSBMA) was established in 2000. In the SSBMA, the daily limit is six black bass, but only one can be a smallmouth bass and it must be at least 15". The 12" minimum size remains on largemouth and spotted bass.

The best shadow bass (goggle-eye) fishing occurs in the tributaries (*e.g.*, Cane Creek and Tenmile Creek) of the Black River. In Cane and Tenmile Creeks, a high percentage of fish are longer than seven inches (PSD 33 to 44), but few reach nine inches (RSD9 ≤ 5). See Appendix 1 for a glossary of fisheries terminology. Both creeks are primarily a wade fishing stream, however some anglers use canoes during the spring. Anglers should fish the deeper pools with minnows, crayfish, or small crank baits. Minnows can be easily obtained from the creek using a trap or cast net.

The Black River supports an excellent walleye population with fish up to 30" (Figure ws). Walleye growth is good with age-3 males averaging at least 15 inches and females even more. Anglers interested in walleye should fish the river upstream of Poplar Bluff. Local anglers fish for walleye primarily during the winter, but walleye can be caught throughout the year. Anglers should try a jig tipped with a minnow or nightcrawler or crank baits.

A significant paddlefish population exists in the Black River. On the opening weekend of snagging season, it is common to have 50 boats in the 100-acre pool below Clearwater Dam. Between 1995 and 2001, 160 paddlefish were measured by MDC personnel (Figure pf). Paddlefish averaged 29" (eye-fork).

The Black River supports an excellent channel catfish population, with many fish up to 5 pounds. Chicken liver fished on the bottom is a popular method, but limblines or trotlines baited with minnows or small sunfish are very effective.

The Black River offers excellent sucker fishing and gigging opportunities. Anglers should try fishing for northern hog suckers with small hooks baited with the meat of mussels or clams and fished on the bottom just downstream of a riffle. Gigging for suckers should be good late in the season as water clarity improves.

Longear sunfish and bluegill are relatively common in the subbasin, but no preferred size fish (>8") have been collected. Sunfish are easily caught using crickets, worms, or small minnows.

Upper Subbasin

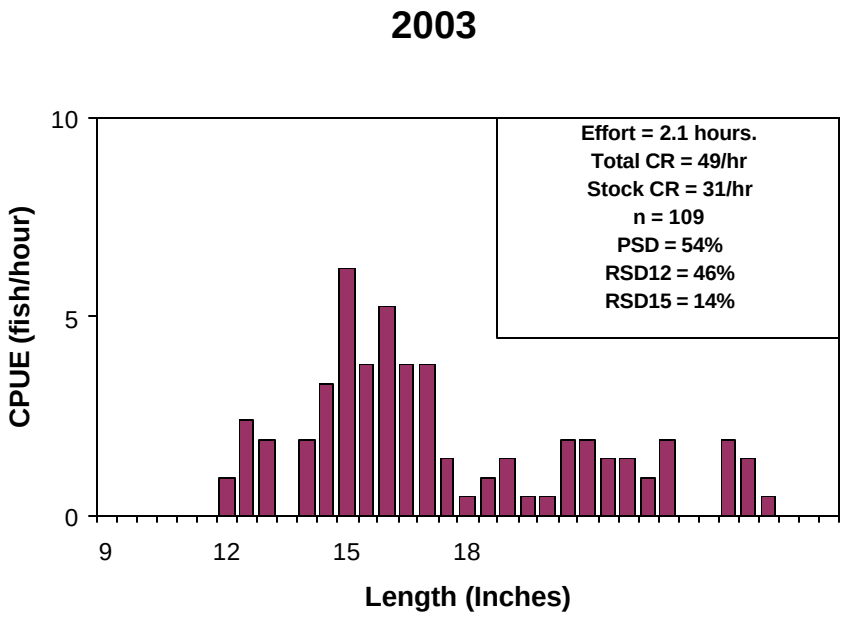
The fish communities in this subbasin offer quality angling and gigging opportunities. In the Black River, smallmouth bass (63%) are more numerous than either largemouth bass (25%) or spotted bass (12%). Smallmouth bass are also the most common black bass in the West Fork of the Black River (99%) and Middle Fork of the Black River (100%). In the East Fork of the Black River, largemouth bass (90%) is the most common black bass. In all subbasin streams combined, the smallmouth bass size structure is good with the PSD $\geq$ 25 and RSD $\geq$ 6. Largemouth bass PSD and RSD in the Black River were 41 and 3, respectively. Spotted bass were only collected in the Black River and PSD(12) and RSD14(0) values were poor. Bass anglers should fish the deeper pools that have boulders and rootwads. Minnows or crayfish are effective baits and easily obtained from the river using a seine or cast net.

