Distribution and relative abundance of fishes in Wisconsin: I. Greater Rock River basin. No. 136 1982

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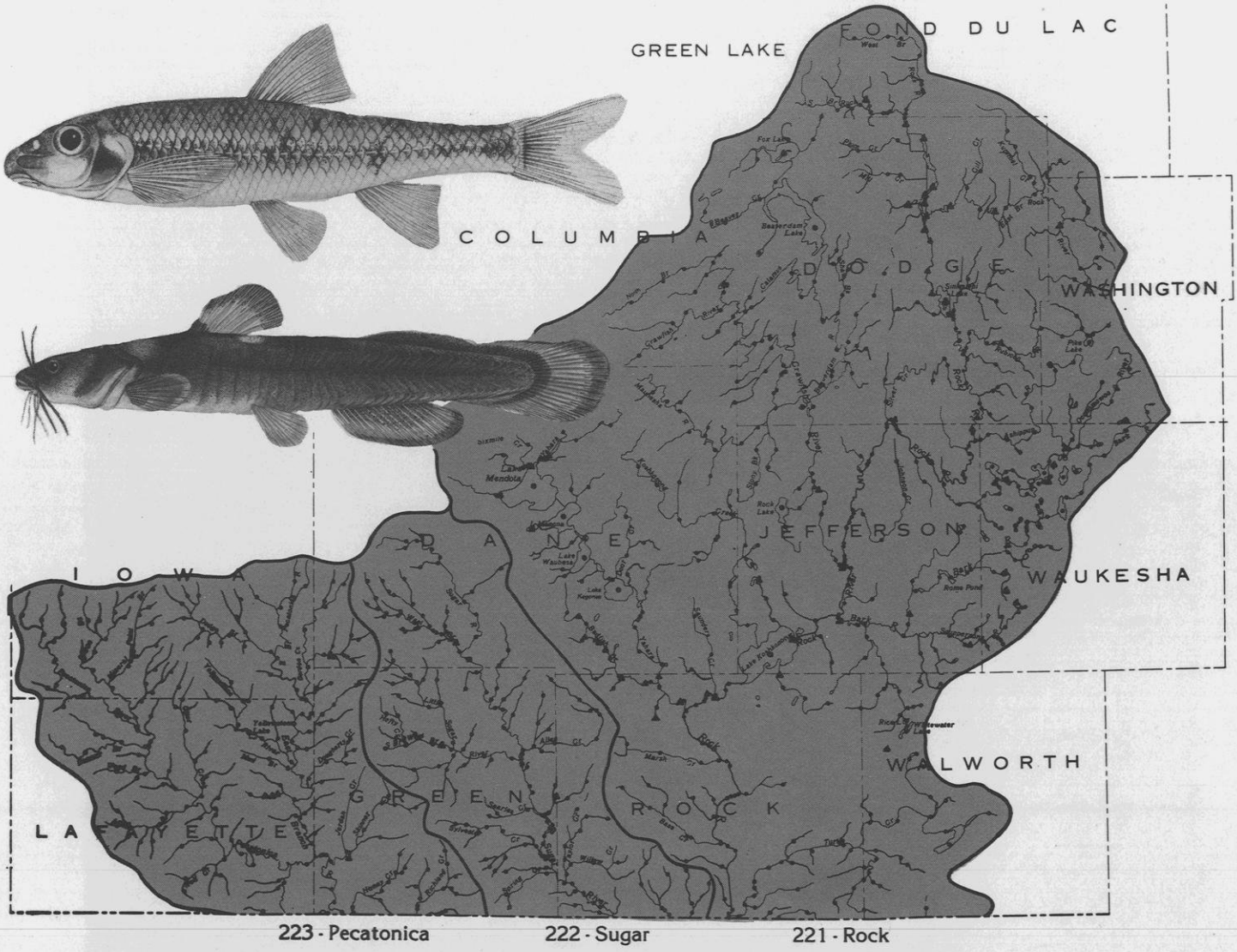

DISTRIBUTION AND RELATIVE ABUNDANCE OF FISHES IN WISCONSIN

I. Greater Rock River Basin

Technical Bulletin No. 136
Department of Natural Resources
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1982

This report is dedicated to the nongame fish, whose interrelationship in the aquatic ecosystem is generally not well documented or appreciated.

PREFACE

Little attention has been given to nongame fish species which comprise over 75% of the 150 fish species in Wisconsin waters. Yet many of those species play a major role in maintenance of sport fish populations so vital to recreational and economic interests in the state. In essentially disregarding these species, their right to exist and their role in maintaining community stability through species diversity have been overlooked. The nongame fish not only make up the majority of fish species in Wisconsin but are also more abundant than sport fish species in both total number and total biomass.

Further attention by either research or management to nongame fish species must be preceded by an inventory of what we have and where we have it. In 1974 the Bureau of Research of the Wisconsin Department of Natural Resources (DNR), with inputs from field fish management personnel, began a statewide assessment of the distribution and relative abundance of fish species, emphasizing but not limited to nongame species. This assessment was begun using a basin approach to delineate locations of sampling stations on over 7,200 lakes (over 350,000 ha) and 11,000 streams (over 68,000 km) within the state. The 3 major basins (Mississippi River, Lake Michigan, and Lake Superior) were further divided into 30 minor basins.

The last report on the distribution of fish species throughout the state was made by Greene (1935) for the 1900-31 period. He covered about 1,400 sampling stations. Since then, other collectors, notably Dr. George Becker (1959, 1964, 1966, 1983), Professor Marlin Johnson (1970), and the students at the University of Wisconsin at Madison (including McNaught 1963) and Stevens Point, have added appreciably to knowledge of regional distribution of Wisconsin fishes.

The need to update our knowledge of statewide fish distribution is most clearly evident from the dearth of information available on nongame species in most watersheds for preparing environmental impact assessments and reports and Department master plans. In addition, both federal and state law now require the establishment of an endangered and threatened species list. Furthermore, the Wisconsin Department of Natural Resources has been directed to "conduct research on endangered and threatened species of this state and shall implement programs directed at conserving, protecting, restoring, and propagating selected state endangered and threatened species to the maximum extent practicable." (Chap 29.415, Wis. Stats.).

