

**RELATIVE
FISHES IN WISCONSIN
I. Eau Claire and Buffalo**

**DISTRIBUTION AND
ABUNDANCE OF FISH
II. Black, Trempealeau
River Basins**

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DISTRIBUTION AND RELATIVE ABUNDANCE OF FISHES IN WISCONSIN

II. Black, Trempealeau, and Buffalo River Basins

By
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ABSTRACT

A statewide survey of the inland waters of Wisconsin was initiated in 1974 by the Bureau of Research, Wisconsin Department of Natural Resources, to establish a comprehensive data base on the distribution and relative abundance of all fish species. The Black and Trempealeau river basins were sampled from 1975 through 1979 and the Buffalo River basin from 1975 through 1982 at 638 stations by research personnel and 208 stations by fish management personnel. An additional 151 stations were partially sampled by fish management personnel and other collectors.

A total of 97 species were collected from the Black River basin, 79 from the Trempealeau River basin, and 60 from the Buffalo River basin. Included were the endangered starhead topminnow as well as the threatened speckled chub, blue sucker, and gilt darter. Eight species on the Department's watch list were also collected.

Data from recent collections for the Black, Trempealeau, and Buffalo river basins were compared with data from the 1900-31 and the 1958-74 periods. Twenty-six species were collected which had not been previously reported from the Black River basin, 15 from the Trempealeau River basin, and 13 from the Buffalo River basin. Two species have apparently been extirpated from the Black River basin, 8 from the Trempealeau River basin, and 13 from the Buffalo River basin.

While this report includes numerous tables, distribution maps of the species, and discussion on many aspects of fish distribution in the 3 basins, the continued use of this data base for the preparation of environmental impact assessments, for the development of master plans for the aquatic resource, and for research on nongame species, fish communities, and ecosystems is recommended.

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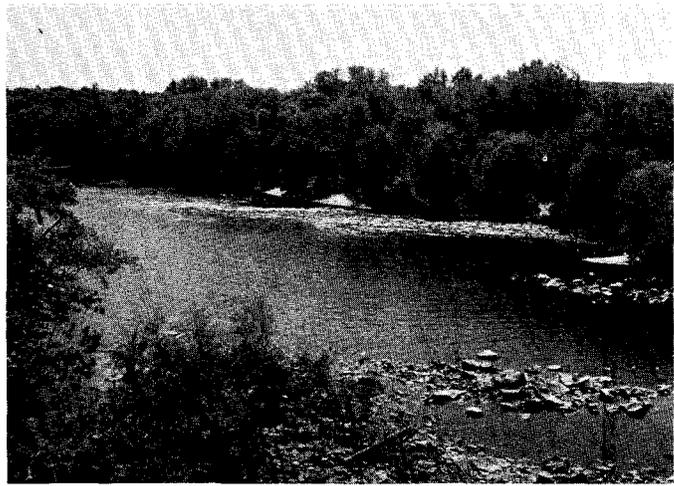
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Trempealeau River north of Dodge.



Black River looking downstream from Highway 54 bridge in Black River Falls.



Black River north of Neillsville.



Buffalo River, a few miles from mouth. Shows one method by which mud darters were collected.

David Siegler

STUDY AREA

Black River Basin

The Black River basin (270) is located in the west central portion of Wisconsin (Fig. 1). It is in the Mississippi River basin and encompasses parts of the following counties: Clark, Jackson, La Crosse, Marathon, Monroe, Taylor, Trempealeau, and Wood. This basin includes the Black River, Halfway Creek, Shingle Creek, and Tank Creek, all of which flow directly into the Mississippi River. The watershed contains an area of approximately 6,188 km² (Holmstrom 1982).

Within this area, we have defined 523 streams with a total length of 3,193 km (Table 1)*. Of these, 351 are unnamed creeks and ditches. There are 167 lakes** in the basin, with a total area of 1,937 ha. However, only 5 lakes are over 80 ha in size. The large number of dams (117) in the basin indicates numerous impoundments which tend to slow down water velocity, create variable discharge patterns, and influence fish migration and species composition.

The average annual precipitation within the Black River basin is 80 cm (76-84 cm) (Wisconsin DNR 1979). The average gradient for the Black

River (319 km in length) is 95 cm/km, which ranges from 175 cm/km in the upper portion of the basin to 38 cm/km in the lower portion (Wisconsin DNR 1976). The average discharge at Galesville, which includes 89% of the drainage area, is 48 m³/sec (U.S. Geological

*These are defined through a water mileage system that divided the state into 3 major and 30 minor basins (Fago 1983).

**Lakes in this report refer to naturally occurring lakes as well as impoundments (bodies of water with dams at their outlets) unless otherwise specified.

Survey 1982). The Black River changes from hard, dark brown water in the upper portion to soft, light brown water in the lower portion. The stream bottom is composed primarily of sand, except for some sections where

gravel, rubble, boulder, and bedrock predominate (Wisconsin DNR 1976).

The dominant land uses in the Black River basin are agriculture (dairy and cash crops) and forestry. The population within the basin in

1978 was estimated at 58,912 which is a 17% increase from 1950. However, most of the increase occurred in La Crosse County (Wisconsin DNR 1979).

Trempealeau River Basin

The Trempealeau River basin (280) is located adjacent to the northern edge of the lower section of the Black River basin (Fig. 1). It encompasses parts of the following Wisconsin counties: Buffalo, Jackson, and Trempealeau. It contains an area of approximately 1,888 km² (Holmstrom 1982). Within this area we have defined 326 streams with a total length of 1,352 km (Table 1). Of these, 272 are unnamed creeks or ditches. There are only 10 lakes with a total area of 57 ha, the largest being 18 ha in size.

The average annual precipitation is the same as for the Black River basin. The average gradient for the Trempealeau River (137 km in length) is 65 cm/km. The average discharge at Dodge, which includes 88% of the drainage area, is 12 m³/sec (U.S. Geological Survey 1982). The Trempealeau River, hard and slightly brown in color, has a stream bottom composed primarily of sand (Wisconsin DNR 1972).

The major land uses are agriculture, which is dominated by dairy farming, and forestry (40% of the woodlands are grazed) (Wisconsin DNR 1978).

Streambank erosion, much of which is caused by livestock, is a major problem throughout the basin. The population within the basin of approximately 23,000 has only shown a 5% increase since 1950.

Buffalo River Basin

The Buffalo River basin (290) is located adjacent to the northern and western edge of the Trempealeau River basin (Fig. 1). It encompasses parts of the following Wisconsin counties: Buffalo, Eau Claire, Jackson, Pepin, and Trempealeau. The basin includes the Buffalo River, Waumandee Creek, and 5 unnamed creeks which flow directly into the Mississippi River. This watershed contains an area of approximately 1,665 km² (Holmstrom 1982). Within this area we have defined 188 streams with a total length of 1,117 km (Table 1). Of these, 141 are unnamed creeks or ditches. There are only 16 lakes with a total area of 77 ha, the largest being 22 ha in size.

The average annual precipitation is the same as for the Black River basin. The average gradient for the Buffalo River (113 km in length) is 76 cm/km.

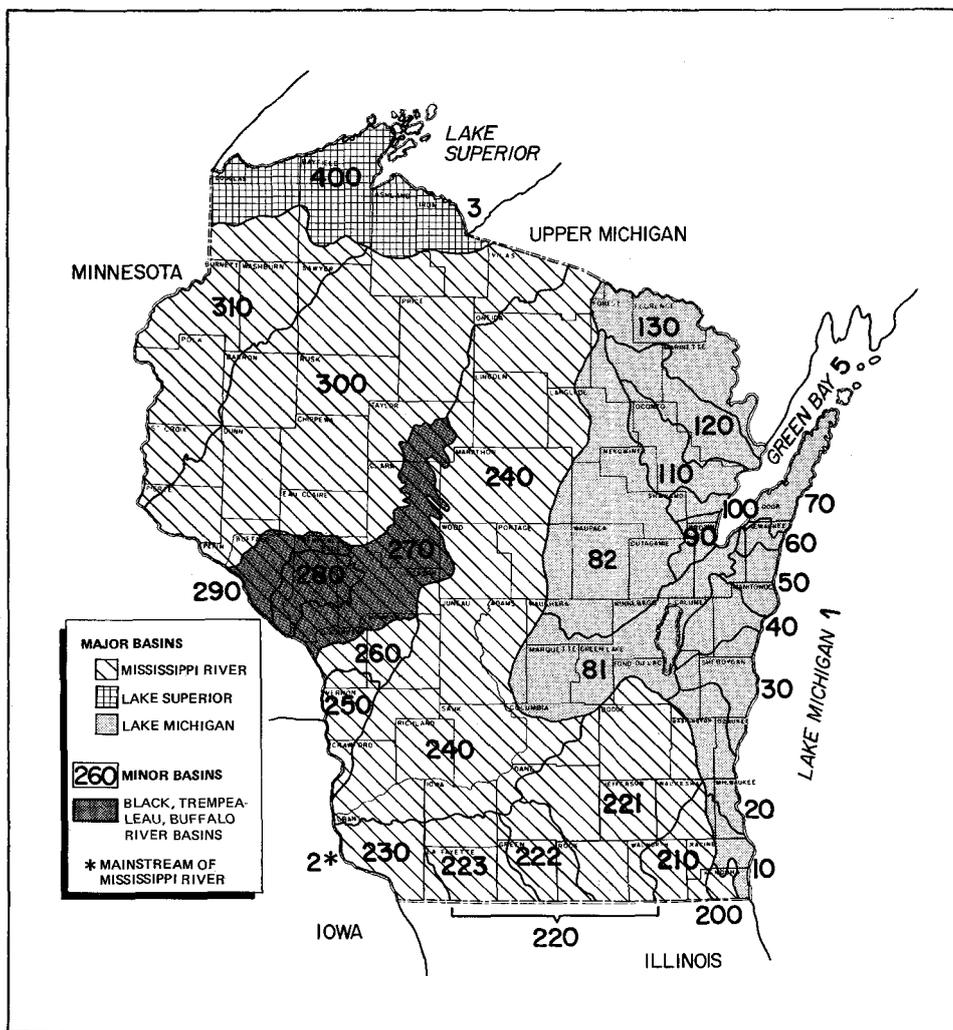


FIGURE 1. Major and minor river basins in Wisconsin.

TABLE 1. Land area, streams, and lakes of the Black, Trempealeau, and Buffalo river basins.

	Black River Basin	Trempealeau River Basin	Buffalo River Basin
Land area (km ²)	6,188	1,888	1,665
Streams			
Total number	523	326	188
(Unnamed creeks or ditches)	(351)	(272)	(141)
Total length (km)	3,193	1,352	1,117
Lakes/impoundments*			
Total number	167	10	16
Area (ha)	1,937	57	77
No. dams	117	10	9

*Impoundments are bodies of water with dams at their outlets.

The average discharge (1932-51) of the Buffalo River at Tell is 7 m³/sec. This measurement encompasses 90% of the Buffalo's watershed (Buffalo River and all its tributaries) and 63% of the entire Buffalo River basin (includes

Waumandee Creek and 5 unnamed creeks) (U.S. Geological Survey 1982). The Buffalo River is similar to the Trempealeau River with a slightly brown color and a bottom composed primarily of sand. Land use practices

are similar to those in the Trempealeau River basin (Wisconsin DNR 1972). Streambank erosion, due principally to livestock, is also a problem. The population of 13,000 within the basin remained virtually the same since 1950.

METHODS

Data Sources and Time Periods

All collections are divided into 3 time periods: 1900-31, 1958-74, and 1975-79 (1975-82 for the Buffalo River basin). The earlier records provide the basis for assessment of changes over time in distribution of fish species within the basins of the Black, Trempealeau, and Buffalo rivers.

If a location was sampled within a time period more than once, only 1 collection is used in the counts of number of stations sampled and number of stations at which a species was taken.

Stations were classified in one of two ways, except for the 1900-31 period, depending on how the samples were taken: complete (those in which all species collected were recorded and identified), and partial (those in which sampling effort and/or species identification were incomplete and therefore did not yield adequate assessment of total species composition).

1900-31 Period. All collections were made between 1900-31 except for 2 stations in the Black River basin (1 in 1938 and 1 in 1943), with 81% taken between 1927 and 1928. Collections from this time period were made at 38 stations in the Black River basin, 7 in the Trempealeau River basin, and 8 in the Buffalo River basin, by a number of collectors. They included C. W. Greene, L. C. Stuart, E. P. Creases, S. N. Jones, G. Wagner, Schultz, C. Tarzwell, H. R. Rich, N. Enting, R. R. Pope, and W. E. Dickman (names taken from original field notes). Most specimens from these collections were verified by Dr. Carl Hubbs or Dr. Greene and cited by Greene (1935).

The stations sampled were located on 26 streams and 4 lakes in the Black River basin, 4 streams in the Trempealeau River basin, and 3 streams and 2 lakes in the Buffalo River basin (Table 2). Thoroughness of sampling effort was unknown, and therefore calculation of percent occurrence of each species was not attempted (Table 5).

1958-74 Period. Complete collections from this period were made at 28 sampling stations on 10 streams and 1 lake in the Black River basin, 11 stations on 3 streams in the Trempealeau River basin, and 11 stations on 7 streams in the Buffalo River basin (Table 2). An additional 249 partial collections in the Black River basin, 110 in the Trempealeau River basin, and 102 in the Buffalo River basin increased the number of streams sampled by 51, 26, and 26 and lakes by 10, 1, and 1 in the Black, Trempealeau, and Buffalo river basins, respectively. The data from these partial samples were kept separate in Table 2 and not included in the percentages of total stations sampled presented in Table 5. These additional 461 stations came from written records provided by fish management.

The complete samples (60% collected between 1964-70) from the Black, Trempealeau, and Buffalo river basins were collected by the following: Dr. George Becker and his students (unpubl. data) — 27 stations:

TABLE 2. Summary of stream and lake sampling efforts in the Black (1900-79), Trempealeau (1900-79), and Buffalo (1900-82) river basins.

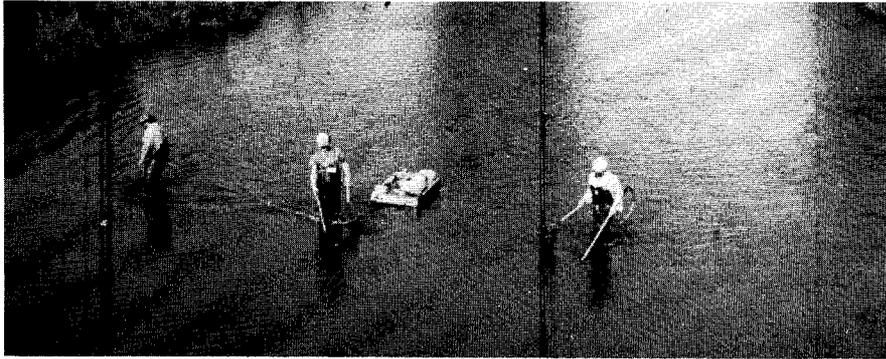
	Black (270)			Trempealeau			Buffalo		
	1900-31	1958-74	1975-79	1900-31	1958-74	1975-79	1900-31	1958-74	1975-82
Streams									
No. sampled	26	10*(51)**	138(6)	4	3(26)	119(2)	3	7(26)	81(2)
No. stations	34	27(238)	341(58)	7	11(109)	334(40)	6	11(101)	163(40)
Lakes/ impoundments									
No. sampled	4	1(10)	6(5)	0	0(1)	1(2)	2	0(1)	0(4)
No. stations	4	1(11)	7(7)	0	0(1)	1(2)	2	0(1)	0(4)
Total no. stations	38	28(249)	348(65)	7	11(110)	335(42)	8	11(102)	163(44)

*Complete samples.

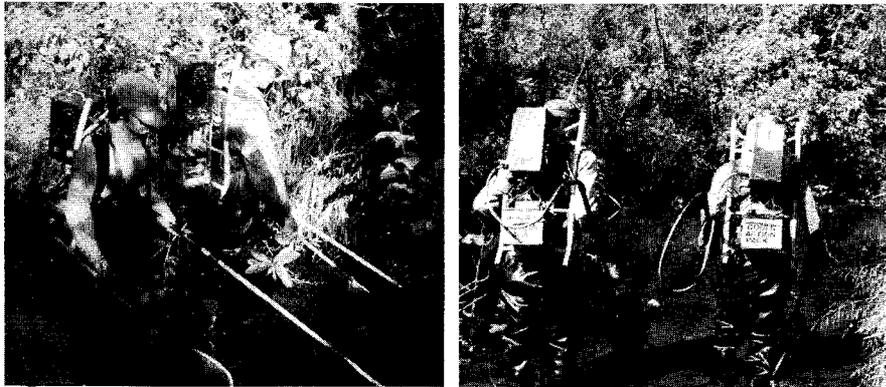
**Partial samples.



Boom shocker near the mouth of the Buffalo River.



Stream shocker with 3-man crew on the Buffalo River near Modena.



David Siegler

Backpack shockers using a 12-volt deep cycle battery.



Minishocker consisting of a 16-foot flatbottom aluminum boat, 5 hp. T&J generator, and pulser control box.

Prof. Marlin Johnson (unpubl. data) — 20 stations: Wisconsin DNR Bureau of Research — 2 stations: and Upper Mississippi River Conservation Commission (Smith and Lopinot 1967) — 1 station.

Total occurrences are defined as the sum of the number of species taken at each station. For example, if a collector took 10 species at one station, 20 at another, and 30 at another, his total species occurrences would be 60. This information has been calculated for each collector since 1958 and reveals the volume of data from both complete and partial samples used (Table 3). For the earliest period, only a grand total of occurrences was calculated (Table 5). Total occurrences increased from 261 for the 1900-31 period to 1,580 for the 1958-74 period for the Black, Trempealeau, and Buffalo river basins. During 1958-74, 71% of the grand total of occurrences for the Black, Trempealeau, and Buffalo river basins were accounted for by fish management personnel. However, collections by Becker and Johnson and their students provided 58 species not taken by fish management in these 3 watersheds (Table 3 and Append. A Table 18).

1975-79 Period*. Complete collections from this period were made at 348 sampling stations (86% collected in 1977-78) on 138 streams and 6 lakes in the Black River basin, 335 stations (79% in 1979) on 119 streams and 1 lake in the Trempealeau River basin, and 163 stations (45% in 1980 and 18% in 1982) on 81 streams in the Buffalo River basin. There were an additional 65 partial collections in the Black River basin, 42 in the Trempealeau River basin, and 44 in the Buffalo River basin which increased the number of streams by 6, 2, and 2 and lakes by 5, 2, and 4 in the Black, Trempealeau and Buffalo river basins, respectively.

For the Black, Trempealeau, and Buffalo river basins, the number of complete samples increased an average of more than 1,800% over the 1958-74 period with 846 stations sampled (Table 2). DNR research personnel sampled 638 (75%) of the complete samples, and fish management personnel sampled 208 (25%). The 151 partial samples were collected by fish management personnel, sport and commercial fishermen.

Total occurrences increased from 1,580 for the 1958-74 period to 7,967 for the Black, Trempealeau, and Buffalo river basins: 75% of these were recorded by research personnel (Table 3). We also collected all of the 99 species found in the Black, Trempealeau, and Buffalo river basins (for list of species taken by all other collectors see Append. A Table 18).

TABLE 3. List of collectors with number of species taken and total occurrences for samples from the Black, Trempealeau, and Buffalo river basins.

Source of Data*	Black (270)				Trempealeau (280)				Buffalo (290)			
	1958-74		1975-79		1958-74		1975-79		1958-74		1975-82	
	No. Species	Total Occurrences	No. Species	Total Occurrences	No. Species	Total Occurrences	No. Species	Total Occurrences	No. Species	Total Occurrences	No. Species	Total Occurrences
Research 0	9	15(2)**	96	3,814(86)	—	—	77	1,530(67)	—	—	57	648(52)
Fish Mgt. 1	17	620(77)	57	597(14)	16	268(63)	36	767(33)	14	237(66)	34	609(48)
Becker 2	37	126(16)	—	—	21	34(8)	—	—	28	52(15)	—	—
Johnson 3	26	40(5)	—	—	49	100(24)	—	—	36	69(19)	—	—
Comm. fish. 7	—	—	1	1(t)	—	—	—	—	—	—	—	—
Sport fish. 8	—	—	1	1(t)	—	—	—	—	—	—	—	—
UMRCC 9	—	—	—	—	19	19(5)	—	—	—	—	—	—
Grand total of occurrences		801		4,413		421		2,297		358		1,257

*Collectors identified in Appendix A Table 18.

**Total occurrences are defined as the sum of the number of species collected at each station; percent of total occurrences in parentheses. t = less than 0.5%.

Collection Methods and Gear**

We used five types of electrofishing gear, depending on the size of the body of water. The types of gear and percentage of stations where each was used were: boom shocker (6%), minishocker (3%), stream shocker (29%), battery-powered backpack (36%), and longline shocker (17%). Small mesh seines were used at 9% of the stations, primarily in lakes and large rivers.

All generators produced direct current, with the boom shocker and minishocker permitting a choice of several pulse rates and frequencies. The boom shocker also produced alternating current and it was used occasionally when the DC unit was inoperative. For more information concerning the boom and stream shocking equipment, see Novotny and Priegel (1971, 1974).

The minishocker consisted of a 5-m flat bottom boat with one boom in the

bow and used the same 5 hp T&J gasoline-powered generator as the stream shocker. It required only 1 person sitting on a chair in the bow to collect the fish, in contrast to 2 people standing in the boat using the boom shocker. The battery-powered backpack used a 12-volt deep cycle battery and pulsed the DC at several frequency and pulse rates. The development and production of this unit, like all the electric fishing gear used, was a joint project between the Wisconsin DNR and the Instrumentation Systems Center, UW-Madison. The seines were 1.2-m and 9.1-m bag seines with 4.8-mm delta mesh.

Sampling Effort

We established sampling locations based on habitat diversity, the distance between stations, and accessibility. The length of a sampling station was approximately 100 m for all electrofishing gear except for the boom and minishockers. Boom shocker and minishocker stations averaged 2.7 km. Areas seined averaged 307 m². Dis-

tance between stations on the main stems of the Black, Trempealeau, and Buffalo rivers averaged 3.7 km. There was an average of 1 station/5 km of the total length of all sampled streams with 1 or more complete stations. On sampled lakes in the Black River basin, there was an average of 1 station/66 ha of water.

Complete collections were made on 26% of the streams and 4% of the lakes in the Black River basin, 37% of the streams and 9% of the lakes in the Trempealeau River basin, and 43% of the streams and none of the lakes in the Buffalo River basin (Tables 1 and 2). While these percentages are relatively low, the streams that were sampled comprise 68%, 74%, and 72% of the total length of all streams in the Black, Trempealeau, and Buffalo river basins, respectively. The sampled lakes comprised only 24%, 31%, and 0%, respectively, of the total surface area for all lakes in each basin. This was due to the fact that most lakes were small, averaging only 12, 5, and 5 ha respectively.

Figure 2 shows the locations of 782 of the 846 complete and 109 of the 151 partial stations sampled in 1975-82. Only one dot per lake was shown and dots were eliminated that would overlap another dot.

*1975-82 for the Buffalo River basin.

**Only the methods and gear employed by DNR research personnel are described; fish management personnel used similar equipment.

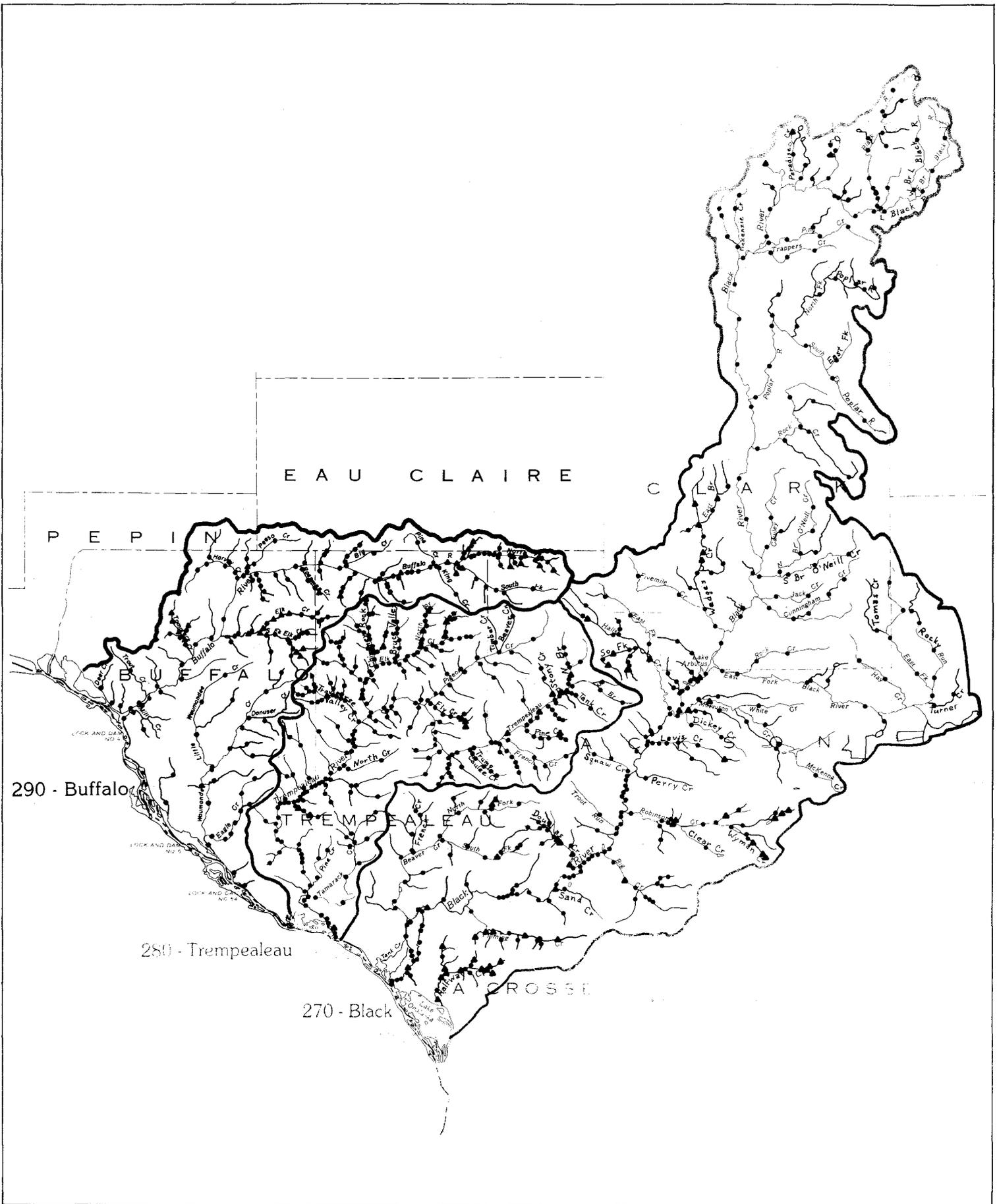


FIGURE 2. Location of 891 sampling stations in the Black, Trempealeau, and Buffalo River basins. There were 782 complete and 109 partial stations. (Due to lack of space, 64 complete and 42 partial stations are not shown.)

Data Handling

Data collected at the sampling stations were recorded in pencil on Form 8100-46 (Append. A Fig. 5), and include station and species information, and ecological data. This form is made of polyethylene paper, is virtually unaffected by salt and fresh water, and is resistant to tearing, discoloration, and rotting.

In order to handle the data on over 1,700 collections from the Black, Trempealeau, and Buffalo river basins, dating from 1900, Cobol and Mark IV computer programs were developed through a cooperative effort with the DNR's Bureau of Information Management to organize, store, and retrieve the data. Some programs are used to update the Fish Master File which contains all data on the stations in the 3 basins as well as on 15,200 additional stations throughout the state.

Other programs are used to help in the analysis of the data. One analysis uses a Cobol program to organize the data by species, and lists all stations for each species. This listing, based on a water mileage system developed for this study, was organized in 2 ways (Fig. 3a and 3b):

- (1) All stations on a river are listed until a tributary of the river is reached (Fig. 3a). All stations on that tributary are then listed before going back to the confluence of the tributary with the original river. This procedure is followed for all tributaries in the basin of the 1st tributary before going back to the original river.
- (2) All stations on a river are listed before going back to the 1st tributary of the original river and listing all stations on the tributary (Fig. 3b). This procedure is followed for all tributaries in the basin of the 1st tributary before going to the 2nd tributary of the original river.

The program for both of these methods can be restricted to one or more of the following criteria: particular minor basins, a sub-basin or part of a sub-basin, individual collectors, dates, township and range (by entire township or contiguous townships), counties, water types, and selected species. At each station, the stream name along with water type, number of fish taken, collector, gear, effort, date, township description, and county are listed. An example of the Cobol listing for one species is shown in Appendix A Figure 6. At the end of each species listing, the total number of stations, total number of specimens, average number of fish/station, and number of stations for each collector are computed. At the end of the printout, a summary table is given

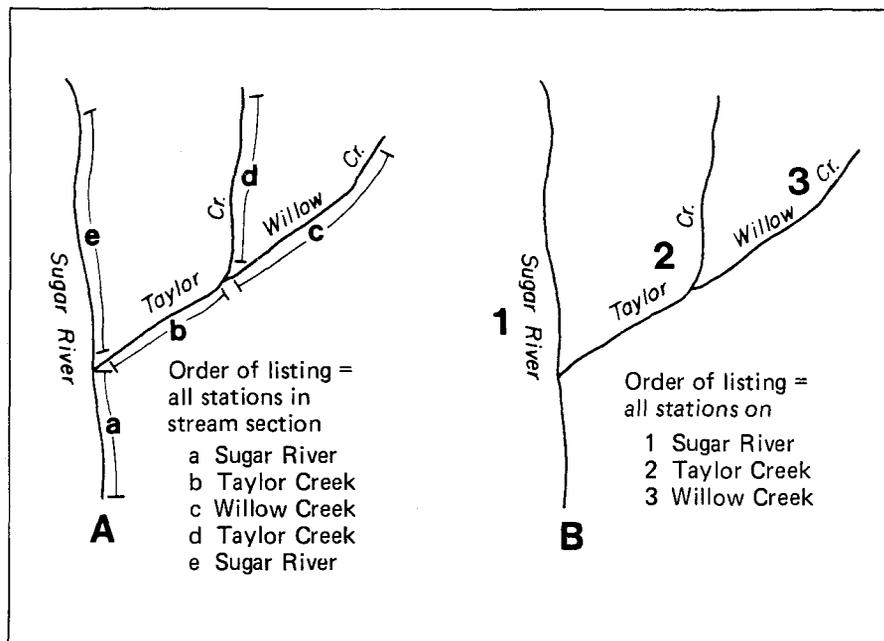


FIGURE 3. Two methods of organizing stations on computer printouts.

that lists each species, the number of stations at which it was taken, the percent of the total stations possible, grand total of species occurrences, totals for each collector, and totals for number of species and hybrids (Append. A Fig. 7).

Another type of analysis uses a Mark IV program to organize the data by stations, and lists for each station all information (number of specimens of each species, hybrids, and unspecified categories). The program can be restricted to the same criteria cited above for the Cobol program, and the listing can be organized the same 2 ways (Fig. 3). However, only the Mark IV listing can be restricted to gear, or any of the 10 ecological variables. This program can be organized in still different ways, including: (1) by county and then alphabetically by name of stream or lake, (2) by county and then by basin, or (3) by township, range, and section. An example of the Mark IV listing is shown in Appendix A Figure 8.

A water mileage system was devised to permit computer analysis of the data and still allow easy recognition of the location by persons wishing to use the data. This was accomplished by using the town, range, section, quarter section, and county along with basin numbers, a series of mileages, and the name of the body of water. A Master Stream and Lake File containing this information has been generated by this study for most streams and lakes in Wisconsin. Mark IV computer programs are available to obtain a variety of listings — such as streams and/or lakes in each basin listed alphabetically.

An example of a page of the water mileage system from a computer printout of the Master Stream and Lake File is shown in Appendix A Figure 9. An example of a page of the Master Fish File which uses the water mileage system to organize the biological and environmental data is included in Appendix A Figure 8. A detailed explanation of the data storage system as exemplified in these figures is presented in Fago (1983).

Fish Identification and Enumeration

In order to reduce the volume of specimens taken back to the laboratory, larger fish were identified to species in the field and were usually returned to the water. Generally all others were preserved in 10% Formalin for later identification in the laboratory (using the unpublished keys of Dr. G. Becker).

At least a few stonerollers at each station were keyed to species. The remainder were left as stonerollers (*Campostoma* spp.). Research personnel identified all fish for the 1975-82 period except for some specimens of 23 species (indicated by an asterisk in Appendix A Table 18) collected by fish management personnel, and American eels caught by sport and commercial fishermen. For the 1958-74 period, species records are based upon the collectors' identification except for the mud darters collected by fish management and identified by research personnel.

TABLE 4. List of common and scientific names of all fish species cited in this report.

Computer No.	Common Name	Scientific Name	Computer No.	Common Name	Scientific Name
	Lampreys	Petromyzontidae	N10	Blue sucker	<i>Cyloleptus elongatus</i>
A02	Chestnut lamprey	<i>Ichthyomyzon castaneus</i>	N13	Northern hog sucker	<i>Hypentelium nigricans</i>
A03	Northern brook lamprey	<i>Ichthyomyzon fossor</i>	N14	Smallmouth buffalo	<i>Ictiobus bubalus</i>
A04	Silver lamprey	<i>Ichthyomyzon unicuspis</i>	N15	Bigmouth buffalo	<i>Ictiobus cyprinellus</i>
A05	American brook lamprey	<i>Lampetra appendix</i>	N17	Spotted sucker	<i>Minytrema melanops</i>
	Gars	Lepisosteidae	N18	Silver redhorse	<i>Moxostoma anisurum</i>
D01	Longnose gar	<i>Lepisosteus osseus</i>	N19	River redhorse	<i>Moxostoma carinatum</i>
D02	Shortnose gar	<i>Lepisosteus platostomus</i>	N21	Golden redhorse	<i>Moxostoma erythrurum</i>
	Bowfins	Amiidae	N22	Shorthead redhorse	<i>Moxostoma macrolepidotum</i>
E01	Bowfin	<i>Amia calva</i>		Bullhead catfishes	Ictaluridae
	Freshwater eels	Anguillidae	O05	Black bullhead	<i>Ictalurus melas</i>
F01	American eel	<i>Anguilla rostrata</i>	O06	Yellow bullhead	<i>Ictalurus natalis</i>
	Herrings	Clupeidae	O07	Brown bullhead	<i>Ictalurus nebulosus</i>
G02	Gizzard shad	<i>Dorosoma cepedianum</i>	O08	Channel catfish	<i>Ictalurus punctatus</i>
	Mooneyes	Hiodontidae	O10	Stonecat	<i>Noturus flavus</i>
H02	Mooneye	<i>Hiodon tergisus</i>	O11	Tadpole madtom	<i>Noturus gyrinus</i>
	Trouts	Salmonidae	O12	Flathead catfish	<i>Pylodictis olivaris</i>
I19	Rainbow trout	<i>Salmo gairdneri</i>		Pirate perches	Aphredoderidae
I21	Brown trout	<i>Salmo trutta</i>	P01	Pirate perch	<i>Aphredoderus sayanus</i>
I22	Brook trout	<i>Salvelinus fontinalis</i>		Trout-perches	Percopsidae
	Mudminnows	Umbridae	Q01	Trout-perch	<i>Percopsis omiscomaycus</i>
K01	Central mudminnow	<i>Umbra limi</i>		Codfishes	Gadidae
	Pikes	Esocidae	R01	Burbot	<i>Lota lota</i>
L02	Northern pike	<i>Esox lucius</i>		Killifishes	Cyprinodontidae
L03	Muskellunge	<i>Esox masquinongy</i>	S03	Starhead topminnow	<i>Fundulus notti</i>
	Minnnows and carps	Cyprinidae		Silversides	Atherinidae
M06	Central stoneroller	<i>Camptostoma anomalum</i>	T01	Brook silverside	<i>Labidesthes sicculus</i>
M07	Largescale stoneroller	<i>Camptostoma oligolepis</i>		Sticklebacks	Gasterosteidae
M09	Redside dace	<i>Climostomus elongatus</i>	U01	Brook stickleback	<i>Culaea inconstans</i>
M12	Common carp	<i>Cyprinus carpio</i>		Temperate basses	Percichthyidae
M14	Brassy minnow	<i>Hybognathus hankinsoni</i>	V01	White bass	<i>Morone chrysops</i>
M15	Silvery minnow	<i>Hybognathus nuchalis</i>		Sunfishes	Centrarchidae
M16	Speckled chub	<i>Hybopsis aestivalis</i>	W04	Rock bass	<i>Ambloplites rupestris</i>
M19	Hornyhead chub	<i>Nocomis biguttatus</i>	W05	Green sunfish	<i>Lepomis cyanellus</i>
M20	Golden shiner	<i>Nolemigonus chrysoleucas</i>	W06	Pumpkinseed	<i>Lepomis gibbosus</i>
M21	Pallid shiner	<i>Notropis amnis</i>	W07	Warmouth	<i>Lepomis gulosus</i>
M23	Emerald shiner	<i>Notropis atherinoides</i>	W08	Orangespotted sunfish	<i>Lepomis humilis</i>
M24	River shiner	<i>Notropis blennioides</i>	W09	Bluegill	<i>Lepomis macrochirus</i>
M28	Common shiner	<i>Notropis cornutus</i>	W11	Smallmouth bass	<i>Micropterus dolomieu</i>
M29	Bigmouth shiner	<i>Notropis dorsalis</i>	W12	Largemouth bass	<i>Micropterus salmoides</i>
M30	Pugnose minnow	<i>Notropis emiliae</i>	W13	White crappie	<i>Pomoxis annularis</i>
M32	Blacknose shiner	<i>Notropis heterolepis</i>	W14	Black crappie	<i>Pomoxis nigromaculatus</i>
M33	Spottail shiner	<i>Notropis hudsonius</i>		Perches	Percidae
M35	Rosyface shiner	<i>Notropis rubellus</i>	X03	Crystal darter	<i>Ammocrypta asprella</i>
M36	Spotfin shiner	<i>Notropis spilopterus</i>	X04	Western sand darter	<i>Ammocrypta clara</i>
M37	Sand shiner	<i>Notropis stramineus</i>	X05	Mud darter	<i>Etheostoma asprigene</i>
M38	Weed shiner	<i>Notropis texanus</i>	X07	Rainbow darter	<i>Etheostoma caeruleum</i>
M39	Redfin shiner	<i>Notropis umbratilis</i>	X09	Iowa darter	<i>Etheostoma ezile</i>
M40	Mimic shiner	<i>Notropis volucellus</i>	X10	Fantail darter	<i>Etheostoma</i>
M41	Suckermouth minnow	<i>Phenacobius mirabilis</i>	X11	Least darter	<i>Etheostoma microperca</i>
M42	Northern redbelly dace	<i>Phoxinus eos</i>	X12	Johnny darter	<i>Etheostoma nigrum</i>
M43	Southern redbelly dace	<i>Phoxinus erythrogaster</i>	X14	Banded darter	<i>Etheostoma zonale</i>
M44	Finescale dace	<i>Phoxinus neogaeus</i>	X15	Yellow perch	<i>Perca flavescens</i>
M45	Bluntnose minnow	<i>Pimephales notatus</i>	X16	Logperch	<i>Percina caprodes</i>
M46	Fathead minnow	<i>Pimephales promelas</i>	X17	Gilt darter	<i>Percina evides</i>
M47	Bullhead minnow	<i>Pimephales vigilax</i>	X18	Blackside darter	<i>Percina maculata</i>
M48	Blacknose dace	<i>Rhinichthys atratulus</i>	X19	Slenderhead darter	<i>Percina phoxocephala</i>
M49	Longnose dace	<i>Rhinichthys cataractae</i>	X20	River darter	<i>Percina shumardi</i>
M50	Creek chub	<i>Semotilus atromaculatus</i>	X21	Sauger	<i>Stizostedion canadense</i>
M51	Pearl dace	<i>Semotilus margarita</i>	X22	Walleye	<i>Stizostedion vitreum vitreum</i>
	Suckers	Catostomidae		Drums	Sciaenidae
N05	River carpsucker	<i>Carpionodes carpio</i>	Y01	Freshwater drum	<i>Aplodinotus grunniens</i>
N06	Quillback	<i>Carpionodes cyprinus</i>			
N07	Highfin carpsucker	<i>Carpionodes velifer</i>			
N09	White sucker	<i>Catostomus commersoni</i>			

The common and scientific names of fish species cited in this report (Table 4) follow names established by the American Fisheries Society's Committee on Names of Fishes (Robins 1980). All hybrids and specimens not keyed to species, except stonerollers, were not dealt with in this report.

At each station, the number of specimens for each species was counted to 98 and recorded on Form 8100-46 (Append. A Fig. 5). However, at many stations there were more than 98 specimens taken for certain species. They were recorded as 99. Therefore, the number of specimens recorded in Tables 6, 11, and 12 for some species is substantially lower than the number actually captured. Furthermore, there

were up to 6 stations for certain species at which the number taken was unknown, further underestimating the total number of specimens.

Questionable specimens were sent to Dr. George Becker at the University of Wisconsin-Stevens Point for verification.

Endangered, Threatened, and Watch Species

The State of Wisconsin currently has 8 species on its endangered list*, 6 species on its threatened list*, and 18 species on its unofficial watch list.

These 3 categories are defined as follows:

Endangered: Any species or subspecies in danger of becoming extirpated. Its continued existence as part of the state's wildlife resources is in jeopardy.

Threatened: Any species or subspecies which appears likely, within the foreseeable future, to become endangered.

Watch: Species or subspecies that may or may not be holding their own at the present time. They will be under special observation to identify conditions that could cause further decline, or any factors that could help to ensure their survival in the state.

*Chap. NR 27, Wis. Admin. Code.

RESULTS AND DISCUSSION

Findings are presented individually for the Black, Trempealeau, and Buffalo river basins. This is followed by a discussion of differences between the basins for selected species, including those on the Wisconsin DNR endangered, threatened, or watch lists. Unless otherwise indicated, findings refer only to the 1975-79 period (1975-82 for Buffalo).

BLACK RIVER BASIN (270)

Species Found

Over 111,000 specimens representing 97 species were identified in samples from the Black River basin (Tables 5 and 6). This includes the endangered starhead topminnow, 3 threatened species (speckled chub, blue sucker, and gilt darter), and 8 watch species. Distribution maps for all species are presented in Appendix B: each map shows the location of stations where the species was collected. An index to the maps is contained in Table 5 and in the front of Appendix B.

Reproducing Populations

In the Black River basin 94 species are believed to have reproducing popu-



Muskellunge taken from the lower Black River.

lations. The presence of reproducing populations of 2 other species is questionable: (1) rainbow trout — all collections can be attributed to stocking (J. Talley, pers. comm.), and (2) brown bullhead — only 1 young-of-year was taken. Another species captured, the American eel, does not spawn in fresh water.

Common and Rare Species

The 5 most common species (caught at the highest percentage of complete stations) were white sucker (63%), Johnny darter (64%), creek chub (52%), central mudminnow (50%), and brook stickleback (41%) (Table

TABLE 5. Number of stations and percent of total stations at which each species was collected and percent change in occurrence in the Black, Trempealeau, and Buffalo river basins, 1900-82.