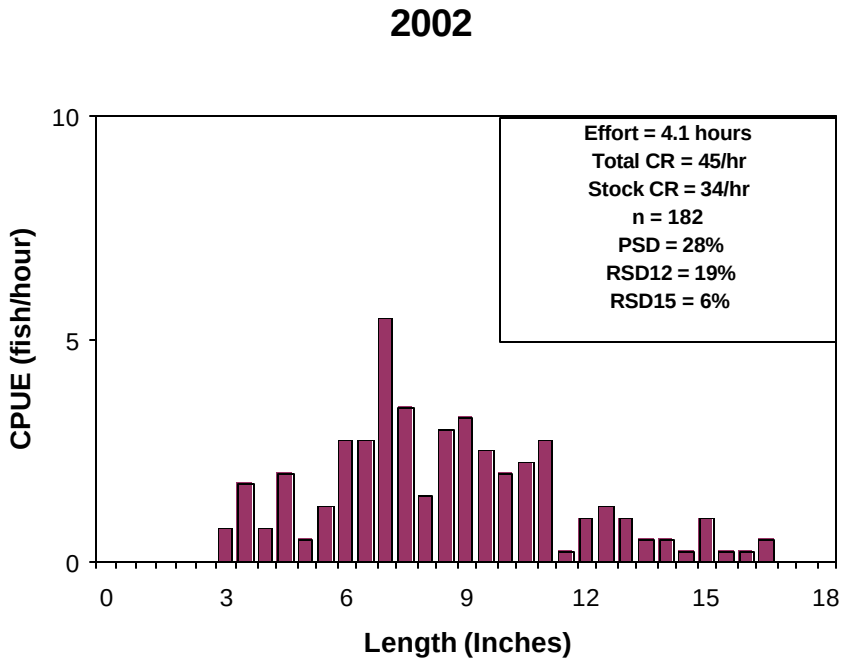
Shadow bass size structure throughout the subbasin includes a high percentage of fish longer than seven inches (PSD 23 to 43), but preferred size fish (>9") are relatively rare. The best fishing occurs in the deep holes filled with large boulders. Anglers should try live bait or small jigs.

Longear sunfish are common in all subbasin streams, but few reach quality (>6") size. Overall, PSD was 11 and no fish longer than eight inches have been collected.

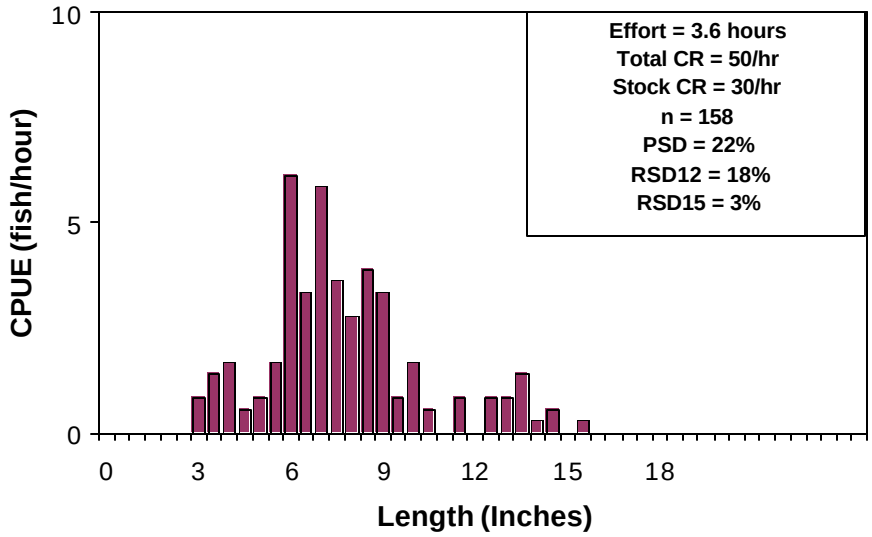
Gigging for suckers is good throughout the Black River and tributaries. Water clarity is usually very good, but angler access to certain sections of river may be limited due to low water levels.

Figure sb. Smallmouth bass densities, size structure, and growth rates in the Black River Basin.