Field collecting under the research study initiated in 1974 was essentially terminated in 1980 due to reduced funding, with only limited sampling after that time. Of the 30 river basins in the state, sampling was complete in 13 and nearly complete in 5. Only scattered samples were taken in the other 12 basins. These samples inventoried about 45% of the state.

The results of the work so far completed on fish distribution are being published in a series of separate bulletins dealing with one or more minor basins. The bulk of the data presented refers primarily to collections made during the Bureau of Research study. However, other fishery biologists and managers have made numerous collections over the years, and their published and unpublished records, when available to us, are included. Therefore, data from as early as 1900 are available for some basins, permitting comparisons between historical and current records.

This series of reports, however, constitutes only an overview of a voluminous mass of data now permanently stored in computer files. For the field manager or investigator, the greatest value of this study lies in the availability of fish data on specific waters or on waters in close proximity to those of immediate concern. Data now in computer files (over 15,000 collections) have already, in over 200 cases, proven to be very useful to the DNR personnel in several bureaus and to other state and federal agencies, environmental consultants, and students. They have used the data for various purposes; e.g., to make assessments on past as well as potential changes in the aquatic environment, indicate water quality through fish species composition, and determine ranges in Wisconsin for particular fish species.

Sufficient data were collected during the research study to recommend the revision of Wisconsin's endangered and threatened fish species lists in 1979 and again in 1982. The first revision added 15 species to both lists and removed 2 from the endangered list. The second revision added 2 to the endangered list, and removed 1 from the endangered and 3 from the threatened list.

The bulk of the preserved fish collections are curated at the Milwaukee Public Museum, further enhancing the value and significance of this study. There they are used by scientists and educators interested in taxonomy, systematics, and natural history. They also are serving as a baseline collection from which to determine changes in fish community structure and environmental loads of pollutants and toxicants.

This report deals with the Greater Rock River basin, consisting of 3 sub-basins: Rock River, Sugar River, and Pecatonica River.

COVER - *Gravel chub (top), slender madtom (bottom)*

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I. Greater Rock River Basin

By

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Technical Bulletin No. 136
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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 abundance of all fish species.

The Greater Rock River basin was sampled from 1974 through 1981 at 1,015 stations by research personnel and 107 stations by fish management personnel to extend our knowledge of fish distribution in Wisconsin. An additional 113 stations were partially sampled by fish management personnel and other collectors.

A total of 102 species (excluding the grass carp and coho salmon) were collected in the Greater Rock River basin; 93 in the Rock River basin, 72 in the Sugar River basin, and 61 in the Pecatonica River basin. Included were the endangered gravel chub, striped shiner, slender madtom, and starhead topminnow as well as the threatened Ozark minnow and black buffalo. Eleven species on the Department's watch list were also collected.

Data from the 1974-81 period for the Greater Rock River basin and for each of its 3 sub-basins (Rock, Sugar, and Pecatonica) were compared to the 1900-28 and the 1960-73 periods. Five species were collected which were not previously reported and 6 species have apparently been extirpated.

While this report includes numerous tables, distribution maps of the species, and discussion on many aspects of fish distribution in the Greater Rock River basin, 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.

CONTENTS

STUDY AREA

The Greater Rock River basin (220)* is located in the south central portion of Wisconsin (Fig. 1). It is part of the Mississippi River basin and is divided into 3 sub-basins: the Rock River (221), containing all tributaries flowing into the Rock River in Wisconsin and into Turtle Creek, which flows into the Rock River in Illinois; the Pecatonica River (223), which also flows into the Rock River in Illinois; and the Sugar River (222), which flows into the Pecatonica River in Illinois. This basin encompasses parts of the following Wisconsin counties: Columbia, Dane, Dodge, Fond du Lac, Green, Iowa, Jefferson, Lafayette, Rock, Walworth, Washington, and Waukesha.

The Greater Rock River basin in Wisconsin contains an area of approximately 14,452 km^2 (Holmstrom 1982). Within this area, we defined 1,061 streams with a total length of 6,473 km (Table 1).** Of these, 773 are unnamed creeks or ditches. There are 226 lakes and impoundments (bodies of water with dams at their outlets) in the basin, with a total area of 25,766 ha (excluding Horicon and Theresa marshes). Twelve of these lakes were over 400 ha in size. Ninety-eight percent of the total area of all lakes and impoundments is in the Rock River basin. The high number of dams (86) in this basin indicates numerous impoundments which tend to slow down water velocity, create variable discharge patterns, and influence fish migration and species composition.