Map No.	Species	Black (270)					Trempealeau (280)					Buffalo (290)							
		1900-31 No. Stn.	1958-74 No. Stn.	Percent Total	1975-79 No. Stn.	Percent Total	Percent Change ²	1900-31 No. Stn.	1958-74 No. Stn.	Percent Total	1975-79 No. Stn.	Percent Total	Percent Change	1900-31 No. Stn.	1958-74 No. Stn.	Percent Total	1975-82 No. Stn.	Percent Total	Percent Change
1	Chestnut lamprey	0	0	-	11	3	-	0	0	-	2	1	-	0	0	-	0	-	-
1	North. brook lamprey	0	0	-	8(2)*	2	-	0	0	-	0	-	-	0	0	-	1	1	-
2	Silver lamprey	0	0	-	3	1	-	0	0	-	0	-	-	0	0	-	1	1	-
2	Am. brook lamprey	2	0	-	34(5)	10	1,900	0	0	-	78(7)	23	-	0	0	-	40(14)	25	-
3	Longnose gar	0	0	-	10	3	-	0	1	8	1	t	0	1	0	-	0	-	-100
3	Shortnose gar	0	0	-	13	4	-	0	0	-	1	t	-	0	0	-	0	-	-
4	Bowfin	0	0	-	1	t**	-	0	0	-	3(2)	1	-	0	0(1)	-	0	-	-100
4	American eel (W) ¹	0	0(1)	-	0(3)	0	200	0	0	-	1	t	-	0	0	-	0	-	-
5	Gizzard shad	1	0	-	1	t	0	0	2	17	13	4	550	0	1	9	1	1	0
5	Mooneye	0	0	-	14	4	-	0	0	-	6	2	-	0	0	-	0	-	-
6	Rainbow trout	0	0(7)	-	4	1	-43	0	0(2)	-	4(2)	1	200	0	0(1)	-	4(7)	2	1,000
7	Brown trout	2	0(89)	-	29(11)	8	-55	0	0(32)	-	51(18)	15	120	0	0(35)	-	29(15)	18	26
8	Brook trout	4	2(138)	7	57(26)	16	-41	0	0(68)	-	51(14)	15	-4	0	0(46)	-	53(23)	33	65
9	Central mudminnow	14	3(65)	11	173(37)	50	210	1	0(7)	-	45(13)	13	730	1	0(27)	-	53(6)	33	120
10	Northern pike	2	1(11)	4	56(13)	16	480	1	2(10)	17	35(8)	10	260	1	1(3)	9	15(1)	9	300
11	Muskellunge	0	0(3)	-	19(8)	5	800	0	0	-	0	-	-	0	0	-	0	-	-
12	Central stoneroller	0	0	-	0	-	-	0	0	-	3	1	-	0	0	-	2	1	-
13	Largescale stoneroller	7	5	18	89(1)	26	1,700	1	0	-	0	-	-100	0	0	-	0	-	-
14	Redside dace (W)	5	0	-	36(1)	10	640	0	0	-	0	-	-	0	0	-	0	-	-
15	Common carp	2	0(5)	-	31(9)	9	700	1	3(7)	25	26(2)	8	180	2	1(12)	9	10(1)	6	-15
16	Brassy minnow	4	1	4	82(1)	24	8,200	0	0	-	40	12	-	0	6	55	10(3)	6	120
17	Silvery minnow	4	2	7	7	2	250	0	2	17	1	t	-50	2	2	18	0	-	-100
17	Speckled chub (T)	0	0	-	1	t	-	0	0	-	0	-	-	0	0	-	0	-	-
18	Hornyhead chub	5	2	7	60	17	2,900	1	1	8	6	2	500	0	1	9	0	-	-100
19	Golden shiner	15	0	-	61(5)	18	340	2	2	17	10(2)	3	500	4	5	45	7(1)	4	60
-	Pallid shiner (E)	1	0	-	0	-	-100	1	0	-	0	-	-100	0	0	-	0	-	-
20	Emerald shiner	4	2	7	5(1)	1	200	0	8	67	24	7	200	3	4	36	4	2	0
21	River shiner	2	0	-	11	3	450	0	1	8	4	1	300	1	1	9	0	-	-100
22	Common shiner	17	13	46	130(3)	37	920	1	1	8	11	3	1,000	0	1	9	0	-	-100
23	Bigmouth shiner	5	5	18	61(1)	18	1,100	0	3	25	76	23	2,400	2	3	27	24(5)	15	870
24	Pugnose minnow (W)	1	2	7	7	2	250	0	4	33	3	1	-25	1	0	-	0	-	-100
25	Blacknose shiner	9	5	18	51(1)	15	940	1	0	-	2	1	100	0	0	-	0	-	-
26	Spottail shiner	0	1	4	2	1	100	0	2	17	2	1	0	1	2	18	1	1	-50
27	Rosyface shiner	5	5	18	54	16	980	0	0	-	0	-	-	0	0	-	0	-	-
28	Spotfin shiner	6	5	18	64(1)	18	1,200	1	8	67	73	22	810	4	6	55	10(2)	6	100
29	Sand shiner	3	3	11	50	14	1,600	0	1	8	2	1	100	1	0	-	0	-	-100
26	Weed shiner (W)	2	0	-	4	1	100	0	0	-	0	-	-	1	5	45	9	6	80
-	Redfin shiner (W)	2	0	-	0	-	-100	2	0	-	0	-	-100	0	0	-	0	-	-
30	Mimic shiner	2	1	4	34	10	3,300	1	1	8	2	1	100	0	0	-	0	-	-
31	Suckermouth minnow	0	1	4	1	t	0	0	2	17	5	1	150	0	2	18	4	2	100
32	North. redbelly dace	5	1	4	56	16	5,500	0	0	-	0	-	-	0	0	-	0	-	-
31	South. redbelly dace	0	0	-	4	1	-	0	0	-	0	-	-	0	1	9	0	-	-100
33	Finescale dace	0	0	-	8(1)	2	-	0	0	-	0	-	-	0	0	-	0	-	-
34	Bluntnose minnow	7	8	29	135(4)	39	1,600	4	6	50	81(1)	24	1,300	4	8	73	29(3)	18	300
35	Fathead minnow	11	5	18	98(7)	28	2,000	3	3	25	123(5)	37	4,200	4	7	64	51(9)	31	760
36	Bullhead minnow	3	2	7	34	10	1,600	0	5	42	9	3	80	1	2	18	2	1	0
37	Blacknose dace	13	0	-	105(6)	30	7,500	0	1	8	137(12)	41	14,800	1	3	27	86(21)	53	3,500
38	Longnose dace	5	1	4	76(3)	22	7,800	0	1	8	50	15	4,900	2	3	27	43(4)	26	1,500
39	Creek chub	19	5	18	181(9)	52	3,700	1	3	25	159(10)	47	5,500	3	4	36	87(11)	53	2,400
40	Pearl dace	6	0	-	52(2)	15	800	0	0	-	18(1)	5	-	0	0	-	1(1)	1	-
41	River carpsucker	0	0	-	2	1	-	0	1	8	2	1	100	0	0	-	0	-	-
42	Quillback	0	1	4	24	7	2,300	0	2	17	15	4	650	0	0	-	0	-	-
41	Highfin carpsucker	0	0	-	15	4	-	0	0	-	10	3	-	0	0	-	0	-	-
43	White sucker	29	8(141)	29	224(38)	64	76	4	2(90)	17	186(34)	56	140	4	6(70)	55	111(36)	68	93
44	Blue sucker (T)	0	0	-	1	t	-	0	0	-	0	-	-	0	0	-	0	-	-
45	Northern hog sucker	13	6(20)	21	83(7)	24	250	0	1(5)	8	1	t	-83	0	2(3)	18	7(1)	4	60
44	Smallmouth buffalo	0	0	-	0	-	-	0	1	8	5	1	400	0	0	-	0	-	-
46	Bigmouth buffalo	0	0	-	13	4	-	0	0	-	6	2	-	0	0	-	2	1	-
47	Spotted sucker	1	0	-	25(1)	7	2,500	1	2	17	7	2	250	0	3	27	1	1	-67
48	Silver redhorse	3	4	14	45(3)	13	1,100	0	1	8	11	3	1,000	2	0	-	3	2	50
49	River redhorse (W)	0	0	-	11	3	-	0	0	-	0	-	-	0	0	-	0	-	-
50	Golden redhorse	3	5	18	65(2)	19	1,200	1	0	-	0	-	-100	0	0	-	0	-	-

TABLE 5. Continued.

Map No.	Species	Black (270)					Percent Change In Occur. ²	Trempealeau (280)					Percent Change In Occur.	Buffalo (290)					
		1900-31		1958-74		1975-79		1900-31		1958-74		1975-79		1900-31		1958-74		1975-82	
		No. Stn.	No. Stn.	Percent Total	No. Stn.	Percent Total		No. Stn.	No. Stn.	Percent Total	No. Stn.	Percent Total		No. Stn.	No. Stn.	Percent Total	No. Stn.	Percent Total	Percent Change In Occur.
51	Shorthead redhorse	1	4	14	59(3)	17	1,500	0	2	17	29	9	1,400	3	1	9	7(1)	4	700
52	Black bullhead	8	0	-	56(1)	16	610	2	2	17	17(2)	5	850	2	0	-	3	2	50
53	Yellow bullhead	1	0	-	15	4	1,400	0	1	8	3	1	200	0	0	-	2(1)	1	-
54	Brown bullhead	1	0	-	1	t	0	0	0	-	1	t	-	0	0	-	0	-	-
55	Channel catfish	2	1(2)	4	24(5)	7	870	1	5(2)	42	20	6	190	0	2(2)	18	1	1	-75
56	Stonecat	1	2	7	28	8	1,300	0	0	-	2	1	-	0	0	-	1(1)	1	-
57	Tadpole madtom	1	0	-	44(1)	13	4,400	0	5	42	4	1	-20	0	2	18	3	2	50
54	Flathead catfish	0	0	-	1(2)	t	-	0	0(2)	-	1	t	-50	0	0(1)	-	2	1	100
58	Pirate perch (W)	0	0	-	2	1	-	0	0	-	0(1)	0	-	0	0	-	1	1	-
-	Trout-perch	0	0	-	0	-	-	0	2	17	0	-	-100	0	0	-	0	-	-
59	Burbot	4	0(34)	-	53(8)	15	79	0	0	-	0	-	-	0	0	-	2	1	-
60	Starhead topminnow (E)	0	0	-	1	t	-	0	0	-	0	-	-	0	0	-	0	-	-
60	Brook silverside	1	2	7	9	3	350	0	2	17	2(1)	1	50	0	2	18	0	-	-100
61	Brook stickleback	11	3(50)	11	148(23)	43	220	1	1(32)	8	170(31)	51	510	0	5(30)	45	91(34)	56	260
62	White bass	0	0	-	2	1	-	0	3	25	6	2	100	0	1	9	2	1	100
63	Rock bass	2	3	11	71(1)	20	2,300	1	2	17	3	20	50	1	0	-	5	3	400
64	Green sunfish	0	0	-	15(1)	4	-	2	1	8	32(5)	10	3,600	0	2	18	13(4)	8	750
65	Pumpkinseed	7	3	11	84(2)	24	2,800	2	3	25	19(1)	6	570	0	0	-	7	4	-
-	Warmouth	0	0	-	0	-	-	1	1	8	0	-	-100	0	1	9	0	-	-100
-	Orangespotted sunfish	0	0	-	0	-	-	0	3	25	0	-	-100	0	1	9	0	-	-100
66	Bluegill	3	5	18	37(1)	11	660	1	4	33	14	4	250	3	2	18	7(1)	4	300
67	Smallmouth bass	9	9(9)	32	90(10)	26	460	0	1(2)	8	2	1	-33	1	0	-	1	1	0
68	Largemouth bass	3	4(12)	14	41(13)	12	240	3	4(2)	33	13(2)	4	150	3	1(3)	9	6(5)	4	175
69	White crappie	4	0	-	13(1)	4	250	2	4	33	3	1	-25	4	1	9	0	-	-100
70	Black crappie	5	4	14	35(2)	10	830	1	3	25	7	2	130	4	3	27	5	3	67
-	Crystal darter (E)	0	0	-	0	-	-	0	1	8	0	-	-100	0	0	-	0	-	-
71	Western sand darter	2	0	-	15	4	650	0	1	8	1	t	0	0	0	-	0	-	-
72	Mud darter (W)	0	0	-	8	2	-	1	3	25	6	2	100	2	1	9	7	4	600
73	Rainbow darter	4	3	11	80(1)	23	2,600	0	0	-	0	-	-	0	0	-	0	-	-
74	Iowa darter	0	0	-	29	8	-	0	2	17	4	1	100	2	1	9	0(2)	-	100
75	Fantail darter	7	1	4	66	19	6,500	2	0	-	16	5	700	0	3	27	21(3)	13	700
76	Least darter (W)	0	0	-	2	1	-	0	0	-	0	-	-	0	0	-	0	-	-
77	Johnny darter	26	15	54	224(12)	64	1,500	5	8	67	214(19)	64	2,800	3	9	82	105(18)	64	1,300
78	Banded darter	3	5	18	51(1)	15	940	0	0	-	13	4	-	0	0	-	4(1)	2	-
79	Yellow perch	6	2(24)	7	28(9)	8	42	0	5	42	2(2)	1	-20	1	0	-	1	1	0
80	Logperch	2	2	7	39(2)	11	2,000	0	3	25	1	t	-70	1	2	18	2	1	0
76	Gilt darter (T)	1	0	-	6	2	500	0	0	-	0	-	-	0	0	-	0	-	-
81	Blackside darter	16	6	21	125(3)	36	2,000	1	1	8	60(5)	18	6,400	1	1	9	15(1)	9	1,500
82	Slenderhead darter	1	1	4	12(1)	3	1,200	0	0	-	0	-	-	0	0	-	0	-	-
83	River darter	0	0	-	6	2	-	0	1	8	1	t	0	0	0	-	0	-	-
84	Sauger	0	0	-	2	1	-	0	2	17	9	3	350	0	0	-	1	1	-
85	Walleye	4	1(9)	4	29(8)	8	270	0	1(3)	8	12	4	200	1	0	-	2	1	100
86	Freshwater drum	0	0	-	7(1)	2	-	0	4(3)	33	9	3	29	1	0(3)	-	3	2	0
No. of Species		67	55		97			33	66		79			38	51		60		
Total no. of occurrences		127	801		4,413			55	421		2,297			79	358		1,257		

* Number in parentheses indicates partial stations. They were kept separate since not all of the fish from the station were adequately keyed to species.

** t = less than 0.5%

¹E = Endangered, T = Threatened, W = Watch.

²Percent change over next most recent period in which species was collected (partial stations included in calculations).



This dark specimen of a channel catfish was taken from the lower Trempealeau River with a boom shocker.



The sauger (on left) and smallmouth bass (on right) were taken in the lower Trempealeau River with a boom shocker.

5). The 5 most numerous species (most specimens caught) were white sucker (9,700), creek chub (8,200), common shiner (7,600), Johnny darter (6,000), and bluntnose minnow (5,400) (Table 6). The central mudminnow and brook stickleback were the 7th and 8th most numerous species.

Of the 19 rarest species (those caught at 5 or fewer of all the stations, Table 7), all but 3 (southern redbelly dace, pirate perch, and least darter) were also represented by the smallest total number of specimens (Table 6).

Differences Between Time Periods

Twenty-six species of fish collected during the 1975-79 period have not been previously reported for this basin (Table 8).

The pallid shiner and redbfin shiner are apparently no longer present in the Black River basin, for they were last taken before 1931 (Table 9). However, they may have been very rare even in the early 1900's for they were reported from only 1 and 2 stations, respectively.

Thirteen species that we collected had not been reported between 1932 and 1975 from this basin (Table 10).

One of the most important results of this study was the documentation of changes in the known distribution of species within the Black River basin in 1975-79 as compared to previous periods (Table 5). These changes have ranged from decreases in the number of stations for 5 species to increases for 65 species, and no change for 3 others. The decreases ranged from 100% for 2 species to 41% for the brook trout. The increases ranged from 42% for the yellow perch to 8,200% for the brassy minnow

(average = 1,500%), and were due primarily but perhaps not entirely to increased sampling effort in 1975-79. There were 128 more streams and 5 more lakes with at least 1 complete station compared to 1958-74 and 113 more streams and 3 more lakes compared to 1900-31 (Table 2). When the total number of complete stations sampled in the 1975-79 period was compared with the 1958-74 and 1900-31 periods, there were increases of 1,100% and 870% respectively.

Species Diversity

Fifty-nine stations (19%) sampled by research personnel in the Black River basin had 20 or more species and 13 stations had more than 25 species (Fig. 4). The average number of species taken per station was 12.

TREMPEALEAU RIVER BASIN (280)

Species Found

Over 35,000 specimens representing 79 species were identified in samples from the Trempealeau River basin (Tables 5 and 11). This included 4 species (American eel, pugnose minnow, pirate perch, and mud darter) on the watch list. Distribution maps for all species are presented in Appendix B.

Reproducing Populations

In the Trempealeau River basin 76 species are believed to have reproducing populations. The presence of reproducing populations of 2 other species is

questionable: (1) rainbow trout — all accounts can be attributed to stocking (J. Talley, pers. comm.), and (2) brown bullhead — only 1 specimen taken at mouth of Trempealeau River. Another species captured was the American eel which does not spawn in fresh water.

Common and Rare Species

The 5 most common species (caught at the highest percentage of complete stations) were Johnny darter (65%), white sucker (58%), brook stickleback (53%), creek chub (47%), and blacknose dace (42%) (Table 5). The 5 most numerous species (most specimens caught) were white sucker (4,800), Johnny darter (4,700), brook stickleback (2,900), spotfin shiner (2,800), and creek chub (2,800) (Table 11).

Of the 32 rarest species (those caught at 5 or fewer of all the stations, Table 7), all but 5 (bowfin, central stoneroller, pugnose minnow, spotted shiner, and yellow perch) were also represented by the smallest number of specimens (Table 11).

Differences Between Time Periods

Fifteen species of fish that we collected have not been previously reported for this basin (Table 8).

Eight species are apparently no longer present in the Trempealeau River basin (Table 9). The largescale stoneroller, pallid shiner, redbfin shiner, and golden redbhorse were taken only before 1932, and the trout-perch, warmouth, orangespotted sunfish, and crystal darter were most recently reported in the 1958-74 time period.

TABLE 6. Number of specimens and number of stations for each species collected in the Black River basin, 1975-79.

Common Name	No. Specimens*	No. Stations**			Common Name	No. Specimens*	No. Stations**		
		<99	>98	"Unknown"			<99	>98	"Unknown"
White sucker	9,700	212	44	6	Quillback	250	24		
Creek chub	8,300	153	37		Yellow perch	220	33	1	3
Common shiner	7,700	70	63		Iowa darter	160	29		
Johnny darter	6,000	214	20	2	Silvery minnow	150	6	1	
Bluntnose minnow	5,400	102	36	1	Longnose gar	150	10		
Largescale stoneroller ¹	5,200	60	30		Muskellunge	120	27		
Central mudminnow	4,600	192	11	7	Bigmouth buffalo	110	13		
Brook stickleback	4,000	152	16	3	Channel catfish	110	29		
Blacknose dace	3,600	95	16		Stonecat	110	28		
Brassy minnow	3,300	61	21	1	Least darter	100	1	1	
Blackside darter	3,300	117	10	1	Slenderhead darter	95	13		
Spotfin shiner	3,200	44	21		Highfin carpsucker	84	15		
Fathead minnow	3,100	88	17		Gilt darter	79	6		
Brook trout	2,800	72	11		Finescale dace	76	9		
Rainbow darter	2,700	65	14	2	Green sunfish	73	16		
Sand shiner	2,600	33	17		Emerald shiner	70	6		
Northern redbelly dace	2,500	38	18		Brook silverside	70	9		
Bigmouth shiner	2,200	49	13		Shortnose gar	66	13		
Hornyhead chub	1,800	50	10		Western sand darter	52	15		
Rock bass	1,700	68	3	1	Yellow bullhead	44	15		
Northern hog sucker	1,700	86	2	2	River shiner	43	11		
Smallmouth bass	1,600	95	4	1	Northern brook lamprey	39	10		
Longnose dace	1,500	71	8		Mud darter	36	8		
Mimic shiner	1,400	23	10	1	Mooneye	33	14		
Bullhead minnow	1,400	24	10		White crappie	23	13		1
Blacknose shiner	1,200	46	6		River redhorse	22	11		
Golden redhorse	1,200	64	2	1	Chestnut lamprey	20	11		
Shorthead redhorse	1,200	60	2		Pirate perch	20	2		
Fantail darter	1,200	64	1	1	Pugnose minnow	18	7		
Rosyface shiner	1,200	53	1		River darter	17	6		
Redside dace	960	33	4		Spottail shiner	13	2		
Bluegill	940	31	6	1	Freshwater drum	11	7		1
Black bullhead	850	53	4		Weed shiner	11	4		
Pearl dace	810	51	3		Flathead catfish	11	3		
Pumpkinseed	790	86			Rainbow trout	4	4		
Common carp	780	35	1	4	Silver lamprey	3	3		
Golden shiner	720	66			American eel	3	3		
Tadpole madtom	690	45			White bass	3	2		
Banded darter	680	52			River carpsucker	2	2		
Silver redhorse	670	47	1		Sauger	2	2		
Spotted sucker	620	25	1		Bowfin	1	1		
Logperch	530	38	2	1	Gizzard shad	1	1		
Brown trout	490	37	3		Speckled chub	1	1		
Walleye	350	35	2		Suckermouth minnow	1	1		
Northern pike	340	68	1		Blue sucker	1	1		
American brook lamprey	320	39			Brown bullhead	1	1		
Southern redbelly dace	300	3	1		Starhead topminnow	1	1		
Burbot	300	56		5					
Largemouth bass	280	53		1					
Black crappie	280	36		1					
					Total ¹	111,530	3,859	506	48

*Rounded to 2 significant figures for each species.

** < 99 = 98 or fewer specimens taken/station.

> 98 = 99 or more specimens taken/station.

Unknown = counts of specimens were not made.

¹4,200 stonerollers were not keyed to species.

These species had been reported from an average of only 1.5 stations, and were considered rare in those years.

The blacknose shiner and fantail darter were not taken between 1931 and 1974 from this basin (Table 10).

As in the Black River basin, one of the most important results of this study was documentation of changes in

the known distribution of species within the Trempealeau River basin in 1975-80 as compared to previous periods (Table 5). These changes ranged from decreases in the number of stations for 18 species to increases for 49 species, and no change for 5 others. The decreases ranged from 100% for 8 species to 4% for the brook trout. The in-

creases ranged from 50% for the brook silverside and rock bass to 14,800% for the blacknose dace (average = 1,200%). The reasons for the increases are the same as for the Black River basin. In 1975-79 there were 116 more streams and 1 more lake with at least 1 complete station compared to 1958-74 and 115 more streams and 1 more lake

TABLE 7. List of species collected at 5 or fewer stations from the Black (1975-79), Trempealeau (1975-79), and Buffalo (1975-82) river basins.

Black (270)	Trempealeau (280)	Buffalo (290)
Silver lamprey	Chestnut lamprey	Northern brook lamprey
Bowfin	Longnose gar	Silver lamprey
American eel	Shortnose gar	Gizzard shad
Gizzard shad	Bowfin	Central stoneroller
Rainbow trout*	American eel	Emerald shiner
Speckled chub	Central stoneroller	Spottail shiner
Spottail shiner	Silvery minnow	Suckermouth minnow
Weed shiner	River shiner	Bullhead minnow
Suckermouth minnow	Pugnose minnow	Pearl dace
Southern redbelly dace	Blacknose shiner	Bigmouth buffalo
River carpsucker	Spottail shiner	Spotted sucker
Blue sucker	Sand shiner	Silver redhorse
Brown bullhead*	Mimic shiner	Black bullhead
Flathead catfish	Suckermouth minnow	Yellow bullhead
Pirate perch	River carpsucker	Channel catfish
Starhead topminnow	Northern hog sucker	Stonecat
White bass	Small mouth buffalo	Tadpole madtom
Least darter	Yellow bullhead	Flathead catfish
Sauger	Brown bullhead*	Pirate perch
	Stonecat	Burbot
	Tadpole madtom	White bass
	Flathead catfish	Rock bass
	Pirate perch	Smallmouth bass
	Brook silverside	Black crappie
	Rock bass	Iowa darter
	Smallmouth bass	Banded darter
	White crappie	Yellow perch
	Western sand darter	Logperch
	Iowa darter	Sauger
	Yellow perch	Walleye
	Logperch	Freshwater drum
	River darter	

*Naturally reproducing population questionable.

compared to 1900-31 (Table 2). When the total number of complete stations sampled in the 1975-79 period was compared with the 1958-74 and 1900-31 periods, there were increases of 2,900% and 5,500%, respectively.

Species Diversity

There were only 2 stations (1%) sampled by research personnel that had 20 or more species, 1 of which had 27 species (Fig. 4). The average number of species taken per station was 7.

BUFFALO RIVER BASIN (290)

Species Found

Over 22,000 specimens representing 60 species were identified in samples from the Buffalo River basin (Tables 5 and 12). This included 3 species (weed shiner, pirate perch, and mud darter) on the watch list. Distribution maps for all species are presented in Appendix B.

Reproducing Populations

In the Buffalo River basin 59 species are believed to have reproducing populations. The presence of reproducing populations of the rainbow trout is questionable since all records can be attributed to stocking (J. Talley, pers. comm.).

Common and Rare Species

The 5 most common species (caught at the highest percentage of complete stations) were white sucker (68%), Johnny darter (64%), brook stickleback (56%), blacknose dace (53%), and creek chub (53%) (Table 5). The 5 most numerous species (most specimens caught) were white sucker (5,200), Johnny darter (2,800), blacknose dace (2,700), creek chub (2,100), and brook trout (1,800) (Table 12). The brook stickleback was the 6th most numerous species.

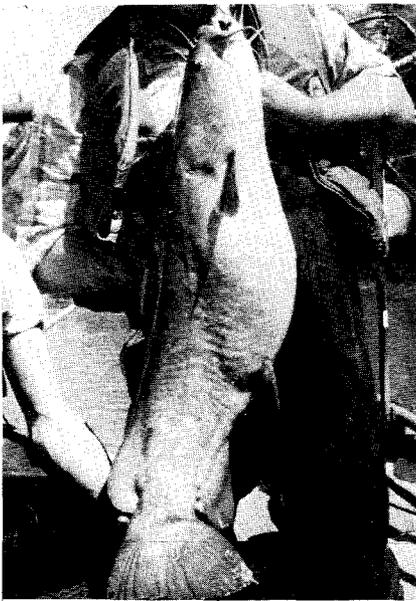
Of the 31 rarest species (those caught at 5 or fewer of all the stations, Table 7), all but 4 (emerald shiner, spotted sucker, silver redhorse, and freshwater drum) were also represented by the smallest total number of specimens (Table 12).

TABLE 8. Fish species collected for the first time during the 1975-79* period from the Black, Trempealeau, and Buffalo river basins.

Black (270)	Trempealeau (280)	Buffalo (290)
Chestnut lamprey	Chestnut lamprey	North. brook lamprey
North. brook lamprey	Am. brook lamprey	Silver lamprey
Silver lamprey	Shortnose gar	Am. brook lamprey
Longnose gar	Bowfin	Central stoneroller
Shortnose gar	American eel**	Pearl dace
Bowfin	Mooneye	Bigmouth buffalo
Mooneye	Central stoneroller	Yellow bullhead
Speckled chub	Brassy minnow	Stonecat
South. redbelly dace	Pearl dace	Pirate perch
Finescale dace	Highfin carpsucker	Burbot
River carpsucker	Bigmouth buffalo	Pumpkinseed
Highfin carpsucker	Brown bullhead	Banded darter
Blue sucker	Stonecat	Sauger
Bigmouth buffalo	Pirate perch	
River redhorse	Banded darter	
Flathead catfish		
Pirate perch		
White bass		
Starhead topminnow		
Green sunfish		
Mud darter		
Iowa darter		
Least darter		
River darter		
Sauger		
Freshwater drum		

*1975-82 for Buffalo River basin.

**Natural reproduction does not occur in this basin.



This large flathead catfish was taken from the lower Buffalo River with the boom shocker.



This fine walleye was taken with the boom shocker in the lower Buffalo River.

Differences Between Time Periods

Thirteen species of fish that we collected have not been previously reported for this basin (Table 8).

Thirteen species are apparently no longer present in the Buffalo River basin (Table 9). The longnose gar, pugnose minnow, and sand shiner were taken only before 1932, and the bowfin, silvery minnow, hornyhead chub, river shiner, common shiner, southern redbelly dace, brook silverside, warmouth, orangespotted sunfish, and white crappie were most recently taken in the 1958-74 time period. These species were apparently rare in earlier years, for they had been reported at only 1 or 2 stations.

The silver redhorse, black bullhead, rock bass, smallmouth bass, yellow perch, and walleye were not taken between 1931 and 1974 from this basin (Table 10).

Again, one of the most important results of this study was documentation of changes in the known distribution of species within the Buffalo River basin in 1975-82 as compared to previous periods (Table 5). These changes ranged from decreases in the number of stations for 17 species to increases for 36 species, and no change for 7 others. The decreases ranged from 100% for 13 species to 15% for the common carp. The increases ranged from 26% for the brown trout to 3,500% for the blacknose dace (average = 520%). The reasons for the increases are the same as for the other 2 basins. In 1975-82 there were 74 more streams with at least 1 complete station compared to 1958-74

TABLE 9. Fish species apparently no longer present in the Black, Trempealeau, and Buffalo river basins.

Last Period Recorded	Black (270)	Trempealeau (280)	Buffalo (290)
1900-31	Pallid shiner Redfin shiner	Largescale stoneroller Pallid shiner Redfin shiner Golden redhorse	Longnose gar Pugnose minnow Sand shiner
1958-74		Trout-perch Warmouth Orangespotted sunfish Crystal darter	Bowfin Silvery minnow Hornyhead chub River shiner Common shiner Southern redbelly dace Brook silverside Warmouth Orangespotted sunfish White crappie

TABLE 10. Fish species reported prior to 1932 but not collected again until 1975-79.*

Black (270)	Trempealeau (280)	Buffalo (290)
American brook lamprey	Blacknose shiner	Silver redhorse
Gizzard shad	Fantail darter	Black bullhead
Redside dace		Rock bass
Golden shiner		Smallmouth bass
Weed shiner		Yellow perch
Blacknose dace		Walleye
Pearl dace		
Black bullhead		
Yellow bullhead		
Brown bullhead		
Tadpole madtom		
Western sand darter		
Gilt darter		

*1975-82 for Buffalo River basin.

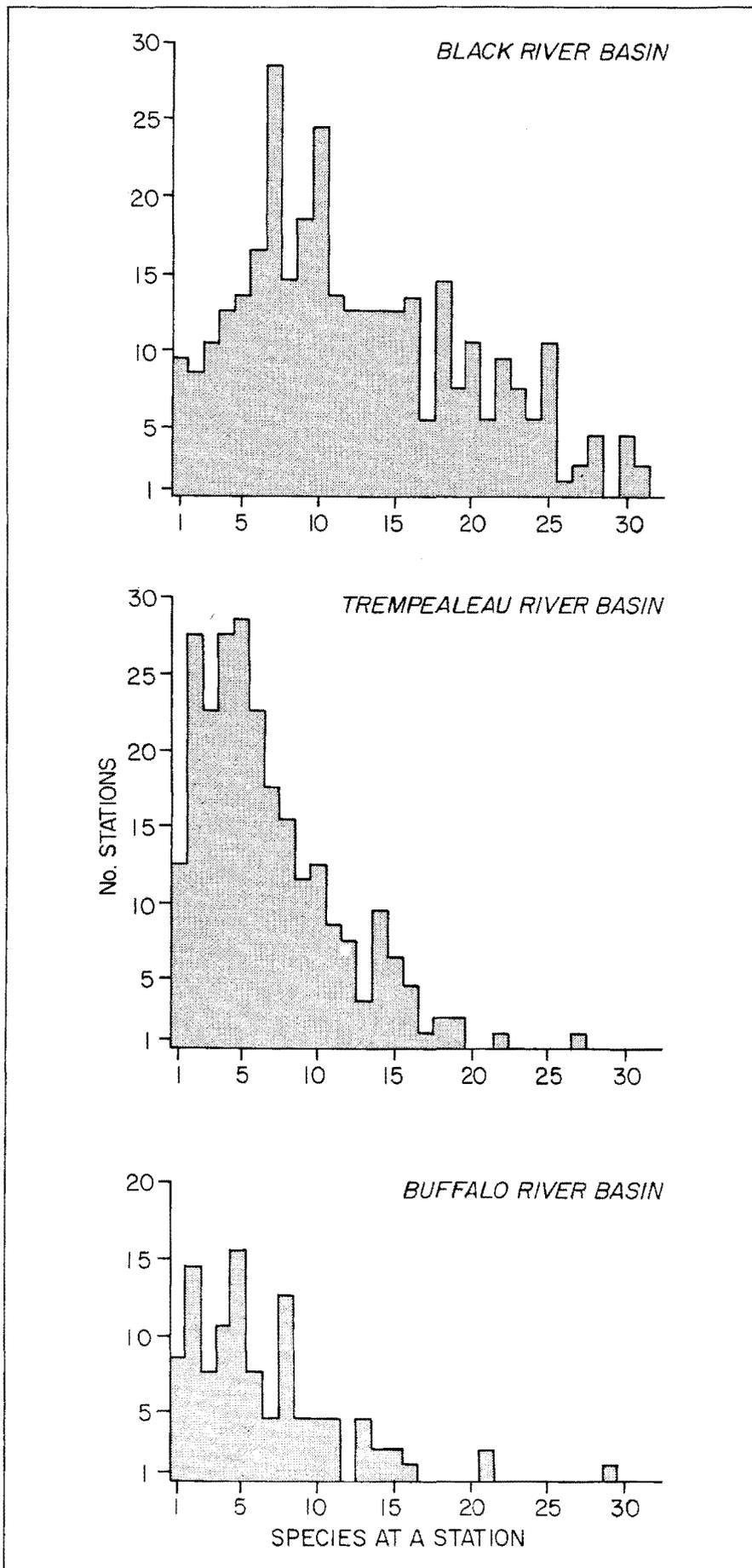


FIGURE 4. Number of stations at which varying numbers of species were taken in the Black, Trempealeau, and Buffalo river basins.

and 78 more streams compared to 1900-31 (Table 2). When the total number of complete stations sampled in the 1975-82 period was compared with the 1958-74 and 1900-31 periods, there were increases of 1,400% and 1,900%, respectively.

Species Diversity

There were only 3 stations (1%) sampled by research personnel that had more than 20 species, 1 of which had 29 species (Fig. 4). The average number of species taken per station was 6.

DIFFERENCES BETWEEN BASINS (270, 280, 290)

Of the 97 species found in the Black River basin, 15 were not found in the Trempealeau or Buffalo river basins (Table 13). Of the 79 species found in the Trempealeau River basin, only the smallmouth buffalo was not captured in the other 2. There were no species found in the Buffalo River basin that were not taken in the Black or Trempealeau river basins.

The Black River basin has a more diverse aquatic habitat, 2 1/2 times larger watershed, and over 4 times larger flow rate of its mainstem than the Trempealeau or Buffalo river basins. These are important factors which may help to explain the larger number of species (97 as compared to 79 and 60) and larger average number of species per station (12 as compared to 7 and 6).

ENDANGERED SPECIES

Only 1 species on the state's endangered species list was found in the Black River basin (none in the 2 other basins). One specimen of the starhead topminnow was taken at a station near the mouth of the Black River (Table 14) (Append. B Map 60). This species had not been reported previously from any location in the state farther north than T8N.

THREATENED SPECIES

Three threatened species were found in the Black River and none in the 2 other basins (Table 15). One specimen of the speckled chub was taken near the mouth of the Black River (Append. B Map 17). One specimen of the blue sucker (Append. B Map 44) was taken at 1 station and 79 gilt darters (Ap-

TABLE 11. Number of specimens and number of stations for each species collected in the Trempealeau River basin, 1975-79.

Common Name	No. Specimens*	No. Stations**			Common Name	No. Specimens*	No. Stations**		
		<99	>98	"Unknown"			<99	>98	"Unknown"
White sucker	4,800	210	9	1	Black crappie	34		7	
Johnny darter	4,700	222	10	1	Walleye	34		12	
Brook stickleback	2,900	193	8		Spottail shiner	33		2	
Creek chub	2,800	163	6		Golden shiner	31		12	
Spotfin shiner	2,700	61	12		Freshwater drum	28		9	
Blacknose dace	2,300	146	3		Banded darter	27		13	
Bigmouth shiner	2,100	69	7		White bass	23		6	
Bluntnose minnow	1,600	76	6		Suckermouth minnow	20		5	
Brook trout	1,500	60	5		White crappie	20		3	
Longnose dace	1,400	44	6		Mooneye	19		6	
Fathead minnow	1,400	125	3		Rainbow trout	19		6	
Emerald shiner	890	17	7		Bigmouth buffalo	18		6	
Brown trout	650	69			Silver redhorse	17		11	
American brook lamprey	600	85			Sand shiner	12		2	
Common carp	550	26	2		Rock bass	11		3	
Brassy minnow	420	40			Mud darter	11		6	
Blackside darter	410	65			Tadpole madtom	7		4	
Gizzard shad	380	10	3		Iowa darter	7		4	
Central mudminnow	330	58			Mimic shiner	6		2	
Shorthead redhorse	320	29			River shiner	5		4	
Green sunfish	220	37			Smallmouth buffalo	5		5	
Northern pike	190	43			Brook silverside	4		2	1
Bluegill	160	13	1		Silvery minnow	3		1	
Common shiner	150	10	1		Yellow bullhead	3		3	
Black bullhead	150	18	1		Stonecat	3		2	
Bowfin	150	5			Chestnut lamprey	2		2	
Channel catfish	150	20			Blacknose shiner	2		2	
Pearl dace	140	19			River carpsucker	2		2	
Bullhead minnow	130	9			Smallmouth bass	2		2	
Fantail darter	120	16			Longnose gar	1		1	
Yellow perch	83	4			Shortnose gar	1		1	
Largemouth bass	65	15			American eel	1		1	
Quillback	64	15			Northern hog sucker	1		1	
Spotted sucker	56	7			Brown bullhead	1		1	
Hornyhead chub	55	6			Flathead catfish	1		1	
Pumpkinseed	48	20			Western sand darter	1		1	
Highfin carpsucker	42	10			Logperch	1		1	
Central stoneroller ¹	35	3			River darter	1		1	
Pugnose minnow	35	3			Pirate perch				1
Sauger	35	9			Total	35,245	2,203	90	4

*Rounded to 2 significant figures for each species.

** <99 = 98 or fewer specimens taken/station.

>98 = 99 or more specimens taken/station.

Unknown = counts of specimens were not made.

¹22 Stonerollers were not keyed to species.

pend. B Map 76) at 6 stations farther up the Black River. Previous to this study, these species had not been reported from these 3 basins.

The gilt darter was found in the shallow riffle area of the mainstem of the Black River where the turbidity was clear to slightly turbid. Habitat characteristics for this darter and 5 watch species are shown in Table 16.

WATCH SPECIES

In the 3 basins, 8 watch species were collected (Table 17). Three American eels were taken from the Black River, Soper Creek (270), and the Trempealeau River (Append. B Map 4). From these 3 basins this species previously

had been reported from only 1 stream in the Black River basin. These fish (only females found in fresh water) migrate back to the Sargasso Sea to spawn. The redbreast dace was captured at 37 stations in 27 streams in the Black River basin (Append. B Map 14). Previously there were records from only 4 streams in this basin. The pugnose minnow occurred at 10 stations in 2 rivers (the Black and Trempealeau) (Append. B Map 24). Previously, this species had been reported in 4 streams from these 3 basins. We sampled the same streams but collected pugnose minnows in only 2 of them — none in the Buffalo River basin.

The weed shiner was taken at 13 stations in 5 streams in 2 basins (Append. B Map 26). This species was previously reported from 4 streams in

the 2 basins; we sampled the same streams but collected weed shiners in only 3 of them. The river redhorse was found at 11 stations in the Black River (Append. B Map 49) and the pirate perch was captured at 4 stations in 3 streams (one in each basin) (Append. B Map 58). There were no previous records of either species in any of the 3 basins. The mud darter was taken at 21 stations in 7 streams in all basins (Append. B Map 72). Previously, this species was reported from only 3 streams in the Trempealeau and Buffalo river basins. The least darter was taken at 2 stations in 2 creeks in the Black River basin (Append. B Map 76). Previously, this species had not been reported from these 3 basins.

Habitat characteristics of 5 of the watch species are shown in Table 16.

TABLE 12. Number of specimens and number of stations for each species collected in the Buffalo River basin, 1975-82.

Common Name	No. Specimens*	No. Stations**		
		<99	>98	"Unknown"
White sucker	5,200	119	28	
Johnny darter	2,800	115	8	
Blacknose dace	2,700	100	7	
Creek chub	2,100	96	2	
Brook trout	1,800	70	6	
Brook stickleback	1,400	120	4	1
Longnose dace	1,100	45	2	
Am. brook lamprey	850	54		
Bluntnose minnow	610	29	3	
Bigmouth shiner	550	27	2	
Fathead minnow	490	60		
Brown trout	440	44		
Central mudminnow	290	59		
Fantail darter	240	24		
Shorthead redhorse	150	7	1	
Blackside darter	140	16		
Emerald shiner	110	3	1	
Silver redhorse	100	2	1	
Spotted sucker	99		1	
Spotfin shiner	69	12		
Common carp	67	11		
Largemouth bass	66	11		
Freshwater drum	64	3		
Mud darter	61	7		
Brassy minnow	55	13		
Weed shiner	54	9		
Northern hog sucker	48	8		
Northern pike	45	16		
Bluegill	35	8		
Rainbow trout	34	11		
Golden shiner	34	8		
Green sunfish	30	17		
Central stoneroller	28	2		
Banded darter	27	5		
Black crappie	17	5		
Tadpole madtom	15	3		
Pumpkinseed	15	7		
Rock bass	14	5		
Black bullhead	11	3		
Suckermouth minnow	7	4		
Iowa darter	6	2		
Bullhead minnow	5	2		
Logperch	5	2		
Yellow bullhead	4	3		
Pearl dace	3	2		
Bigmouth buffalo	3	2		
Burbot	3	2		
Walleye	3	2		
Channel catfish	2	1		
Stonecat	2	2		
Flathead catfish	2	2		
Pirate perch	2	1		
White bass	2	2		
Smallmouth bass	2	1		
Yellow perch	2	1		
Sauger	2	1		
North. brook lamprey	1	1		
Silver lamprey	1	1		
Gizzard shad	1	1		
Spottail shiner	1	1		
Total	22,017	1,190	66	1

*Rounded to 2 significant figures for each species.

** <99 = 98 or fewer specimens taken/station.

>98 = 99 or more specimens taken/station.

Unknown = counts of specimens were not made.

TABLE 13. Fish species found in only one of the three basins, 1975-79*.

Black (270)	Trempealeau (280)	Buffalo (290)
Muskellunge	Smallmouth buffalo	None
Largescale stoneroller		
Redside dace		
Speckled chub		
Rosyface shiner		
Northern redbelly dace		
Southern redbelly dace		
Finescale dace		
Blue sucker		
River redhorse		
Golden redhorse		
Starhead topminnow		
Least darter		
Gilt darter		
Slenderhead darter		

*1975-82 for the Buffalo River basin.

TABLE 14. Endangered species collected in the Black River basin during 1975-79 and records from stations in other Wisconsin basins since 1974.

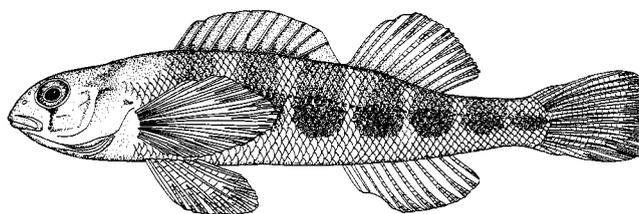
Species	Basin	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/Station	No. Records From Other Basins*
Starhead topminnow	270	Black R.	La Crosse	1	1	1	8 (210,222)

*Basin numbers shown in parentheses (see Fig. 1).

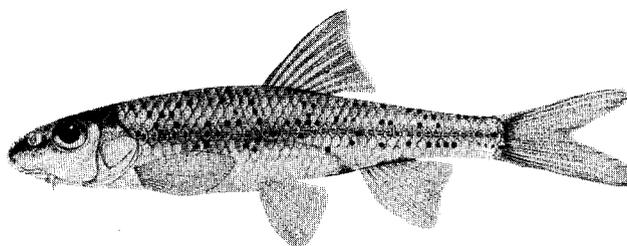
TABLE 15. Threatened species collected in the Black River basin during 1975-79 and records from stations in other Wisconsin basins since 1974.

Species	Basin	Body of water	County	No. Stations	No. Fish	Avg. No. Fish/Station	No. Records From Other Basins*
Speckled chub	270	Black R.	Trempealeau	$\frac{1}{1}$	$\frac{1}{1}$	1	28 (2,240,310)
			Total	1	1		
Blue sucker	270	Black R.	Jackson	$\frac{1}{1}$	$\frac{1}{1}$	1	53 (2,240,300, 310)
			Total	1	1		
Gilt darter	270	Black R.	Jackson	5	75	13	41 (2,300,310)
			Monroe	$\frac{1}{4}$	$\frac{4}{4}$		
			Total	6	79		

*Basin numbers shown in parentheses (see Fig. 1).



Gilt darter, a species currently on the threatened list, inhabits riffles in larger rivers. When this study began it had previously only been taken at a total of 4 stations.



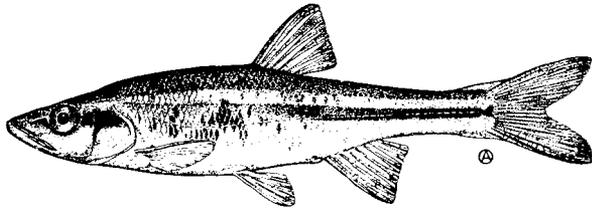
Speckled chub, presently on the threatened list, inhabits sand and gravel riffles of larger rivers.

TABLE 16. Characteristics of stream habitat for selected species* collected in the Black and Trempealeau (1975-79) and Buffalo (1975-82) river basins.

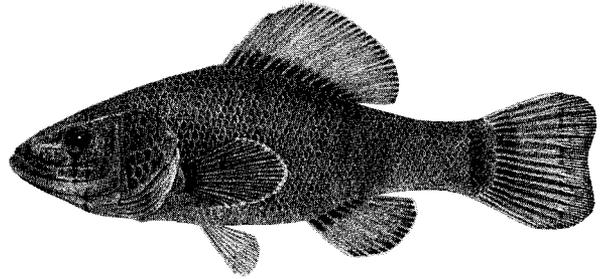
Species	Stream Width (m)	Stream Depth (m)	Velocity**	Turbidity**	Cond. (µmhos)	Temp. Temp. (F)
THREATENED						
Gilt darter	27-76	0.1-0.3	moderate	clear to slightly turbid	50-100	54-57
WATCH						
Pugnose minnow	6-69	0.3-0.7	sluggish to moderate	moderately turbid	125-275	53-62
Weed shiner	3-69	0.3-0.9	sluggish to moderate	moderately turbid	125-500	53-70
River redhorse	23-64	0.6-1.0	moderate	slightly turbid	50-100	53-74
Pirate perch	8-15	0.7-0.9	sluggish to moderate	moderately turbid to turbid	125-500	54-60
Mud darter	1-30	0.2-1.1	sluggish to moderate	moderately turbid to turbid	125-550	53-71

*Endangered, threatened, or watch species for which we have collected data from 3 or more stations.

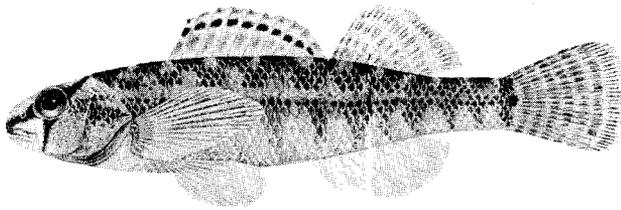
**Terms are defined in Fago (1983).



Redside dace, a species presently on the watch list, prefers clear pools in small to medium size streams.



Pirate perch, a species currently on the watch list, previously not reported from the Black, Trempealeau or Buffalo River basins.



Mud darter, presently on the watch list, prefers slow moving weedy areas adjacent to streams.



River redhorse, presently on the watch list, prefers fast moving areas of larger rivers. This specimen was taken from the lower Black River.

RECOMMENDATIONS

CONTINUING USE OF FISH DISTRIBUTION DATA

The data in both the Master Fish and Master Stream and Lake files* are available and should be used by interested persons when preparing environmental impact assessments, forming master plans, and planning future research studies.

*See section on Data Handling in this report and Fago (1983) for explanation of these files.

FUTURE RESEARCH STUDIES

This series of reports on fish distribution does not deal generally with the ecological data collected since 1974. Analysis of these data should be the subject of another study. The species composition of fish communities and their relationship to the ecological data collected are two other subjects for study.

The potential integration of the data compiled by the study with data collected by other researchers, on, for example, water quality, open up fur-

ther areas for study and analysis.

PROTECTION OF ENDANGERED AND THREATENED SPECIES AND THEIR HABITATS

Starhead Topminnow. Any proposed manipulation of the aquatic environment near the mouth of the Black River where the endangered starhead topminnow was captured (Append. B Map 60) should recognize the presence of this population.