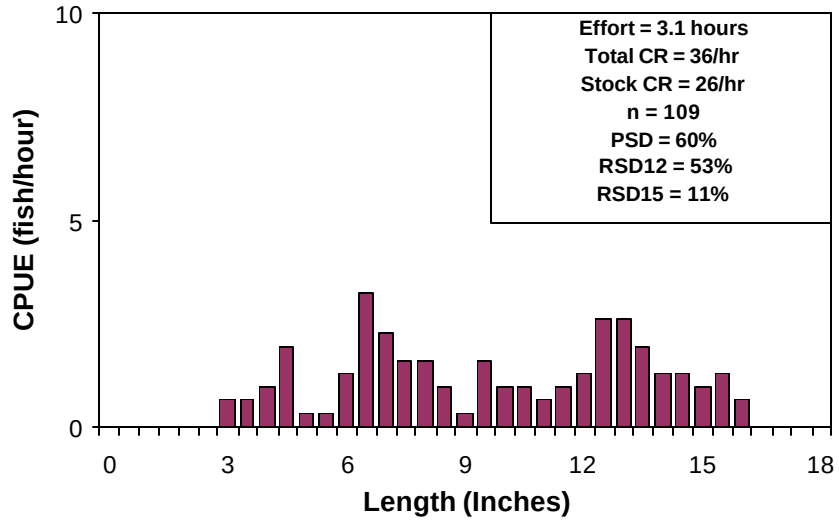




2001


Effort = 3.6 hours
Total CR = 50/hr
Stock CR = 30/hr
n = 158
PSD = 22%
RSD12 = 18%
RSD15 = 3%
CPUE (fish/hour)
Length (Inches)
0
5
10
0
3
6
9
12
15
18

2000


Effort = 3.1 hours
Total CR = 36/hr
Stock CR = 26/hr
n = 109
PSD = 60%
RSD12 = 53%
RSD15 = 11%
CPUE (fish/hour)
Length (Inches)
0
5
10
0
3
6
9
12
15
18

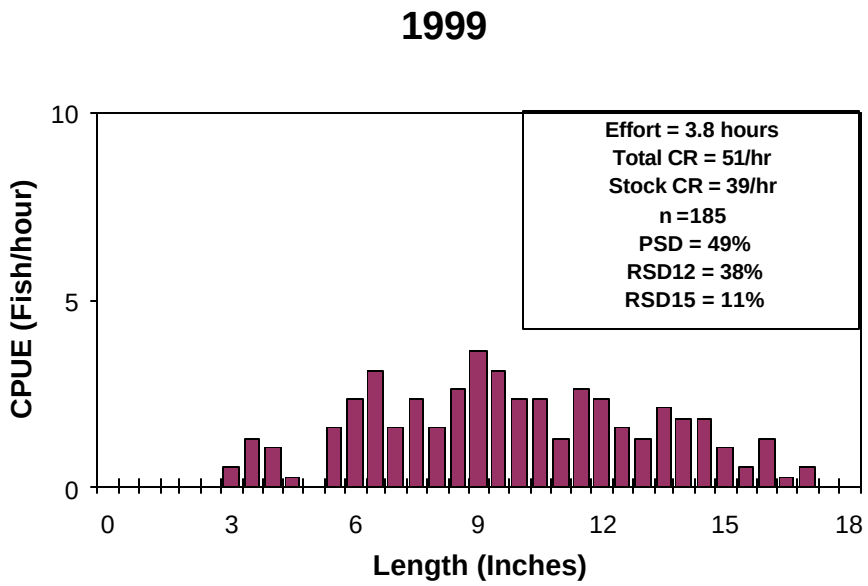


Figure pf. Average length of paddlefish found in the Black River Basin.