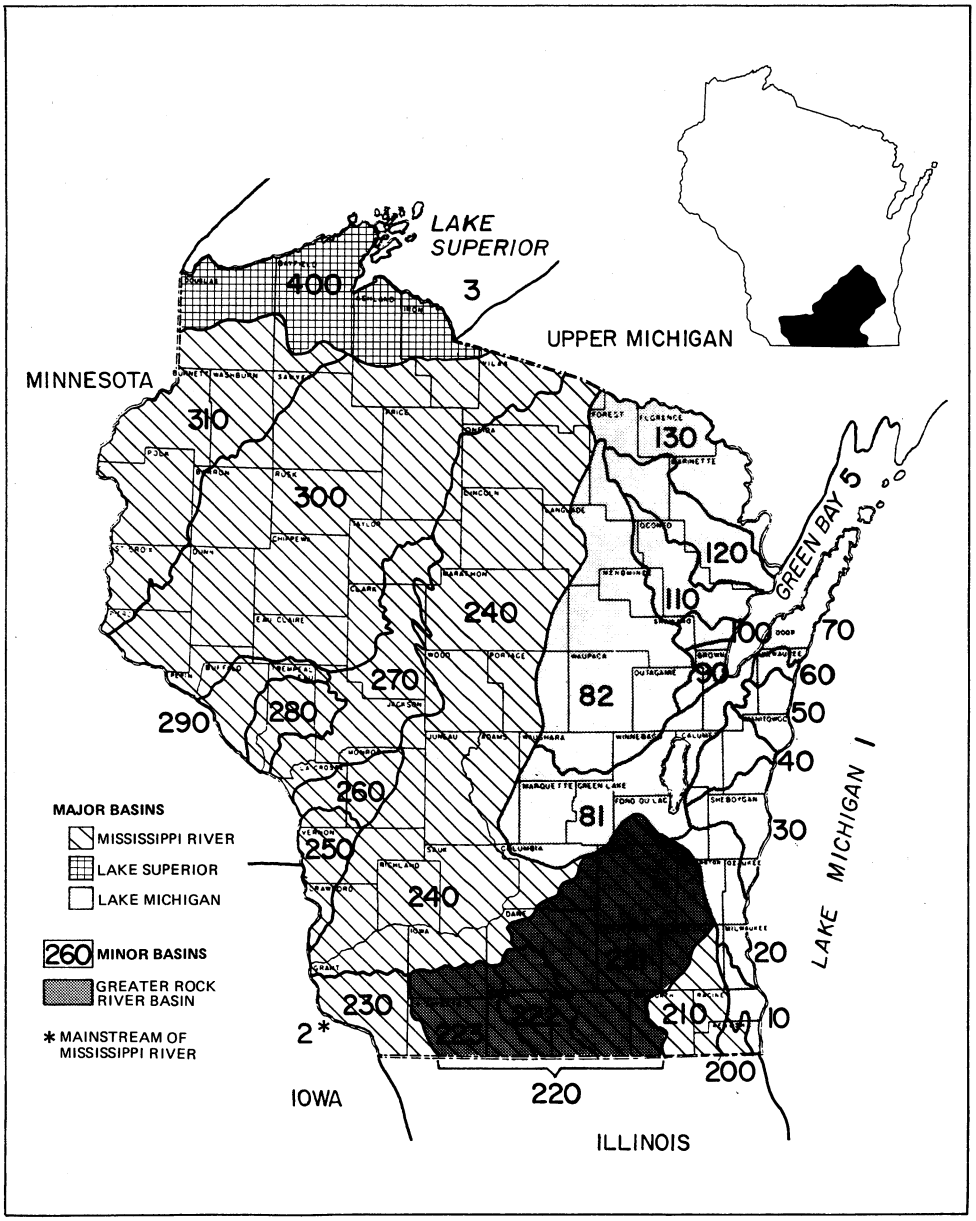


FIGURE 1. *Major and minor river basins in Wisconsin.*

TABLE 1. *Land area, streams, and lakes of the Greater Rock River basin.*

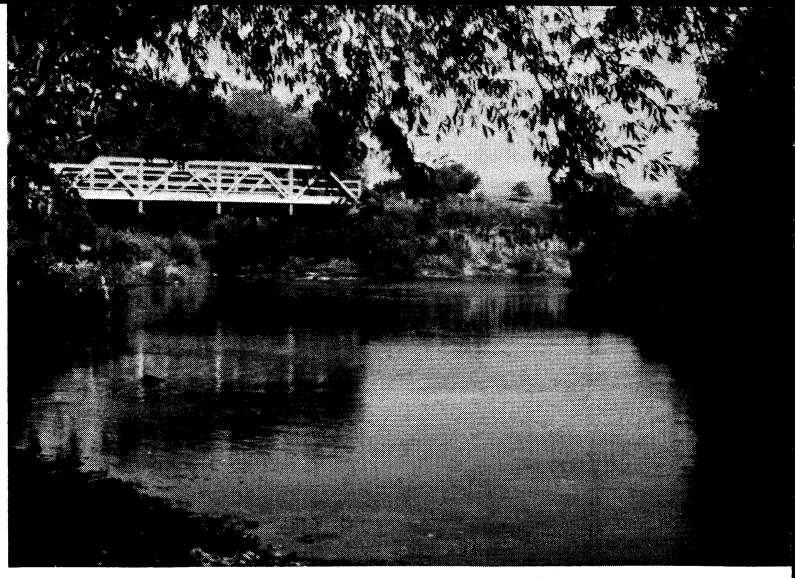
	Rock River Basin	Sugar River Basin	Pecatonica River Basin	Total
Land area (km^2)*	9,694	1,909	2,849	14,452
Streams				
Total no.	544	116	401	1,061
(Unnamed creeks or ditches)	(395)	(65)	(313)	(773)
Total length (km)	3,695	861	1,917	6,473
Lakes/impoundments**				
Total no.	208	12	6	226
Area (ha)	25,304	202	260	25,766
No. dams	86	9	6	101

*Drainage area in Wisconsin.
**Impoundments are bodies of water with dams at their outlets.

*All basins in the state were assigned a 3-digit number for ease of reference.

**See Appendix B for explanation on how the streams and lakes were defined.

Turtle Creek (Rock River basin)—looking upstream at habitat of the greater redhorse.



Pecatonica River at County Trunk O with Mineral Point Branch coming in on the right.

The average annual precipitation within the Greater Rock River basin is 80 cm (76-84 cm) according to National Weather Service data. The average gradient for the Rock River above the mouth of the Crawfish River (in Jefferson Co.) is 23 cm/km. It decreases to 18 cm/km below the mouth of the Crawfish River. The average gradients for the Pecatonica and Sugar rivers, however, are considerably higher at 76 and 72 cm/km, respectively. The discharges near where the Rock, Pecatonica, and Sugar rivers cross the state's border average 48, 19, and 9 m^3/sec, respectively.

The dominant land use in the Greater Rock River basin is agricultural, including both crop and pasture lands. The turbidity of many streams in the basin, especially in the Pecatonica River basin, can be traced in large measure to the activity of dairy and beef cattle in the streams and on the stream banks. The eutrophic condition of the water in many streams and lakes in the Greater Rock River basin, especially in the Rock River basin, can be traced to municipal sewage treatment facilities as well as to the agricultural land practices (Wisconsin Department of Natural Resources 1971, 1971, 1971, 1976).

