WATER QUALITY AND USE

Beneficial Use Attainment

Water quality in Cuivre River, the first 42 miles of West Fork Cuivre River and the first 24 miles of the North Cuivre River is satisfactory for fish, wildlife and livestock watering (MDNR 1992). Standards for whole body contact recreation are met in these same reaches except on the portion of Cuivre River and the first 24 miles of the North Fork Cuivre River.

The Cuivre River is not designated for use as a drinking water supply and is not considered a navigable stream as defined by the U.S. Army Corps of Engineers. The streams have no public surface water withdrawals. During periods of drought riparian landowners probably remove some water. In Lincoln and Audrain counties at least 500 million gallons of water are used annually for irrigation (MDNR 1986). Less irrigation occurs (or data are available) for the remaining basin counties.

Boating

The North Fork, the West Fork and the Cuivre River can be floated by canoe or small johnboat during normal flows. The most frequently floated sections are Davis to Highway 61 on the North Fork Cuivre River (5 miles), Highway D to Highway 61 on the West Fork Cuivre River (13 miles) and from Highway 61 downstream on the Cuivre River (25 miles; Pemberton 1978). Logjams occasionally interfere with boating on the West Fork. The lower reaches of the Cuivre River (up to the vicinity of Moscow Mills) are influenced by water levels in the Mississippi River. On the Cuivre River, large johnboats usually can motor upstream from the mouth to about river mile 14 (2.5 miles upstream from the confluence with Big Creek). When the Mississippi River stage is low, however, a shallow riffle just upstream from Chain of Rocks impedes boat passage further upstream. Boaters can use three MDC-managed accesses--Riggs Ferry and Old Monroe on the Cuivre River, and R. H. Crouch on the West Fork Cuivre River--to launch their boats, but none of these accesses has a concrete boat ramp (Figure pa, see land use chapter). Small boats must be carried to the water by hand. A small, privately-owned concrete boat ramp is located near Old Monroe along Cuivre River and is open to the public for a fee. The next closet ramp is at Cuivre Island Conservation Area along the Mississippi River in Cuivre Slough.

Chemical Quality of Stream Flow

Water-quality data were collected at the Cuivre River gage station (#05514500) near Troy from 1972 to 1975 and from water year 1983 to the present. Generally, Cuivre River has hard water that is periodically turbid, high in total phosphorus, manganese and fecal coliform, and low in dissolved oxygen. The high total phosphorus level is probably associated with the large amount of land (77%) under cultivation, pasture-use or urban development. Omernik (1977) demonstrated a direct relationship between amount of phosphorus and the proportions of agricultural land in a watershed. Two water years, 1974 and 1990, were arbitrarily selected to compare water quality values between the 1970s

and 1990s (Table 9). Most water quality parameters were similar except total phosphorus, dissolved oxygen, fecal coliform and streptococci counts. State standards for fecal coliform and manganese were exceeded in 1990 and 1974 and dissolved oxygen levels fell below the standard in 1990.

Point Source Pollution/Nonpoint Source Pollution

The basin's principal water-quality problems are related to soil erosion and animal waste (Figure ps). Sheet erosion in the watershed for all land types (e.g., tilled land, permanent pasture and forest) is 9.2 tons per acre per year. The sediment yield to waterways is 2.5 tons per acre per year, and 88% of that sediment comes from sheet and rill erosion. Of the remaining sediment yield, 9% comes from gully erosion, 3% from streambank erosion and 1% from urban and development areas (Anderson 1980). Excessive stream sediment often reduces populations of fish and other aquatic organisms, reduces habitat quality and quantity, increases turbidity and raises water temperatures. Low levels of dissolved oxygen can occur at high flows. The basin's livestock population is high, estimated at 1,565,000 human population equivalents (MDNR 1984). Pollution from animal wastes can increase organic and bacteria levels, increase turbidity, foster excessive algae, lower dissolved oxygen levels (high B.O.D.) And produce high levels of ammonia. Pollution from point sources is minimal. In 1988, the MDNR issued 16 permits for point discharges in the basin. Point sources affected 7.6 miles of stream. Upon inspection of discharge sites, the MDNR found predominately aesthetic impacts on receiving streams. The major problems were bad odor, water discoloration and excessive algae. Sedimentation and a reduction in benthic fauna were less-common problems. During worst-case situations low oxygen levels and high ammonia levels were also possible. No industrial or mining point-source discharges were permitted. Two potential sources of nonpoint pollution are found in the basin. Shenandoah Stables (Lincoln County near Crooked Creek) is contaminated with dioxin and 13.5 acres of coal near Vandalia (Audrain County, near Shady Creek) are a source of sediment and acid runoff (MDNR 1984).