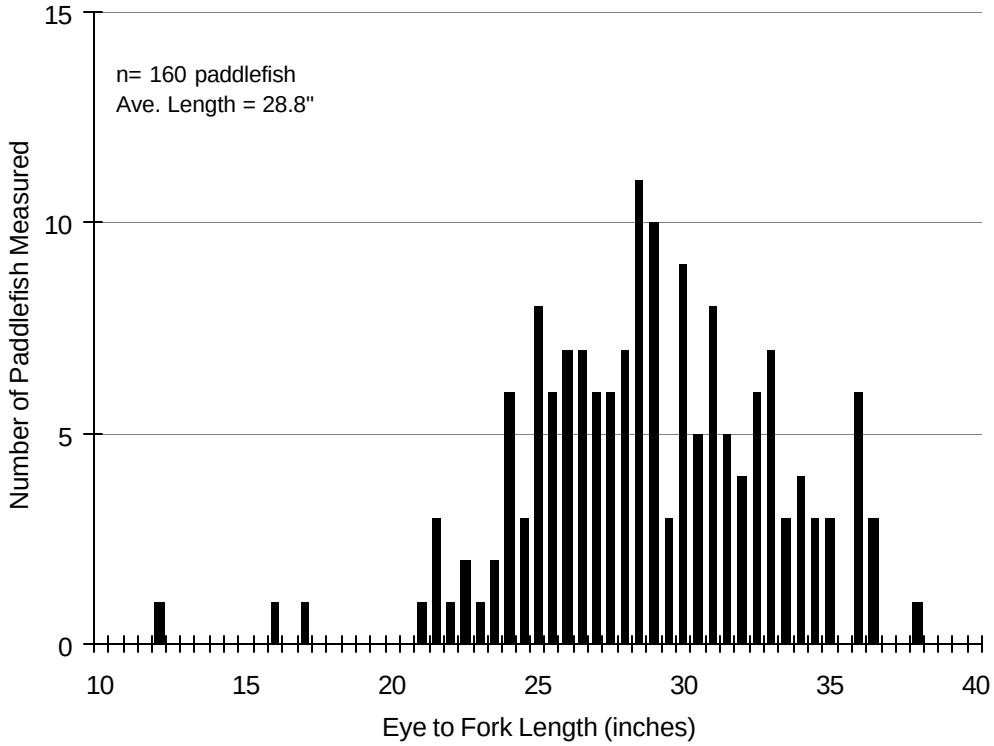
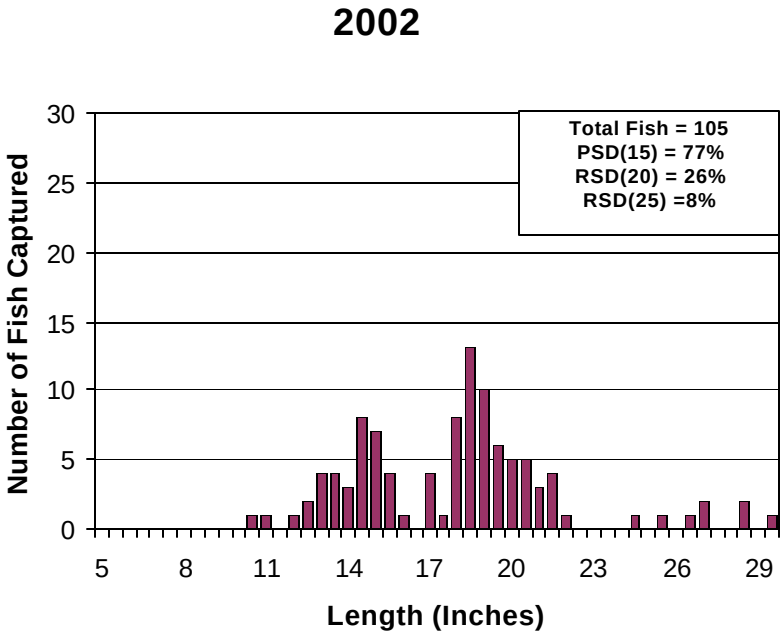
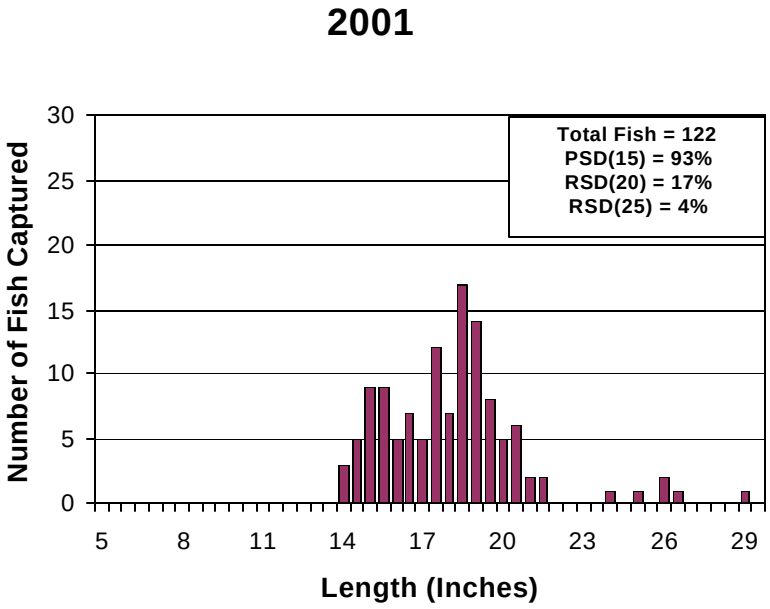
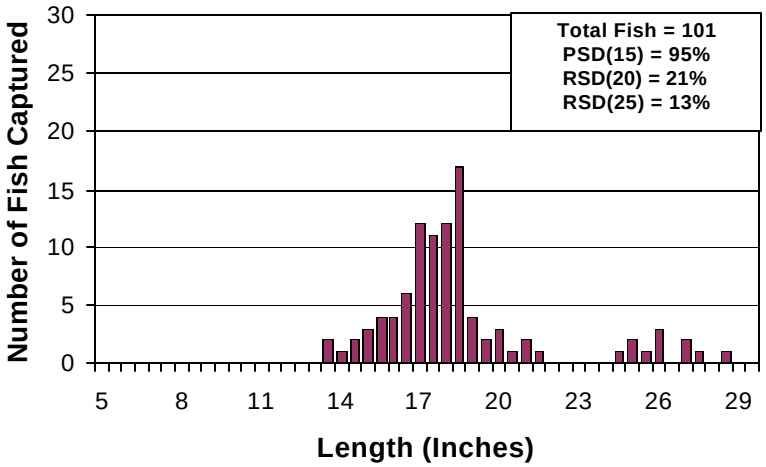