METHODS

Data Sources and Time Periods

All collections except 4 are divided into 3 time periods: 1900-28, 1960-73, and 1974-81. The earlier records provide the basis for assessment of changes over time in distribution of fish species within the Greater Rock River basin.

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 during the 1960-73 and 1974-81 periods, 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).

1900-28 Period. Collections from this period were made at 126 stations in the Greater Rock River basin (Table 2), primarily by one or more of the following individuals: Cahn (1927) and C. W. Green, L. C. Stuart, C. L. Turner, G. Wagner, Schultz, Tarzwell, E. Creaser, and J. L. Griffith (names taken from the original field notes). Most specimens were verified by Dr. Carl Hubbs or Dr. Greene. The majority of the species locations were cited by Greene (1935).

The stations sampled were located on 64 streams and 18 lakes in the Greater Rock River basin (Table 2). Thoroughness of sampling effort is unknown, and therefore calculation of percent occurrence of each species was not attempted.

1960-73 Period. Complete collections from this period were made at 259 sampling stations on 99 streams and 13 lakes in the Greater Rock River basin (Table 2). An additional 49 partial collections, which increased the number of streams sampled by 5 and lakes by 16, came from written records provided by fish management personnel, and sport and commercial fishermen. The data from these partial samples were therefore kept separate in Tables 2 and 3, and are not included in the percentages of total stations sampled in Table 3. All collections (except 4 made between 1946 and 1959 from the 49 partial stations) were made between 1960 and 1973.

TABLE 2. *Summary of stream and lake sampling effort in the Greater Rock River basin, 1900-81.*

	Rock (221)			Sugar (222)			Pecatonica (223)			Greater Rock (220)		
	1900-28	1960-73	1974-81	1900-28	1960-73	1974-81	1900-28	1960-73	1974-81	1900-28	1960-73	1974-81
Streams												
No. sampled	32	54* (3)	**167 (2)	11	21 (2)	66	21	24	116	64	99 (5)	349 (2)
No. stations	51	165 (8)	457 (48)	14	35 (14)	165 (2)	26	38 (1)	222 (4)	91	238 (23)	844 (55)
Lakes/ impoundments												
No. sampled	16	12 (10)	50 (19)	1	(5)	4 (2)	1	1 (1)	2 (1)	18	13 (16)	56 (22)
No. stations	33	18 (20)	266 (56)	1	2 (5)	5 (2)	1	1 (1)	7 (1)	35	21 (26)	278 (59)
Total No. stations	84	183 (28)	723 (104)	15	37 (19)	170 (4)	27	39 (2)	229 (5)	126	259 (49)	1,122 (113)

*Complete samples.
**Partial samples.

Of the complete collections made at 259 stations, 60 were made by fish management and 3 by research personnel. The bulk (196), however, came from other cooperators, with major contributions by Dr. George Becker (unpubl. data) and Prof. Marlin Johnson (unpubl. data) and their students.

Total occurrences are 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 equal 60. This information has been calculated since 1960, and reveals the volume of data from both complete and partial stations used in this study over the 21-year period (Table 4). During 1960-73, total occurrences for the Greater Rock River basin numbered 2,800, two-thirds of which were accounted for by Becker and Johnson and their students. They also collected 79 out of the 94 species for that time period (Table 4 and Append. A Table 16).

1974-81 Period. Collections from this period were made at 1,122 stations on 349 streams and 56 lakes in the Greater Rock River basin (Fig. 2). Of these collections, 94% occurred between 1974 and 1976. There were 113 partial collections, which increased the number of streams sampled by 2 and lakes by 22.

For the Greater Rock River basin, there was an average increase in effort over the 1960-73 period of 330%, with 1,122 stations sampled, reflecting the input of the research project (Table 2). The greatest increase occurred in the Pecatonica River basin which had a 490% increase. DNR research personnel sampled 1,015 (90%) of the complete stations, and fish management 107 (10%). The 113 partial samples were collected by fish management personnel, University of Wisconsin-Madison students, and sport and commercial fishermen.

Total occurrences increased from 2,800 for the 1960-73 period to 11,253, 87% of which were recorded by research personnel (Table 4). They also collected 98 out of the 102 species from the Greater Rock River basin. Species not collected by research personnel were: lake sturgeon, cisco (lake herring), muskellunge, burbot, and grass carp. (For species taken by all other collectors, see Append. A Table 16.)

Collection Methods and Gear (1974-81)

Only the methods and gear employed by DNR research personnel are described; fish management personnel used similar equipment. Four types of electrofishing gear were used, depending on the size of the body of water. The types of gear, and percent of the stations at which they were used, were: boom shocker (7%), stream shocker (44%), longline shocker (11%), and gasoline-powered backpack shocker (7%). All generators produced direct current, with the boom shocker 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 electrofishing equipment, see Novotny and Priegel (1971, 1974).

Small-mesh seines were used at 30% of the stations, primarily in lakes and large rivers. The seines were 1.2-m and 9.1-m bag seines with 4.8-mm delta mesh. The areas sampled averaged 278 m^2.

Sampling Effort (1974-81)

Establishment of sampling locations was based primarily on habitat diversity and secondarily on the distance between stations and accessibility. The length of the stretch constituting a sampling station was approximately 100 m for all electrofishing gear except the boom shocker. For the boom shocker, stations averaged 1.9 km. There was an average of 1 station/6 km for the total length of sampled streams in the basin. On the main stem of the Rock, Sugar, and Pecatonica rivers, distance between stations averaged 4 km. On sampled lakes and impoundments there was an average of 1 station/72 ha of water.

Complete collections were made on 31% of the streams and 25% of the lakes and impoundments in the Rock River basin, 57% of the streams and 44% of the lakes and impoundments in the Sugar River basin, and 29% of the streams and 33% of the lakes and impoundments in the Pecatonica River basin (Tables 1 and 2). While these percentages are relatively low, the streams that were sampled comprised 75% of the total length of all streams in the Greater Rock River basin. Furthermore, the lakes and impoundments that were sampled comprised 85% of the total surface area for these types of water in this basin. Figure 2 shows the location of 968 of the 1,122 complete and 113 partial stations. Only one dot per lake was shown, and dots were eliminated that would overlap another dot. In the determination of percent of occurrence of a species in a stream or lake environment, 27 stations at which the aquatic habitat was somewhere between a stream and lake environment were not used.