TABLE 17. *Watch species collected in the Black, Trempealeau, and Buffalo river basins and records from stations in other Wisconsin basins since 1974.*

Species	Basin	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/Station	No. Records From Other Basins*	
American eel	270	Black R.	Jackson	1	1	1	36 (5,81,2,221,222,240,300)	
		Black R.	La Crosse	1	1			
		Soper Cr.	Monroe	1	1			
	280	Trempealeau R.	Trempealeau	1	1			
			Total	4	4			
Redside dace	270	Black R.	Taylor	2	22	26	81 (50,90,222,223,240,300)	
		E. Fork Halls Cr.	Jackson	1	1			
		S. Fork Halls Cr.	Jackson	2	20			
		Cisna Cr.	Jackson	1	12			
		Un. Cr.	Jackson	1	1			
		Wedges Cr.	Clark	1	46			
		Crooked Cr.	Clark	1	1			
		Meadows Cr.	Clark	2	126			
		Pony Cr.	Clark	1	1			
		E. Br. Wedges Cr.	Clark	1	47			
		Jack Cr.	Clark	2	24			
		S. Br. O'Neill Cr.	Clark	3	140			
		N. Br. O'Neill Cr.	Clark	2	105			
		Middle Br. O'Neill Cr.	Clark	1	99			
		Cawley Cr.	Clark	2	7			
		Panther Cr.	Clark	1	99			
		Nelson Cr.	Clark	1	40			
		Un. Cr. (17-15)	Clark	1	79			
		Poplar R.	Clark	1	1			
		S. Fork Poplar R.	Clark	1	20			
		Un. Cr.	Clark	1	2			
		McKenzie Cr.	Taylor	1	1			
		Trappers Cr.	Taylor	1	2			
		Pine Cr.	Taylor	1	24			
		Paradise Cr.	Taylor	1	19			
		Maurer Cr.	Taylor	1	2			
		Un. creeks	Taylor	3	18			
			Total	37	959			
Pugnose minnow	270	Black R.	La Crosse	5	14	5	114 (81,82,2,210,221,240,300,310)	
		Black R.	Jackson	2	4			
	280	Trempealeau R.	Trempealeau	3	35			
			Total	10	53			
Weed shiner	270	Black R.	La Crosse	3	6	5	59 (82,120,210,221,222,240,250,260,300,310)	
		Black R.	Trempealeau	1	5			
	290	Waumandee Cr.	Buffalo	1	5			
	Buffalo R.	Buffalo	6	36				
	Peeso Cr.	Buffalo	1	4				
		Big Cr.	Trempealeau	1	9			
			Total	13	65			
River redhorse	270	Black R.	Jackson	5	10	2	60 (82,2,210,221,222,240,300,310)	
		Black R.	La Crosse	2	2			
		Black R.	Monroe	4	10			
			Total	11	22			
Pirate perch	270	Black R.	La Crosse	2	20	6	21 (200,240,250)	
	280	Trempealeau R.-Bay	Trempealeau	1	-			
	290	Waumandee Cr.	Buffalo	1	2			
			Total	4	22			
Mud darter	270	Black R.	La Crosse	5	28	5	57 (2,230,240,250)	
		Black R.	Trempealeau	1	1			
		Fleming Cr.	La Crosse	1	1			
		Sand Cr.	Jackson	1	6			
		280	Trempealeau R.	Trempealeau	6			11
		290	Waumandee Cr.	Buffalo	1			44
		Buffalo R.	Buffalo	5	11			
		Deer Cr.	Buffalo	1	6			
			Total	21	108			
Least darter	270	Nelson Cr.	Clark	1	99	50	88 (20,82,200,210,221,222,300,310,400)	
		Un. Cr. (17-15)	Clark	1	1			
			Total	2	100			

*Basin numbers shown in parentheses (see Fig. 1); refers only to those basins sampled to date (approximately 45% of the geographic area of the state).

**1975-82 for Buffalo River basin.

-Unknown number collected.

Speckled Chub. This threatened species was also found near the mouth of the Black River (Append. B Map 17). This should reinforce our concern for the future of this habitat.

Blue Sucker. This threatened species was taken at 1 station in the lower Black River (Append. B Map 44). Management of the lower Black River should take cognizance of this valuable species.

Gilt Darter. This threatened species was taken at 6 stations from the Black River, all except 1 below the City of Black River Falls (Append. B Map 76). The maintenance of good water quality in the mainstem of the Black

River is needed for the protection of this beautiful darter.

UPDATING PRESENT RECORDS

District fish management personnel should in the course of routine surveys preserve at least 1 specimen of each endangered, threatened, and watch species they observe (except paddlefish, lake sturgeon, and American eel) and notify the Bureau of Research. Such collections will permit continuing reassessment of the endangered and

threatened species lists as required by law and of the watch list as well.

COMPLETION OF THIS SURVEY

Completion of the statewide survey has not been achieved due to funding reduction: only 45% of the state has been covered. When additional funds become available for investigations of endangered, threatened, and/or non-game species, high priority should be accorded to completion of the surveys in compliance with the legislative mandate.

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APPENDIX A. Supplementary Data

TABLE 18. List of species reported from the Black, Trempealeau, and Buffalo river basins by collectors other than DNR research personnel.

Species	Black (270)		Trempealeau (280)		Buffalo (290)	
	1958-74	1975-79	1958-74	1975-79	1958-74	1975-82
Chestnut lamprey	-	-	-	1	-	-
Northern brook lamprey	-	1	-	-	-	1
American brook lamprey	-	1	-	1	-	1
Longnose gar	-	-	9	-	-	-
Bowfin*	-	-	-	1	1	-
American eel*	1	1,7,8	-	-	-	-
Gizzard shad	-	-	3,9	-	2	-
Rainbow trout*	1	-	1	1	1	1
Brown trout*	1	1	1	1	1	1
Brook trout*	1,3	1	1	1	1	1
Central mudminnow*	1,2	1	1	1	1	1
Northern pike*	1,2	1	1,2,9	1	1,2	1
Muskellunge*	1	1	-	-	-	-
Central stoneroller	-	-	-	1	-	1
Largescale stoneroller	2	1	-	-	-	-
Redside dace	-	1	-	-	-	-
Common carp*	1	1	1,2,3,9	1	1,2	1
Brassy minnow	3	1	-	1	2,3	1
Silvery minnow	3	-	3	-	2,3	-
Hornyhead chub	2	-	2	-	3	-
Golden shiner	-	1	2,3	1	2,3	1
Emerald shiner	3	1	2,3,9	1	2,3	-
River shiner	-	-	2	-	3	-
Common shiner	2	1	2	-	3	-
Bigmouth shiner	2,3	1	2,3	1	3	1
Pugnose minnow	3	-	3	-	-	-
Blacknose shiner	2	1	-	1	-	-
Spottail shiner	3	-	3	-	2,3	-
Rosyface shiner	2	-	-	-	-	-
Spotfin shiner	3	1	2,3	1	2,3	1
Sand shiner	3	-	3	-	-	-
Weed shiner	-	-	-	-	2,3	-
Mimic shiner	2	1	2	-	-	-
Suckermouth minnow	3	-	3	-	3	-
Northern redbelly dace	2	-	-	-	-	-
Southern redbelly dace	-	-	-	-	3	-
Finescale dace	-	1	-	-	-	-
Bluntnose minnow	2,3	1	2,3	1	2,3	1
Fathead minnow	2,3	1	2,3	1	2,3	1
Bullhead minnow	3	-	3,9	-	2,3	-
Blacknose dace	-	1	2	1	3	1
Longnose dace	2	1	2	1	3	1
Creek chub	2,3	1	2,3	1	3	1
Pearl dace	-	1	-	1	-	1
River carpsucker	-	-	3	-	-	-
Quillback	3	-	3	-	-	-
White sucker*	1,2,3	1	1,2	1	1,2,3	1
Northern hog sucker*	1,2,3	1	1,3	-	1,2,3	1
Smallmouth buffalo	-	-	9	-	-	-
Spotted sucker	-	1	3,9	-	2	-
Silver redhorse	2,3	1	3	-	-	-
Golden redhorse	2	1	-	-	-	-
Shorthead redhorse	2	1	3,9	-	3	1
Black bullhead	-	1	3	1	-	1
Yellow bullhead	-	1	3	-	-	1
Channel catfish*	1	1	1,2,3,9	-	1,2,3	-
Stonecat	2	-	-	-	-	1
Tadpole madtom	-	1	2,3	-	3	-
Flathead catfish*	-	1	1	-	1	-
Pirate perch*	-	-	-	1	-	-
Trout-perch*	-	-	3	-	-	-
Burbot*	1	1	-	-	-	-
Brook silverside*	2,3	-	3	1	2,3	-
Brook stickleback*	1,2,3	1	1,3	1	1,2,3	1
White bass	-	-	3,9	-	2	-
Rock bass	2	1	3,9	-	-	-
Green sunfish	-	1	3	1	2,3	1
Pumpkinseed	2,3	1	2,3	1	-	-

TABLE 18 (Cont.)

Species	Black (270)		Trempealeau (280)		Buffalo (290)	
	1958-74	1975-79	1958-74	1975-79	1958-74	1975-82
Warmouth	-	-	3	-	3	-
Orangespotted sunfish	-	-	3	-	3	-
Bluegill	2,3	1	3,9	1	2,3	1
Smallmouth bass*	1,2,3	1	1,9	-	-	-
Largemouth bass*	1,2,3	1	1,3,9	1	1,2	1
White crappie	-	1	3,9	-	2	-
Black crappie	2,3	1	3	-	2,3	-
Crystal darter	-	-	2	-	-	-
Western sand darter	-	-	3	-	-	-
Mud darter	-	-	1,3	-	3	-
Rainbow darter	2	1	-	-	-	-
Iowa darter	-	-	3	1	3	1
Fantail darter	2	1	-	1	3	1
Johnny darter	2,3	1	2,3	1	2,3	1
Banded darter	2	1	-	-	-	1
Yellow perch*	1,2	1	3,9	1	-	-
Logperch	2	1	3	-	2,3	-
Blackside darter	2	1	3	1	2	1
Slenderhead darter	2	1	-	-	-	-
River darter	-	-	3	-	-	-
Sauger	-	-	3,9	-	-	-
Walleye*	1,2	1	1,3	-	-	-
Freshwater drum*	-	1	1,3,9	-	1	-

*Records of this species collected by Fish Management, students, and sport and commercial fishermen are based upon their identification.

KEY TO COLLECTOR'S CODE

- | | |
|---|---|
| 1 = All Fish Management collections | [6 = UW-Madison students] |
| 2 = Dr. George Becker and his students | 7 = Commercial fishermen |
| 3 = Professor Marlin Johnson and his students | 8 = Sport fishermen |
| [4 = Dr. George Seeburger and his students] | 9 = Upper Mississippi River Conservation Commission (UMRCC) |
| [5 = Milwaukee Public Museum] | |

[] = Collector not used in this report

- 1 ADD
- 2 CHANGE
- 3 DELETE

F
OR
S

SEQUENCE _____

MAJOR BASIN _____

MINOR BASIN _____

CC1 MB MILES _____

ORDER MILEAGES 1) _____ 2) _____ 3) _____
 4) _____ 5) _____ 6) _____
 7) _____ 8) _____ 9) _____
 10) _____ 11) _____

REPORT LOCATION

STATION MILEAGE _____

NAME _____

DAM OR JAR CODE _____ WATERTYPE _____ LANDLOCKED SEQUENCE NUMBER _____

STREAM OR LAKE LOCATION
 TOWNSHIP _____ RANGE _____ SEC. _____ 1/16 _____ 1/4 _____ COUNTY _____

STATION LOCATION
 TOWNSHIP _____ RANGE _____ SEC. _____ 1/16 _____ 1/4 _____ COUNTY _____

SOURCE OF DATA _____ GEAR _____ EFFORT _____ DATE MO / DAY / YR _____ HOUR _____

WIDTH _____ L _____ M _____ U _____ DEPTH _____ L _____ M _____ U _____

VELOCITY _____ TEMPERATURE _____ CONDUCTIVITY _____ TURBIDITY _____

BOTTOM TYPES _____

AQUATIC VEG. _____

STRM. BANK VEG. _____

FISH SPECIES

1) _____ 2) _____ 3) _____ 4) _____
 5) _____ 6) _____ 7) _____ 8) _____
 9) _____ 10) _____ 11) _____ 12) _____
 13) _____ 14) _____ 15) _____ 16) _____

MORE DATA ON BACK: YES

17) _____ 18) _____ 19) _____ 20) _____
 21) _____ 22) _____ 23) _____ 24) _____
 25) _____ 26) _____ 27) _____ 28) _____
 29) _____ 30) _____ 31) _____ 32) _____
 33) _____ 34) _____ 35) _____ 36) _____
 37) _____ 38) _____ 39) _____ 40) _____
 41) _____ 42) _____ 43) _____ 44) _____

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28 FIGURE 5. Example of field collection form (8100-46).

MINOR=223SELECTION=223
 MIN. MONTH = MAX. MONTH =

SOURCE=NOT 40 81 94 95 99
 MIN. YEAR = 1950 MAX. YEAR = 1973 COUNTY = OR < 72

MILE ON

PAGE 43

X12 JOHNNY DARTER

ETHEOSTOMA NIGRUM

DATE RUN 11/09/83

BASIN	MBM	-----O R D E R M I L E A G E S-----					MILE	LAKE OR STREAM NAME	WT	NO	SD	GEF	--DATE--	TWRRNGSECQTQTCO	N86006A
		1	2/7	3/8	4/9	5/10									
2 223	1434.8R	156.9L					139.1	PECATONICA R	2	2	46	5	6/27/60	2N 3E12SESE33	
2 223	1434.8R	156.9L					182.4	PECATONICA R -MIFFLIN	2	11	46	5	8/15/62	5N 1E27SESE25	
2 223	1434.8R	156.9L	72.8R				30.5	RICHLAND CR	2		61	5	11/28/65	1N 8E 7SENE23	
2 223	1434.8R	156.9L	72.8R	27.0R			1.8E	TWIN GROVE BR	2		61	5	10/20/64	1N 8E29NWN23	
2 223	1434.8R	156.9L	102.8R	13.8Y			1.3	BUCKSKIN SCHOOL CR	2		61	5	7/ 5/65	2N 7E 5SWSW23	
2 223	1434.8R	156.9L	105.8R				30.2	E BR PECATONICA R	2	44	46	5	6/30/60	4N 5E26SESE33	
2 223	1434.8R	156.9L	105.8R				40.3	E BR PECATONICA R	2	27	46		6/30/60	4N 5E 4SENE25	
2 223	1434.8R	156.9L	105.8R				53.4	E BR PECATONICA R	2		61	5	10/15/64	5N 5E 4NWNW25	
2 223	1434.8R	156.9L	105.8R				58.3	E BR PECATONICA R	2	3	61	5	8/ 1/69	6N 5E22 SE25	
2 223	1434.8R	156.9L	105.8R	10.9L			.5	WHITESIDE CR	2	3	46		6/30/60	2N 5E 3SESW33	
2 223	1434.8R	156.9L	105.8R	10.9L	1.6R		1.9	APPLE BR	2		61	5	10/ 7/65	3N 5E32 NE33	
2 223	1434.8R	156.9L	105.8R	10.9L	1.6R		3.3E	APPLE BR	2	19	46		6/29/60	3N 5E30SESE33	
2 223	1434.8R	156.9L	105.8R	15.0R			5.3	DOUGHERTY CR	2		61	5	10/ 6/64	3N 6E19NWSE23	
2 223	1434.8R	156.9L	105.8R	19.2L			.3	MUD BR	2	24	46		6/29/60	3N 5E22 SW33	
2 223	1434.8R	156.9L	105.8R	19.2L			3.7	MUD BR	2		61	5	10/ 1/64	3N 5E20NWNW33	
2 223	1434.8R	156.9L	105.8R	19.2L			9.6	MUD BR	2	24	46		6/29/60	3N 4E15NENW33	
2 223	1434.8R	156.9L	105.8R	19.7L			6.1E	YELLOWSTONE R	2	5	46		6/29/60	3N 5E 8SENE33	
2 223	1434.8R	156.9L	105.8R	19.7L			17.0	YELLOWSTONE R	2	9	46		6/28/60	4N 4E23SESE33	
2 223	1434.8R	156.9L	105.8R	25.4R			1.3	SAWMILL CR	2		61	5	10/ 7/64	3N 5E 2NESE33	
2 223	1434.8R	156.9L	105.8R	25.4R			6.5E	SAWMILL CR	2		61	5	10/ 6/64	4N 6E20SESW23	
2 223	1434.8R	156.9L	105.8R	27.5L			1.0	UN CR	2	27	46		6/28/60	4N 5E27NWSE33	
2 223	1434.8R	156.9L	105.8R	33.5R			.9	GORDON CR	2		61	5	10/ 1/64	4N 5E13NWSW25	
2 223	1434.8R	156.9L	105.8R	44.2L	6.1R		6.3	CONLEY LEWIS CR	2	1	61	5	8/ 1/69	6N 4E34SWNE25	
2 223	1434.8R	156.9L	139.5L				1.2	AMES BR	2	3	46		6/27/60	2N 3E11SESE33	
2 223	1434.8R	156.9L	141.0R				.4	OTTER CR	2	2	46		6/27/60	2N 4E 6SENW33	
2 223	1434.8R	156.9L	153.4L				5.1	BONNER BR	2	7	46		8/15/62	3N 2E11SENW33	
2 223	1434.8R	156.9L	159.0R				9.9	MINERAL POINT BR	2	3	46	5	8/15/62	4N 2E10 NE25	
2 223	1434.8R	156.9L	159.0R				13.7	MINERAL POINT BR	2	1	46		8/ 9/62	5N 2E36SWNE25	
2 223	1434.8R	156.9L	159.0R	8.8L			8.3	SUDAN BR	2	4	46		8/14/62	5N 2E29SWSE25	
2 223	1434.8R	156.9L	159.0R	8.8L	10.6R		.4	PEDLER CR	2	2	46		8/14/62	5N 2E21SWNE25	
2 223	1434.8R	156.9L	172.9L				1.5	JONES BR	2		45		7/11/62	4N 1E23SWSE33	

NUMBER OF STATIONS WITH FISH = 31 NUMBER OF STATIONS WITH 1-98 FISH = 20 NUMBER OF STATIONS WITH 99 OR MORE FISH = 0
 TOTAL NUMBER OF FISH = 221 AVERAGE NUMBER OF FISH = 11.1 (ESTIMATE)
 PERCENT OF TOTAL NUMBER OF STATIONS = 79.49 NUMBER OF STATIONS WITH A " " = 11
 # STATIONS/SD: SD-11= 0 SD-14,16= 0 SD-15,17,19= 0 SD-23-33= 0 SD-40= 0 SD-45,46= 19 SD-50= 0 SD-55,56= 0
 SD-61= 12 SD-66= 0 SD-72= 0 SD-75= 0 SD-76= 0 SD-77= 0 SD-78= 0 SD-80= 0
 SD-83= 0 SD-86= 0 SD-88= 0 SD-89= 0 SD-94= 0 SD-98= 0 SD-99= 0 SD-36= 0

TOTAL NUMBER OF SPECIES OCCURRENCES 31

FIGURE 6. Sample listing for a species using the Cobol program (listing method B, Figure 3, used here).

A86006

NUMBER OF STATIONS PERCENT OF TOTAL STATIONS

DATE RUN 11/09/83

STATION	SPECIES	NUMBER OF STATIONS	PERCENT OF TOTAL STATIONS
I21	BROWN TROUT	1	2.56
KO1	CENTRAL MUDMINNOW	4	10.26
MO5	STONEROLLERS	13	33.33
MO6	CENTRAL STONEROLLER	19	48.72
MO7	LARGESCALE STONEROLLER	4	10.26
M12	COMMON CARP	5	12.82
M14	BRASSY MINNOW	5	12.82
M19	HORNYHEAD CHUB	21	53.85
M23	EMERALD SHINER	1	2.56
M28	COMMON SHINER	28	71.79
M29	BIGMOUTH SHINER	5	12.82
M35	ROSYFACE SHINER	17	43.59
M36	SPOTFIN SHINER	16	41.03
M37	SAND SHINER	14	35.90
M41	SUCKERMOUTH MINNOW	8	20.51
M43	SOUTHERN REDBELLY DACE	18	46.15
M45	BLUNTNOSE MINNOW	29	74.36
M46	FATHEAD MINNOW	6	15.38
M48	BLACKNOSE DACE	2	5.13
M50	CREEK CHUB	27	69.23
M76	COMMON SHINER X ROSYFACE SHINER	1	2.56
NO2	SUCKERS	1	2.56
NO4	REDHORSES	1	2.56
NO6	QUILLBACK	1	2.56
NO9	WHITE SUCKER	29	74.36
N13	NORTHERN HOG SUCKER	10	25.64
N15	BIGMOUTH BUFFALO	3	7.69
N18	SILVER REDHORSE	9	23.08
N21	GOLDEN REDHORSE	8	20.51
N22	SHORTHEAD REDHORSE	13	33.33
O08	CHANNEL CATFISH	1	2.56
O10	STONECAT	5	12.82
SO2	BLACKSTRIPE TOPMINNOW	1	2.56
UO1	BROOK STICKLEBACK	12	30.77
WO4	ROCK BASS	5	12.82
WO5	GREEN SUNFISH	6	15.38
WO8	ORANGESPOTTED SUNFISH	5	12.82
WO9	BLUEGILL	10	25.64
W11	SMALLMOUTH BASS	14	35.90
W12	LARGEMOUTH BASS	6	15.38
XO7	RAINBOW DARTER	2	5.13
X10	FANTAIL DARTER	13	33.33
X12	JOHNNY DARTER	31	79.49
X14	BANDED DARTER	5	12.82
X15	YELLOW PERCH	3	7.69
X18	BLACKSIDE DARTER	7	17.95
X19	SLENDERHEAD DARTER	4	10.26
X22	WALLEYE	1	2.56
ZO1	MOTTLED SCULPIN	7	17.95

TOTAL NUMBER OF SPECIES OCCURRENCES 441

# STATIONS/SD:	SD-11=	SD-14,16=	SD-15,17,19=	SD-23-33=	SD-40=	SD-45,46=	SD-50=	SD-55,56=
	0	0	0	0	0	283	0	0
	SD-61= 158	SD-66= 0	SD-72= 0	SD-75= 0	SD-76= 0	SD-77= 0	SD-78= 0	SD-80= 0
	SD-83= 0	SD-86= 0	SD-88= 0	SD-89= 0	SD-94= 0	SD-98= 0	SD-99= 0	SD-36= 0

TOTAL NUMBER OF SPECIES OCCURRENCES 441

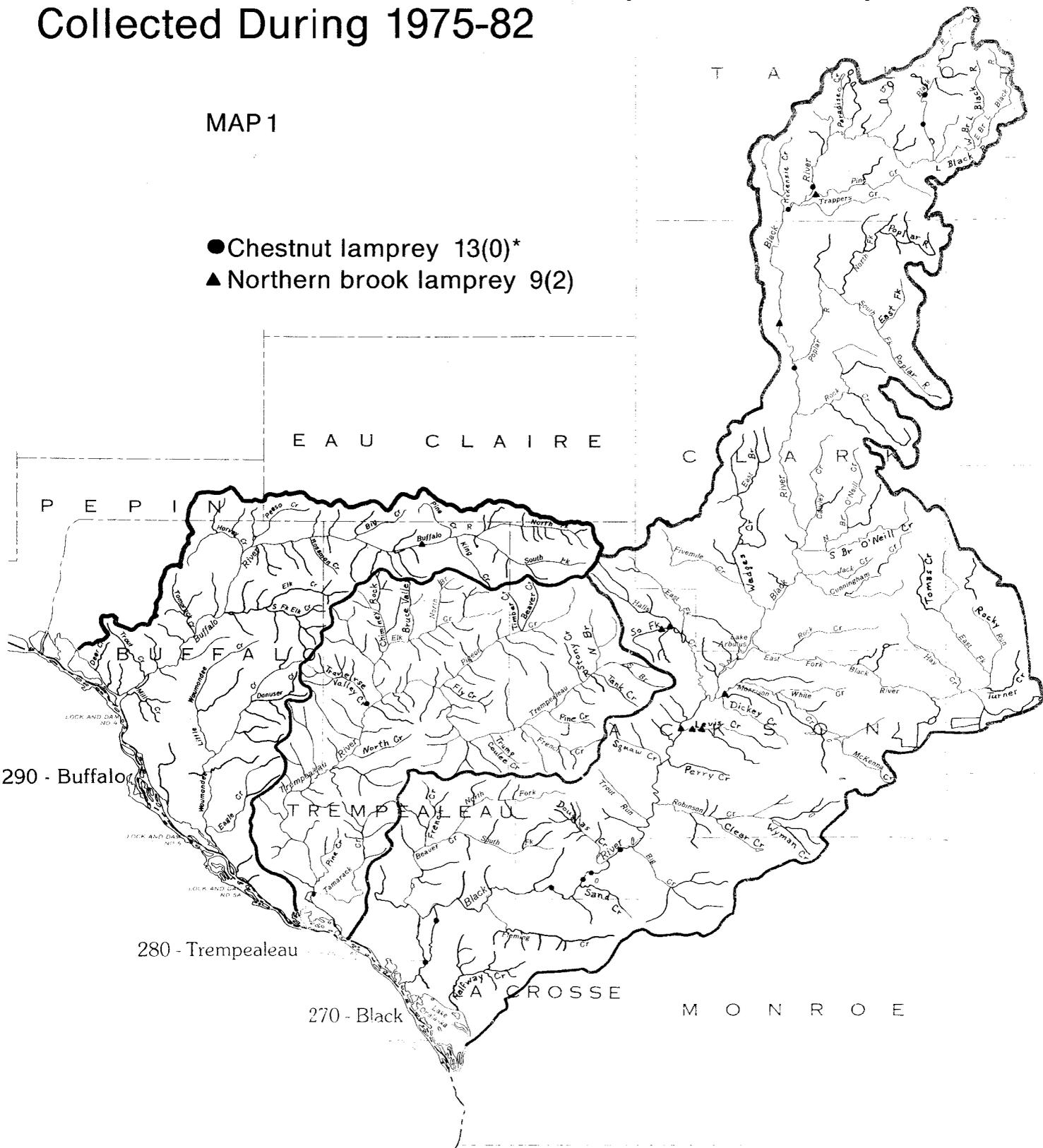
TOTAL NUMBER OF STATIONS	
(WITH MILE RULE)	39
(WITHOUT MILE RULE)	42
TOTAL NUMBER OF SPECIES	45
TOTAL NUMBER OF HYBRIDS	1

FIGURE 7. Sample summary report for species listing shown in Figure 6.

APPENDIX B. Distribution Maps For All Species Collected During 1975-82

MAP 1

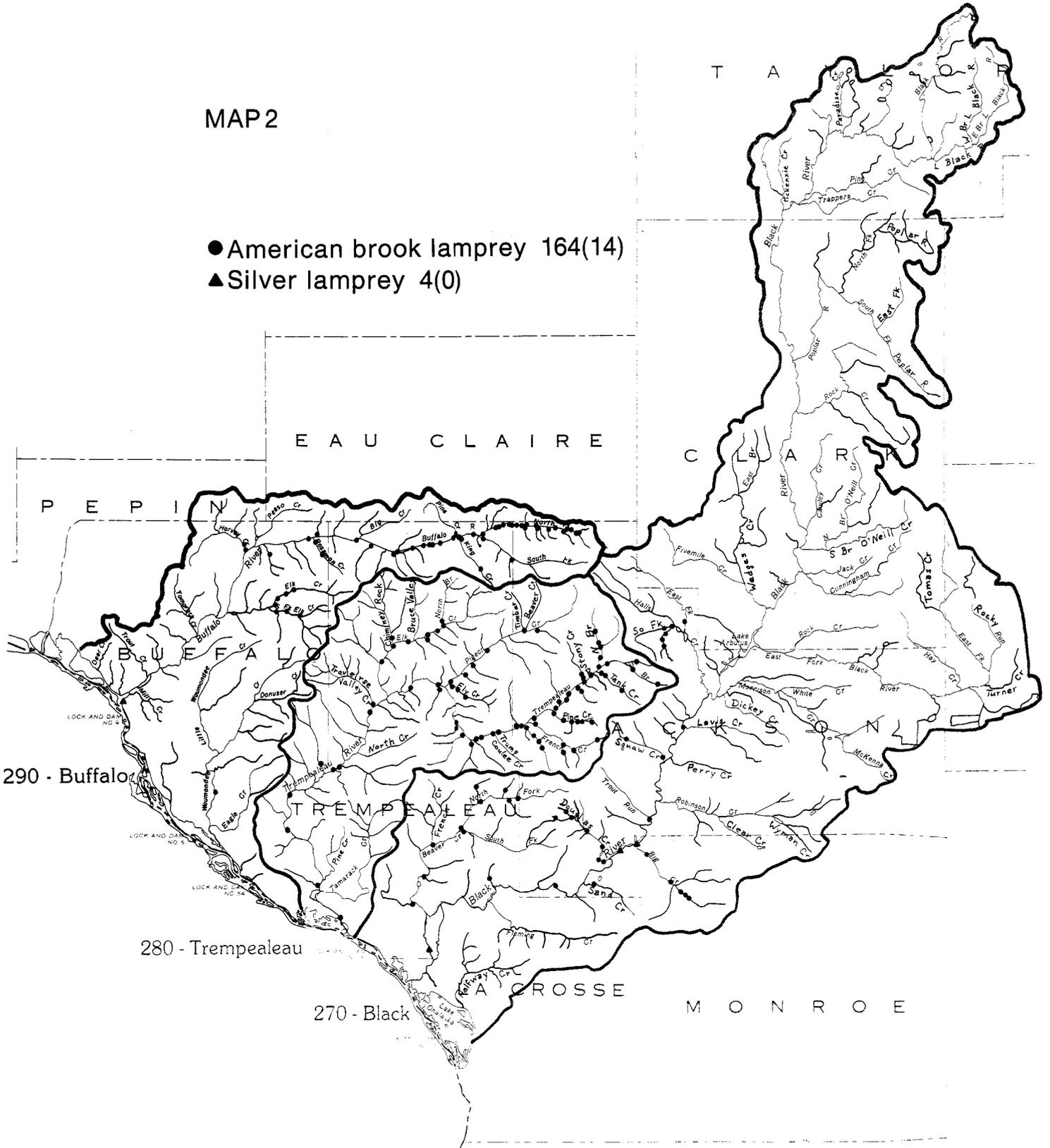
- Chestnut lamprey 13(0)*
- ▲ Northern brook lamprey 9(2)



* Number in parentheses is the number of locations not shown due to lack of space.

MAP 2

- American brook lamprey 164(14)
- ▲ Silver lamprey 4(0)



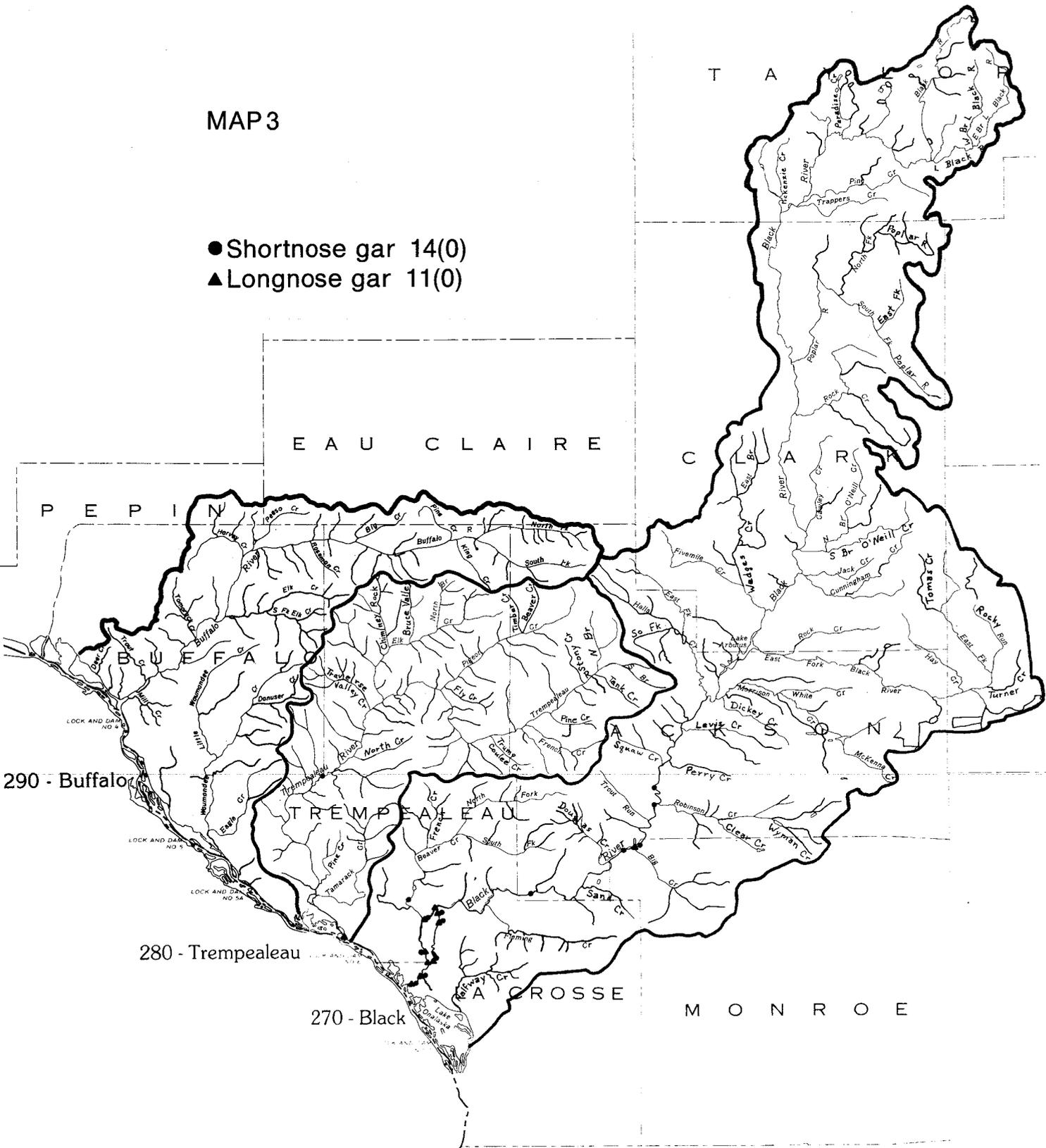
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 3

- Shortnose gar 14(0)
- ▲ Longnose gar 11(0)



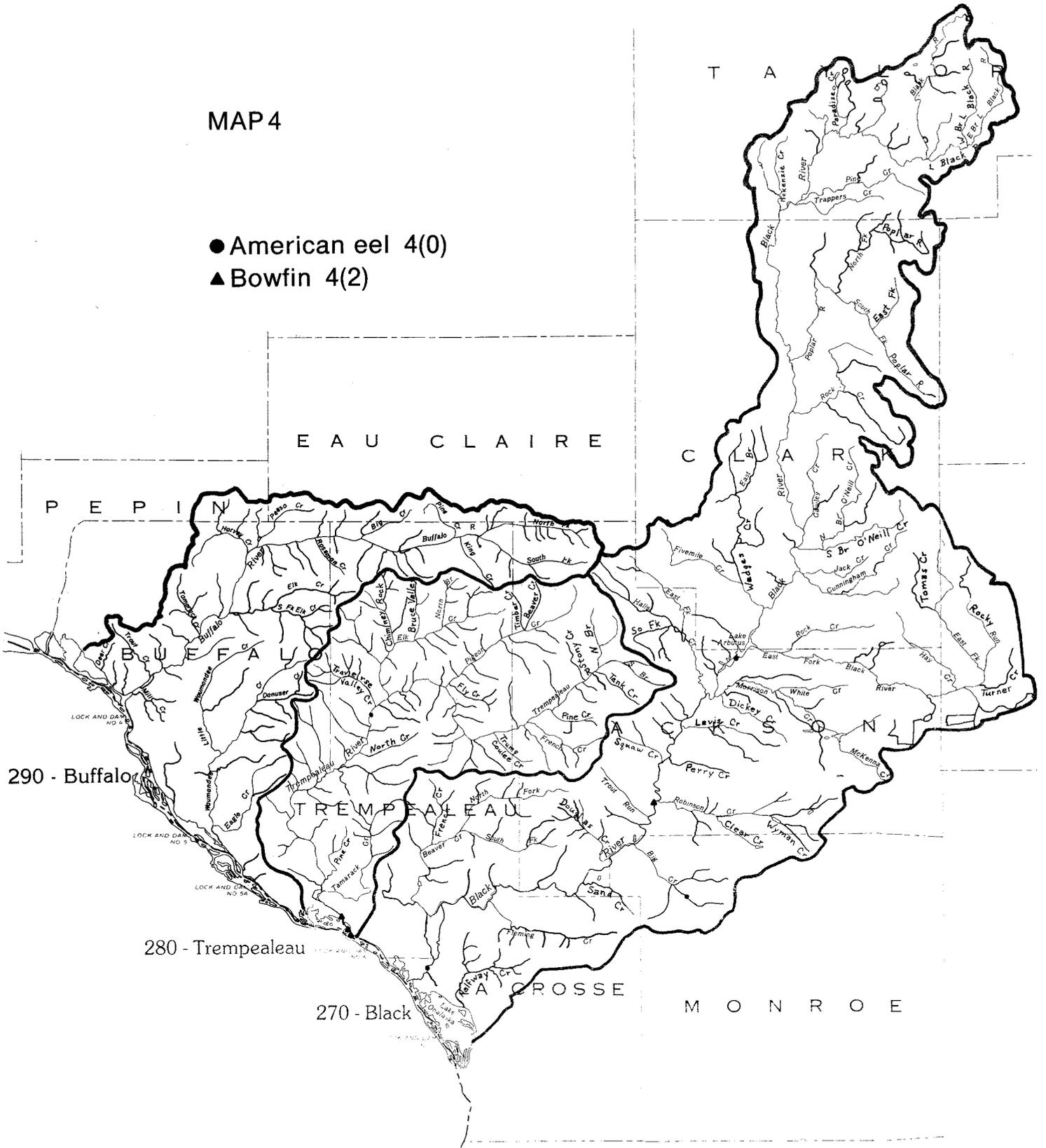
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 4

- American eel 4(0)
- ▲ Bowfin 4(2)



290 - Buffalo

280 - Trempealeau

270 - Black

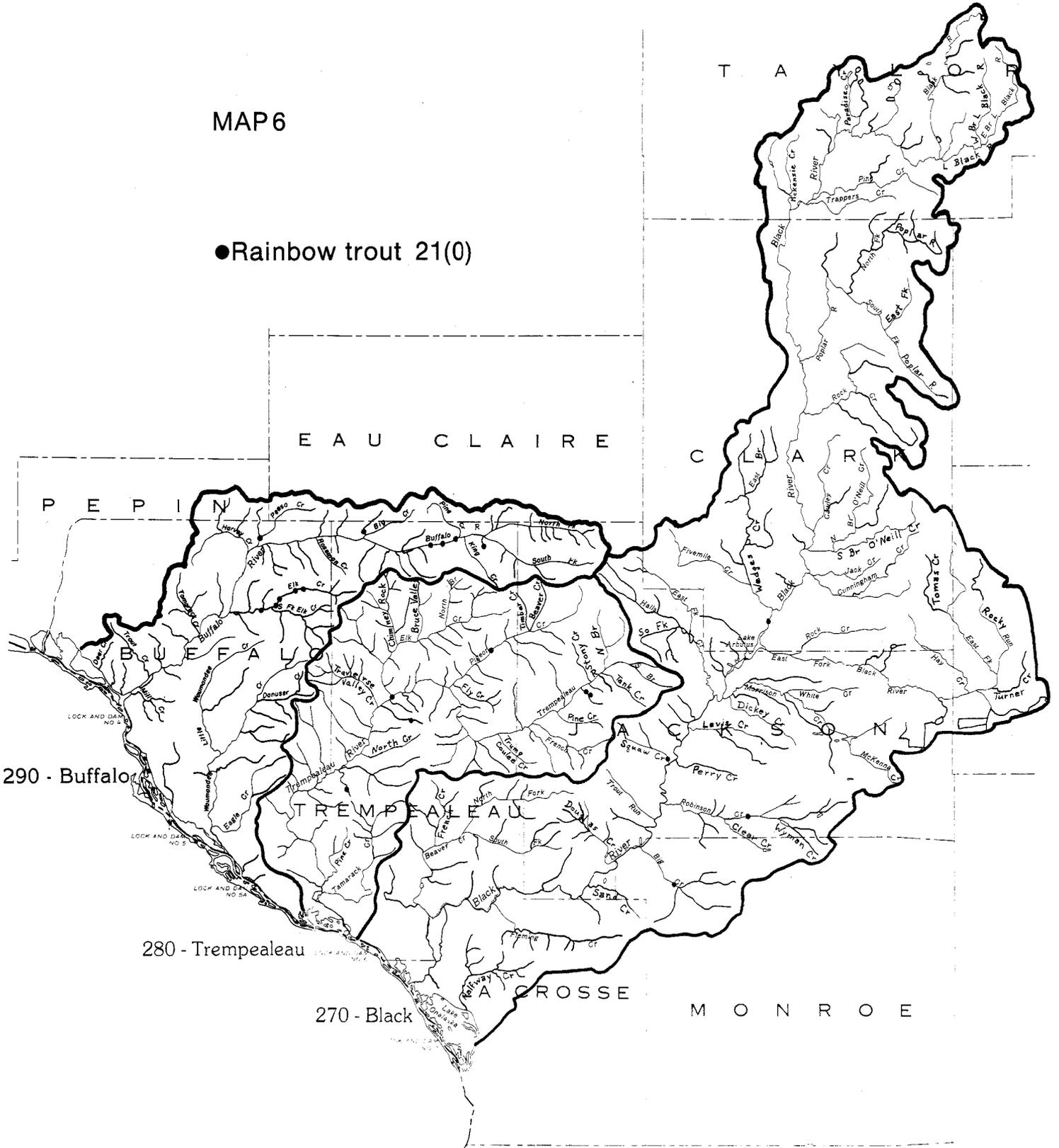
MAP 5

- Mooneye 19(1)
- ▲ Gizzard shad 13(2)



MAP 6

● Rainbow trout 21(0)



290 - Buffalo

280 - Trempealeau

270 - Black

MAP 8

● Brook trout 201(23)



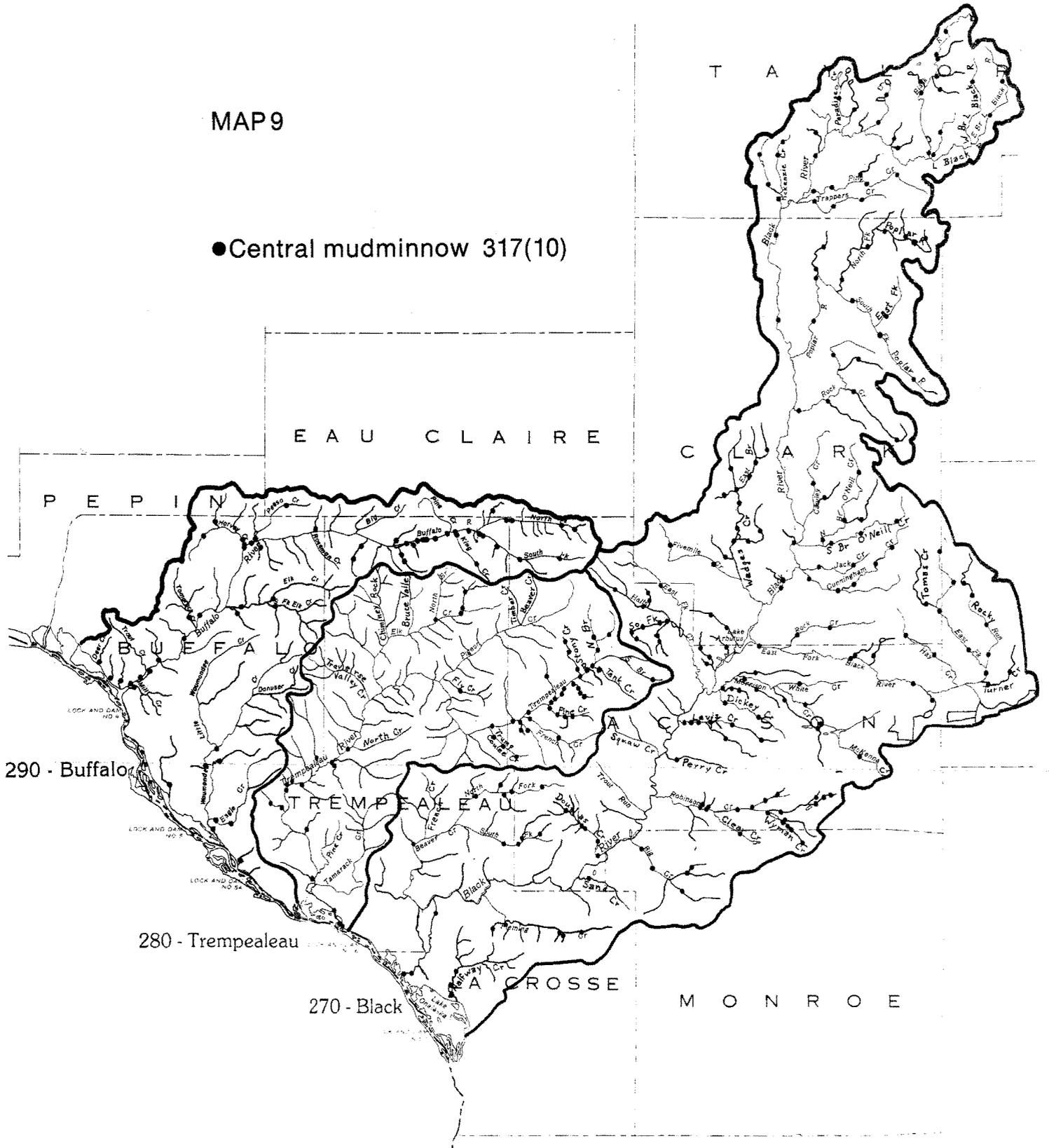
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 9

● Central mudminnow 317(10)



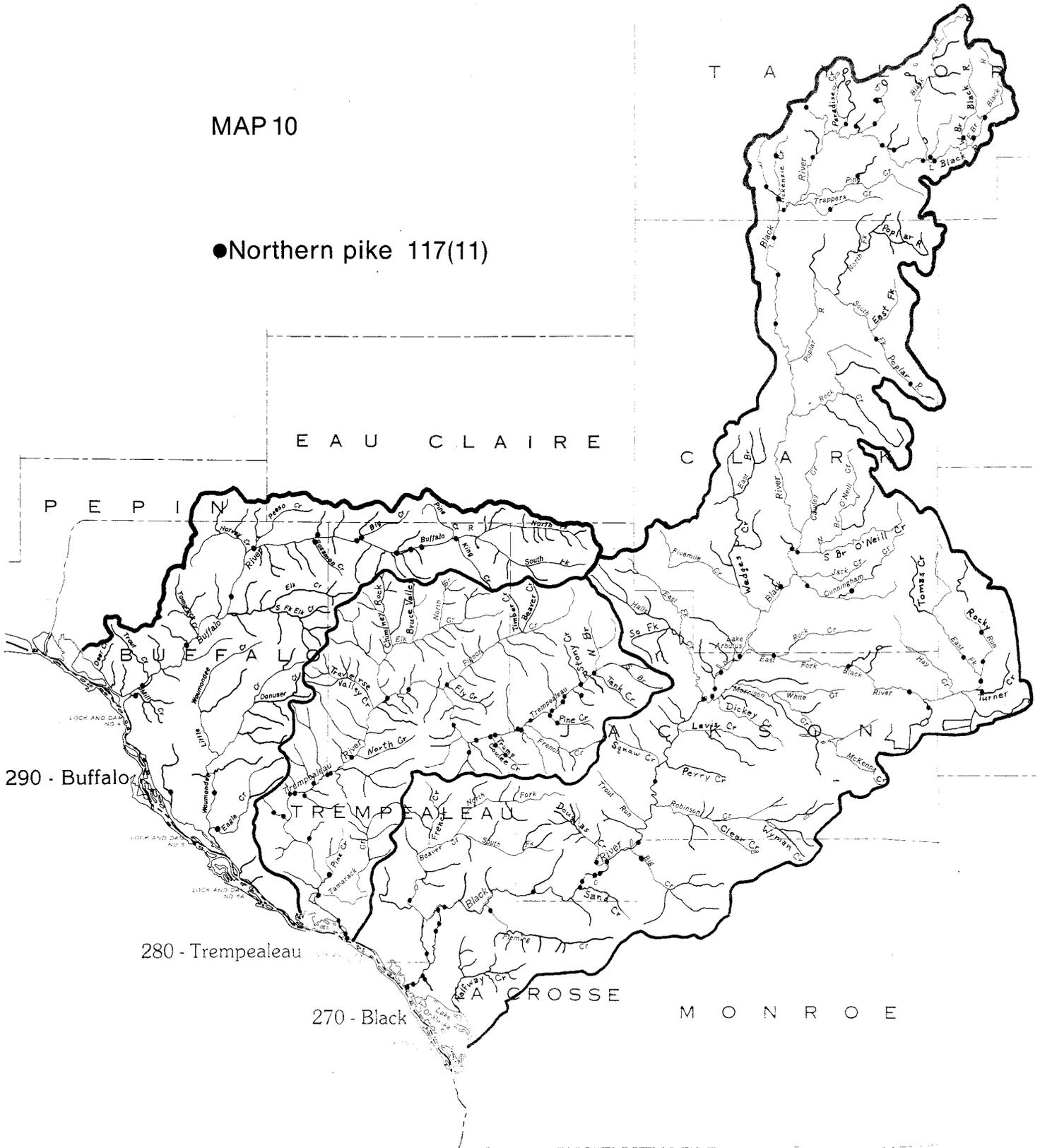
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 10