Figure ws. Walleye Spring sampling in the Black River Basin. Total number- Gill net and EF data combined.

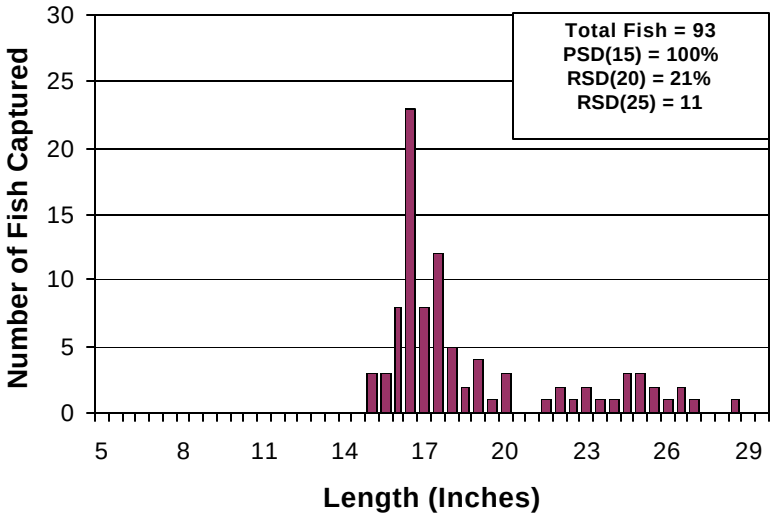




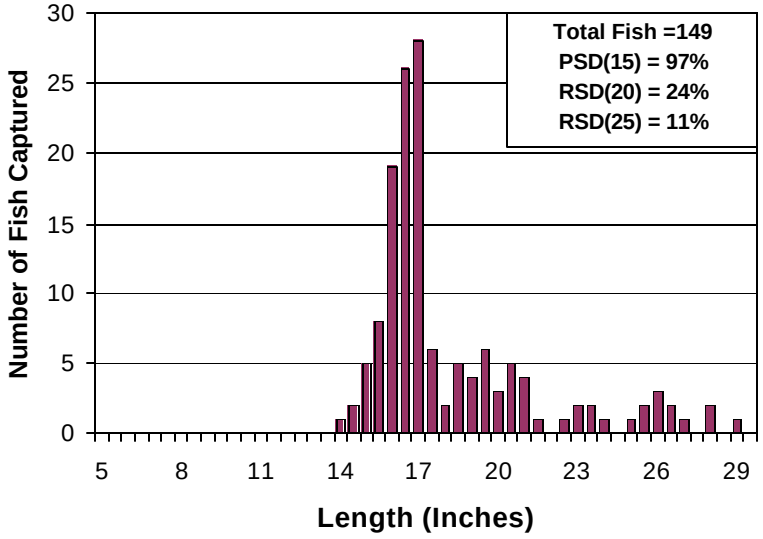
2000


Total Fish = 101
PSD(15) = 95%
RSD(20) = 21%
RSD(25) = 13%
Number of Fish Captured
0
5
10
15
20
25
30
5
8
11
14
17
20
23
26
29
Length (Inches)

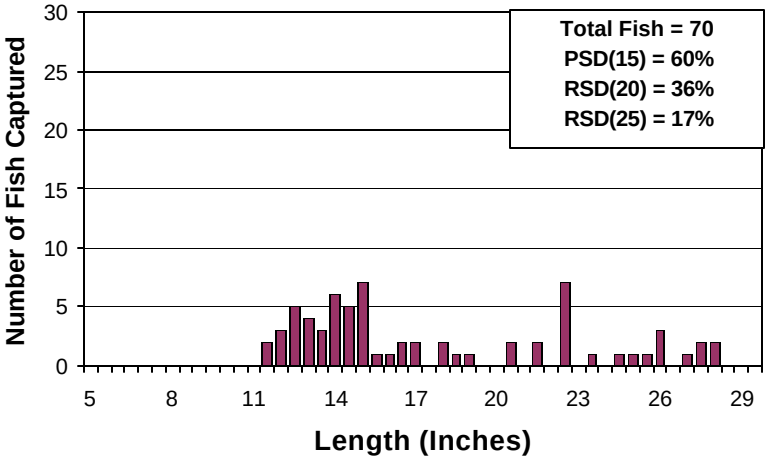
1999


Total Fish = 93
PSD(15) = 100%
RSD(20) = 21%
RSD(25) = 11
Number of Fish Captured
0
5
10
15
20
25
30
5
8
11
14
17
20
23
26
29
Length (Inches)