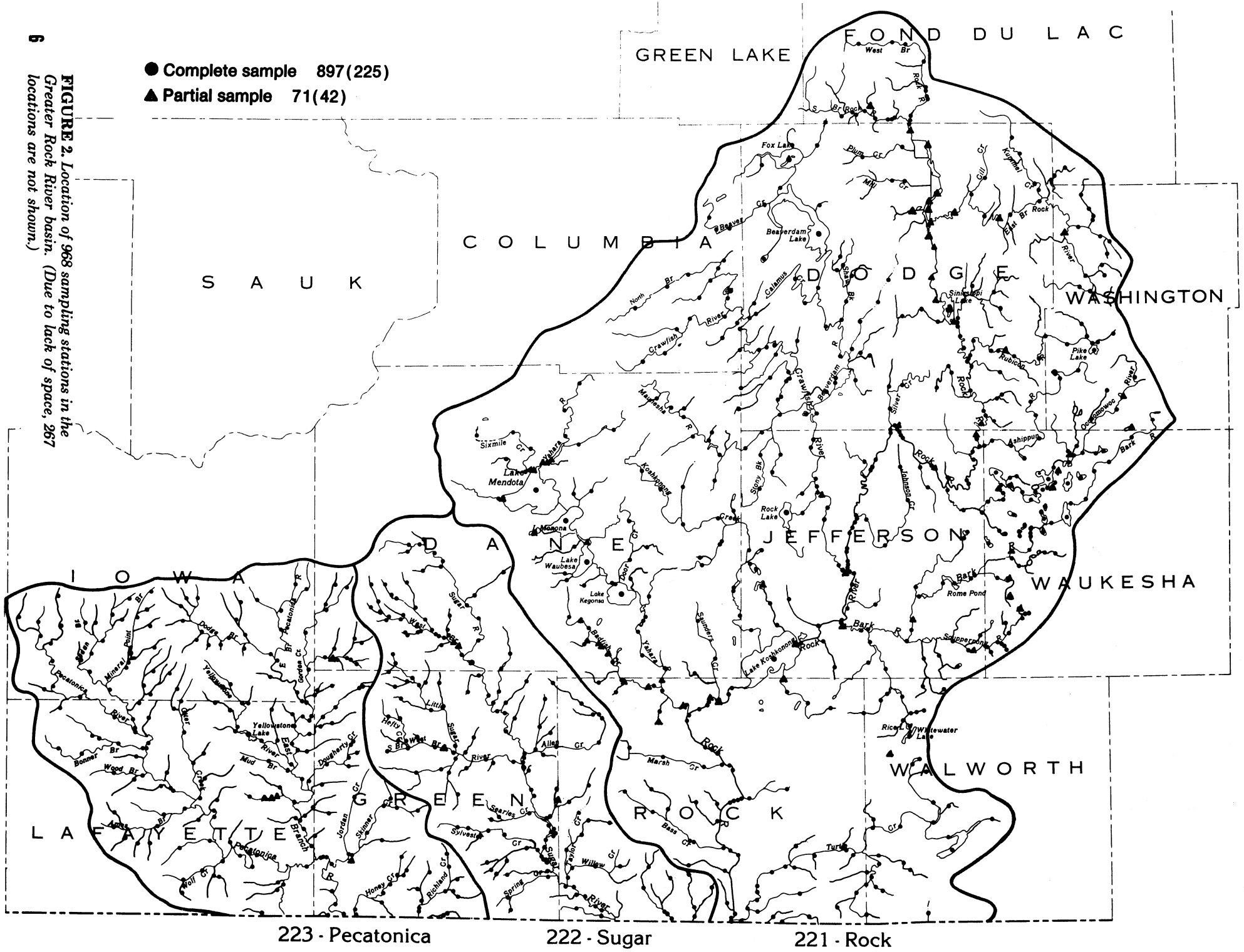


FIGURE 2. *Location of 968 sampling stations in the Greater Rock River basin. (Due to lack of space, 267 locations are not shown.)*

Boom shocker on Pecatonica River.

Three-man stream shocking unit.

Three-man small-mesh seining operation.

Gasoline-powered back-pack shocker on Story Creek (Sugar River basin).

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 1,500 collections from the Greater Rock River basin dating from 1900, Cobal 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 Greater Rock River, as well as on 13,400 additional stations throughout the state.

Other programs are used to help in the analysis of the data. One analysis uses a Cobal 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 b):

(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 first tributary of the original river and listing all stations on that 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,