● Northern pike 117(11)



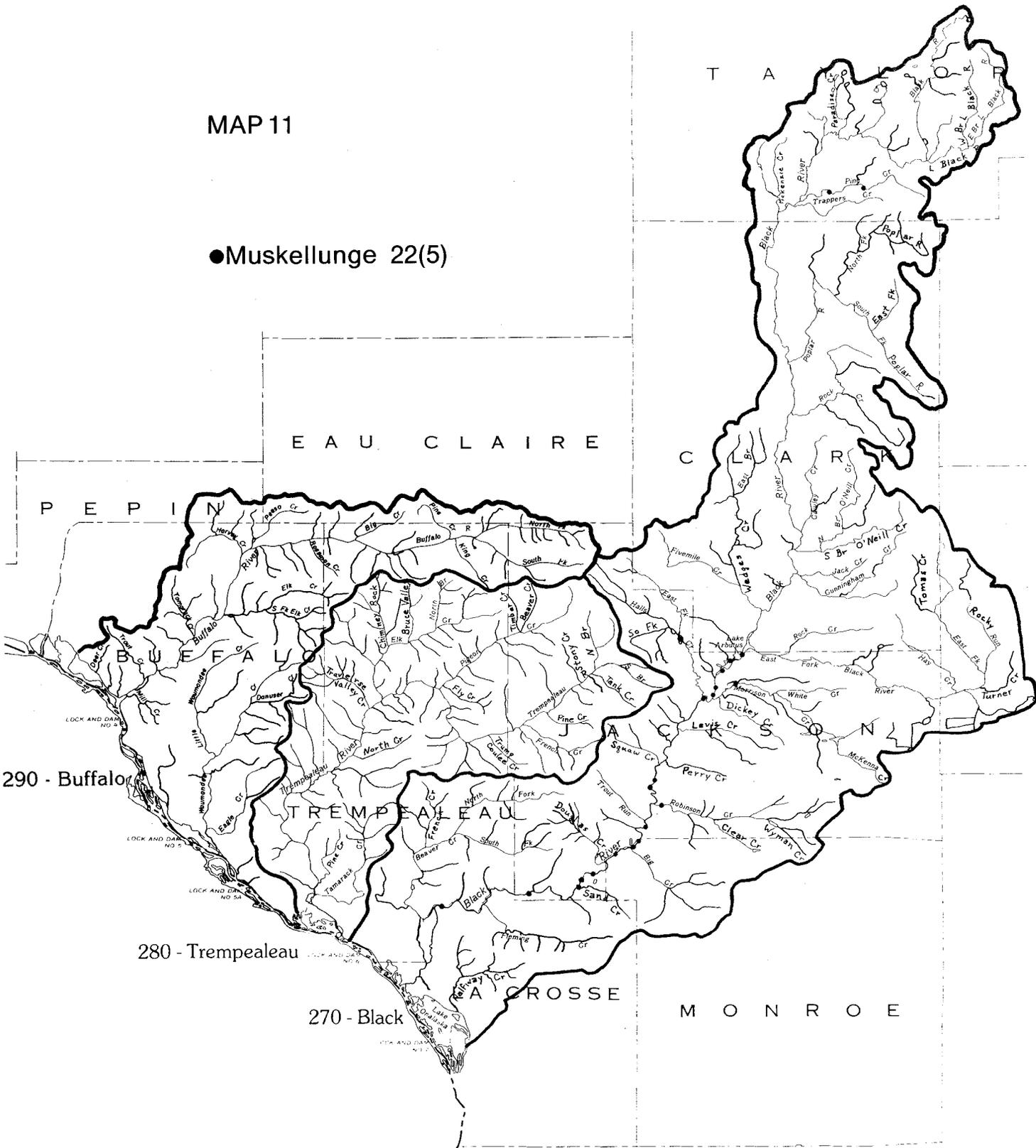
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 11

●Muskellunge 22(5)



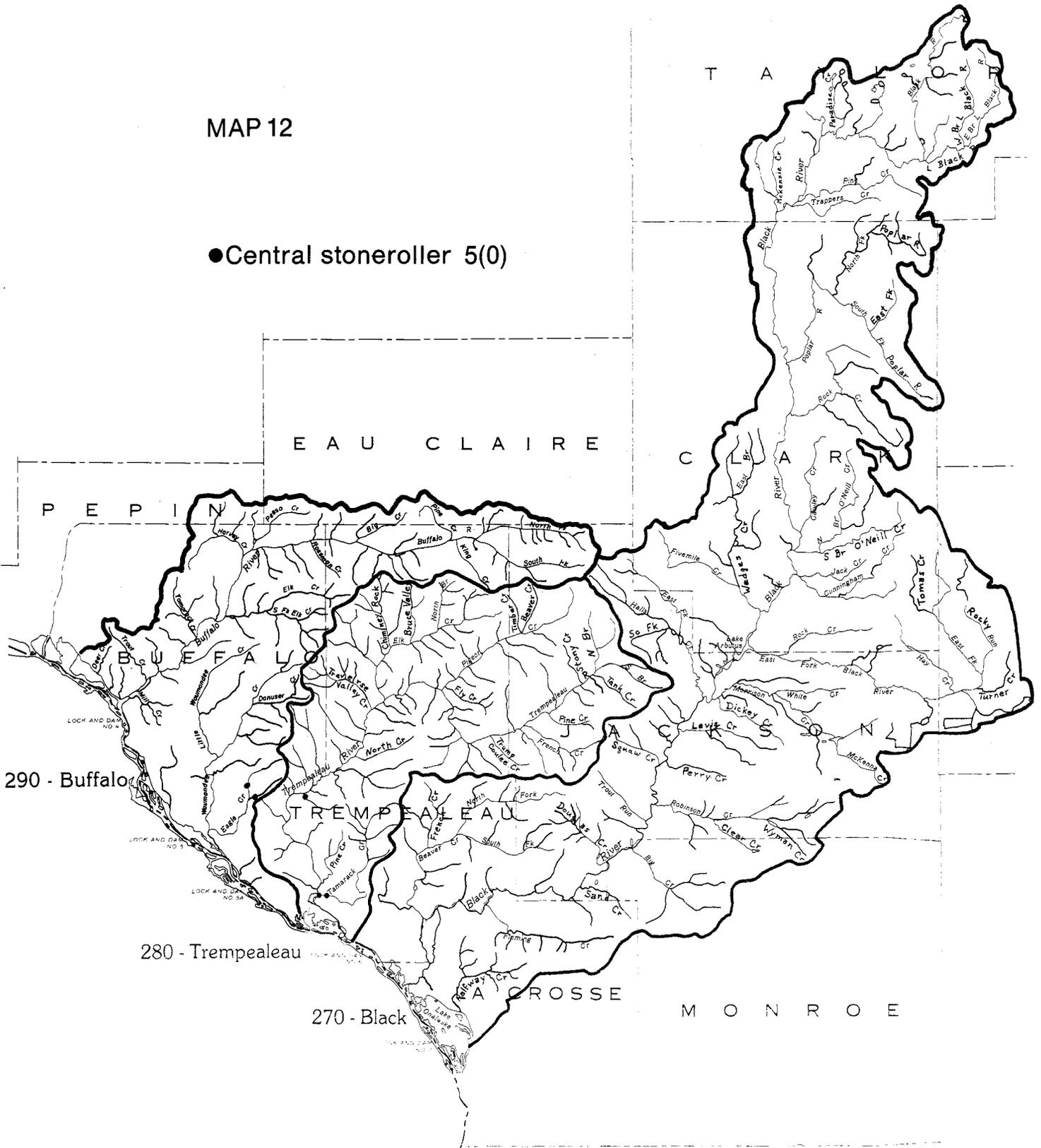
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 12

● Central stoneroller 5(0)



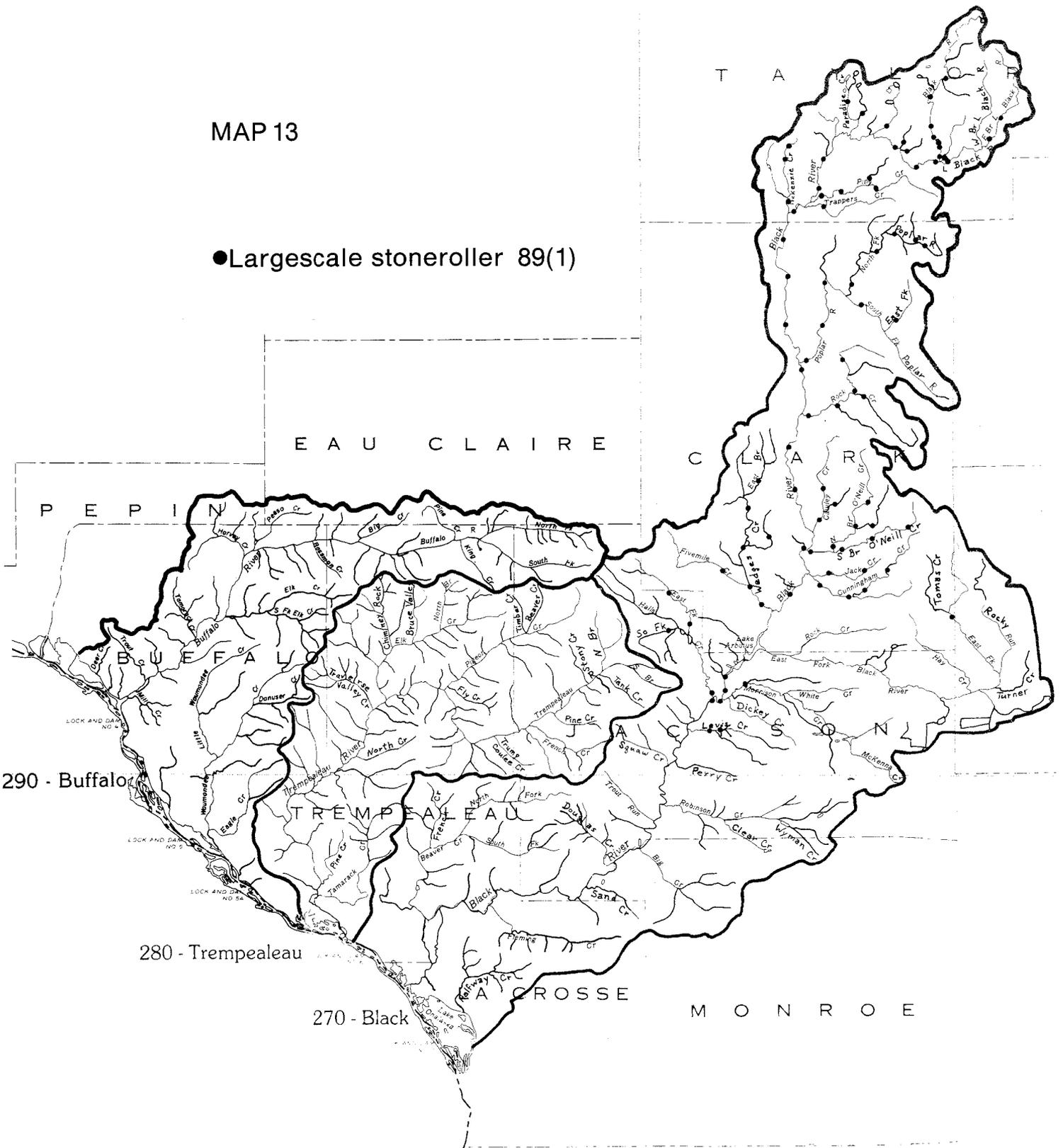
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 13

● Largescale stoneroller 89(1)



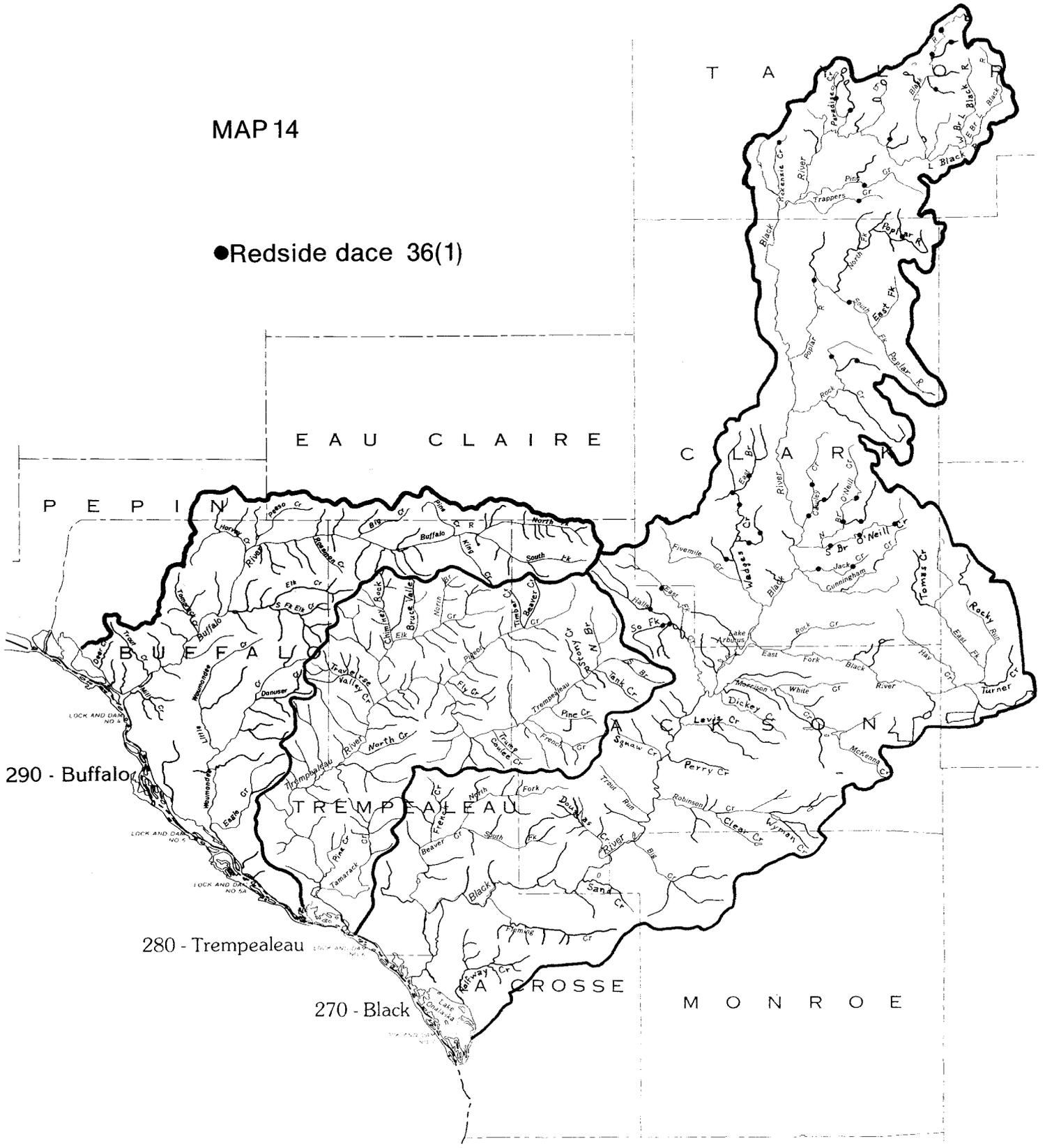
290 - Buffalo

280 - Trempealeau

270 - Black

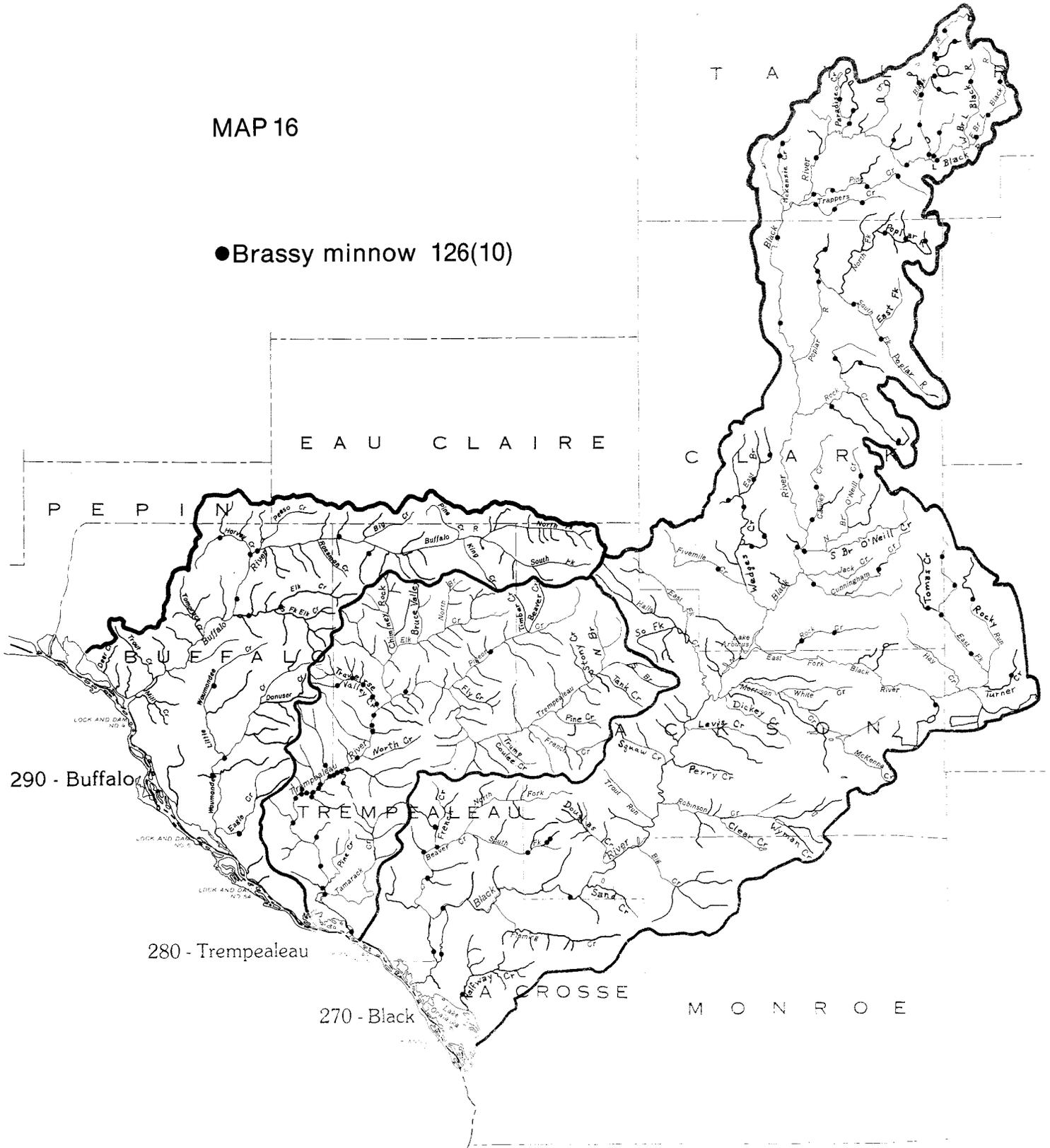
MAP 14

●Redside dace 36(1)



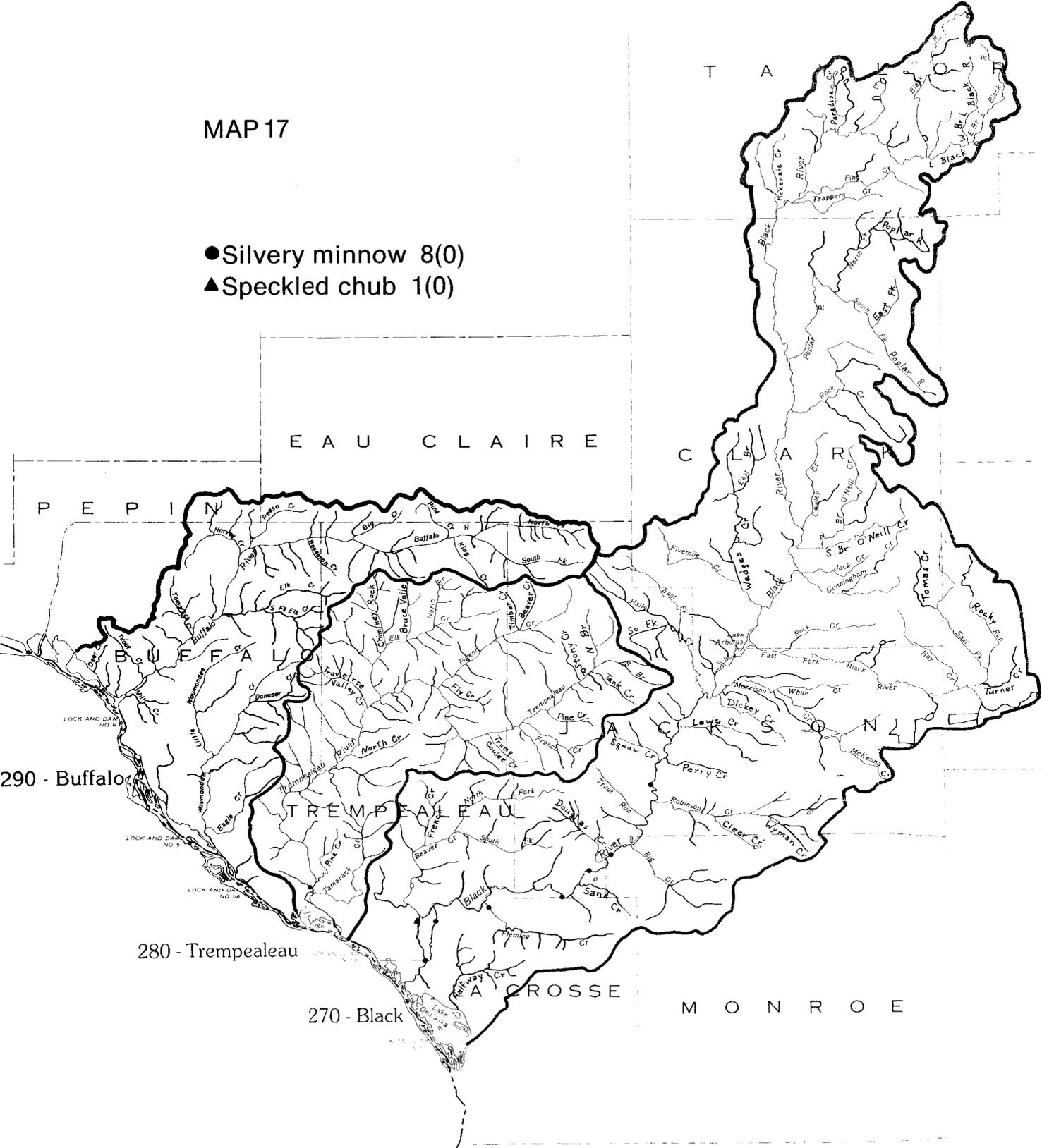
MAP 16

●Brassy minnow 126(10)



MAP 17

- Silvery minnow 8(0)
- ▲ Speckled chub 1(0)



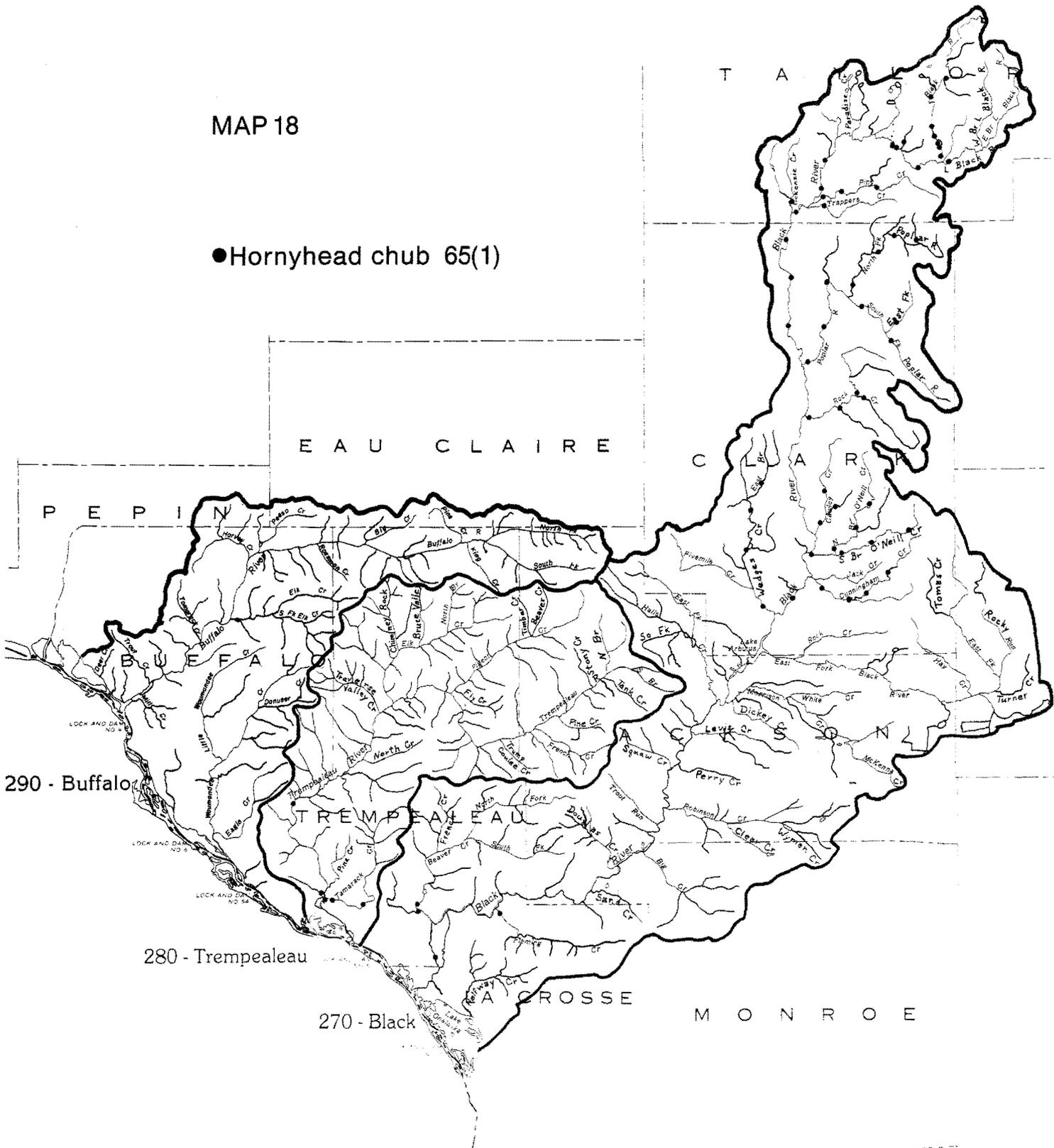
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 18

●Hornyhead chub 65(1)



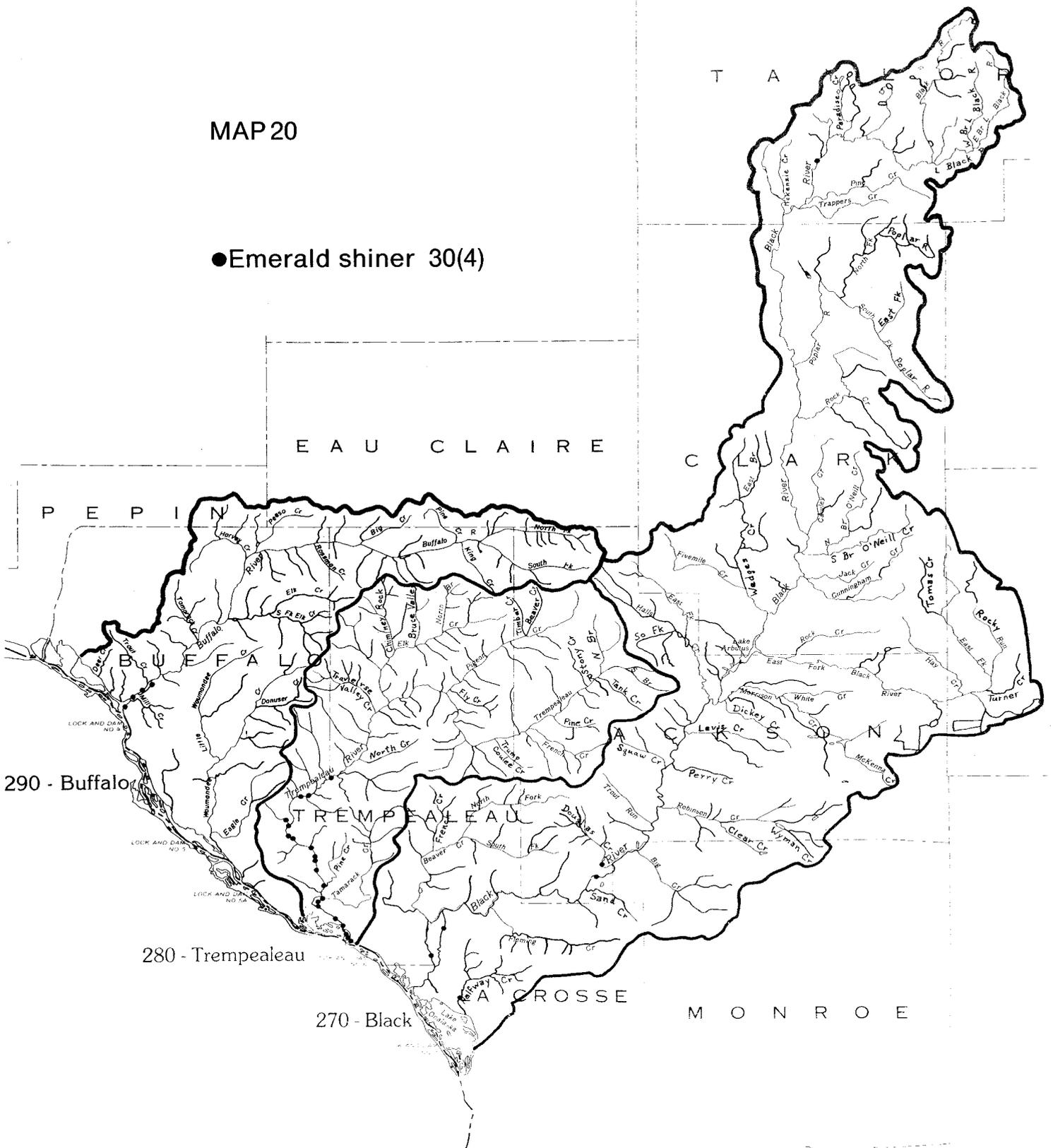
290 - Buffalo

280 - Trempealeau

270 - Black

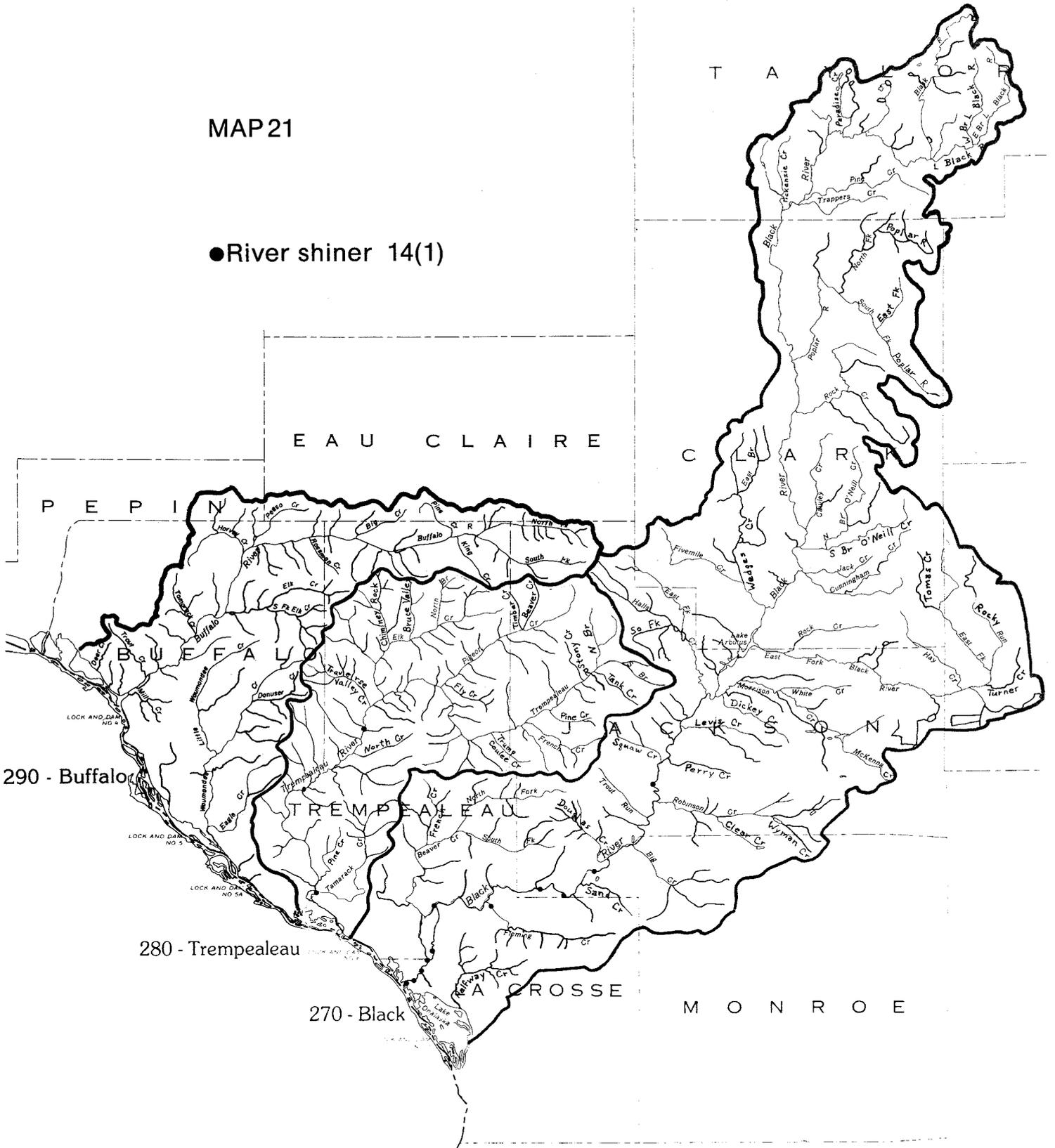
MAP 20

●Emerald shiner 30(4)



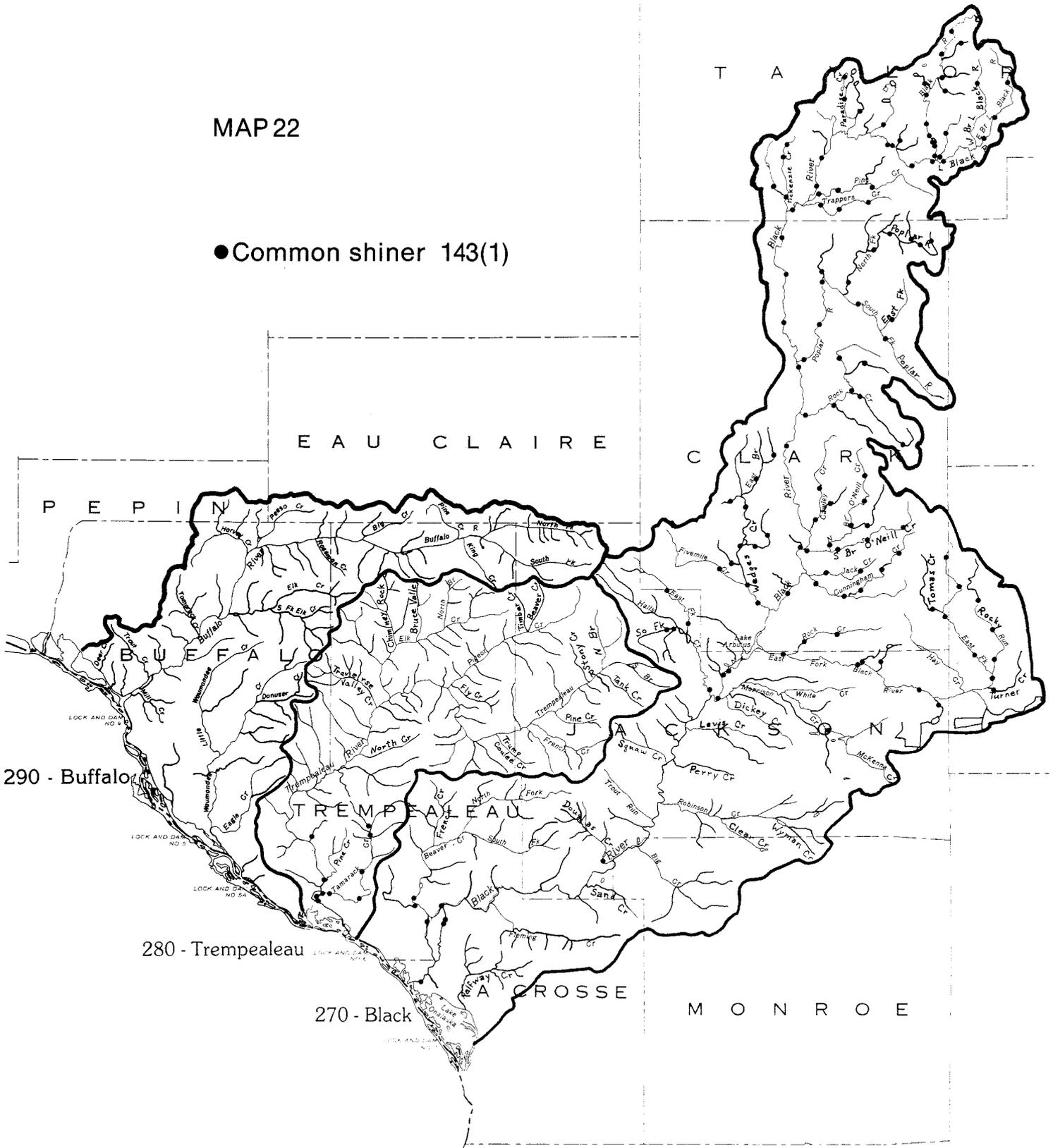
MAP 21

● River shiner 14(1)



MAP 22

● Common shiner 143(1)



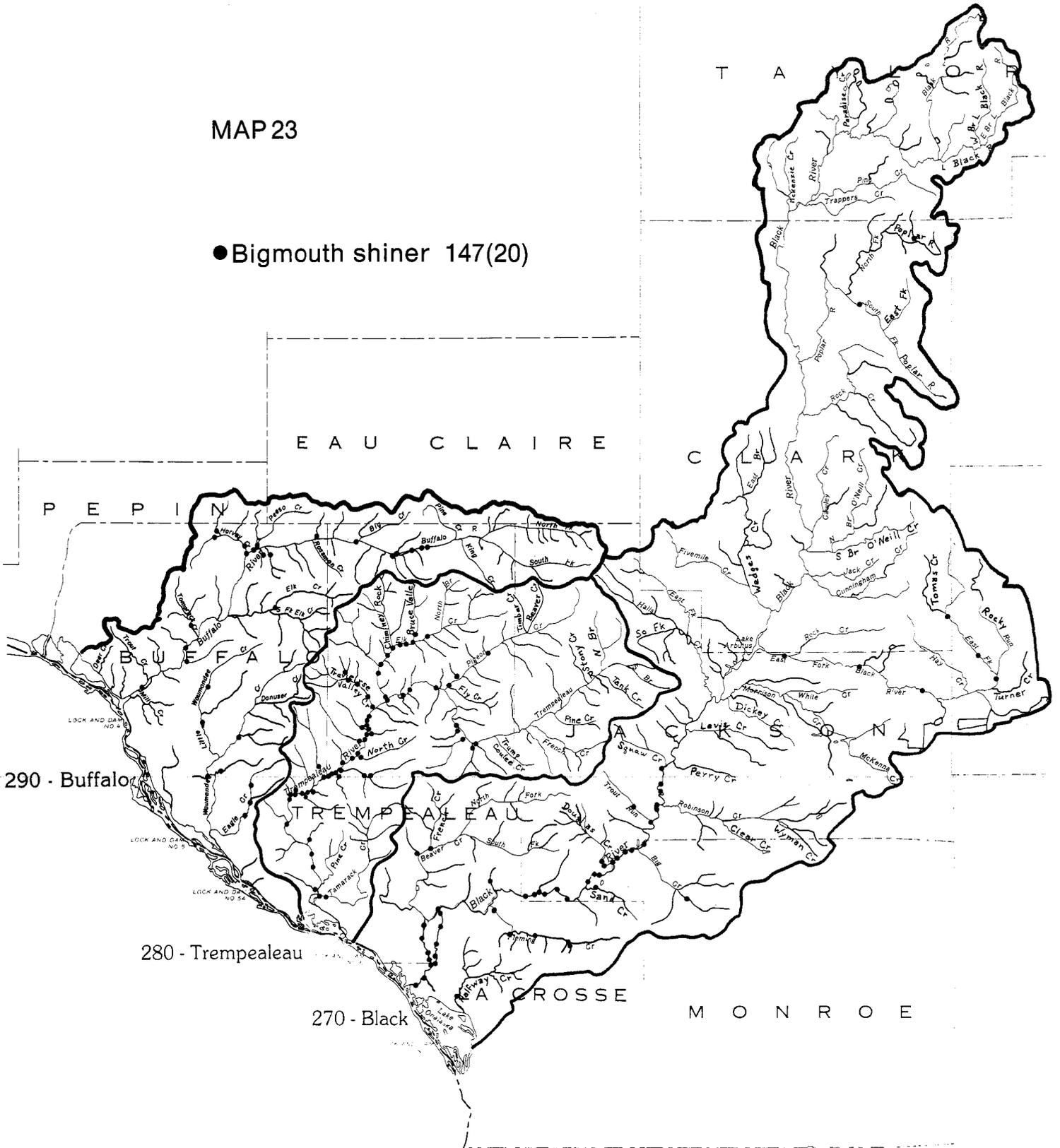
290 - Buffalo

280 - Trempealeau

270 - Black

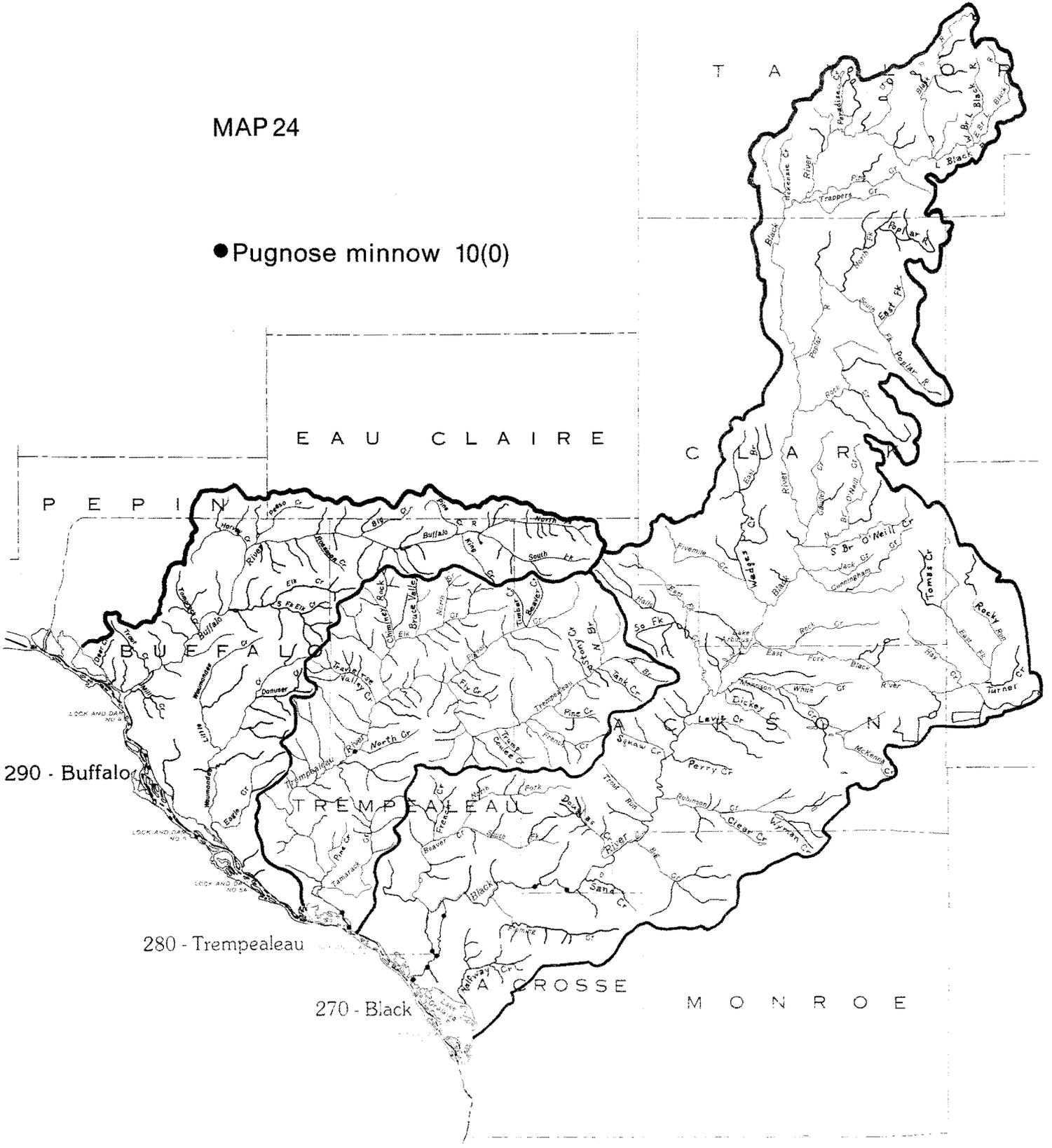
MAP 23

● Bigmouth shiner 147(20)