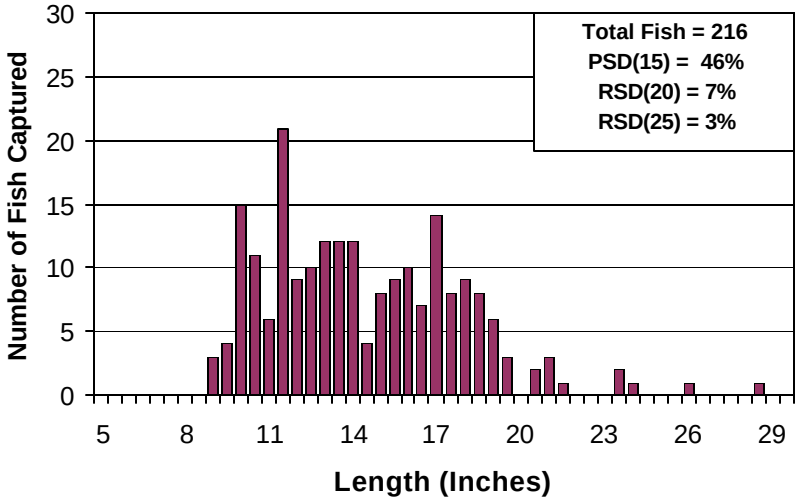
1998


Total Fish =149
PSD(15) = 97%
RSD(20) = 24%
RSD(25) = 11%
Number of Fish Captured
0
5
10
15
20
25
30
5
8
11
14
17
20
23
26
29
Length (Inches)

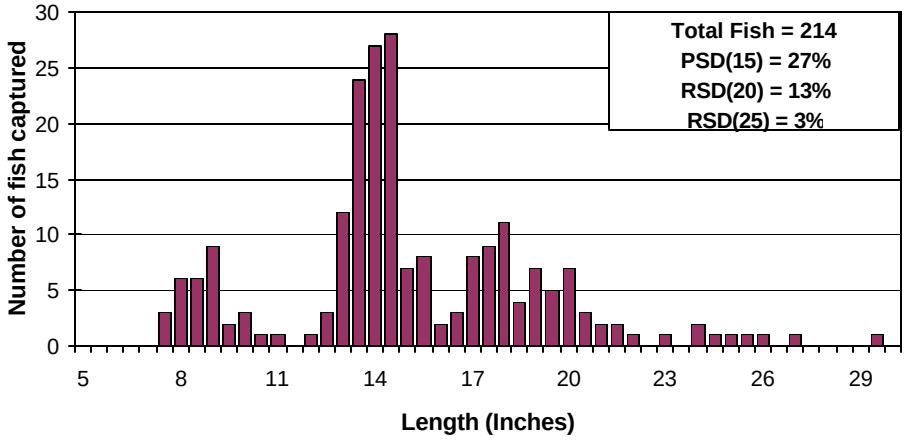
1997


Total Fish = 70
PSD(15) = 60%
RSD(20) = 36%
RSD(25) = 17%
Number of Fish Captured
0
5
10
15
20
25
30
5
8
11
14
17
20
23
26
29
Length (Inches)

1996


Total Fish = 216
PSD(15) = 46%
RSD(20) = 7%
RSD(25) = 3%
Number of Fish Captured
0
5
10
15
20
25
30
5
8
11
14
17
20
23
26
29
Length (Inches)

1995


Total Fish = 214
PSD(15) = 27%
RSD(20) = 13%
RSD(25) = 3%
Number of fish captured
0
5
10
15
20
25
30
5
8
11
14
17
20
23
26
29
Length (Inches)

Appendix 1. Glossary of fisheries terminology.

Age Determination

Age-0 – Fish in their first year of life, prior to January 1. Sometimes referred to as Young-of-the-Year (YOY).

Age 1, 2... Fish in their first, second, third, etc, growing season.

CR – Catch Rate - The number of fish caught per unit of time.

Example: 100 largemouth bass are caught during a one-hour electrofishing survey. The CR is 100 bass/hour.