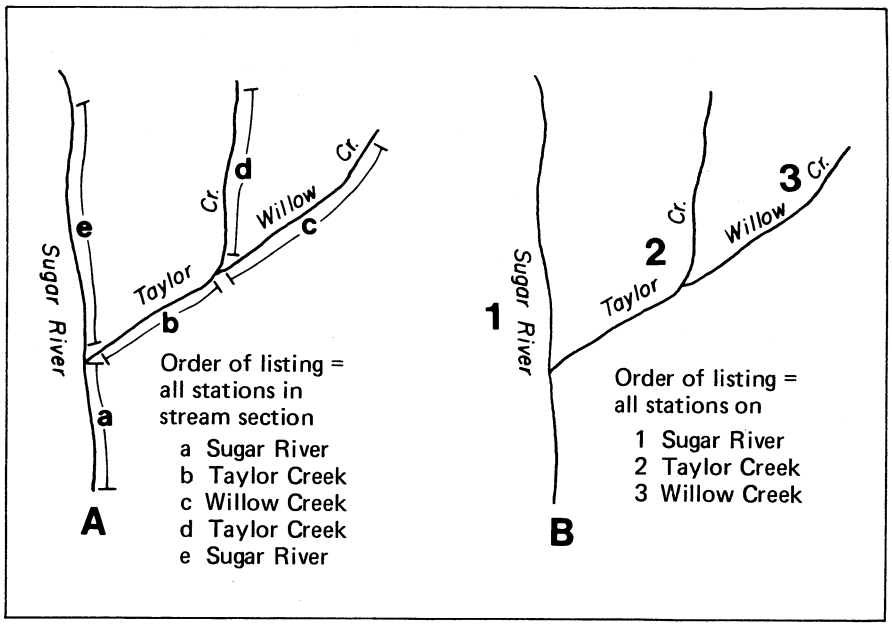


FIGURE 3. *Two methods of organizing stations on computer printouts.*

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 Cobal 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 is computed. At the end of the printout, a summary table is given 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, and the total number of species, hybrids, and unspecified categories). The program can be restricted to the same criteria cited above for the Cobal program, and the listing can be organized in the same 2 ways (Fig. 3a and b). 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 B Figure 8.

A water mileage system was devised to permit computer analysis of the data and yet allow easy recognition of locations by persons using the file. Details of this system are given in Appendix B.

Fish Identification and Enumeration (1974-81)

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 (using the unpublished keys of Dr. G. Becker) in the laboratory. The nomenclature used follows that established by the American Fisheries Society's Committee on Names of Fishes (Robins 1980). The common and scientific names of fish collected in the Greater Rock River basin can be found in Table 5. In 1974 and part of 1975, stonerollers (*Campostoma* spp.) were not keyed out to species. All hybrids and specimens not keyed down to species, except stonerollers, are 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 Table 10 for some species is substantially lower than the number actually captured. Furthermore, there were up to 10 stations for certain species at which the number taken was unknown, further underestimating the total number of specimens.

Research personnel identified all fish in the 1974-81 period except some specimens of the 27 species with an asterisk by their names in Appendix A Table 16, which were collected by Fish Management personnel, students, or sport and commercial fishermen.

For the 1960-73 period species records are based upon the collectors' identification except for Fish Management's records of the species that do not have an asterisk by their names in Appendix A Table 16. These records are based upon identification by research personnel.

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 three 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 first for the individual basins, then for the entire Greater Rock River basin, and finally for some of the more interesting species including those that are on the Wisconsin DNR endangered, threatened, or watch lists. Unless otherwise indicated, findings refer only to the 1974-81 period.

ROCK RIVER BASIN (221)

Species Found

A total of 93 species (excluding the coho salmon) was taken from the 827 locations sampled in this basin (Table 3). This included 3 endangered species (gravel chub, striped shiner, and slender madtom), 1 threatened (Ozark minnow), and 9 watch species.

Reproducing Populations

In the Rock River basin, 88 species are known to have reproducing populations. The presence of reproducing populations of 5 other species is questionable: (1) rainbow trout (there are no records of natural reproduction), (2) coho salmon (*Oncorhynchus kisutch*) (taken from Nine Spring Creek, but not listed in any table in this report since they were known to have escaped from the Nevin Fish Hatchery; reproduction has not been reported), (3) muskellunge (occurrence based on fish management records from Fox Lake where they have been stocked), (4) river shiner (a single specimen from the Rock River at Watertown in 1977 that may have been a result of fish management's restocking program), and (5) striped shiner (a single specimen from the Rubicon River below Hartford). Reproduction is impossible for the American eel because it does not spawn in fresh water.

Brook trout reproduction is limited to small areas in 2 streams in the basin, and brown trout are known to reproduce in very limited areas in 3 streams.

Common and Rare Species

The 5 most commonly found species (caught at the highest percentage of complete stations) were bluegill (44%), white sucker (43%), bluntnose minnow (42%), green sunfish (37%), and black bullhead (34%) (Table 3).

The 13 rarest species (caught at 5 or fewer of all the stations) were American brook lamprey, American eel, cisco, muskellunge, goldfish, silvery minnow, river shiner, striped shiner, pugnose minnow, silver redhorse, river redhorse, greater redhorse, and burbot.

Differences Between Basins and Time Periods

Of the 93 species found in the Rock River basin, 23 were not found in the Sugar or Pecatonica River basins (Table 6). However, the muskellunge and striped shiner, whose natural reproduction in the basin is questionable, are 2 of these.

Three species of fish have not been previously reported from this basin — river shiner*, river redhorse, and greater redhorse (Table 7).

Seven species are apparently no longer present in the Rock River basin (Table 8). The weed shiner, flathead catfish, and western sand darter were taken only before 1929; the shortnose gar was taken at only 1 station in 1948 (and included in the 1960-73 time period); and the finescale dace, bullhead minnow, and longear sunfish were most recently taken in the 1960-73 time period. It is questionable if a reproducing population ever existed for the flathead catfish or shortnose gar.

Seven species not taken between 1929 and 1973 from the basin (Table 9), including the striped shiner*, were collected during the 1974-81 period.

*Natural reproduction in basin is questionable

SUGAR RIVER BASIN (222)

Species Found

The 174 locations sampled in this basin yielded 72 species (excluding the grass carp) (Table 3). This included 2 endangered (gravel chub and starhead topminnow), and 6 watch species.

Reproducing Populations

In the Sugar River basin, 66 species are known to have reproducing populations. The presence of reproducing populations of 5 other species is questionable: (1) northern brook lamprey (only 2 specimens from Willow Creek), (2) and (3) rainbow and brook trout (no streams in this basin known to have natural reproduction), (4) grass carp (*Ctenopharyngodon idella*) (illegally imported into state and chemically removed from Maloney Pond; not listed in any table in this report since all specimens are believed to have been destroyed), (5) yellow perch (also caught in Maloney Pond before it was chemically treated and were replanted afterwards; this private pond has a controlled outlet and natural reproduction has not been documented in other areas). The American eel does not spawn in fresh water.

There are only 4 streams that are known to have reproducing populations of brown trout, 1 of which (Mt. Vernon Creek) has excellent reproduction (C. Brynildson, Wis. Dep. Nat. Resour., pers. comm.).