MAP 24

● Pugnose minnow 10(0)



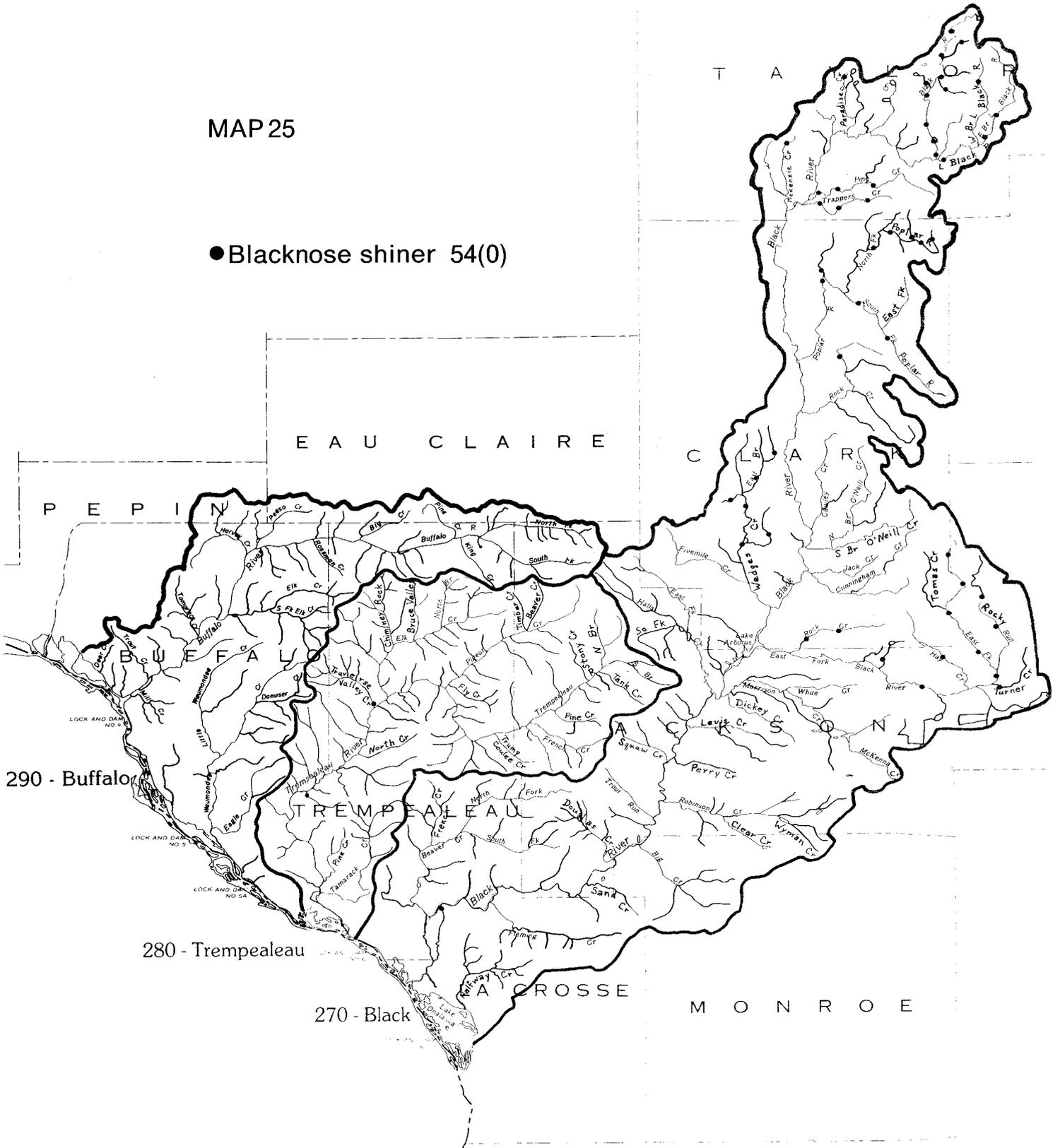
290 - Buffalo

280 - Trempealeau

270 - Black

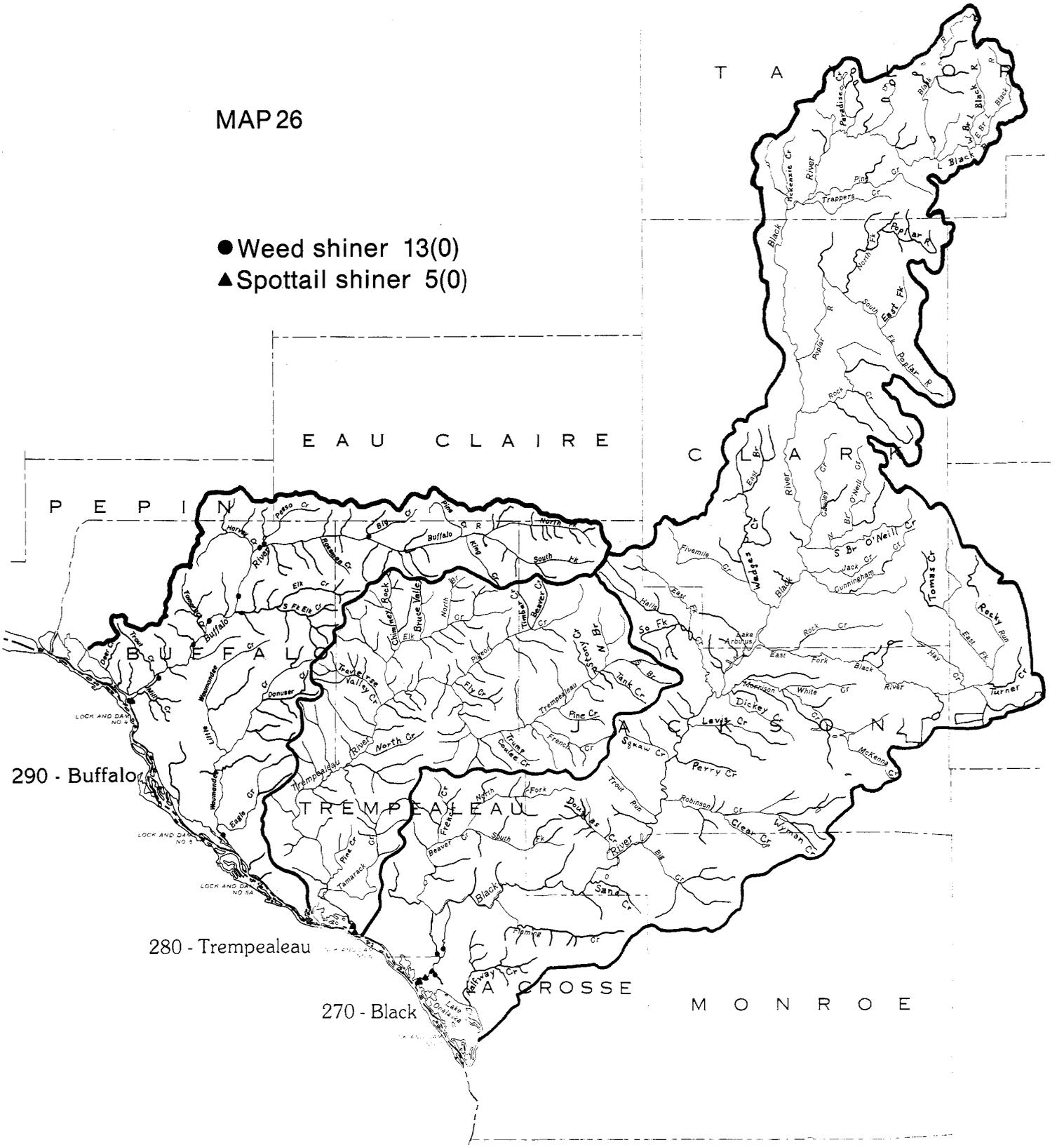
MAP 25

● Blacknose shiner 54(0)



MAP 26

- Weed shiner 13(0)
- ▲ Spottail shiner 5(0)



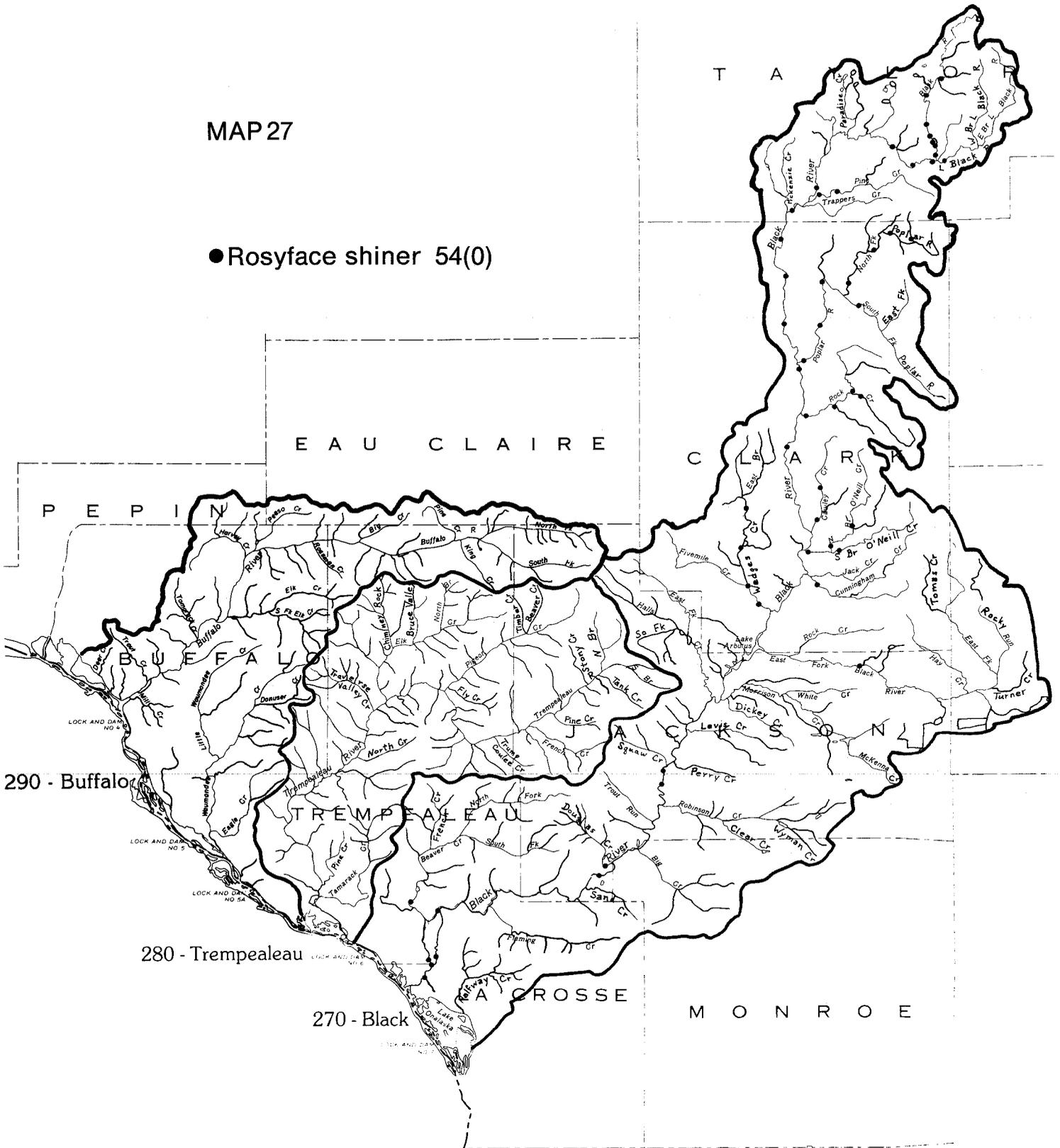
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 27

● Rosyface shiner 54(0)



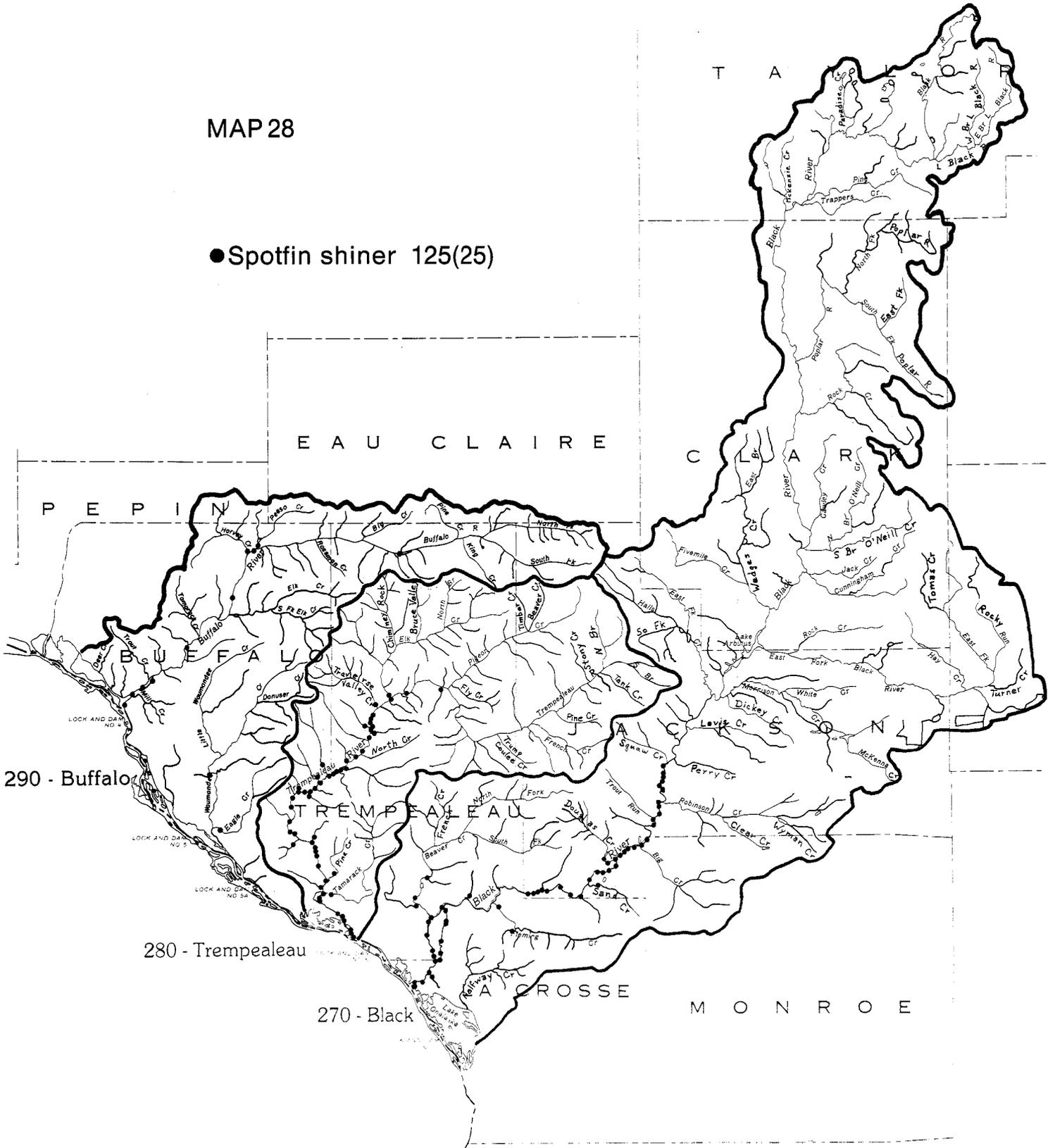
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 28

● Spottfin shiner 125(25)



290 - Buffalo

280 - Trempealeau

270 - Black

MAP 29

● Sand shiner 46(6)



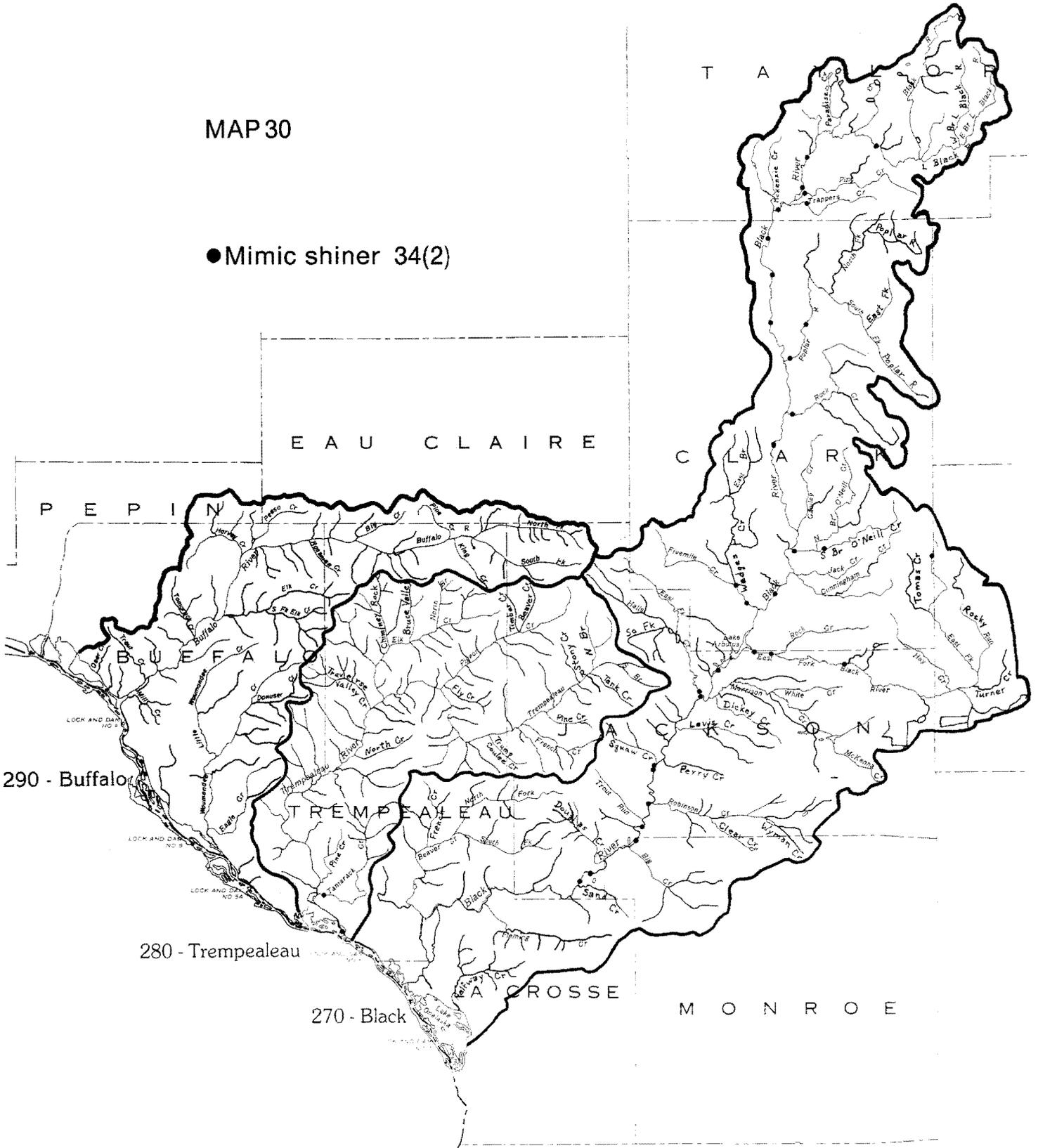
290 - Buffalo

280 - Trempealeau

270 - Black

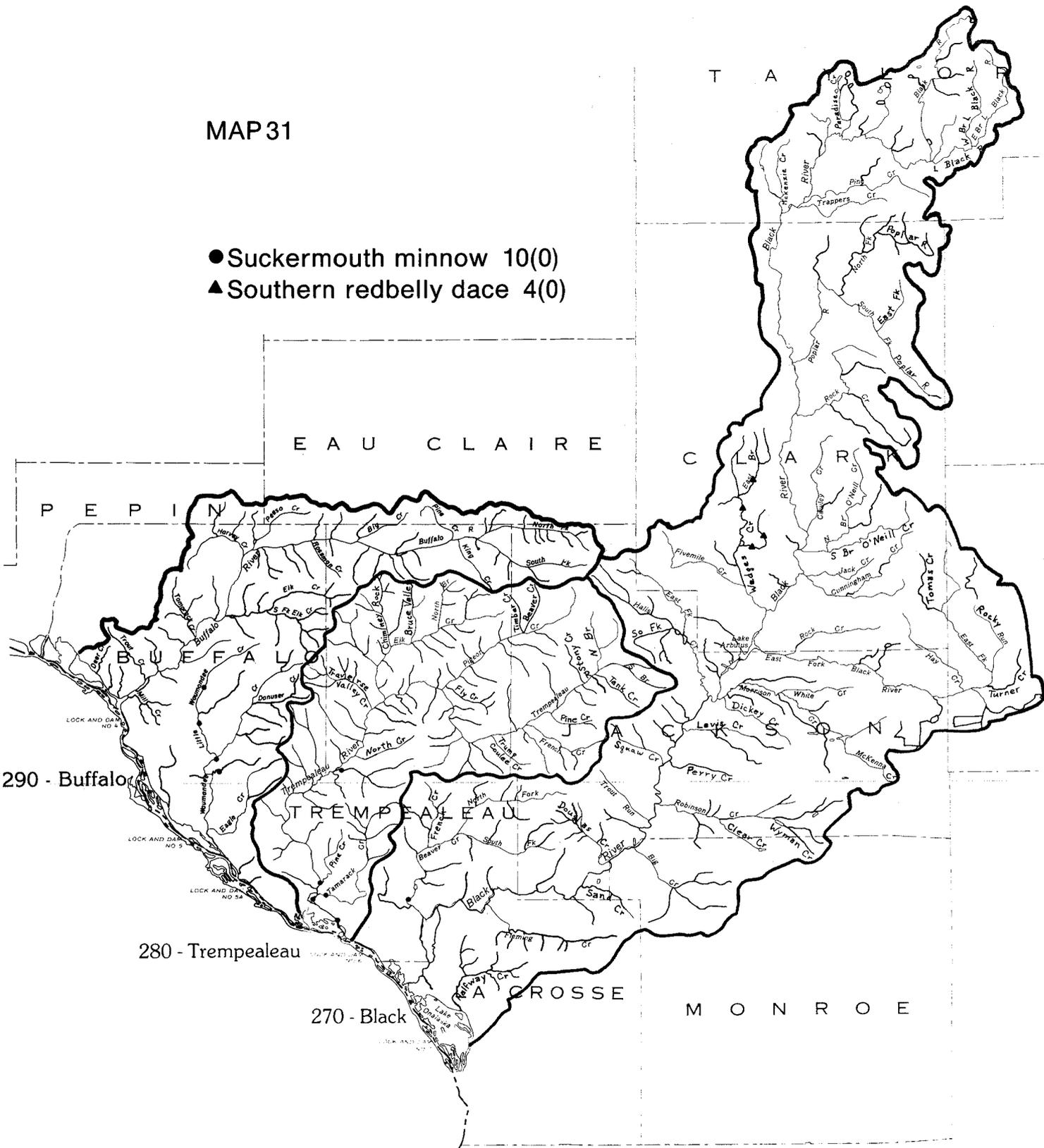
MAP 30

● Mimic shiner 34(2)



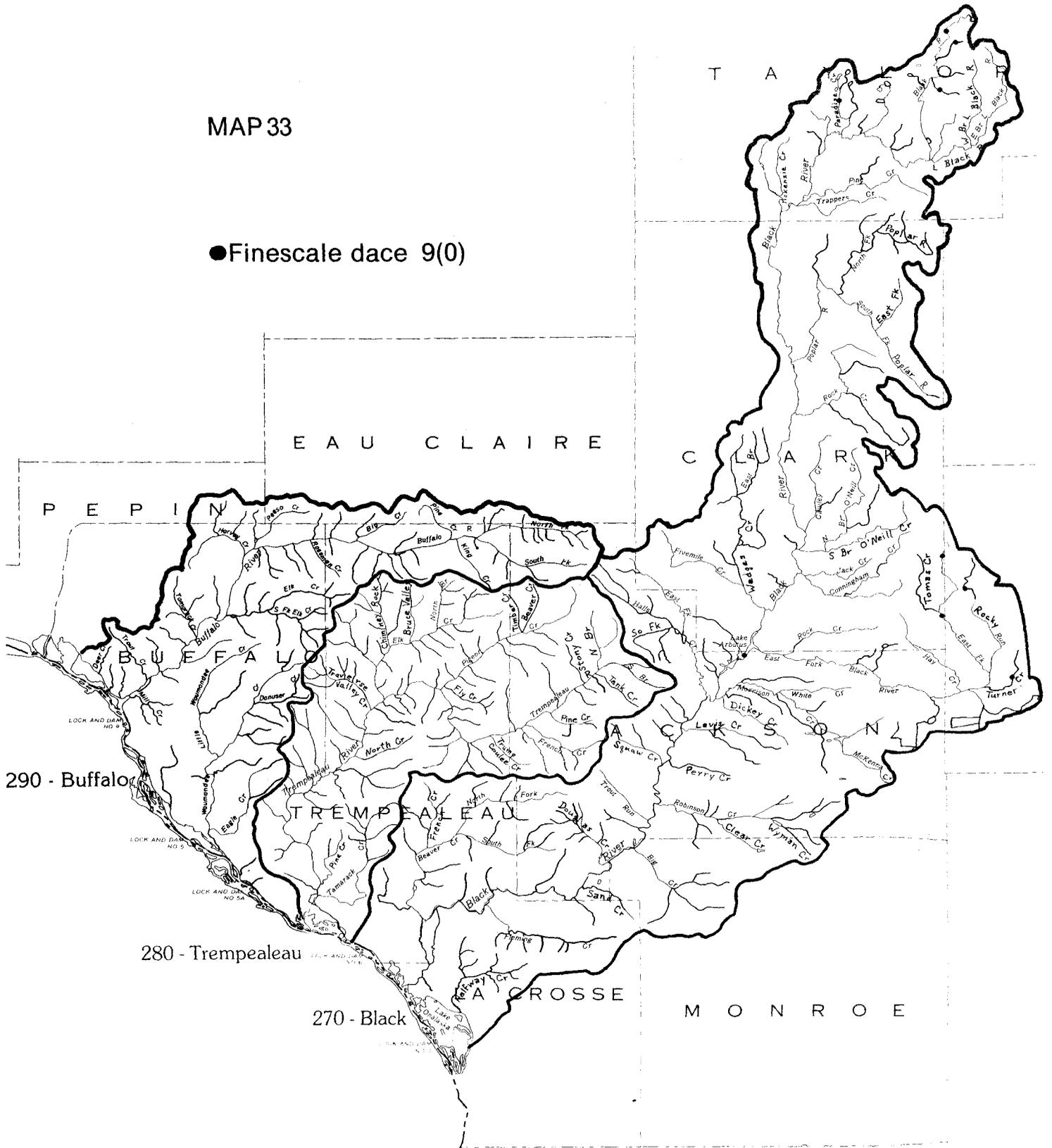
MAP 31

- Suckermouth minnow 10(0)
- ▲ Southern redbelly dace 4(0)



MAP 33

● Finescale dace 9(0)



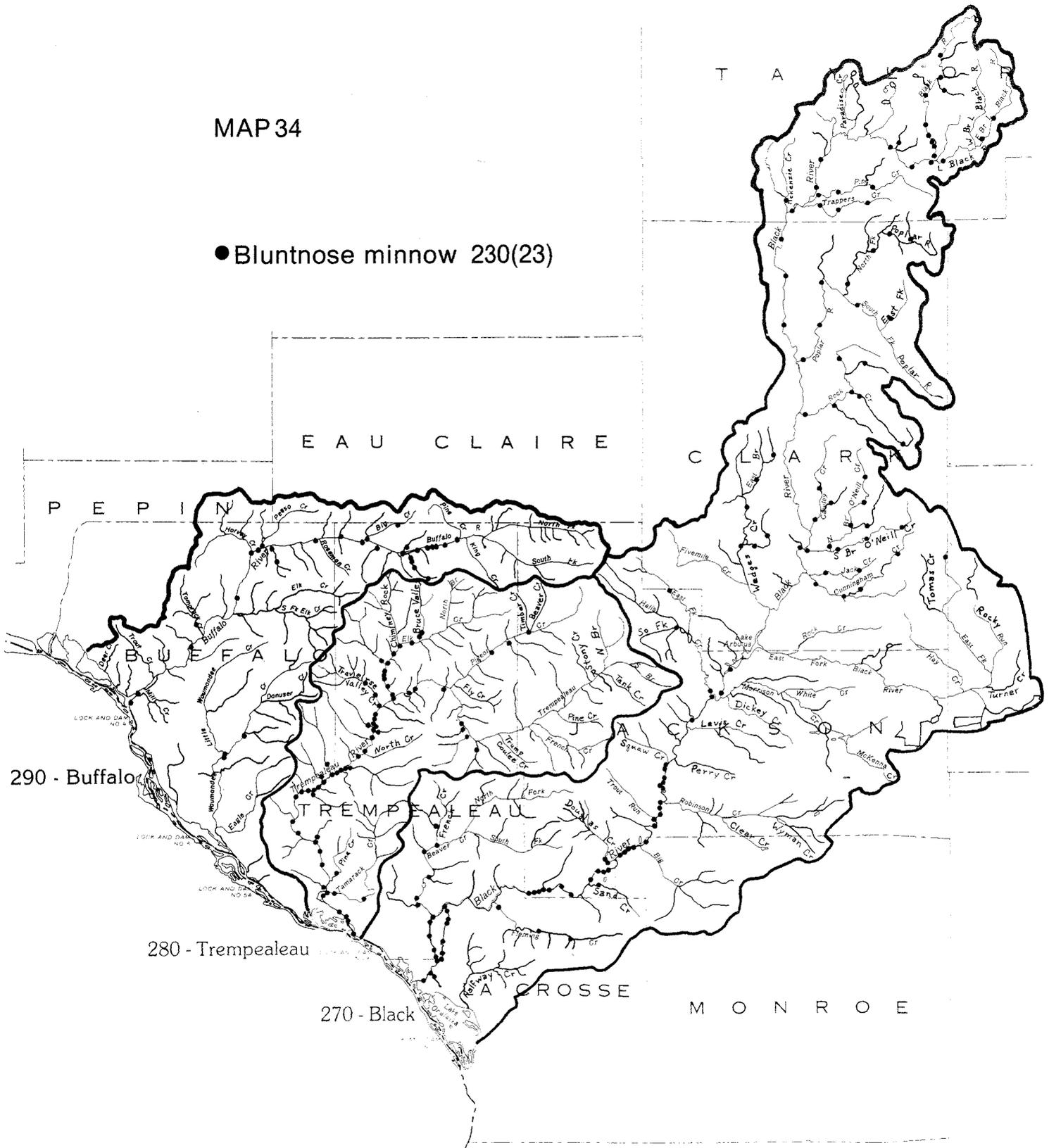
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 34

● Bluntnose minnow 230(23)



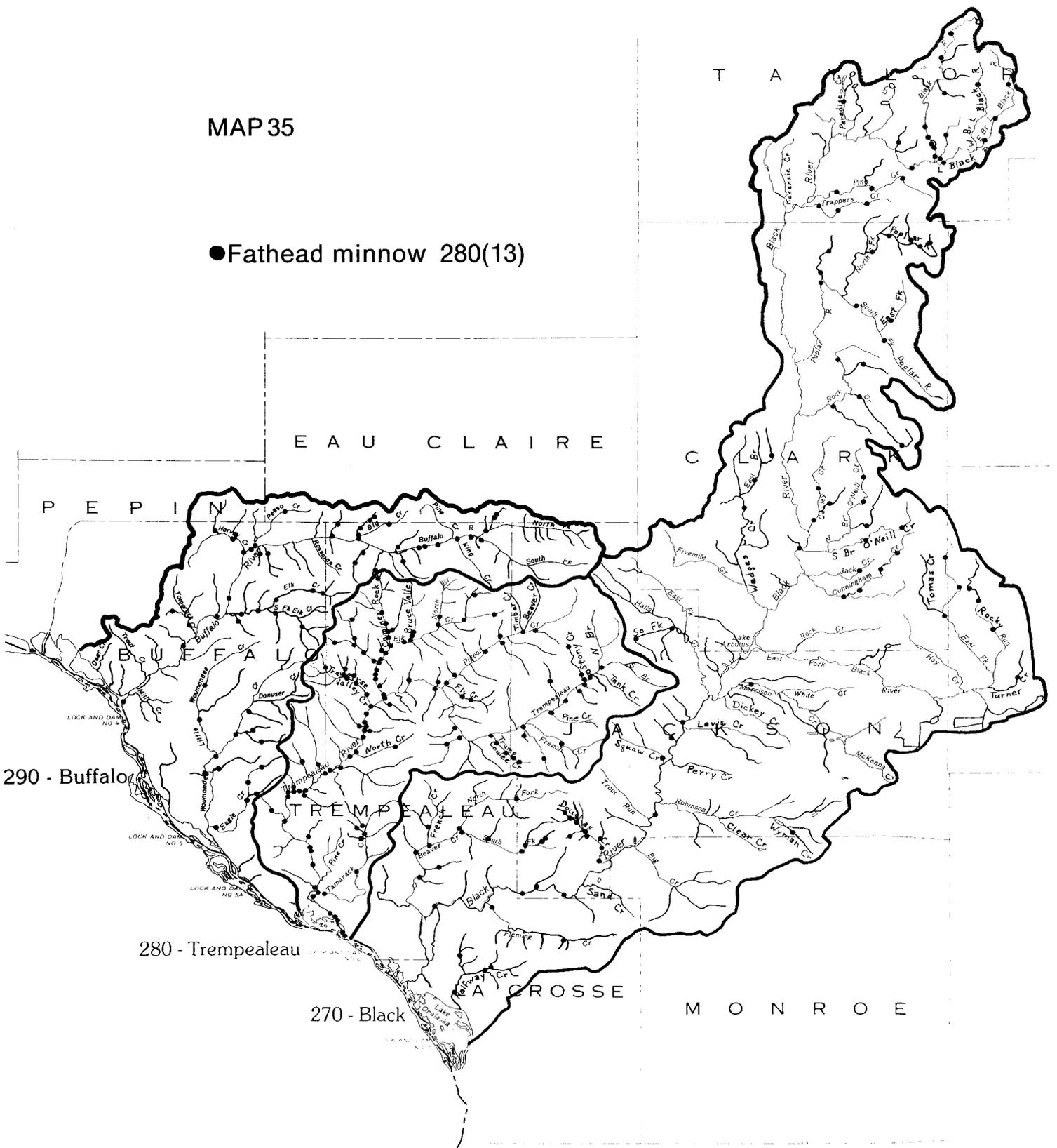
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 35

● Fathead minnow 280(13)



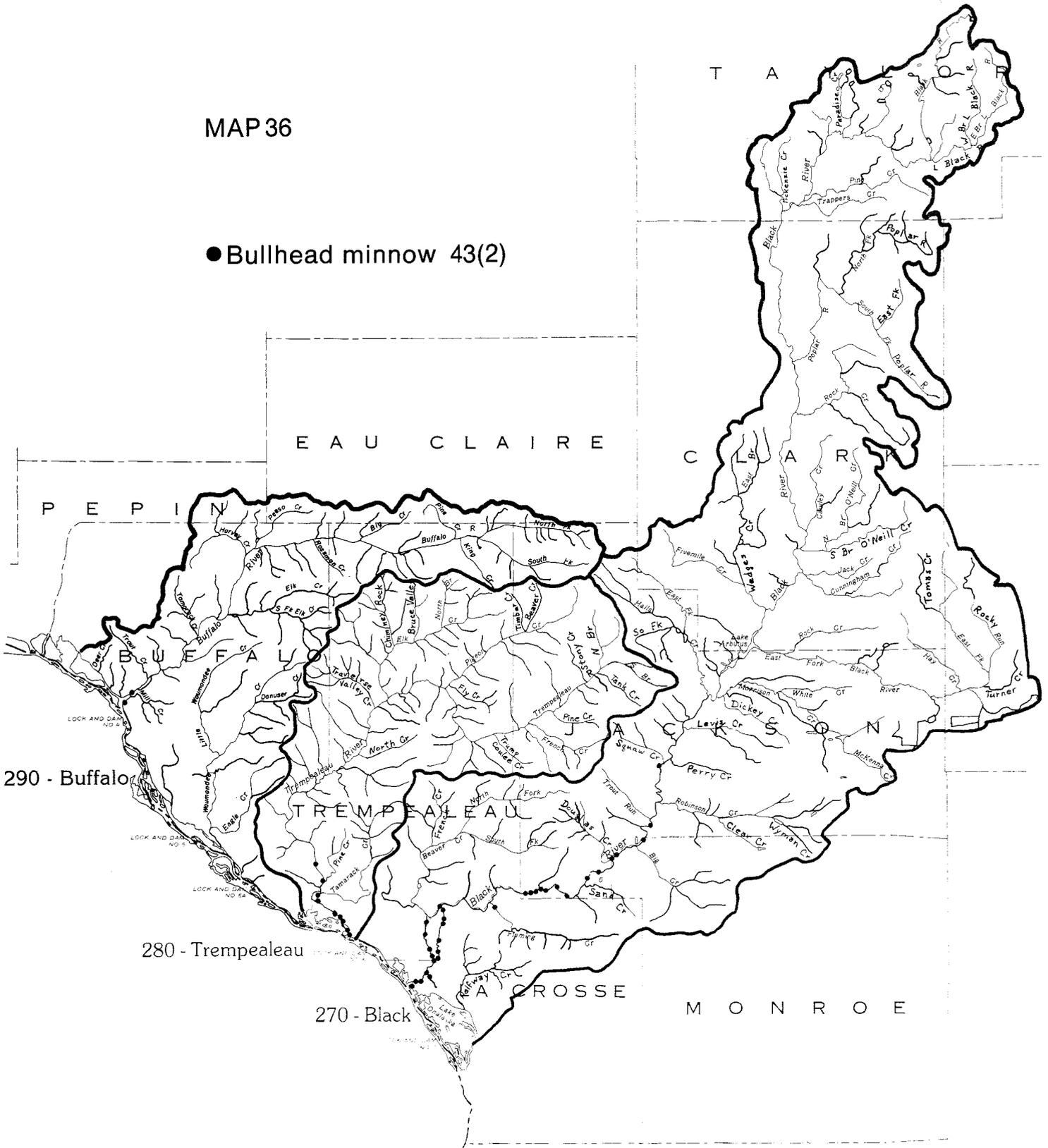
290 - Buffalo

280 - Trempealeau

270 - Black

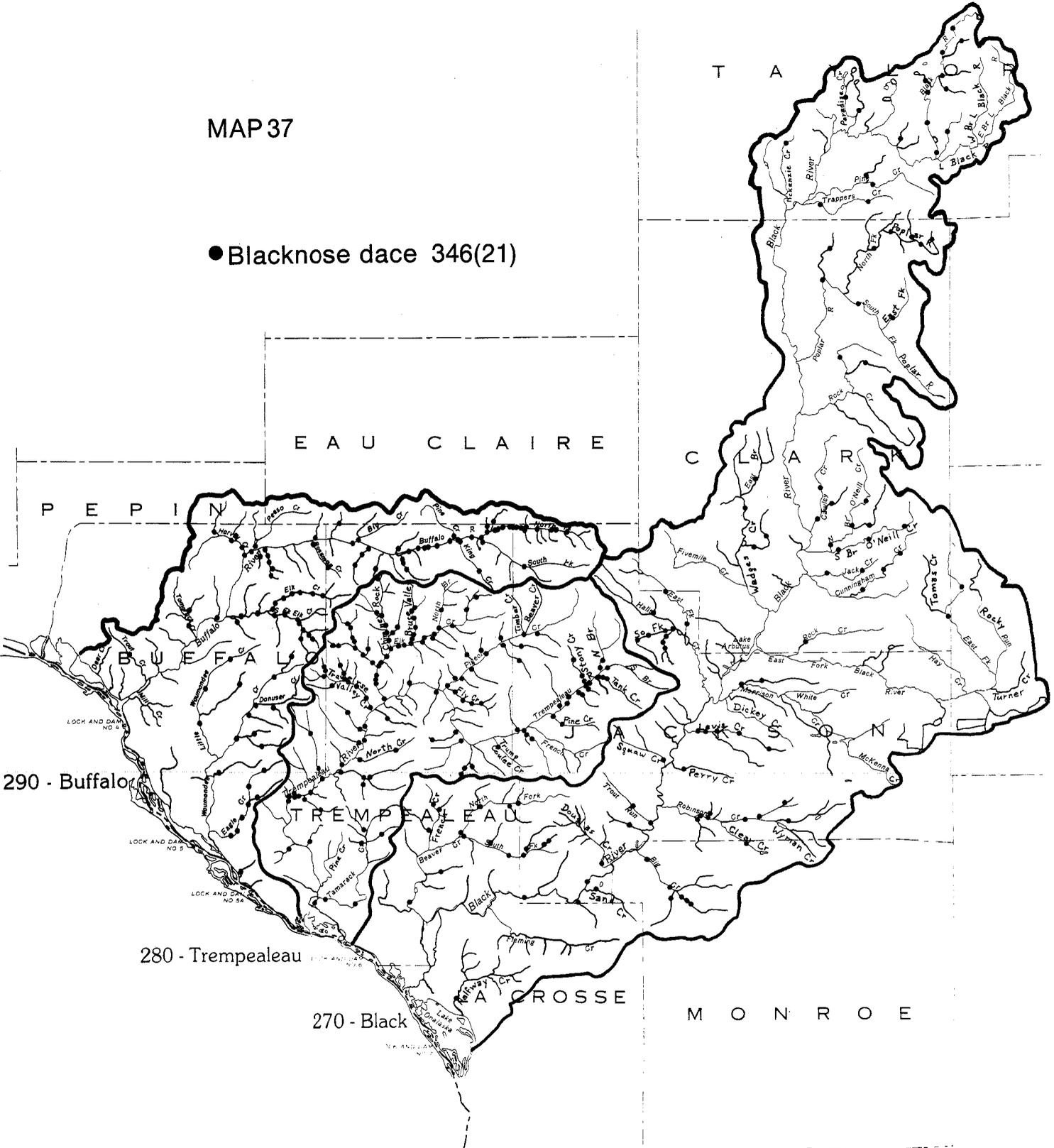
MAP 36

● Bullhead minnow 43(2)



MAP 37

● Blacknose dace 346(21)



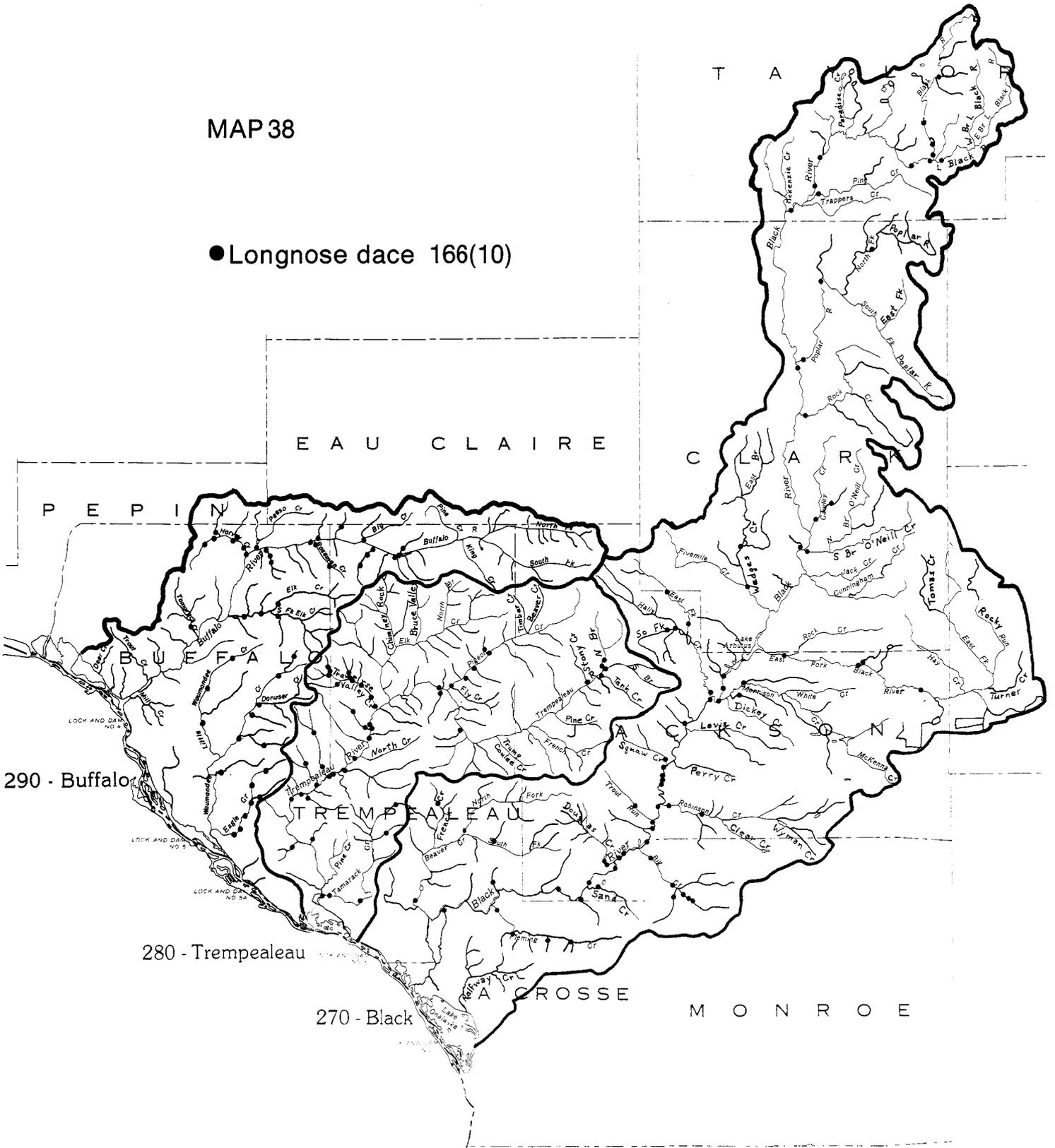
290 - Buffalo

280 - Trempealeau

270 - Black

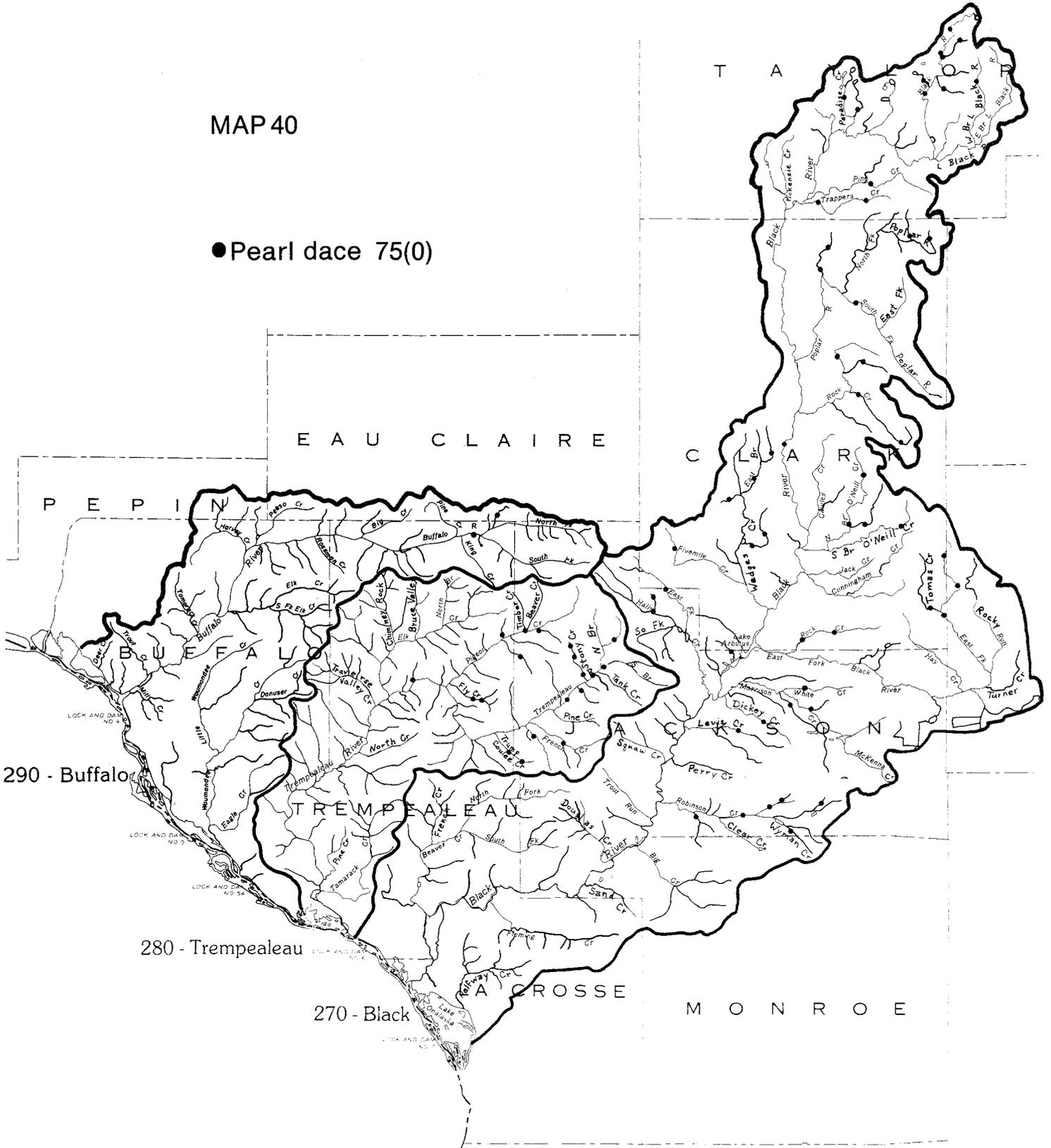
MAP 38

● Longnose dace 166(10)