Density – The number of fish in a body of water. Example: low electrofishing catch rates of bass in a lake indicate the bass density (number of bass in that lake) is low.

EF – Electrofishing - This refers to fish sampled with electrofishing gear.

GNN – Gill Net Night - A gill net set overnight to catch fish. Example: 20 channel catfish are caught in a gill net set overnight. The catch rate is 20 channel catfish / GNN.

PSD – Proportional Stock Density = (No. Quality-size fish / No. Stock-size fish) x 100

RSD – Relative Stock Density = (No. Preferred-size fish / No. Stock-size fish) x 100

Species	Length (inches)		
	Stock size	Quality size	Preferred size
Bluegill	≥ 3	≥ 6	≥ 8
Largemouth bass	≥ 8	≥ 12	≥ 15
Smallmouth bass	≥ 7	≥ 11	≥ 14
Spotted bass	≥ 7	≥ 11	≥ 14
Shadow bass	≥ 4	≥ 7	≥ 9
Walleye	≥ 10	≥ 15	≥ 20

GLOSSARY

Alluvial soil: Soil deposits resulting directly or indirectly from the sediment transport of streams, deposited in river beds, flood plains, and lakes.

Aquifer: An underground layer of porous, water-bearing rock, gravel, or sand.

Benthic: Bottom-dwelling; describes organisms which reside in or on any substrate.

Benthic macroinvertebrate: Bottom-dwelling (benthic) animals without backbones (invertebrate) that are visible with the naked eye (macro).

Biota: The animal and plant life of a region.

Biocriteria monitoring: The use of organisms to assess or monitor environmental conditions.

Channelization: The mechanical alteration of a stream which includes straightening or dredging of the existing channel, or creating a new channel to which the stream is diverted.

Concentrated animal feeding operation (CAFO): Large livestock (ie. cattle, chickens, turkeys, or hogs) production facilities that are considered a point source pollution, larger operations are regulated by the MDNR. Most CAFOs confine animals in large enclosed buildings, or feedlots and store liquid waste in closed lagoons or pits, or store dry manure in sheds. In many cases manure, both wet and dry, is broadcast overland.

Confining rock layer: A geologic layer through which water cannot easily move.

Chert: Hard sedimentary rock composed of microcrystalline quartz, usually light in color, common in the Springfield Plateau in gravel deposits. Resistance to chemical decay enables it to survive rough treatment from streams and other erosive forces.

Cubic feet per second (cfs): A measure of the amount of water (cubic feet) traveling past a known point for a given amount of time (one second), used to determine discharge.

Discharge: Volume of water flowing in a given stream at a given place and within a given period of time, usually expressed as cubic feet per second.

Disjunct: Separated or disjoined populations of organisms. Populations are said to be disjunct when they are geographically isolated from their main range.

Dissolved oxygen: The concentration of oxygen dissolved in water, expressed in milligrams per liter or as percent.

Dolomite: A magnesium rich, carbonate, sedimentary rock consisting mainly (more than 50% by weight) of the mineral dolomite ($CaMg(CO_3)_2$).

Endangered: In danger of becoming extinct.

Endemic: Found only in, or limited to, a particular geographic region or locality.

Environmental Protection Agency (EPA): A Federal organization, housed under the Executive branch, charged with protecting human health and safeguarding the natural environment — air, water, and land — upon which life depends.

Epilimnion: The upper layer of water in a lake that is characterized by a temperature gradient of less than 1^o Celcius per meter of depth.

Eutrophication: The nutrient (nitrogen and phosphorus) enrichment of an aquatic ecosystem that promotes biological productivity.

Extirpated Exterminated on a local basis, political or geographic portion of the range.

Faunal: The animals of a specified region or time.

Fecal coliform: A type of bacterium occurring in the guts of mammals. The degree of its presence in a lake or stream is used as an index of contamination from human or livestock waste.

Flow duration curve: A graphic representation of the number of times given quantities of flow are equaled or exceeded during a certain period of record.

Fragipans: A natural subsurface soil horizon seemingly cemented when dry, but when moist showing moderate to weak brittleness, usually low in organic matter, and very slow to permeate water.

Gage stations: The site on a stream or lake where hydrologic data is collected.

Gradient plots: A graph representing the gradient of a specified reach of stream. Elevation is represented on the Y-axis and length of channel is represented on the X- axis.

Hydropeaking: Rapid and frequent fluctuations in flow resulting from power generation by a hydroelectric dam's need to meet peak electrical demands.

Hydrologic unit (HUC): A subdivision of watersheds, generally 40,000-50,000 acres or less, created by the USGS. Hydrologic units do not represent true subwatersheds.