Common and Rare Species

The 5 most commonly found species (caught at the highest percentage of complete stations) were white sucker (76%), creek chub (66%), Johnny darter (60%), bluntnose minnow (55%), and brook stickleback (47%) (Table 3).

The 24 rarest species (caught at 5 or fewer of all the stations) were northern brook lamprey*, American eel, rainbow trout*, brook trout*, grass pickerel, goldfish, silver chub, rosyface

TABLE 3. *No. of stations and percent of total stations at which each species was collected, and percent change in occurrence, Greater Rock River basin, 1900-81.*

Map No.	Species	Rock (221)					Sugar					Pecatonica (223)					Greater Rock (220)					Percent Change in Occurrence[2]
		1900-28	1960-73		1974-81		1900-28	1960-73		1974-81		1900-28	1960-73		1974-81		1900-28	1960-73		1974-81		
		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	No. Stn.	No. Stn.	Percent Total	No. Stn.	Percent Total	
1.	Northern brook lamprey	0	0	-	0	-	0	0	-	1	1	0	0	-	0	-	0	0	-	1	t	-
1.	American brook lamprey	2	0	-	3	t**	0	0	-	13	8	0	0	-	14	6	2	0	-	30	3	1,400
2.	Lake sturgeon (W)[1]	1	0 (2)*	-	0 (8)	-	0	0	-	0	-	0	0	-	0	-	1	0 (2)	-	0 (8)	-	300
2.	Longnose gar	5	2 (2)	1	4 (13)	1	0	0	-	0	-	0	0	-	2	1	5	2 (2)	1	6 (13)	1	380
-	Shortnose gar	0	0 (1)	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0 (1)	-	0	-	-100
3.	Bowfin	1	8 (6)	4	20 (23)	3	0	0	-	0	-	0	0	-	0	-	1	8 (6)	3	20 (23)	2	210
3.	American eel (W)	3	0 (1)	-	0 (4)	-	0	0	-	1	1	0	0	-	0	-	3	0 (1)	-	1 (4)	t	400
4.	Cisco (lake herring)	8	0 (1)	-	1 (3)	t	0	0	-	0	-	0	0	-	0	-	8	0 (1)	-	1 (3)	t	300
5.	Rainbow trout	1	5 (1)	3	7 (7)	1	0	0	-	4 (1)	2	0	0	-	14	6	1	5 (1)	2	25 (8)	2	450
4.	Brown trout	1	6 (2)	3	13 (7)	2	0	1 (1)	3	31 (2)	18	0	1	3	42 (4)	18	1	8 (3)	3	86 (13)	8	1,100
5.	Brook trout	1	2 (1)	1	1 (5)	t	0	0	-	3	2	0	0	-	1	t	1	2 (1)	1	5 (5)	t	230
6.	Central mudminnow	14	61 (4)	33	198 (17)	27	1	6	16	55 (1)	32	2	4	10	2	1	14	71 (4)	27	255 (18)	22	260
7.	Grass pickerel	4	5	3	23	3	0	1	3	4	2	0	0	-	0	-	4	6	2	27	2	350
8.	Northern pike	13	49 (13)	27	190 (72)	26	0	7 (3)	19	41 (1)	24	0	0 (1)	-	14 (2)	6	13	56 (17)	22	245 (75)	22	660
8.	Muskellunge	1	1 (1)	1	0 (1)	-	0	0	-	0	-	0	0	-	0	-	1	1 (1)	t	0 (1)	1	-50
9.	Stonerollers	1	33	18	73	10	3	23	62	60	35	1	13	33	99	43	5	69	27	232	21	-
10.	Central stoneroller	11	9	5	70	10	8	5	14	24	14	15	19	49	139	61	34	33	13	233	21	610
11.	Largescale stoneroller	4	1	1	8	1	2	0	-	0	-	5	4	10	21	9	11	5	2	29	3	480
11.	Goldfish	0	1	1	4	1	0	0	-	1	1	0	0	-	1	t	0	1	t	6	1	500
12.	Redside dace (W)	0	0	-	0	-	3	1	3	18	11	1	0	-	2	1	4	1	t	20	2	1,900
13.	Common carp	8	60 (13)	33	205 (70)	28	5	7 (1)	19	37 (5)	22	2	5 (1)	13	48 (1)	21	15	72 (15)	28	290 (76)	26	320
14.	Brassy minnow	2	11	6	50	7	2	6	16	13	8	0	5	13	28	12	4	22	8	91	8	310
15.	Silvery minnow	1	1	1	1	t	1	0	-	0	-	0	0	-	0	-	2	1	t	1	t	0
15.	Silver chub	0	0	-	0	-	0	0	-	2	1	0	0	-	2	1	0	0	-	4	t	-
16.	Gravel chub (E)	0	1	1	7	1	1	0	-	8	5	0	0	-	3	1	1	1	t	18	2	1,700
17.	Hornyhead chub	14	24	13	76	10	2	6	16	17	10	9	21	54	112	49	25	51	20	205	18	300
18.	Golden shiner	10	21	11	102	14	2	3	8	13	8	0	0	-	7	3	12	24	9	122	11	410
-	Pallid shiner (E)	0	0	-	0	-	1	0	-	0	-	0	0	-	0	-	1	0	-	0	-	-100
19.	Pugnose shiner (W)	2	1	1	13	2	0	0	-	0	-	0	0	-	0	-	2	1	t	13	1	1,200
20.	Emerald shiner	1	14	8	66	9	0	2	5	0	-	0	1	3	2	1	1	17	7	68	6	300
19.	River shiner	0	0	-	1	t	1	0	-	0	-	0	0	-	1	t	1	0	-	2	t	100
21.	Striped shiner (E)	1	0	-	1	t	0	0	-	0	-	0	0	-	0	-	1	0	-	1	t	0
22.	Common shiner	20	56	31	155	21	5	23	62	49	29	21	28	72	161	70	46	107	41	365	32	240
21.	Bigmouth shiner	0	10	5	64	9	0	14	38	30	18	0	5	13	57	25	0	29	11	151	13	420
23.	Pugnose minnow (W)	2	4	2	1	t	0	0	-	0	-	0	0	-	0	-	2	4	2	1	t	-75
23.	Blackchin shiner	9	3	2	24	3	0	0	-	0	-	0	0	-	0	-	9	3	1	24	2	700
24.	Blacknose shiner	7	0	-	47	6	2	0	-	0	-	0	0	-	0	-	9	0	-	47	4	420
25.	Spottail shiner	1	7	4	38	5	0	0	-	0	-	0	0	-	0	-	1	7	3	38	3	440
26.	Ozark minnow (T)	4	0	-	15	2	0	0	-	0	-	1	0	-	2	1	5	0	-	17	2	240
27.	Rosyface shiner	4	2	1	12	2	1	4	11	1	1	9	17	44	60	26	14	23	9	73	6	220
28.	Spotfin shiner	7	52	28	141	19	7	23	62	51	30	14	16	41	49	21	28	91	35	241	21	160
29.	Sand shiner	7	23	13	56	8	6	16	43	46	27	9	14	36	38	17	22	53	20	140	12	160
30.	Weed shiner (W)	4	0	-	0	-	0	1	3	4	2	0	0	-	0	-	4	1	t	4	t	300
30.	Redfin shiner (W)	5	8	4	7	1	3	5	14	5	3	0	0	-	0	-	8	13	5	12	1	-8
31.	Mimic shiner	7	1	1	34	5	1	0	-	0	-	1	0	-	0	-	9	1	t	34	3	3,300
32.	Suckermouth minnow	2	2	1	12	2	3	4	11	17	10	9	8	21	31	14	14	14	5	60	5	330
33.	Northern redbelly dace	0	11	6	27	4	0	0	-	1	1	0	0	-	0	-	0	11	4	28	2	150
34.	Southern redbelly dace	13	18	10	63	9	1	10	27	37	22	9	18	46	114	50	23	46	18	214	19	370
-	Finescale dace	2	1	1	0	-	0	0	-	0	-	0	0	-	0	-	2	1	t	0	-	-100
35.	Bluntnose minnow	30	83	45	308	42	11	29	78	93	55	18	29	74	151	66	59	141	54	552	49	290
36.	Fathead minnow	3	63	34	205	28	4	11	30	70	41	4	6	15	53	23	11	80	31	328	29	310
37.	Bullhead minnow	0	1	1	0	-	2	4	11	3	2	2	0	-	0	-	4	5	2	3	t	-40
37.	Blacknose dace	1	19	10	61	8	1	1	3	15	9	1	2	5	7	3	3	22	8	83	7	280
38.	Creek Chub	10	46	25	171	23	5	26	70	113	66	14	27	69	190	83	29	99	38	474	42	380
39.	Pearl dace	8	18	10	49	7	0	0	-	0	-	0	0	-	0	-	8	18	7	49	4	170
40.	River carpsucker	0	0	-	0	-	1	1	3	1	1	0	0	-	0	-	1	1	t	1	t	0
40.	Quillback	1	0	-	11	2	1	8	22	26	15	0	1	3	28	12	2	9	3	65	6	620
41.	White sucker	21	71 (15)	39	313 (66)	43	7	27 (5)	73	129 (5)	76	14	29	74	198 (2)	87	42	127 (20)	49	640 (74)	57	390