MAP 40

● Pearl dace 75(0)



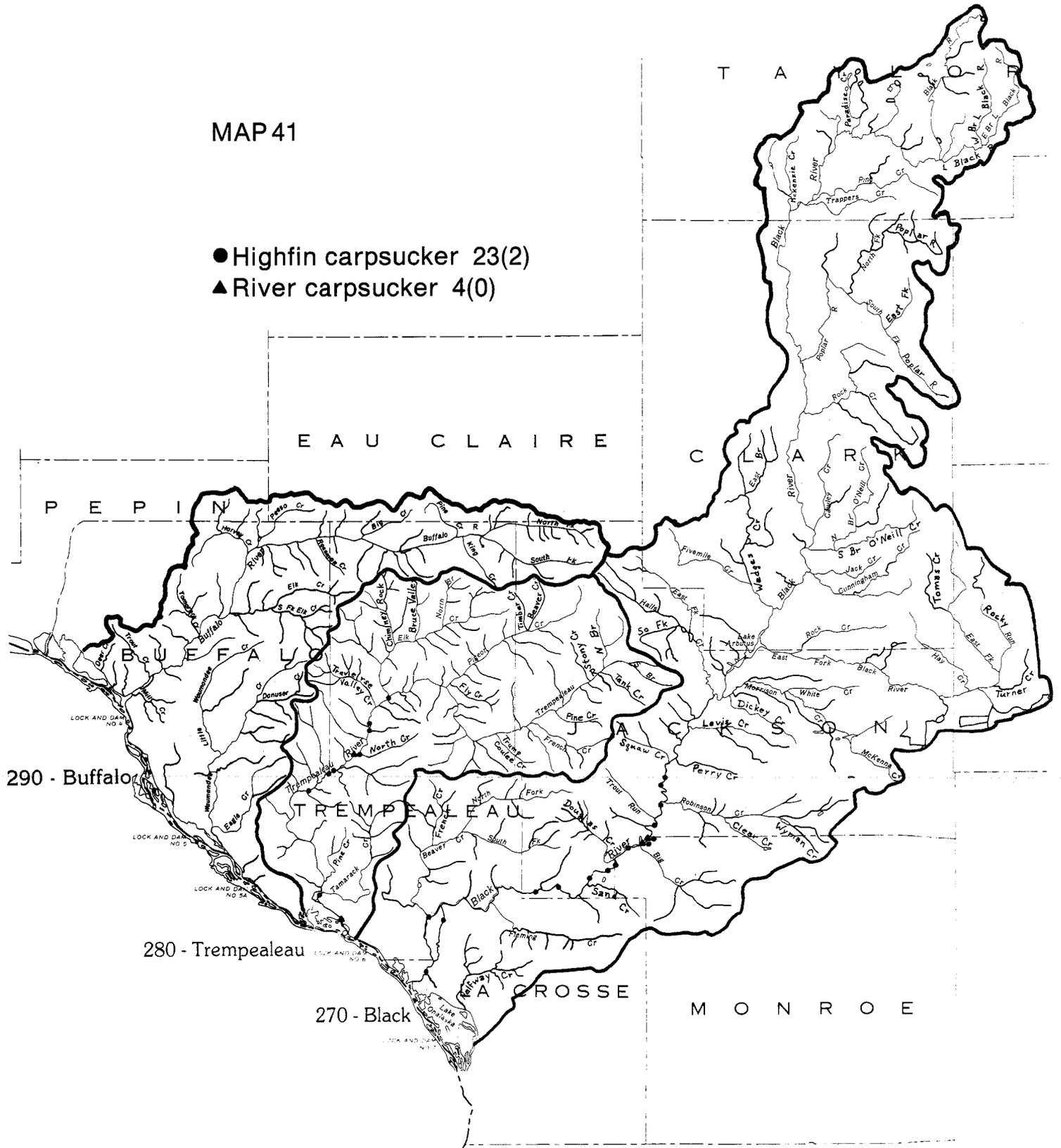
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 41

- Highfin carpsucker 23(2)
- ▲ River carpsucker 4(0)



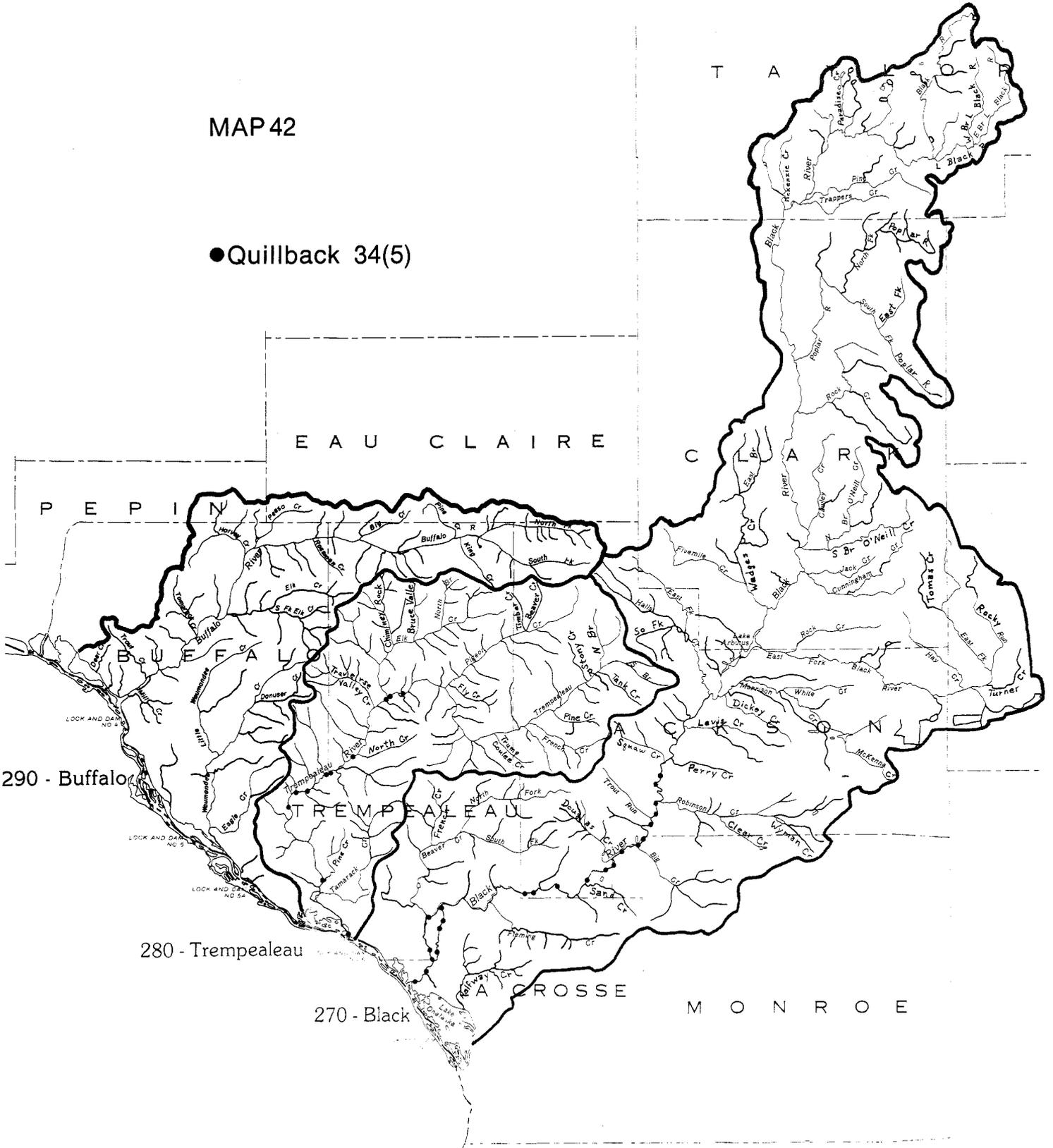
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 42

● Quillback 34(5)



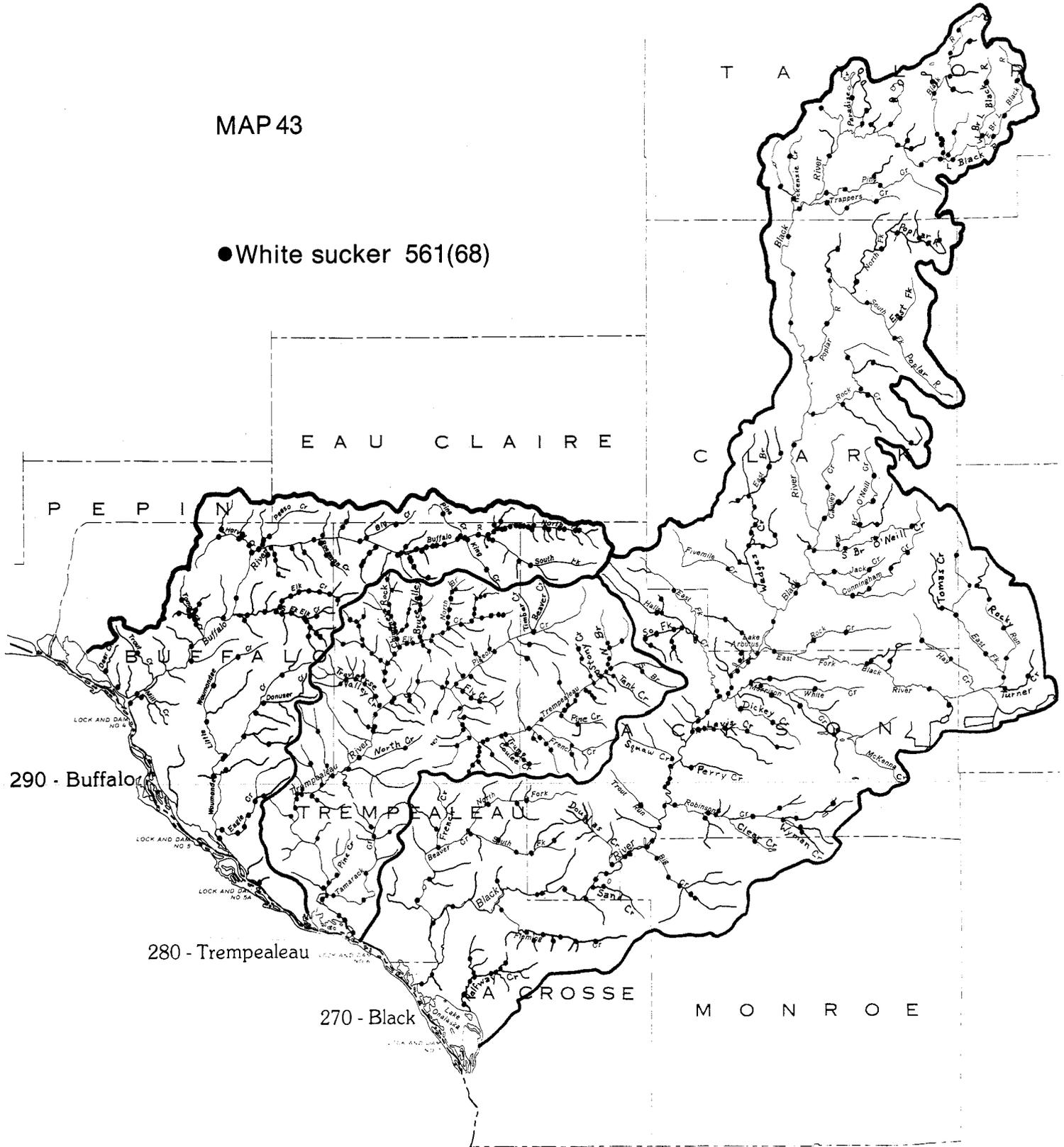
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 43

● White sucker 561(68)



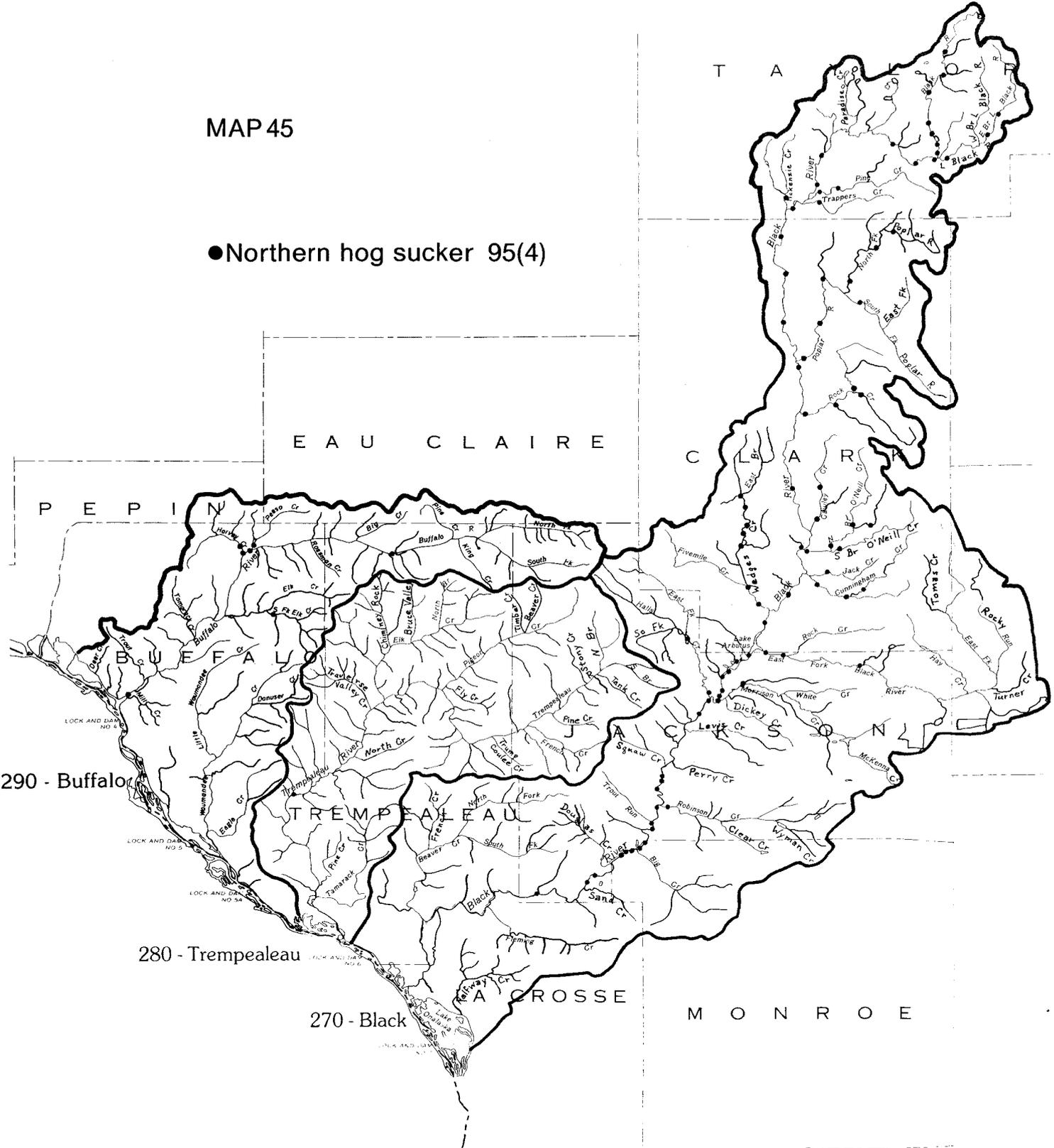
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 45

● Northern hog sucker 95(4)



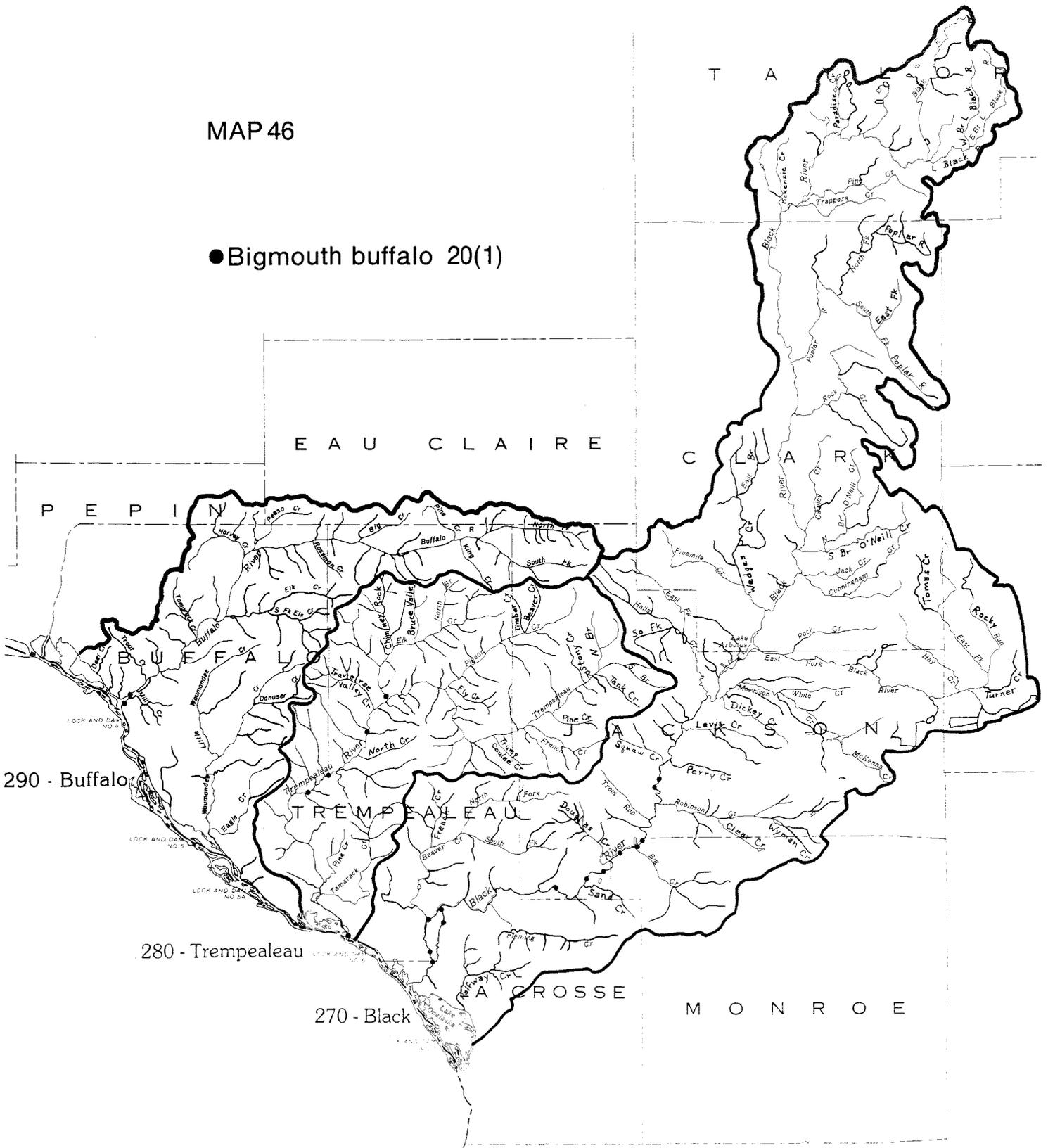
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 46

● Bigmouth buffalo 20(1)



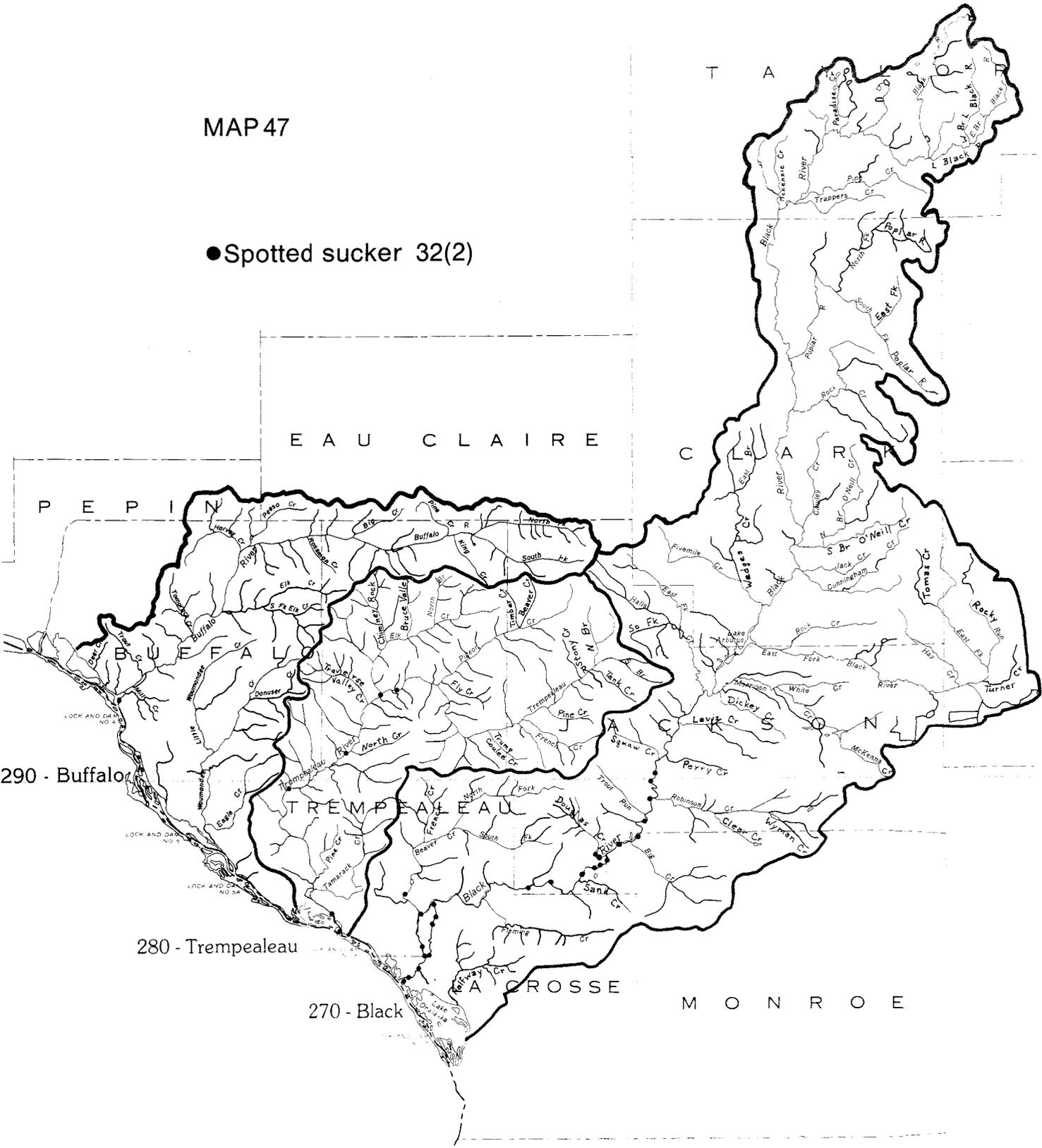
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 47

● Spotted sucker 32(2)



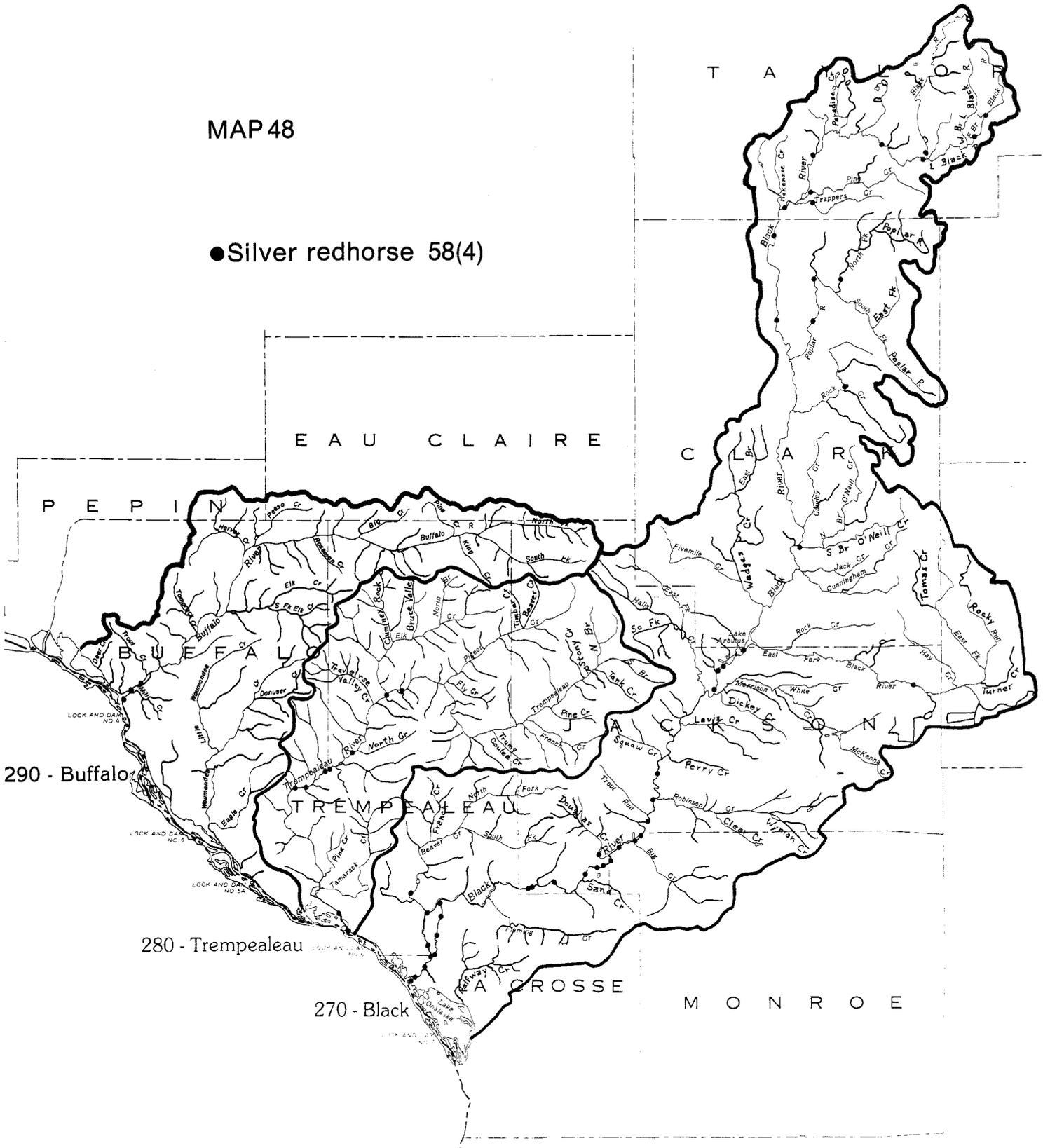
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 48

● Silver redhorse 58(4)



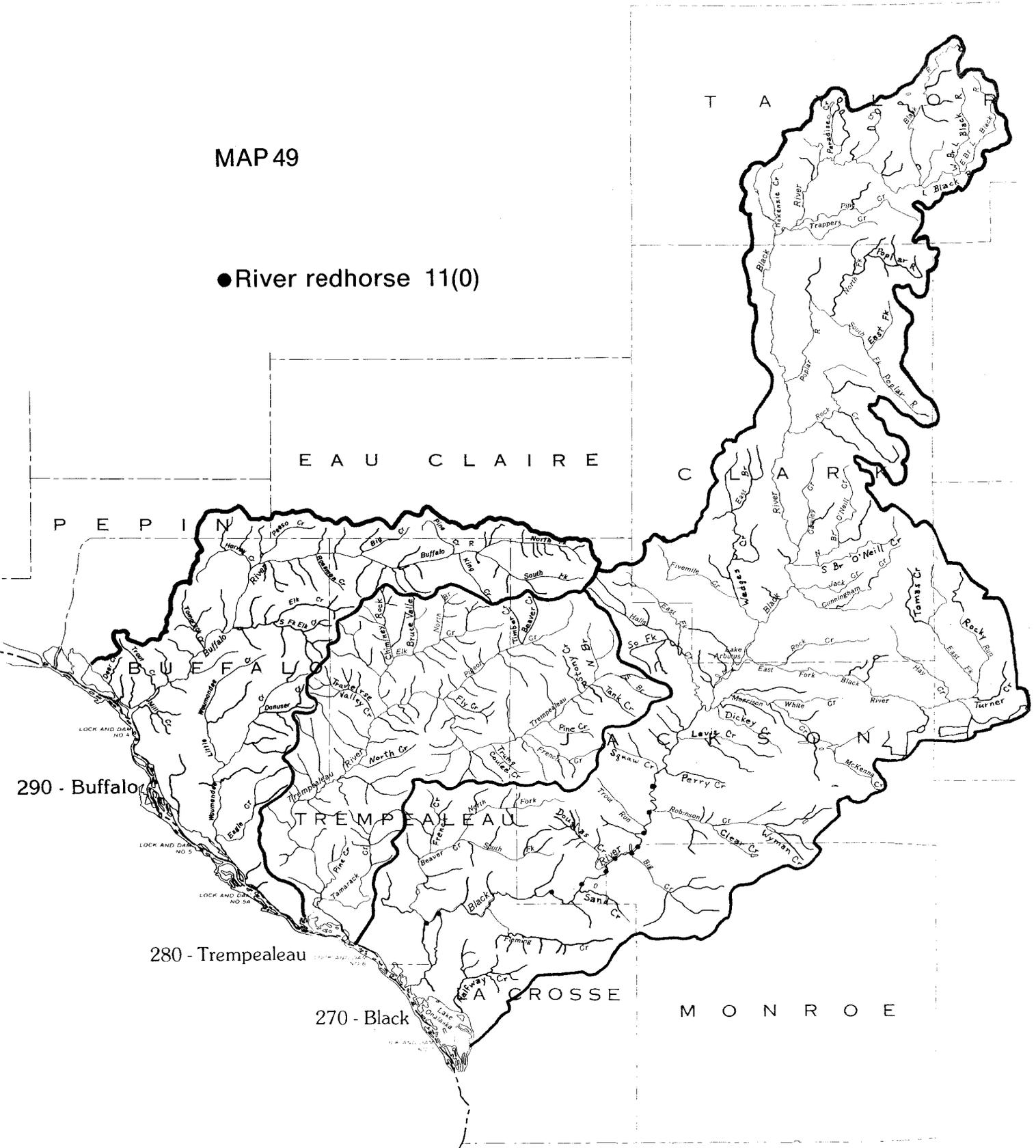
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 49

● River redhorse 11(0)



290 - Buffalo

280 - Trempealeau

270 - Black

MAP 50

● Golden redhorse 64(3)



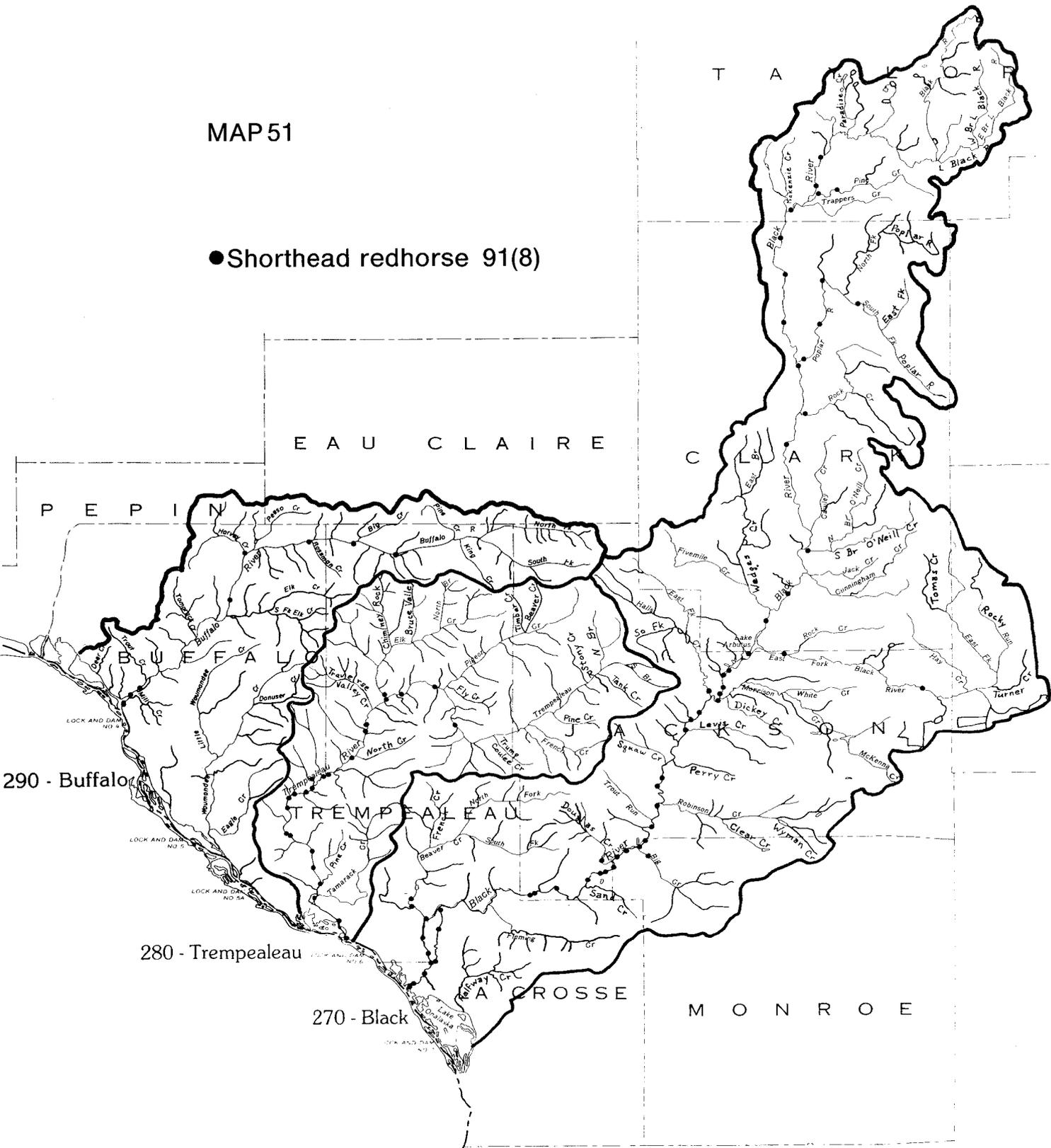
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 51

● Shorthead redhorse 91(8)



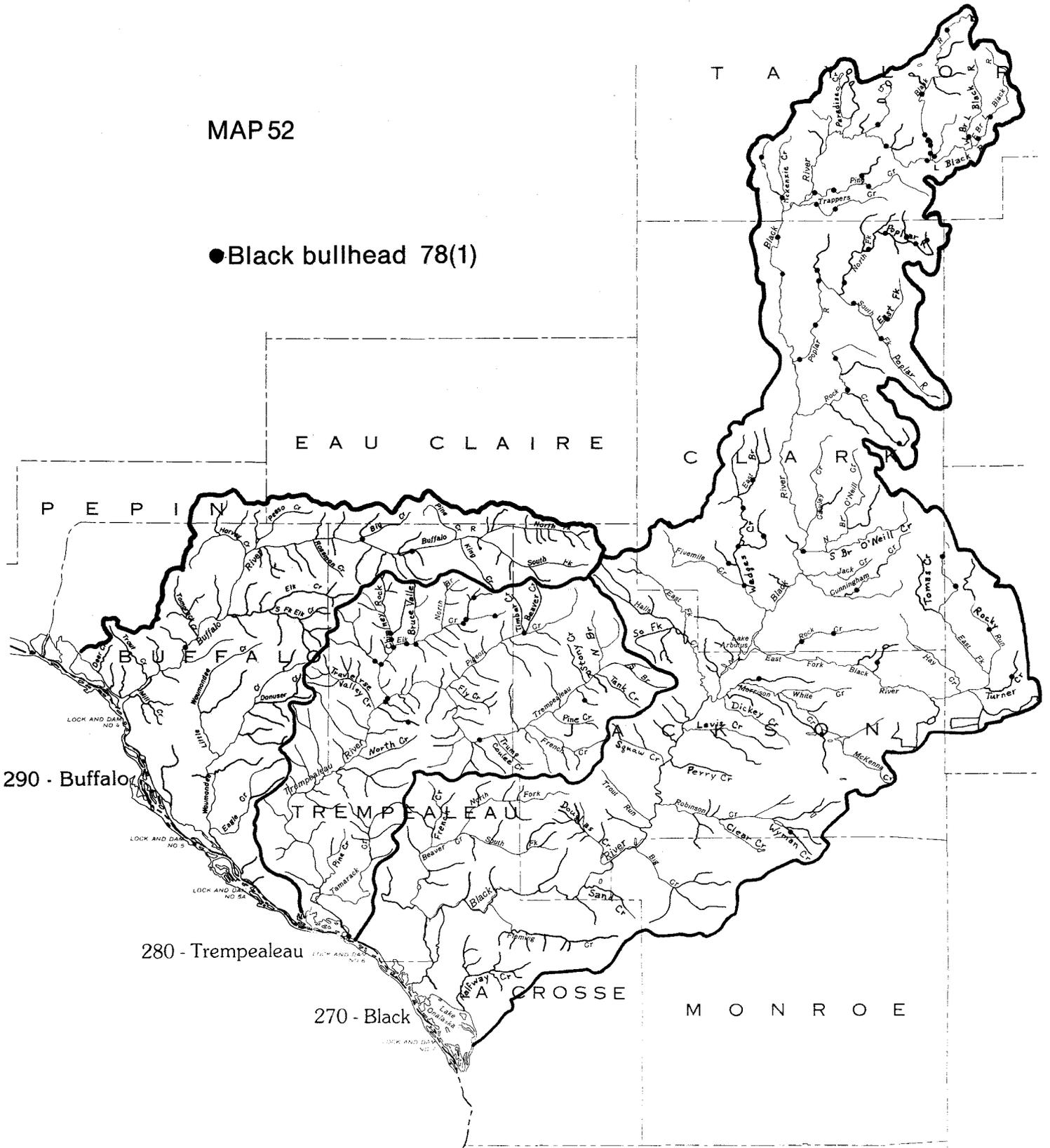
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 52

● Black bullhead 78(1)



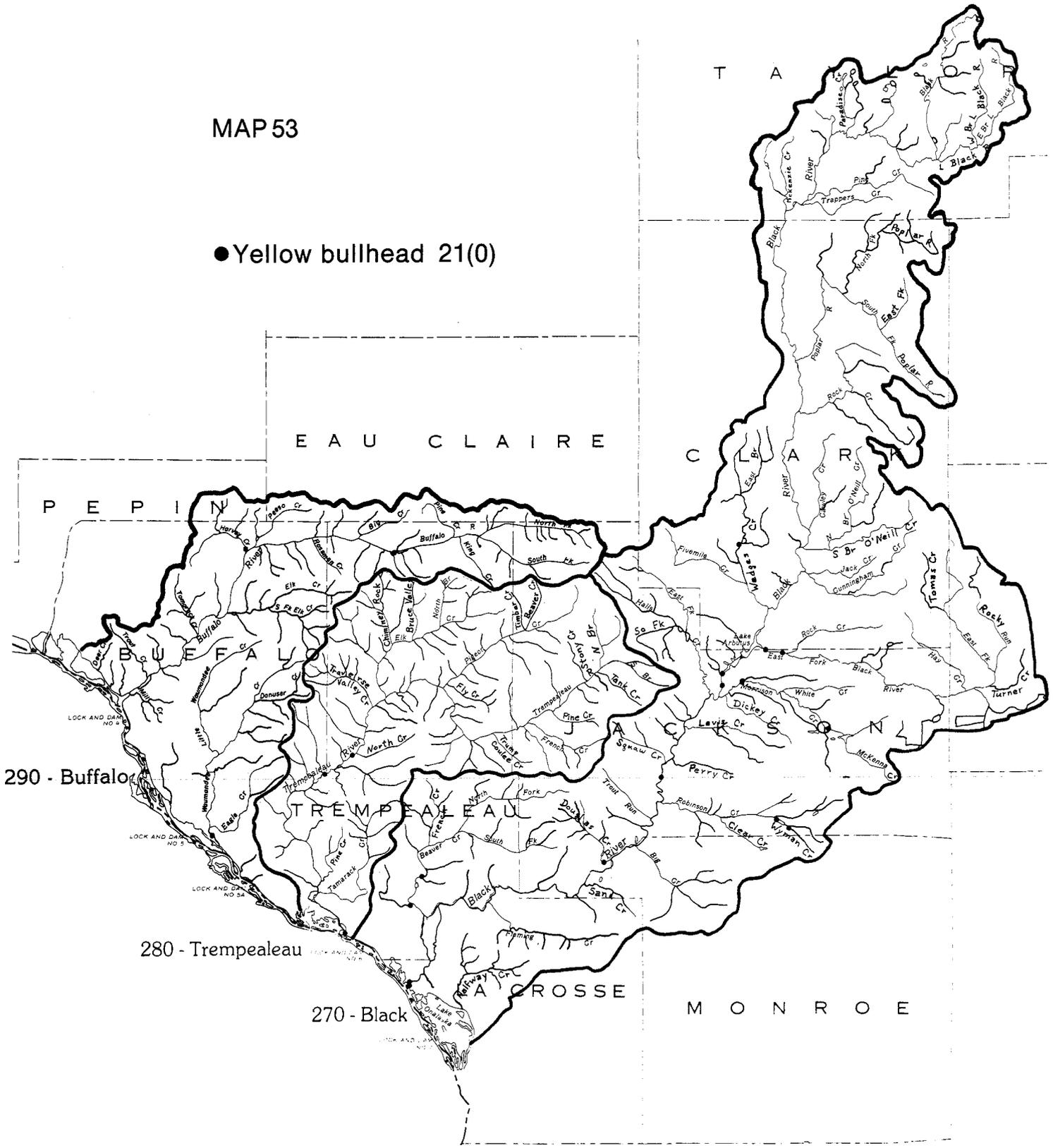
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 53

● Yellow bullhead 21(0)