Hypolimnion: The region of a body of water that extends from the thermocline to the bottom and is essentially removed from major surface influences during periods of thermal stratification.

Incised: Deep, well defined channel with narrow width to depth ration, and limited or no lateral movement. Often newly formed, and as a result of rapid down-cutting in the substrate

Intermittent stream: One that has intervals of flow interspersed with intervals of no flow. A stream that ceases to flow for a time.

Karst topography: An area of limestone formations marked by sinkholes, caves, springs, and underground streams.

Loess: Loamy soils deposited by wind, often quite erodible.

Low flow: The lowest discharge recorded over a specified period of time.

Missouri Department of Conservation (MDC): Missouri agency charged with: protecting and managing the fish, forest, and wildlife resources of the state; serving the public and facilitating their participation in resource management activities; and providing opportunity for all citizens to use, enjoy, and learn about fish, forest, and wildlife resources.

Missouri Department of Natural Resources (MDNR): Missouri agency charged with preserving and protecting the state's natural, cultural, and energy resources and inspiring their enjoyment and responsible use for present and future generations.

Mean monthly flow: Arithmetic mean of the individual daily mean discharge of a stream for the given month.

Mean sea level (MSL): A measure of the surface of the Earth, usually represented in feet above mean sea level. MSL for conservation pool at Pomme de Terre Lake is 839 ft. MSL and Truman Lake conservation pool is 706 ft. MSL.

Necktonic: Organisms that live in the open water areas (mid and upper) of waterbodies and streams.

Non-point source: Source of pollution in which wastes are not released at a specific, identifiable point, but from numerous points that are spread out and difficult to identify and control, as compared to point sources.

National Pollution Discharge Elimination System (NPDES): Permits required under The Federal Clean Water Act authorizing point source discharges into waters of the United States in an effort to protect public health and the nation's waters.

Nutrification: Increased inputs, viewed as a pollutant, such as phosphorous or nitrogen, that fuel abnormally high organic growth in aquatic systems.

Optimal flow: Flow regime designed to maximize fishery potential.

Perennial streams: Streams fed continuously by a shallow water table an flowing year-round.

pH : Numeric value that describes the intensity of the acid or basic (alkaline) conditions of a solution. The pH scale is from 0 to 14, with the neutral point at 7.0. Values lower than 7 indicate the presence of acids and greater than 7.0 the presence of alkalis (bases).

Point source: Source of pollution that involves discharge of wastes from an identifiable point, such as a smokestack or sewage treatment plant.

Recurrence interval: The inverse probability that a certain flow will occur. It represents a mean time interval based on the distribution of flows over a period of record. A 2-year recurrence interval means that the flow event is expected, on average, once every two years.

Residuum: Unconsolidated and partially weathered mineral materials accumulated by disintegration of consolidated rock in place.

Riparian: Pertaining to, situated, or dwelling on the margin of a river or other body of water.

Riparian corridor: The parcel of land that includes the channel and an adjoining strip of the floodplain, generally considered to be 100 feet on each side of the channel.

7-day Q^{10}: Lowest 7-day flow that occurs an average of every ten years.

7-day Q^{2}: Lowest 7-day flow that occurs an average of every two years.

Solum: The upper and most weathered portion of the soil profile.

Special Area Land Treatment project (SALT): Small, state funded watershed programs overseen by MDNR and administered by local Soil and Water Conservation Districts. Salt projects are implemented in an attempt to slow or stop soil erosion.

Stream Habitat Annotation Device (SHAD): Qualitative method of describing stream corridor and instream habitat using a set of selected parameters and descriptors.

Stream gradient: The change of a stream in vertical elevation per unit of horizontal distance.

Stream order: A hierarchial ordering of streams based on the degree of branching. A first order stream is an unbranched or unforked stream. Two first order streams flow together to make a second order stream; two second order streams combine to make a third order stream. Stream order is often determined from 7.5 minute topographic maps.

Substrate: The mineral and/or organic material forming the bottom of a waterway or waterbody.

Thermocline: The plane or surface of maximum rate of decrease of temperature with respect to depth in a waterbody.

Threatened: A species likely to become endangered within the foreseeable future if certain conditions continue to deteriorate.

United States Army Corps of Engineers (USCOE) and now (USACE): Federal agency under control of the Army, responsible for certain regulation of water courses, some dams, wetlands, and flood control projects.

United States Geological Survey (USGS): Federal agency charged with providing reliable information to: describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect the quality of life.

Watershed: The total land area that water runs over or under when draining to a stream, river, pond, or lake.

Waste water treatment facility (WWTF): Facilities that store and process municipal sewage, before release. These facilities are under the regulation of the Missouri Department of Natural Resources.

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