Fish Contamination Levels, Health Advisories and Fish Kills

Although several fish kills have been documented throughout the Cuivre River Basin, there are no chronic fish kill problems. A major fish kill occurred in Cuivre River in August 1992. Approximately, 44,617 fish died. Species killed included largemouth bass, white bass, channel catfish, fathead catfish, sunfish, crappie, gizzard shad, carpsuckers, common carp, buffalo, shortnose gar, freshwater drum, bighead carp and northern pike (one fish observed) (Duchrow 1992b). After extensive investigation, the cause of this kill remains unknown. Data regarding other fish kills that have occurred since 1970 are summarized in Table 10. There is general health advisory for consuming fish in the basin (Missouri Department of Health 1992). The advisory cautions people to limit their consumption of buffalo, drum, suckers and paddlefish to no more than one pound a week for fish taken within Missouri outside the Ozark region.

Table 9. Selected water-quality data for the Cuivre River near Troy at gage station #05514500, water years 1974 and 1990 (USFS 1974; USGS 1990; Code of State Regulations 10 CSR 20.7).

Parameter	State Standard				Water Year	
	I	III	VI	VII	1974	1990
Temperature (^{o}F)	90° max				32-79	34-79
Specific Conductance (us/cm)					248-440	361-462
Ph					7.3-7.9	7.6-8.0
Turbidity (NTU)						2.5-31
Sediment, suspended (mg/L)						29-50
Oxygen, dissolved (mg/L)	5				6.9-12.6	4.5-13.1
Coliform, fecal (colonies/100 ml)			200 non-storm runoff		60-1400	<4-K710
Streptococci, fecal (colonies/100 ml)					20-550	<4-180
Total Hardness (mg/L $CaCO_3$					120-200	170-220
Nitrogen, Total Ammonia (mg/L as N)	1.4 chronic level at this temp & Ph				0-0.16	0.01-0.14
Phosphorus, Total (mg/L as P)					0.07-0.26	0.06-0.47
Manganese, dissolved (ug/L as Mn)		50		50	190-490	84-610
Fluoride, dissolved (mg/L as F)		2.2		2.2	0.1-0.3	<0.01-0.04

K: Non-ideal count of colonies (e.g., sample was not diluted enough, colonies merged)
I: Protection of aquatic life
III: Drinking water supply
VI: Whole-body-contact recreation
VII:Groundwater