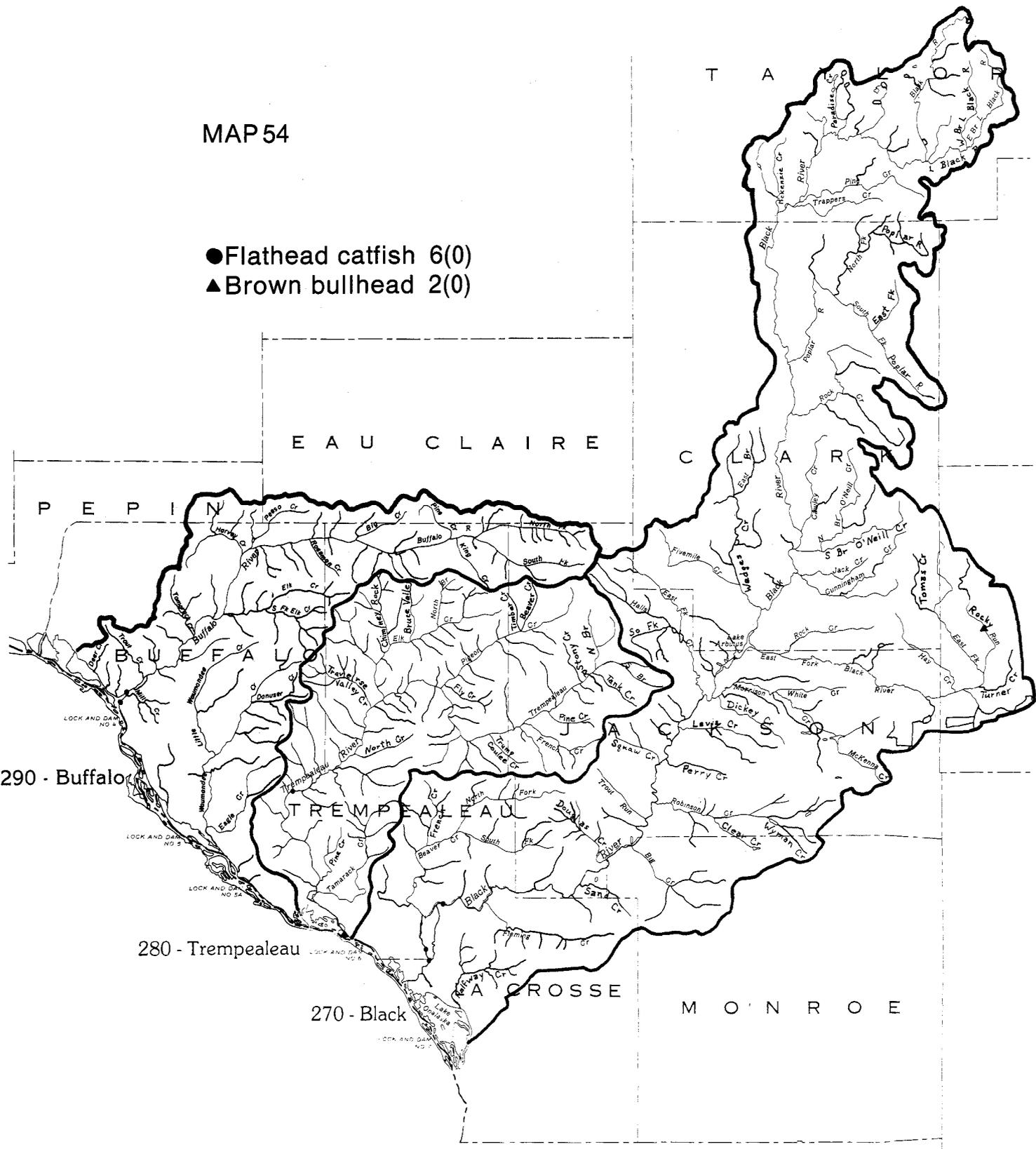
290 - Buffalo

280 - Trempealeau

270 - Black

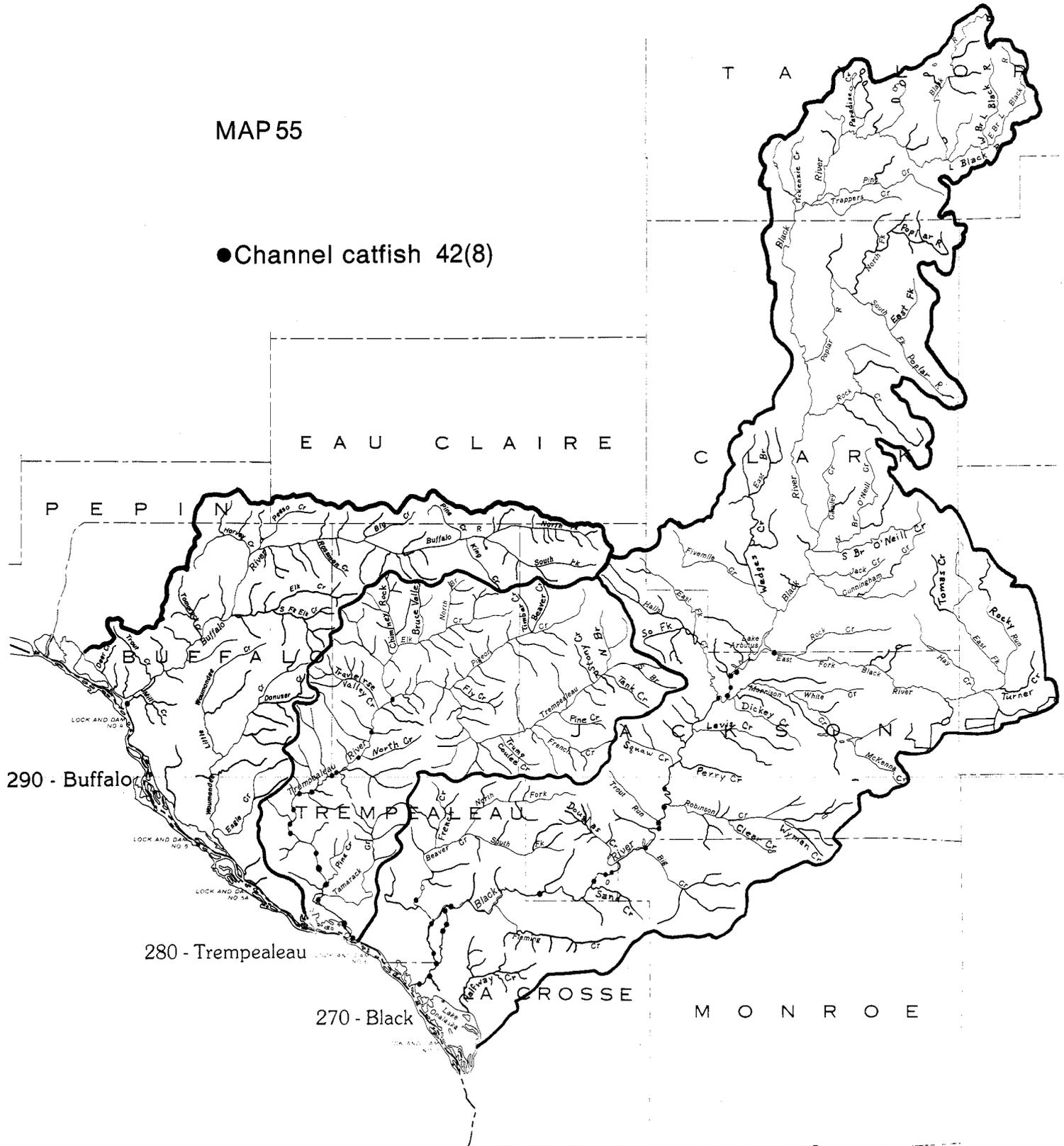
MAP 54

- Flathead catfish 6(0)
- ▲ Brown bullhead 2(0)



MAP 55

● Channel catfish 42(8)



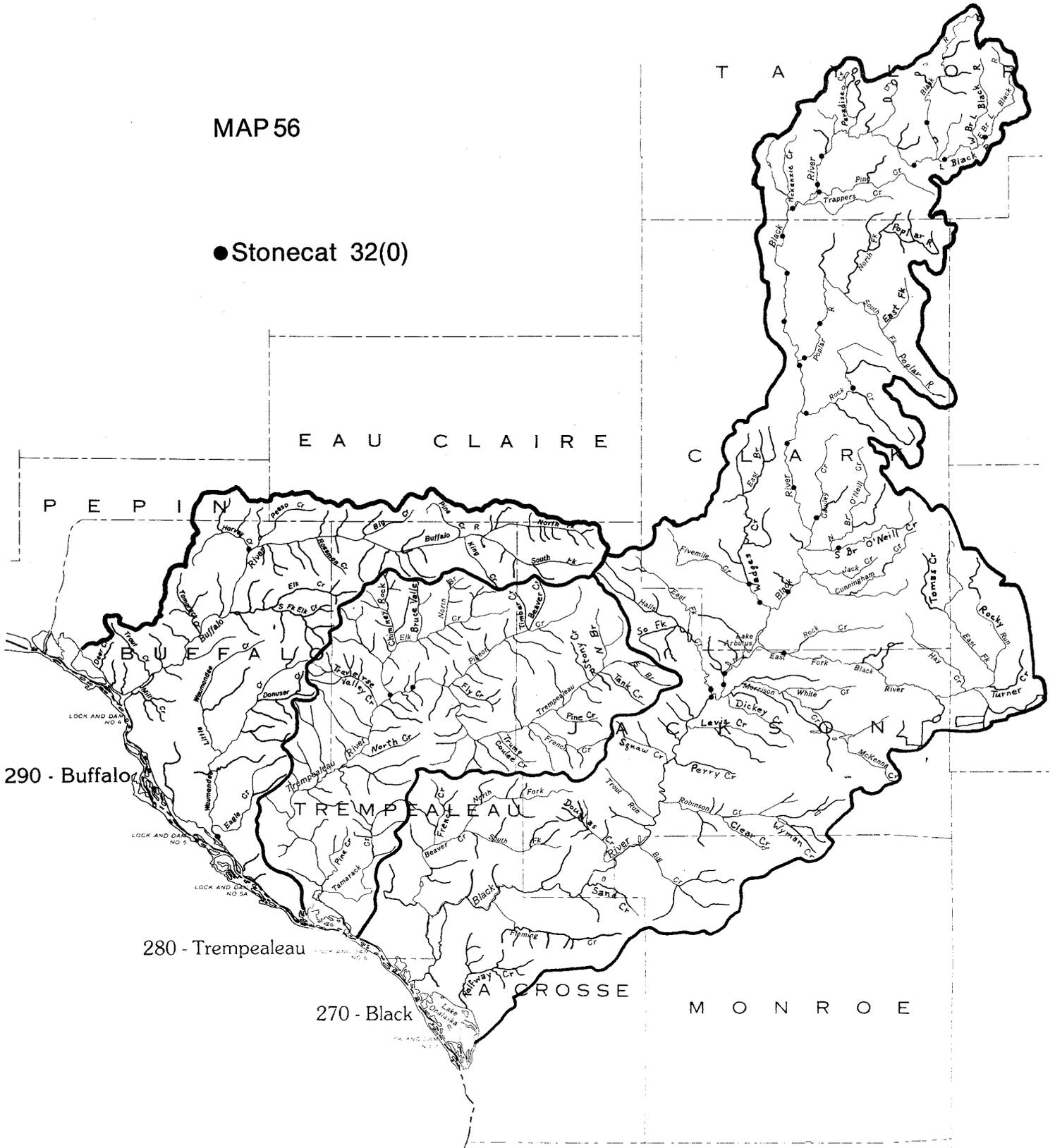
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 56

● Stonecat 32(0)



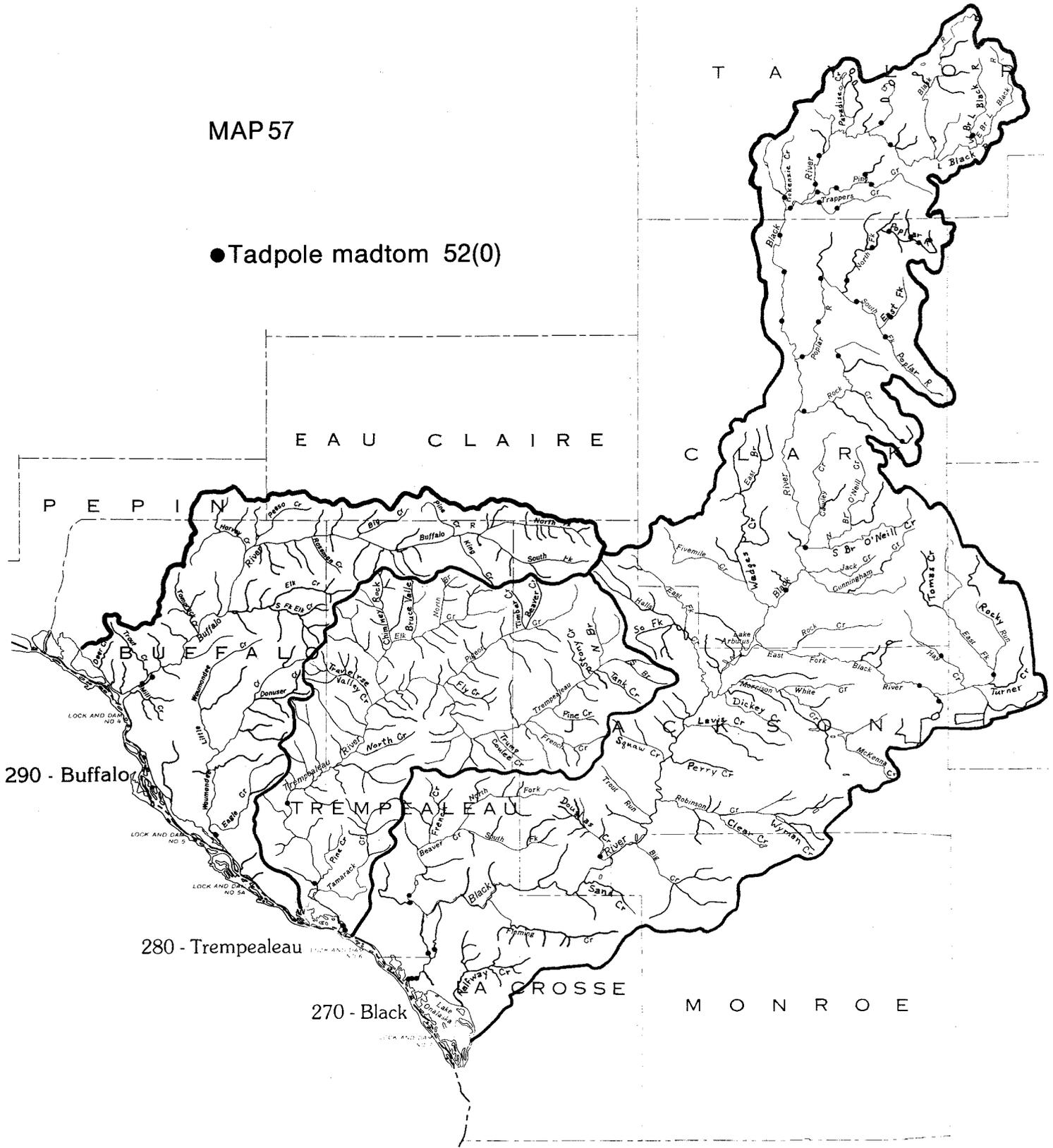
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 57

● Tadpole madtom 52(0)



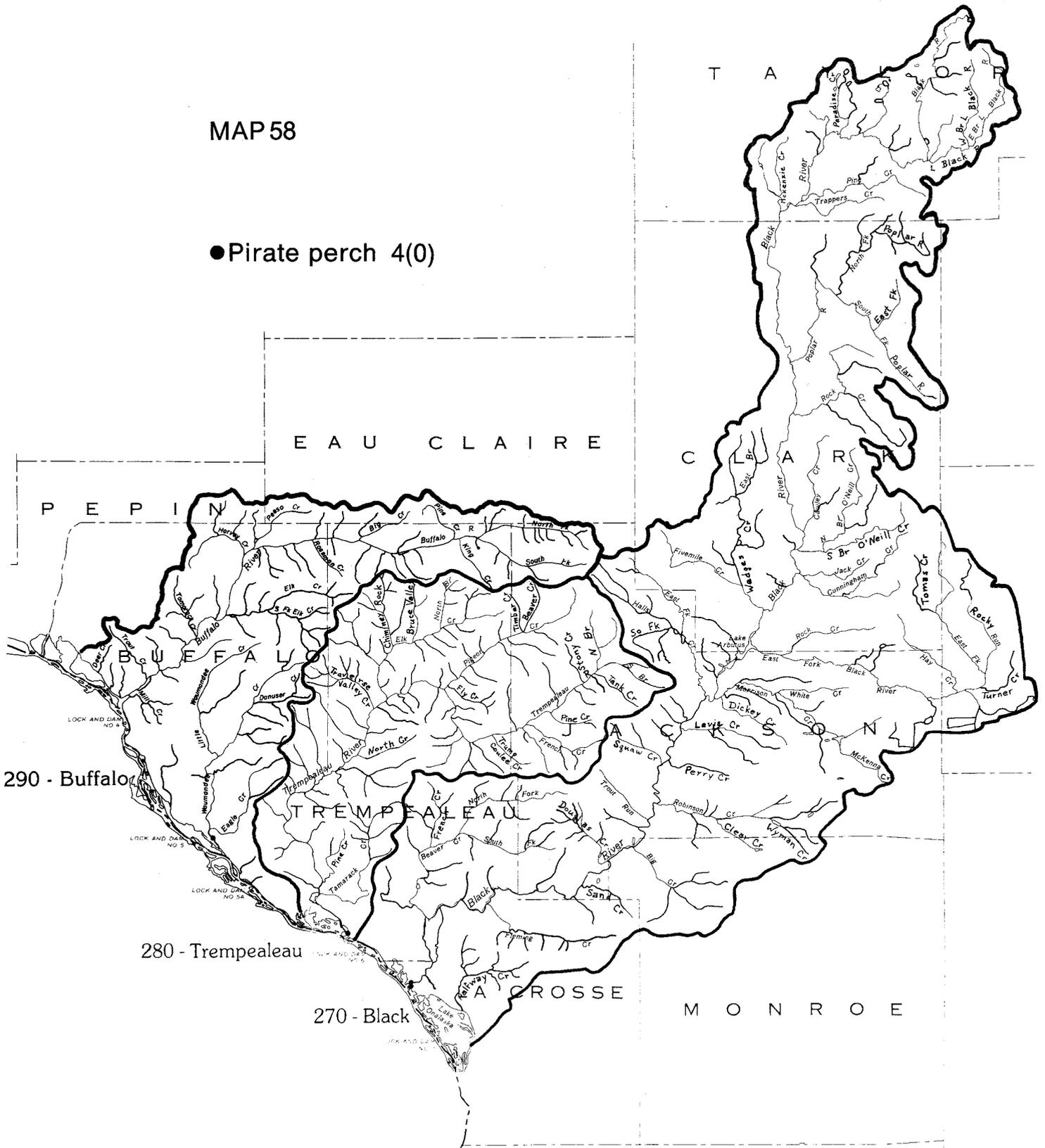
290 - Buffalo

280 - Trempealeau

270 - Black

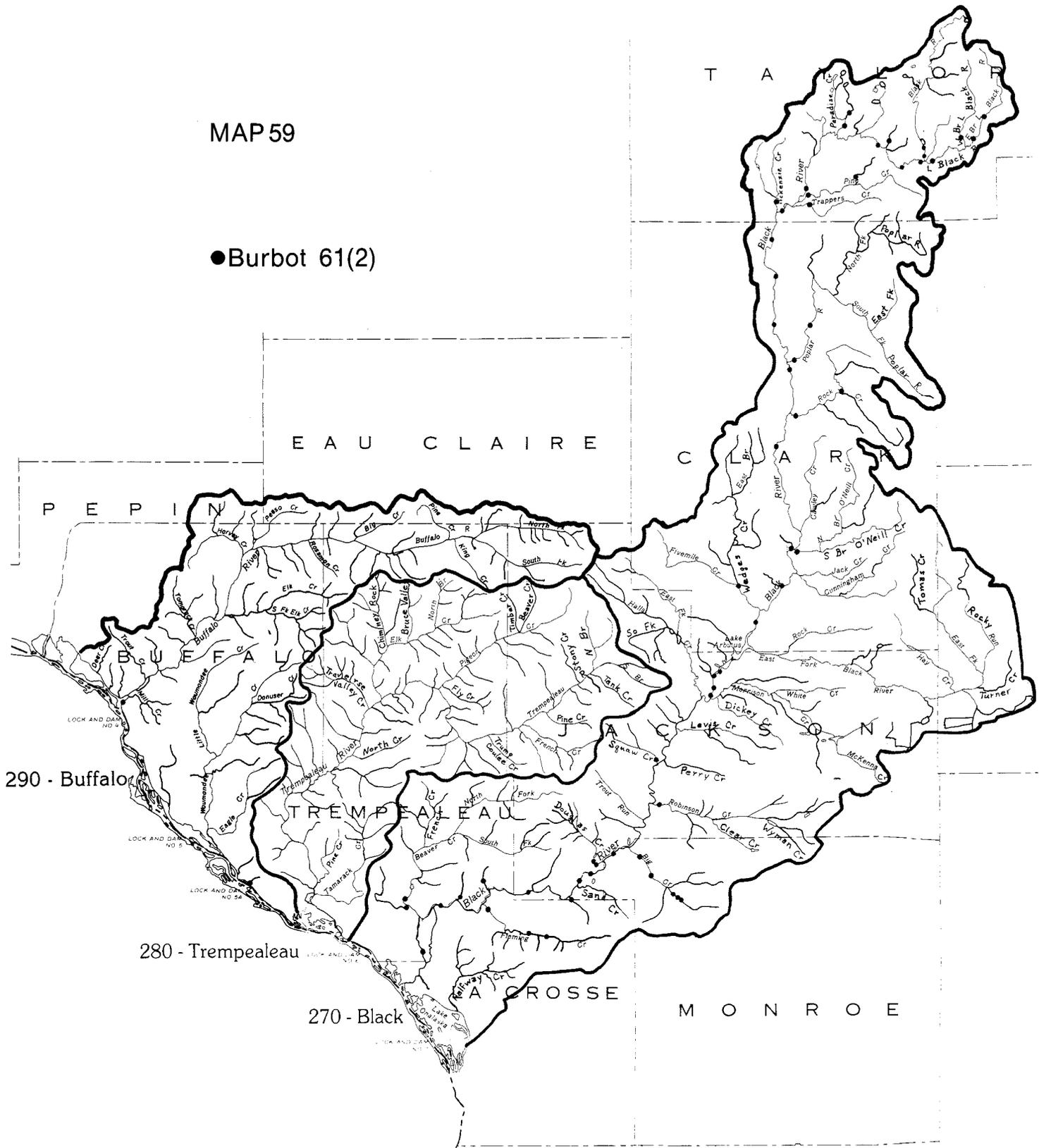
MAP 58

●Pirate perch 4(0)



MAP 59

● Burbot 61(2)



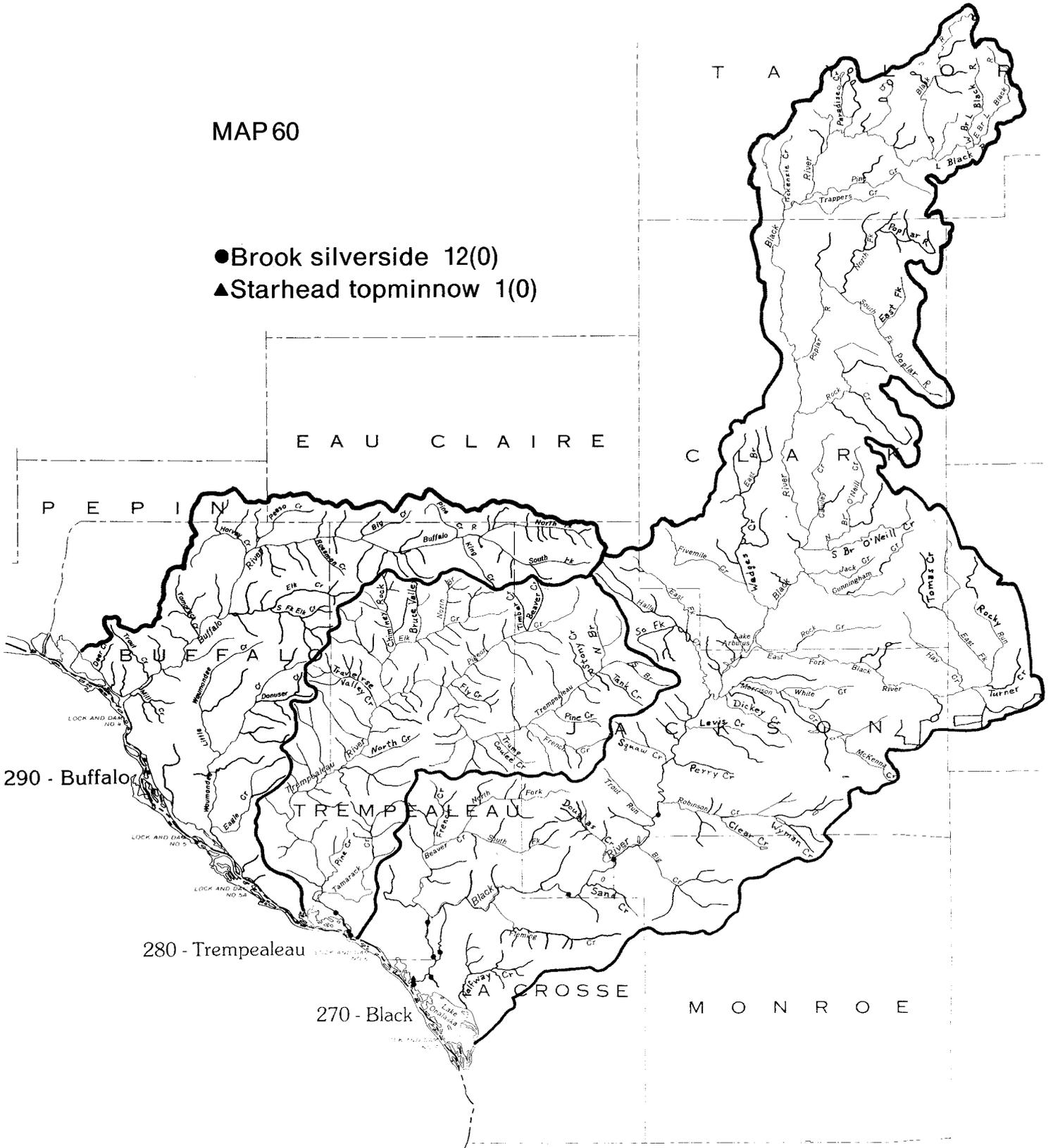
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 60

- Brook silverside 12(0)
- ▲ Starhead topminnow 1(0)



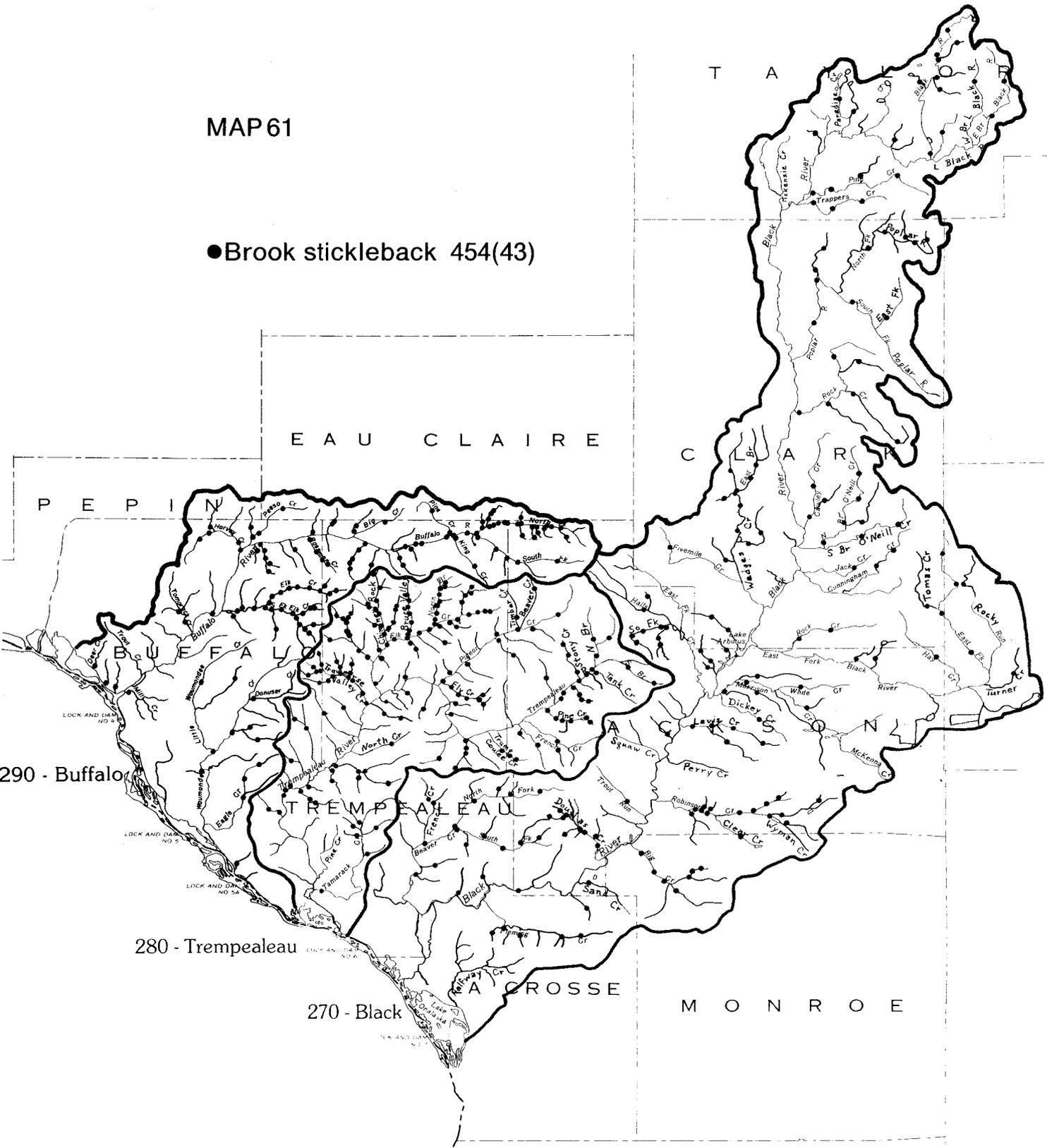
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 61

● Brook stickleback 454(43)



290 - Buffalo

280 - Trempealeau

270 - Black

MAP 62

● White bass 10(0)



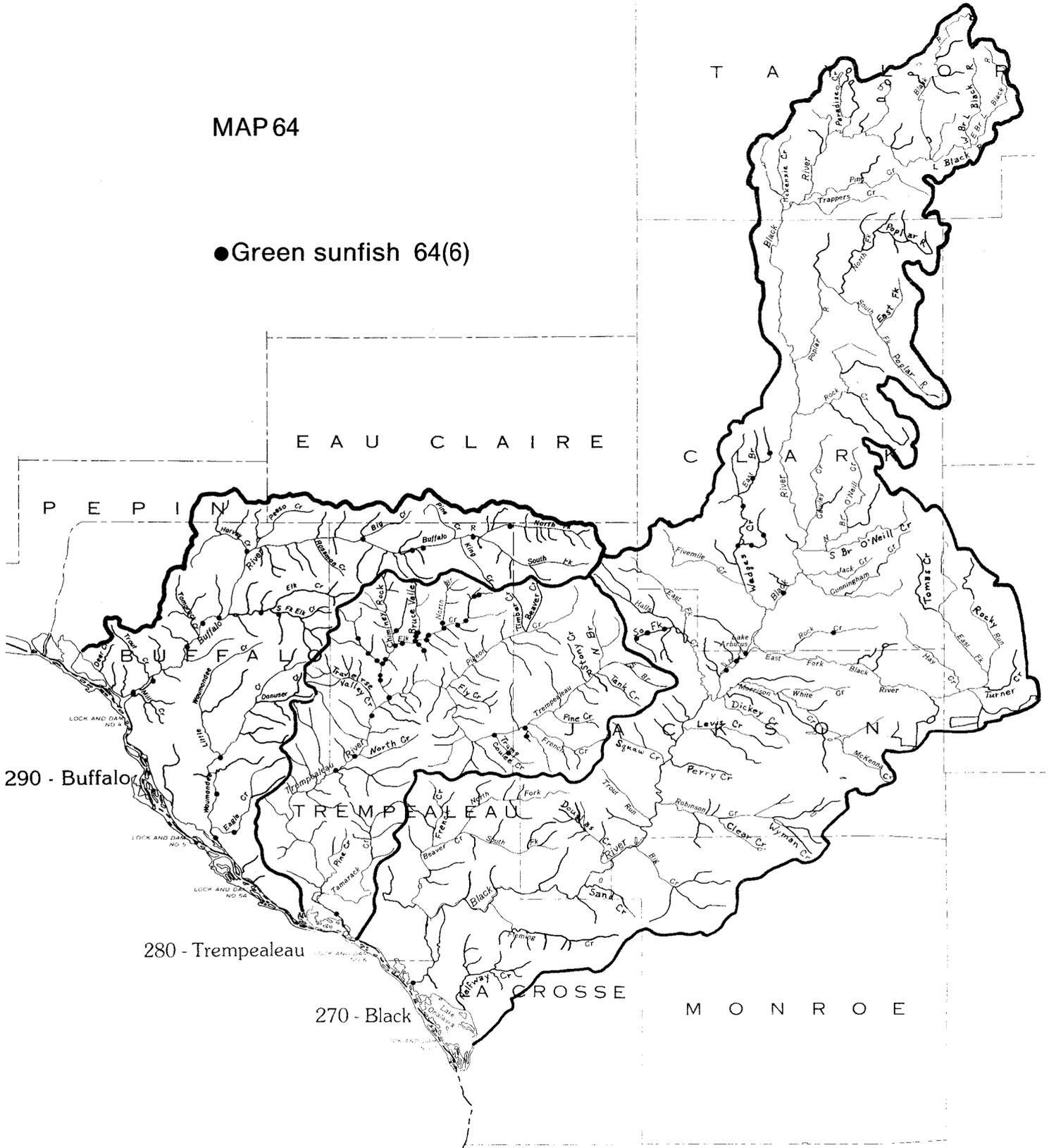
290 - Buffalo

280 - Trempealeau

270 - Black

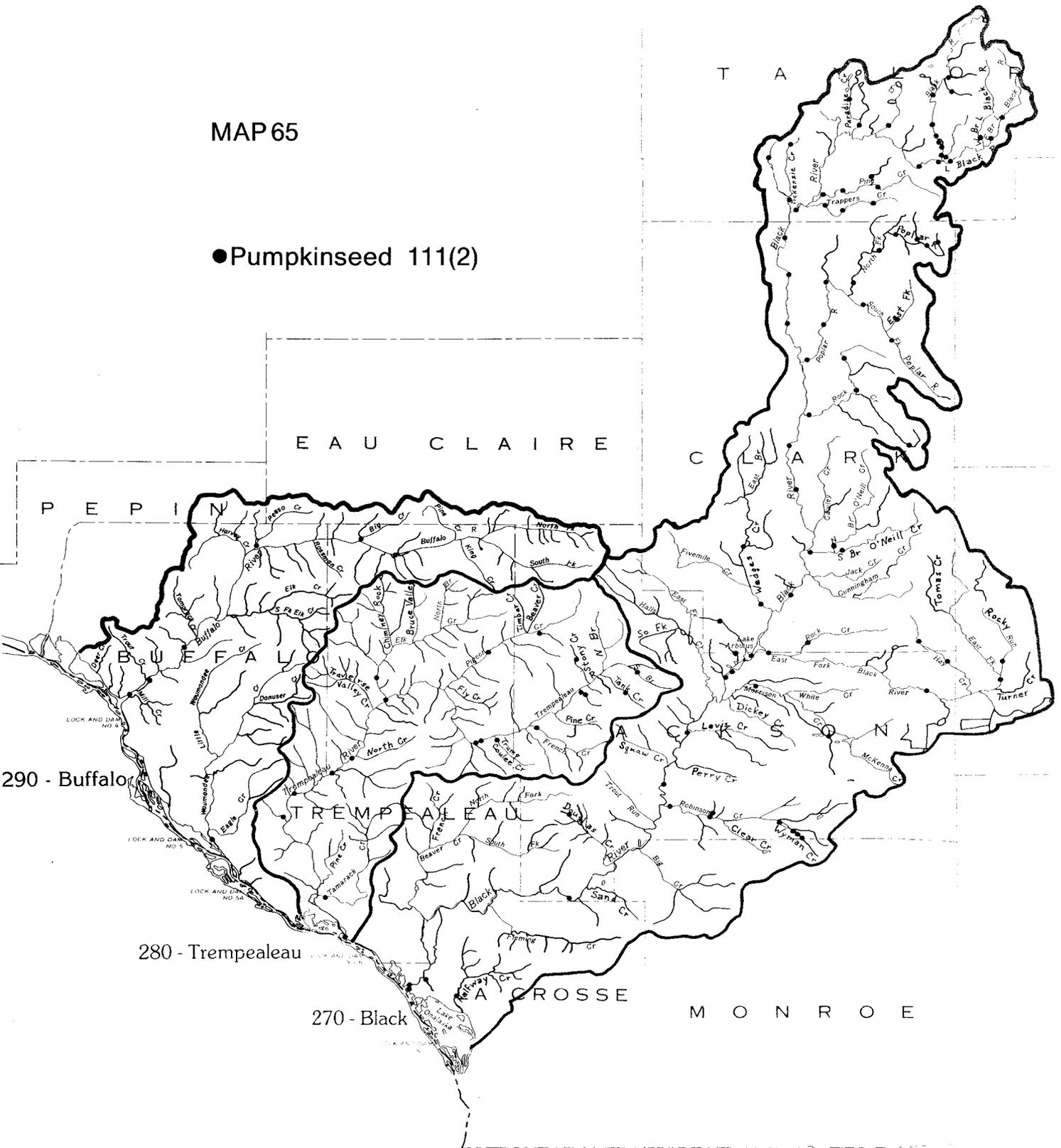
MAP 64

● Green sunfish 64(6)



MAP 65

●Pumpkinseed 111(2)



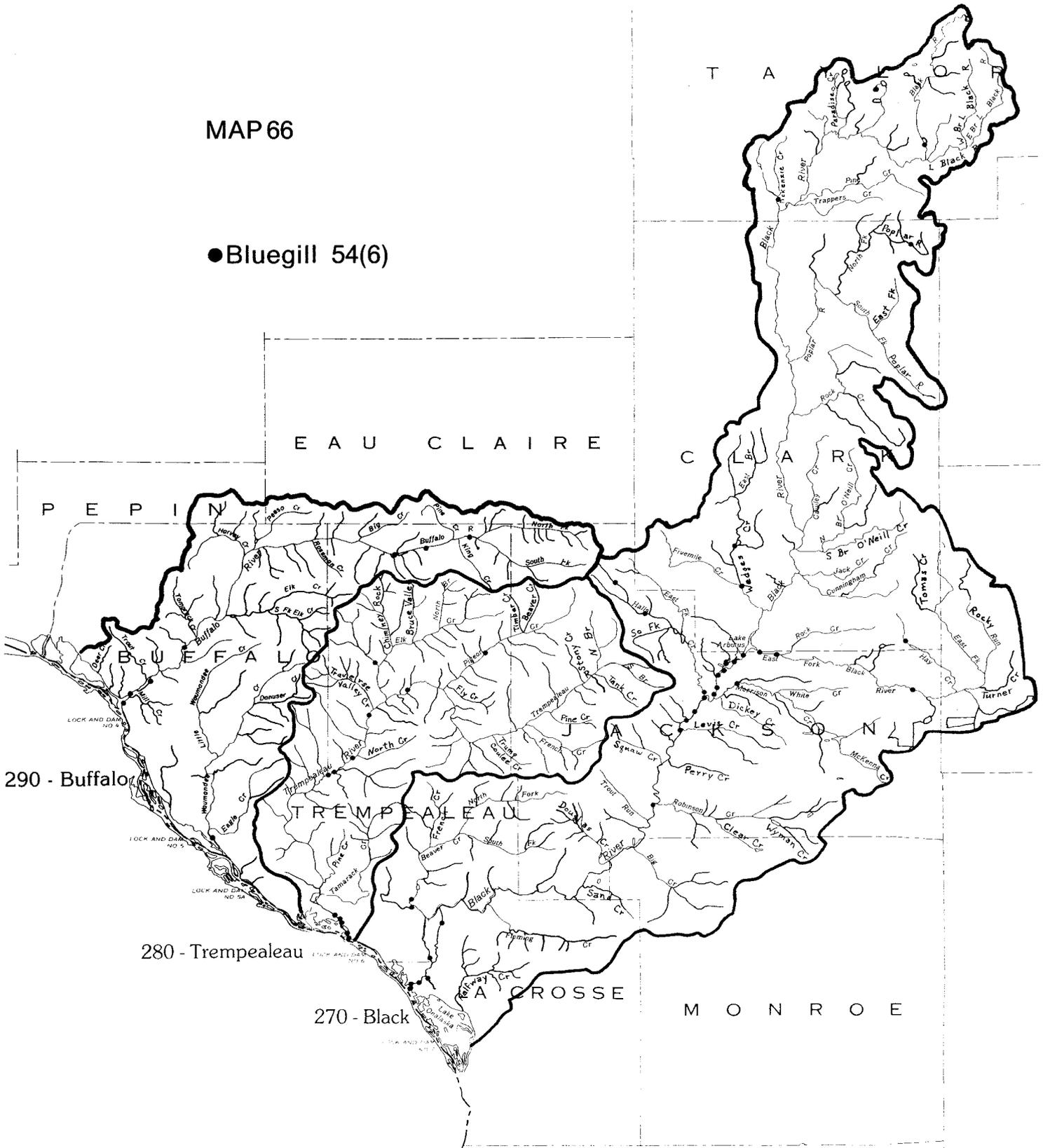
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 66

●Bluegill 54(6)



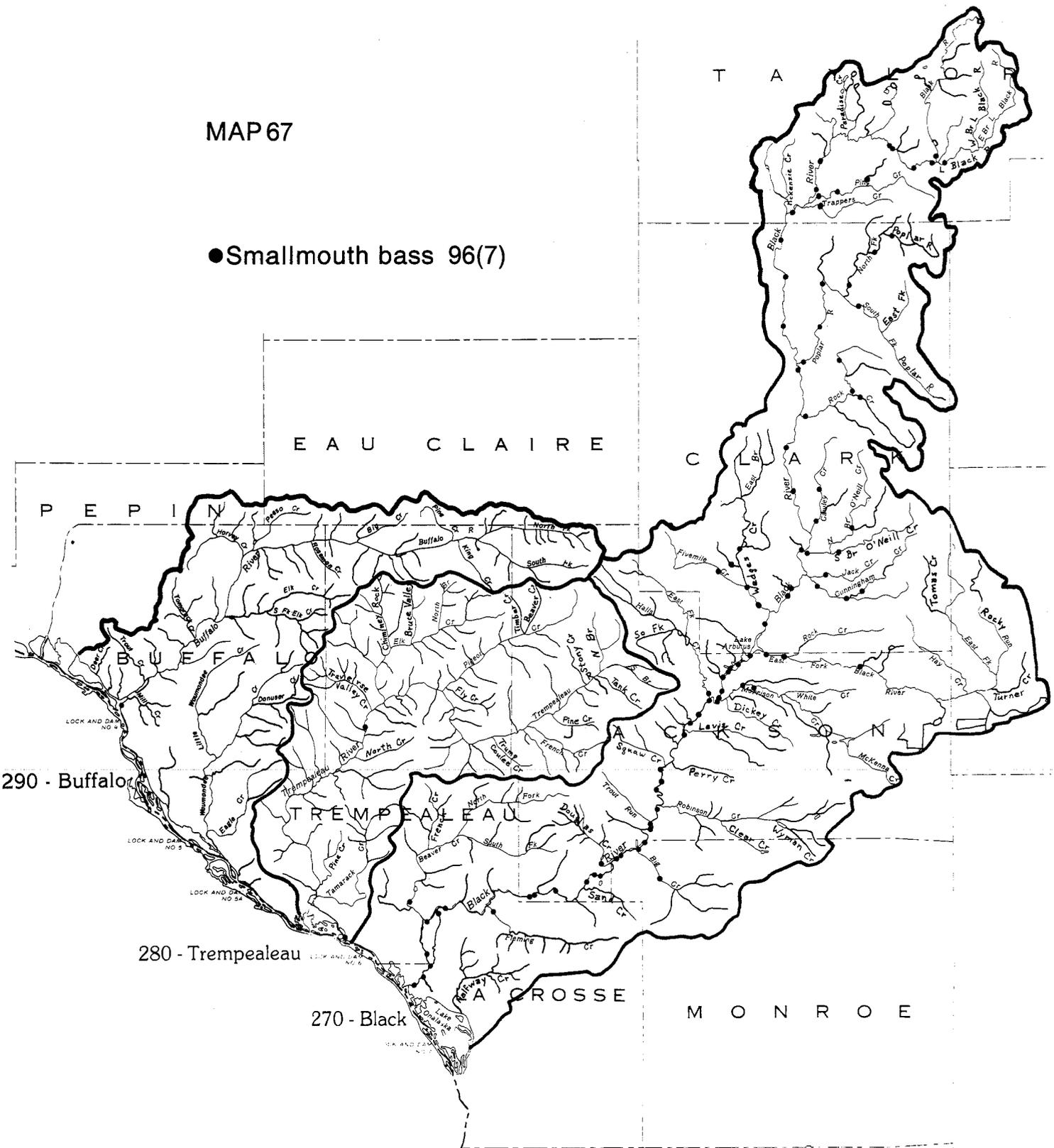
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 67

● Smallmouth bass 96(7)



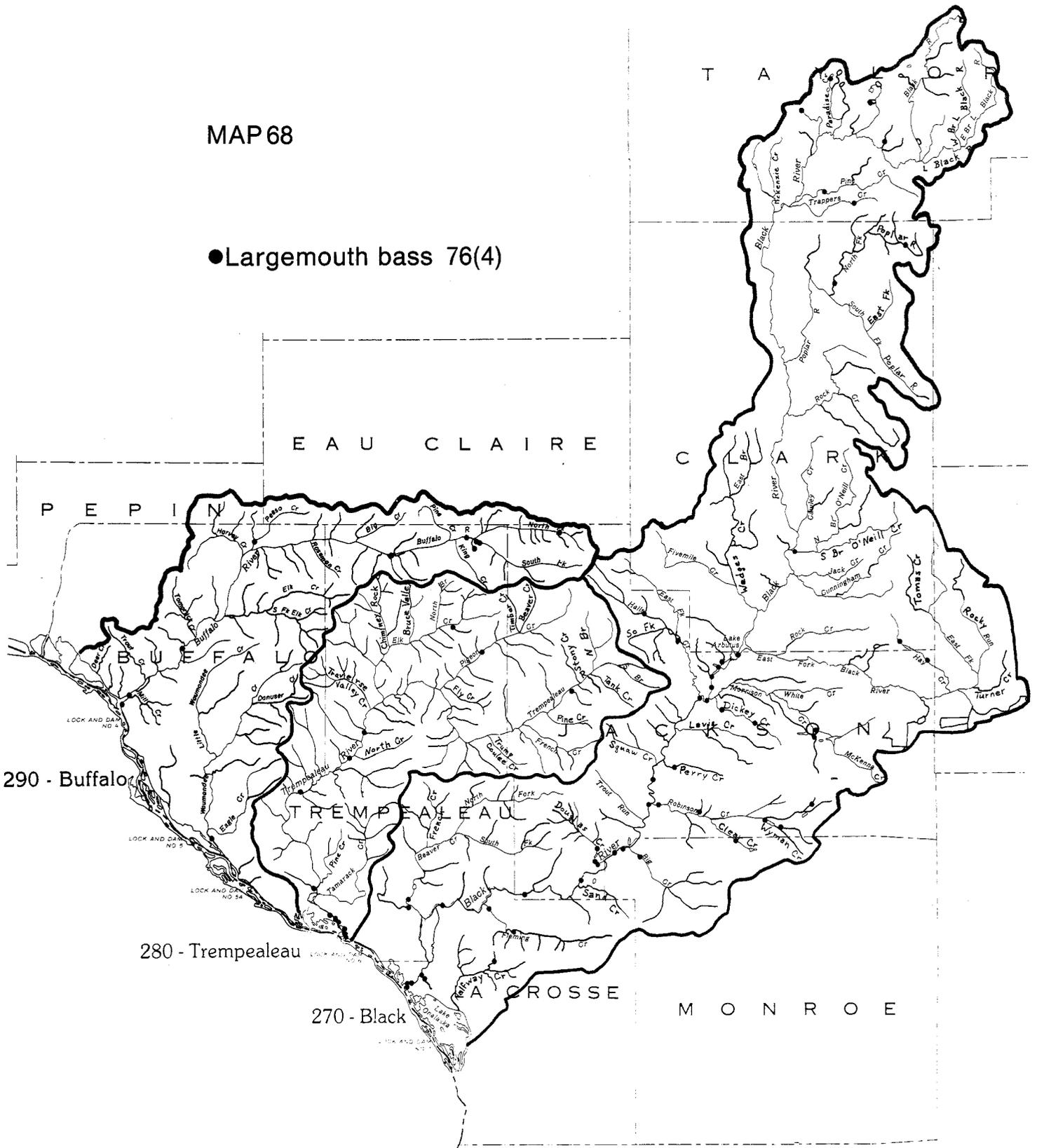
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 68