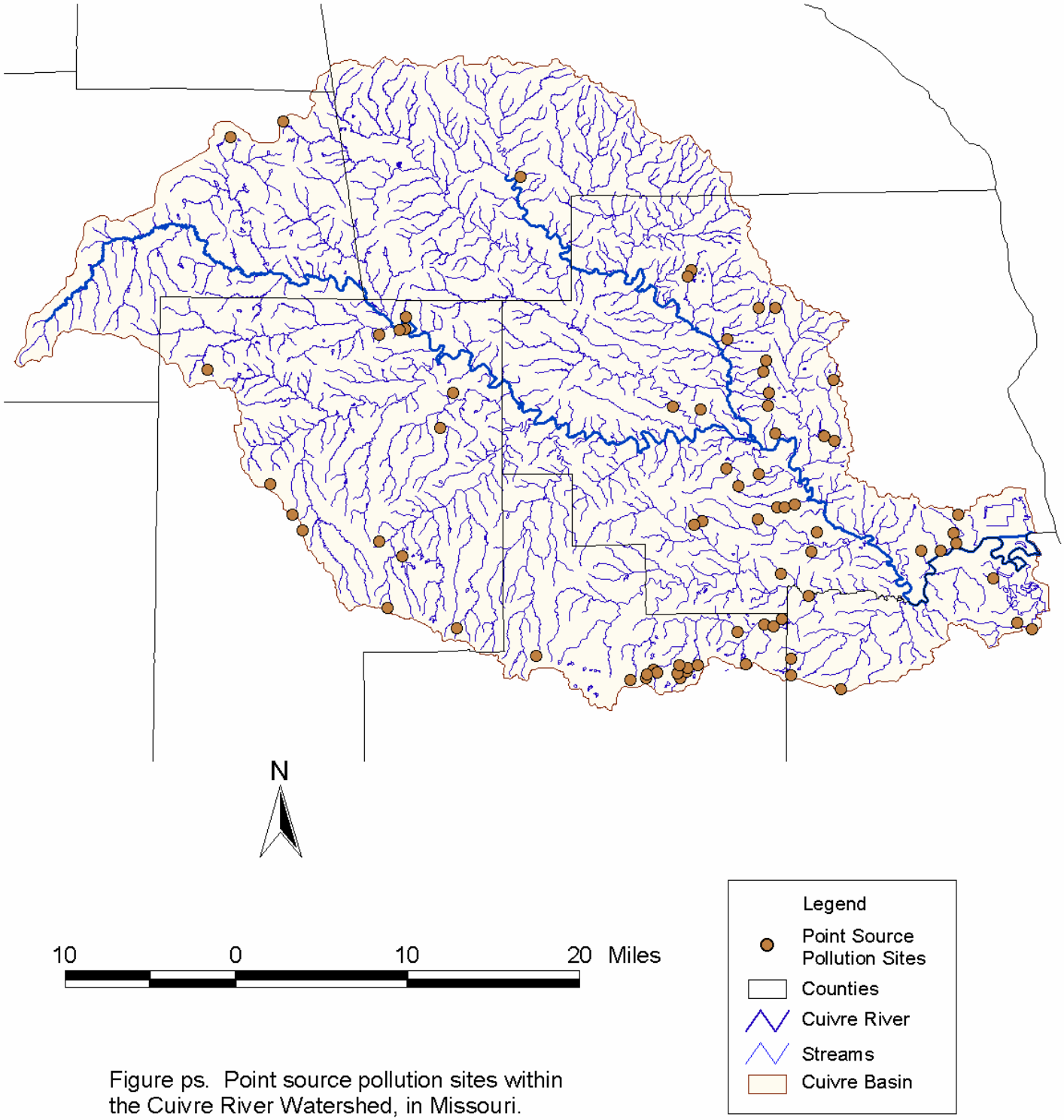

Figure ps. Point source pollution sites within the Cuivre River Watershed, in Missouri.

Table 10: Fish kill data for the Cuivre River Basin, 1970-present.

Year	Stream	County (Nearest Town)	Number of Fish Killed	Estimated Value	Discharged Substance	Source
1970	Tributary to Little Sandy Creek	Lincoln (Whiteside)	25.33	*	Feedlot wastes	Fuchs 1970
1970	Crooked Creek	Lincoln	349,000	*	Pesticides	Czarneski 1983a
1976	West Fork Cuivre River	Lincoln (Hawk Point)	40	*	Chicken Manure	Robinson-Wilson 1976a; Duchrow 1976
1976	West Fork Cuivre River	Lincoln (Hawk Point)	1,696	$102.60	Unidentified	Robinson-Wilson 1976a Robinson-Wilson 1976b
1978	Unnamed Creek	Warren (Warrenton)	Undeter-mined	*	Herbicide	Czarnezki 1979a
1978	Little Elkhorn Creek	Montgomery (Montgomery City)	10,523	$836.00	Molasses	Czarnezki 1979a
1979	Cuivre River	Lincoln (Old Monroe)	20,031	$13,371.85	Unidentified	Czarnezki 1979b
1980	McCoy Creek	St. Charles (Wentzville)	6,790	$879.48	Chlorine	Czarnezki 1981
1980	Indian Camp Creek	St. Charles (Floristell)	250	*	Anaerobic discharge	Czarnezki 1981
1982	West Fork Cuivre River	Lincoln (Hawk Point)	5,255	$4,485.00	Chicken manure	Czarnezki 1983b
1987	Big Lead Creek	Lincoln	2,256	$499.00	Unidentified	Bush 1989
1989	Cuivre Creek	Pike	100	$51.36	Sewage	Buchanan 1990
1992	Cuivre River	Lincoln	44,617	$45,486.46	Unknown	Duchrow 1992b

* Data unavailable