● Largemouth bass 76(4)



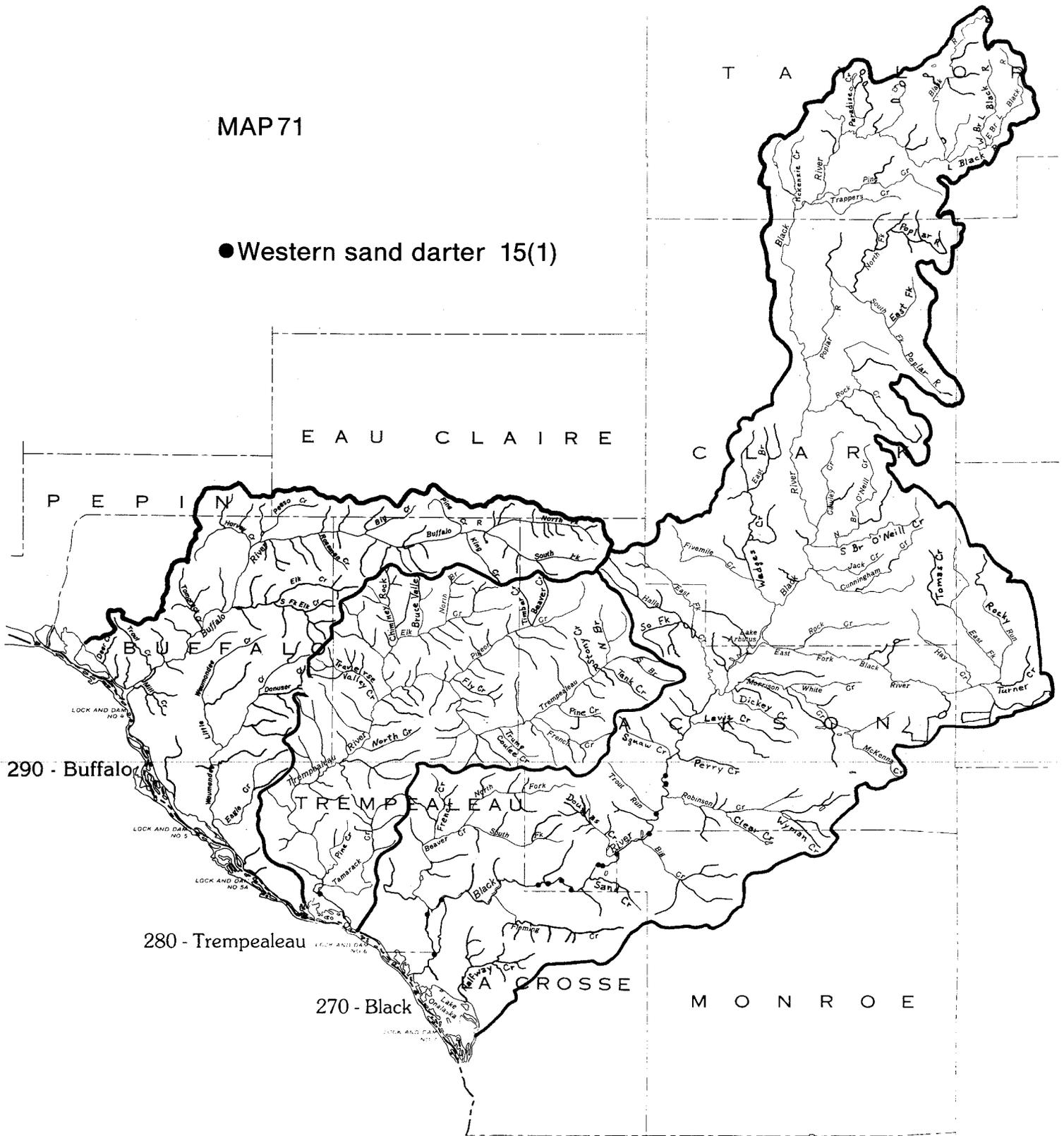
MAP 70

● Black crappie 47(2)



MAP 71

● Western sand darter 15(1)



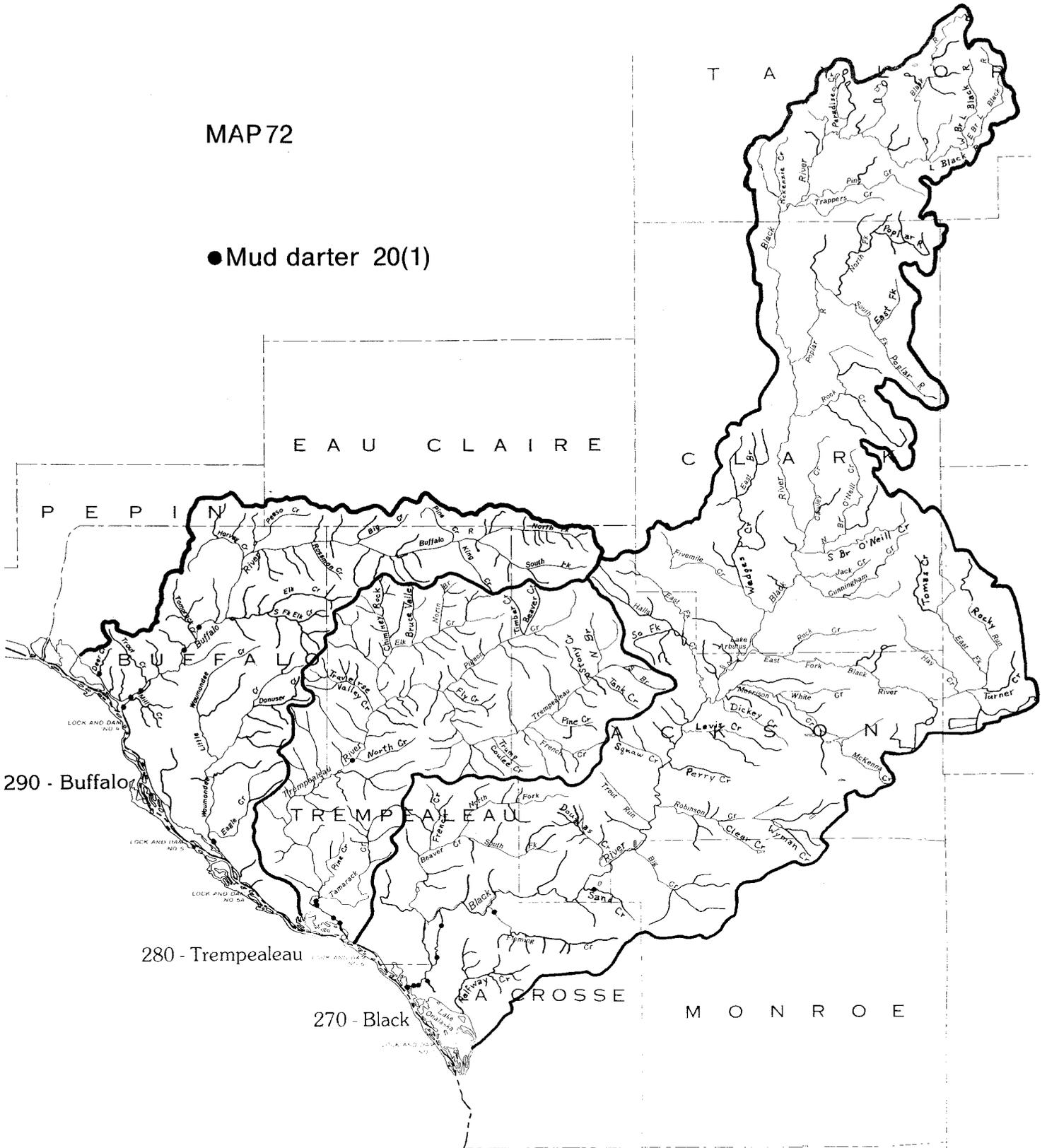
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 72

● Mud darter 20(1)



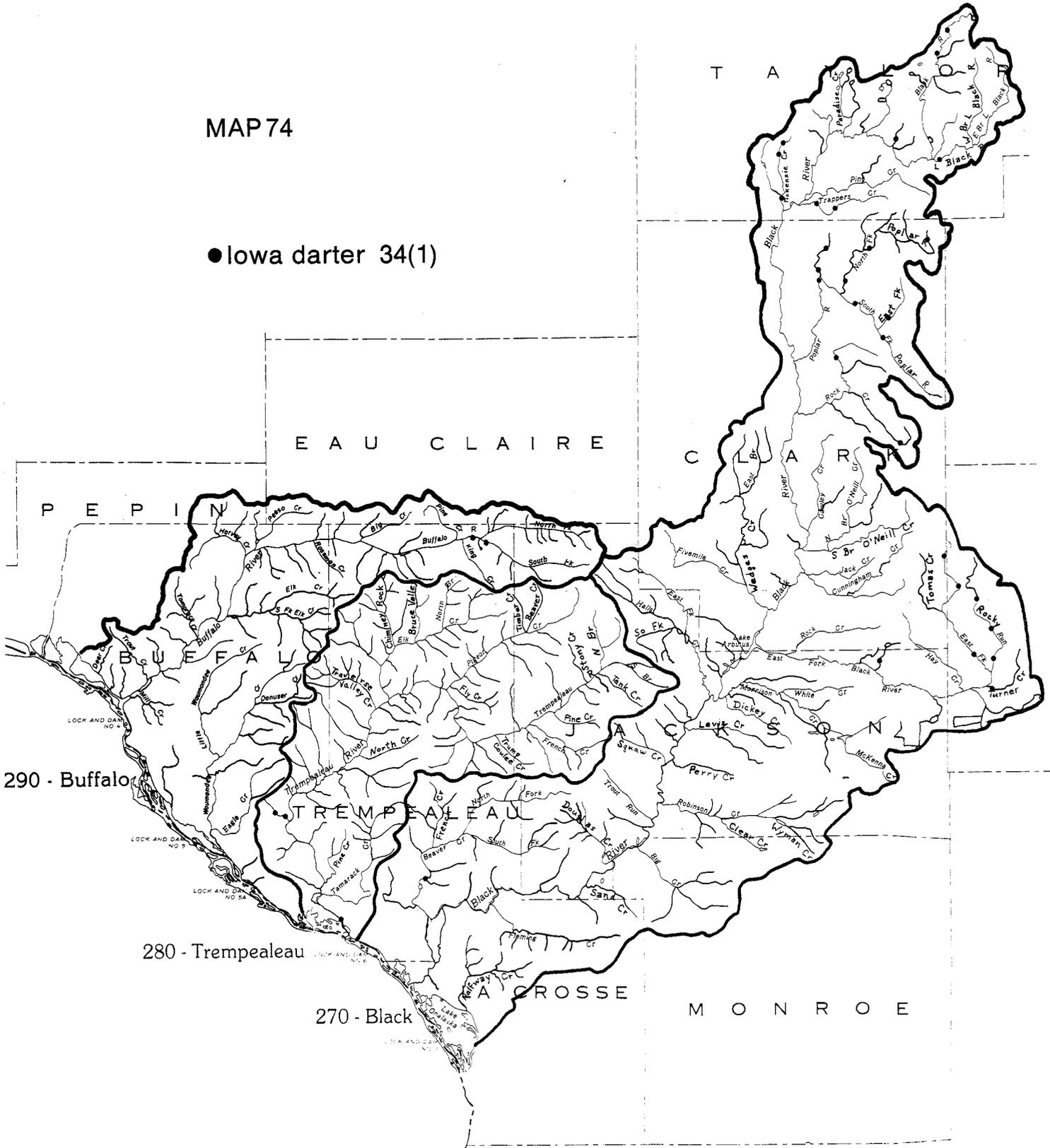
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 74

● Iowa darter 34(1)



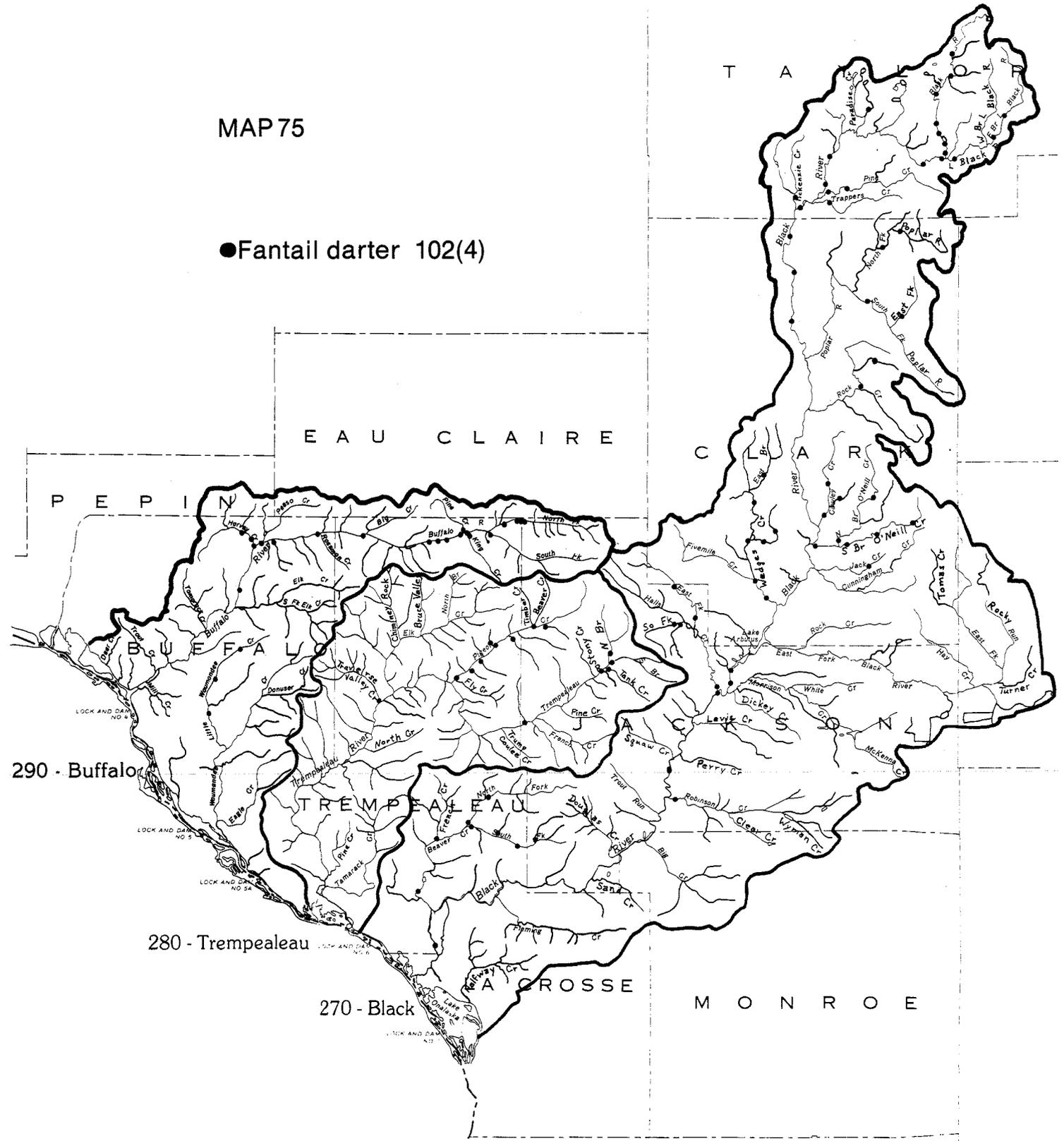
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 75

● Fantail darter 102(4)



290 - Buffalo

280 - Trempealeau

270 - Black

MAP 76

- Gilt darter 6(0)
- ▲ Least darter 2(0)



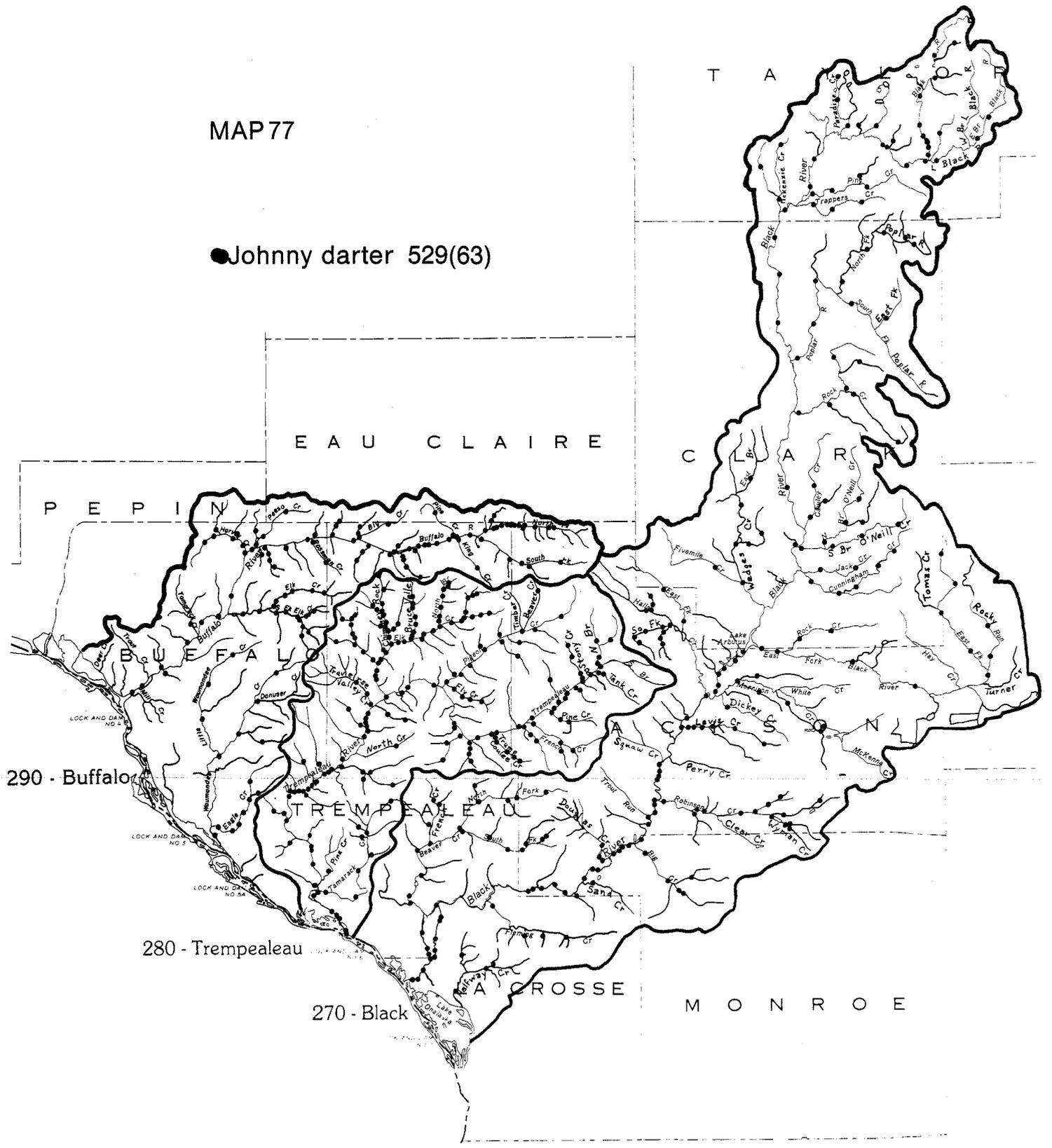
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 77

● Johnny darter 529(63)



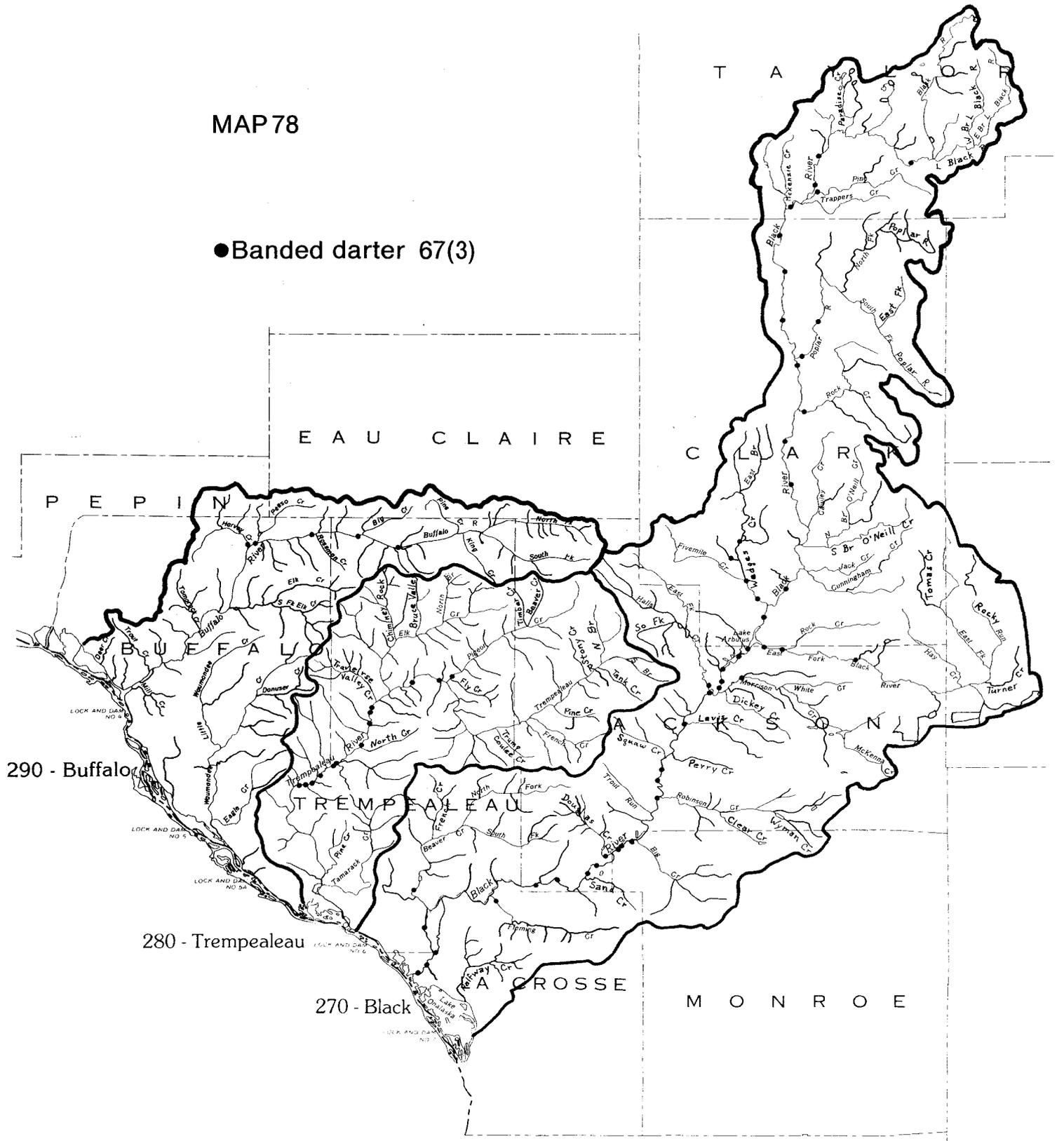
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 78

● Banded darter 67(3)



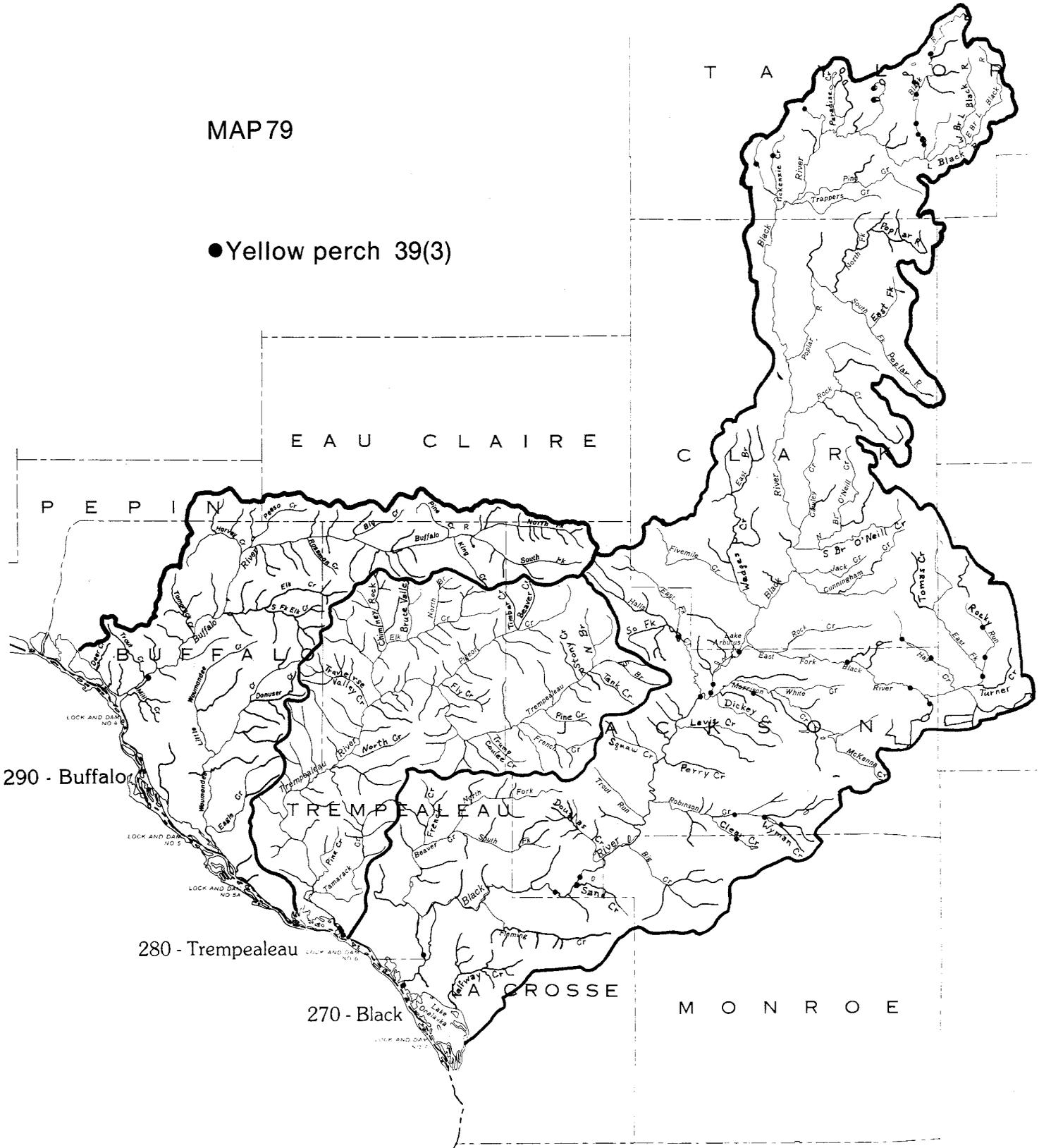
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 79

● Yellow perch 39(3)



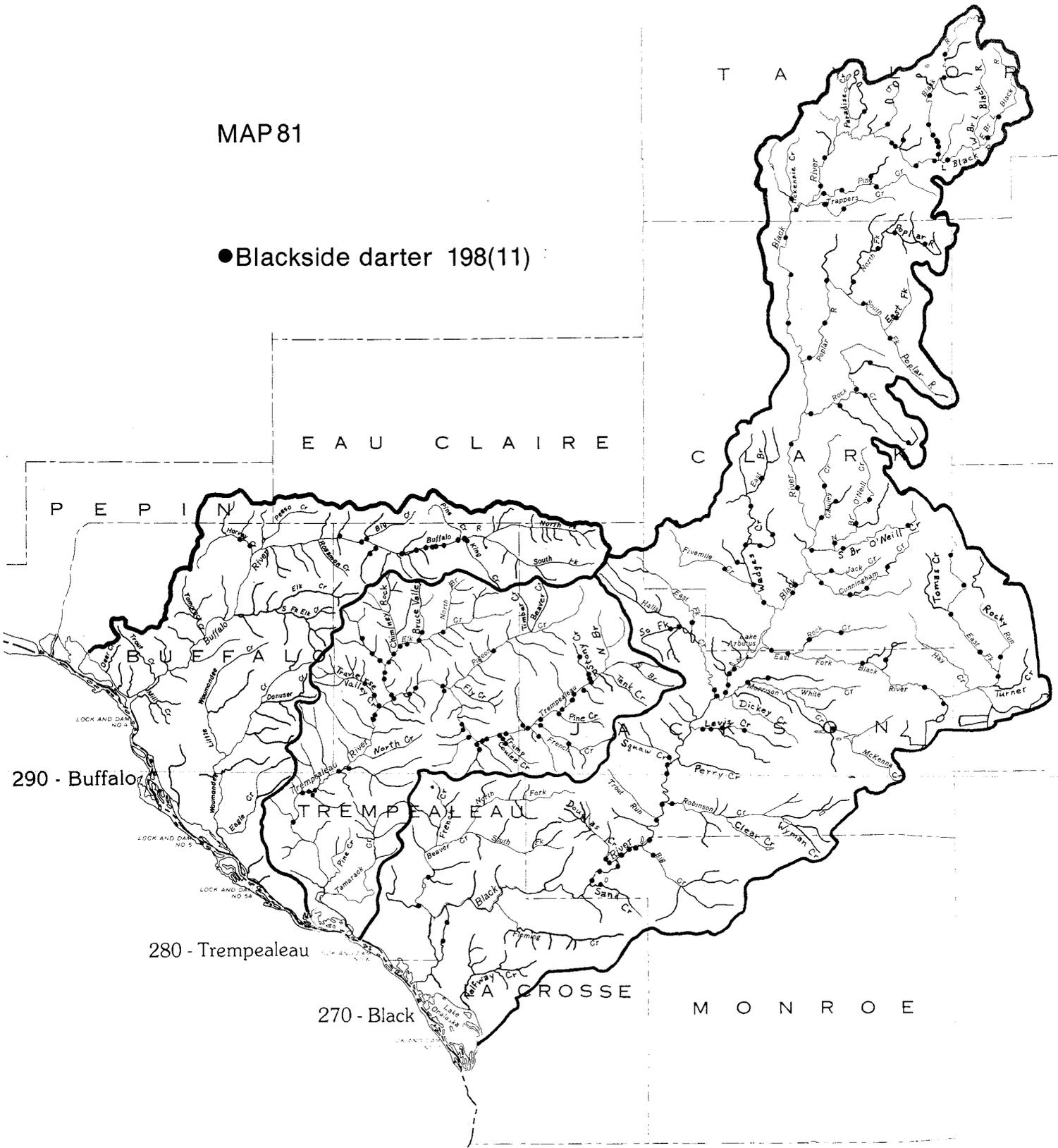
290 - Buffalo

280 - Trempealeau

270 - Black

MAP 81

● Blackside darter 198(11)



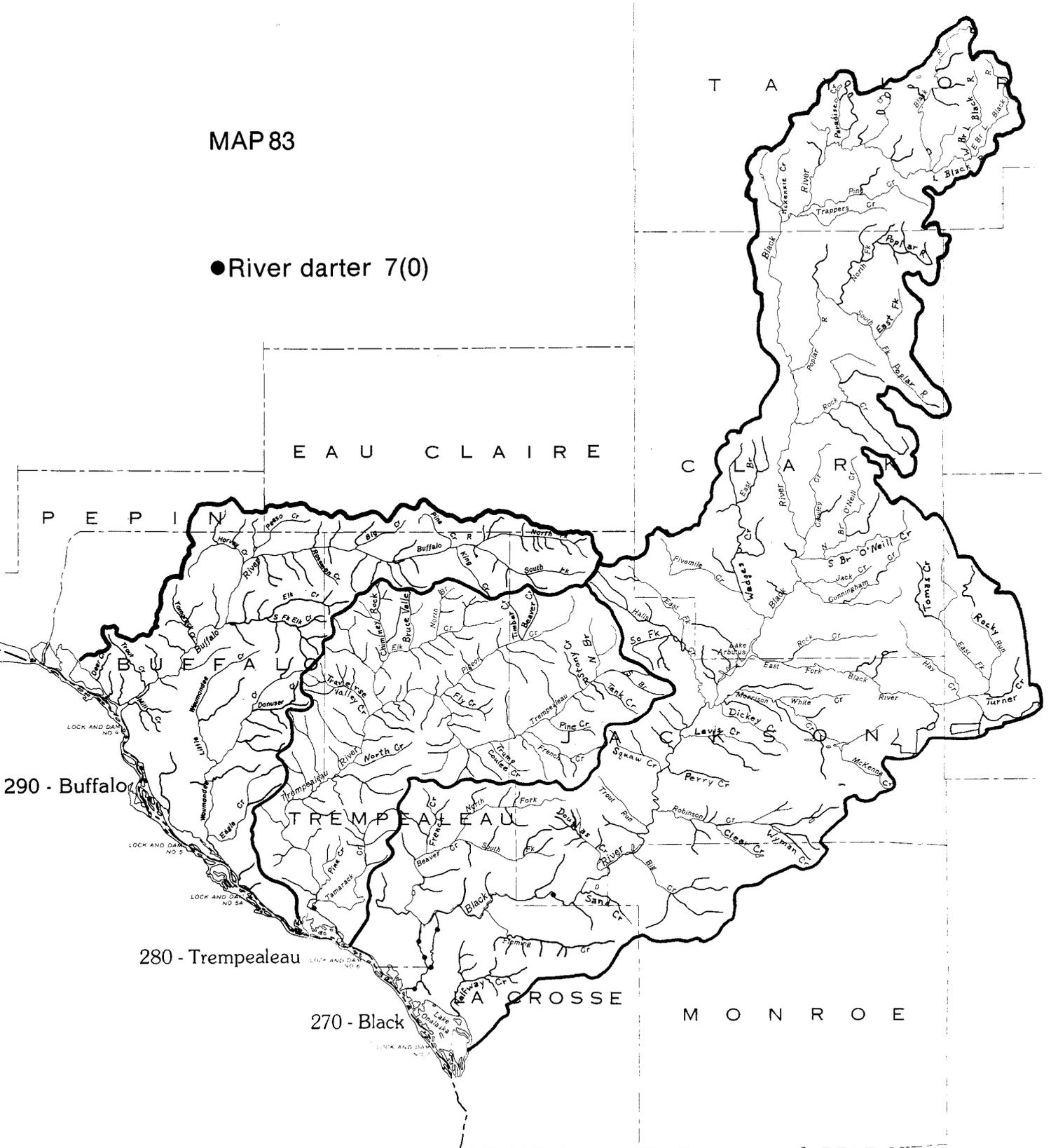
290 - Buffalo

280 - Trempealeau

270 - Black

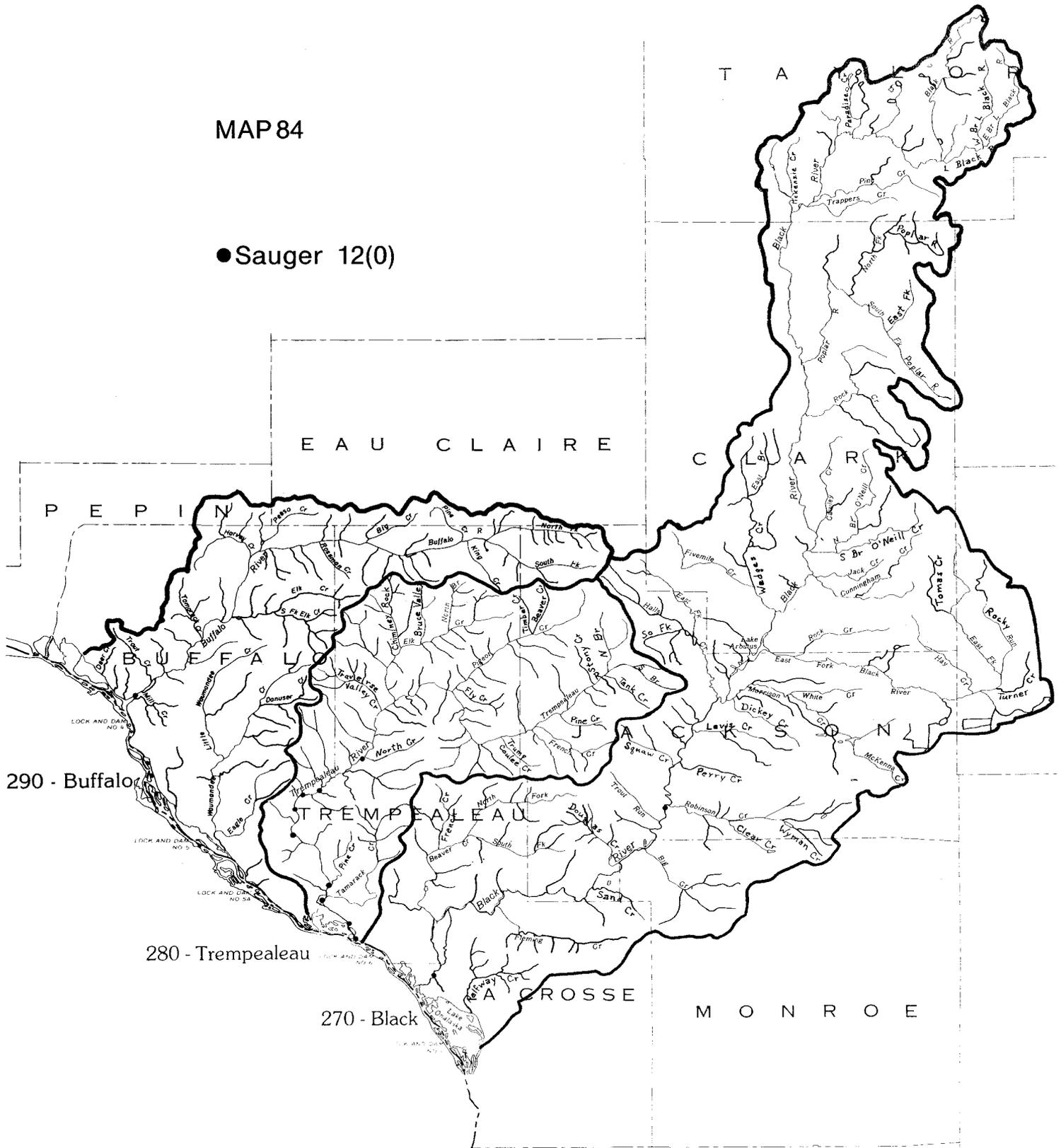
MAP 83

● River darter 7(0)



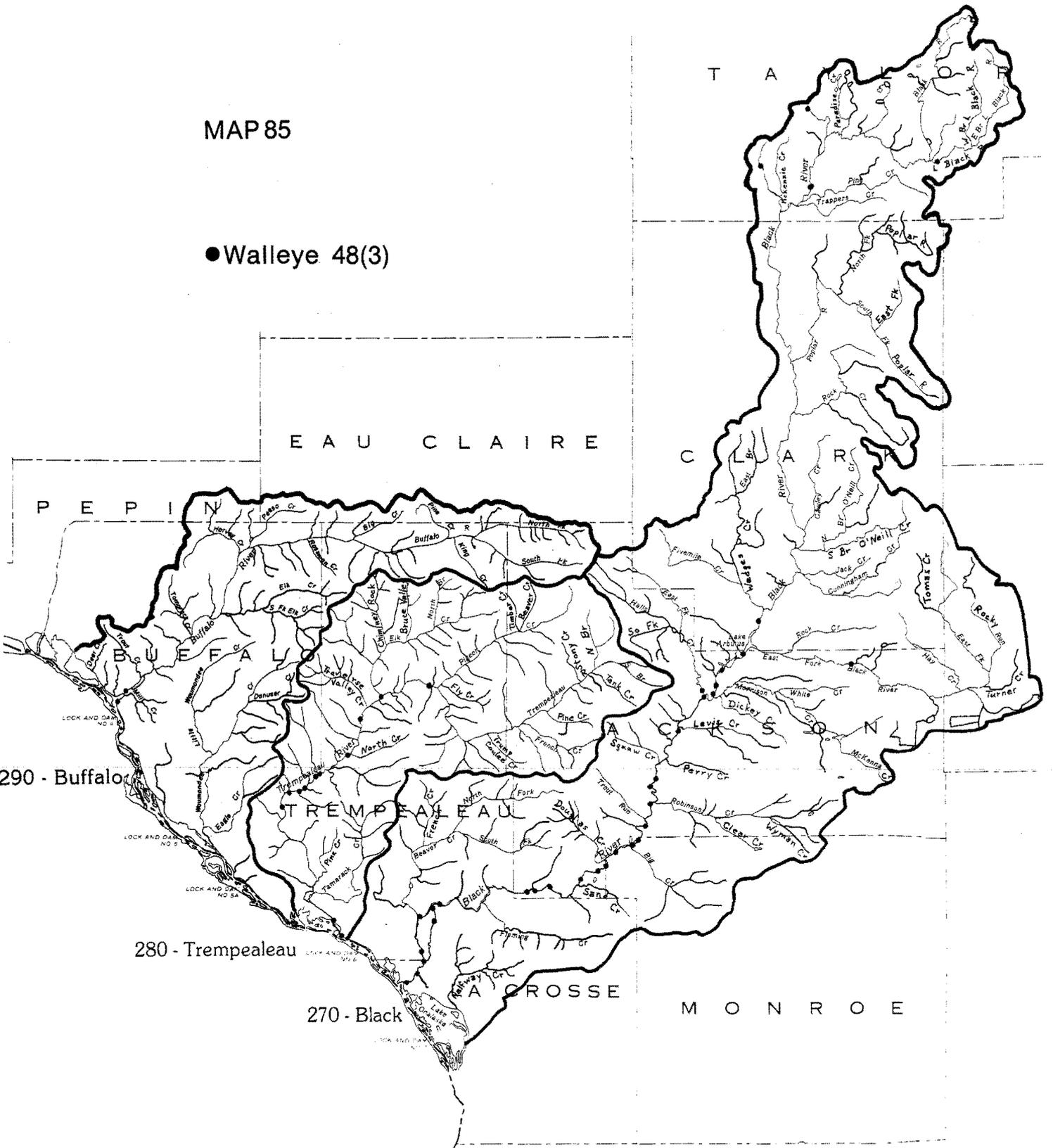
MAP 84

● Sauger 12(0)



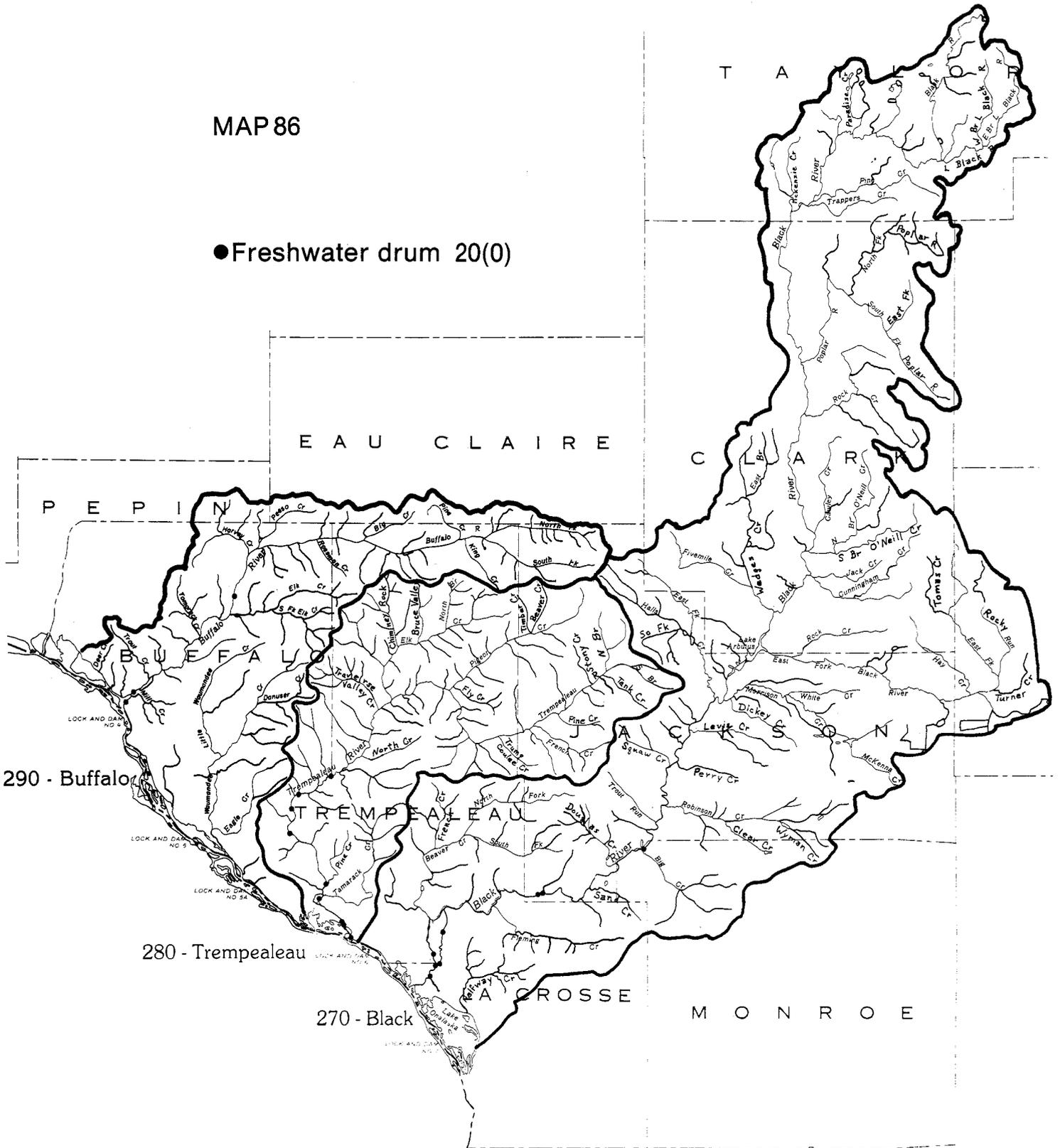
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MAP 86

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290 - Buffalo

280 - Trempealeau

270 - Black

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METRIC-ENGLISH AND ENGLISH-METRIC CONVERSIONS

$1 \text{ km} = 0.6214 \text{ mile}$
 $1 \text{ km}^2 = 0.3861 \text{ miles}^2$
 $1 \text{ ha} = 2.47 \text{ acres}$
 $1 \text{ cm} = 0.3937 \text{ inches (0.3937")}$
 $1 \text{ m}^3 = 35.21 \text{ ft}^3$
 $1 \text{ ft} = 30.48 \text{ cm}$
 $1 \text{ mile} = 1.609 \text{ km}$
 $1 \text{ acre} = 0.4047 \text{ ha}$

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