TABLE 3 *(Cont.)*

Map No.	Species	Rock (221) 1900-28 No. Stn.	Rock (221) 1960-73 No. Stn.	Rock (221) 1960-73 Percent Total	Rock (221) 1974-81 No. Stn.	Rock (221) 1974-81 Percent Total	Sugar 1900-28 No. Stn.	Sugar 1960-73 No. Stn.	Sugar 1960-73 Percent Total	Sugar 1974-81 No. Stn.	Sugar 1974-81 Percent Total	Pecatonica (223) 1900-28 No. Stn.	Pecatonica (223) 1960-73 No. Stn.	Pecatonica (223) 1960-73 Percent Total	Pecatonica (223) 1974-81 No. Stn.	Pecatonica (223) 1974-81 Percent Total	Greater Rock (220) 1900-28 No. Stn.	Greater Rock (220) 1960-73 No. Stn.	Greater Rock (220) 1960-73 Percent Total	Greater Rock (220) 1974-81 No. Stn.	Greater Rock (220) 1974-81 Percent Total	Percent Change in Occurrence[2]
42.	Lake chubsucker (W)[1]	2	4 (2)	2	19 (5)	3	0	0	-	0	-	0	0	-	0	-	2	4 (2)	2	19 (5)	2	300
43.	Northern hog sucker	3	4 (1)	2	41	6	3	13	35	26	15	4	10	26	45	20	10	27 (1)	10	112	10	300
44.	Bigmouth buffalo	1	3	2	28	4	0	0	-	4	2	0	3	8	20	9	1	6	2	52	5	770
44.	Black buffalo (T)	0	0	-	0	-	0	0	-	0	-	0	0	-	2	1	0	0	-	2	t	-
45.	Silver redhorse	1	0	-	3	t	0	4	11	22	13	0	9	23	37	16	1	13	5	62	5	380
46.	River redhorse (W)	0	0	-	4	1	0	0	-	2	1	0	0	-	0	-	0	0	-	6	1	370
47.	Golden redhorse	1	6	3	51	7	2	9	24	21	12	2	8	21	37	16	5	23	9	109	10	370
48.	Shorthead redhorse	3	14	8	61	8	3	10	27	34	20	6	13	33	61	27	12	37	14	156	14	320
46.	Greater redhorse (W)	0	0	-	3	t	0	0	-	0	-	0	0	-	0	-	0	0	-	3	t	-
49.	Black bullhead	2	60	33	250	34	2	6	16	29	17	0	0	-	13	6	4	66	25	292	26	340
50.	Yellow bullhead	6	29	16	137	19	0	3	8	9	5	0	0	-	0	-	6	32	12	146	13	360
51.	Brown bullhead	4	7	4	50	7	0	1	3	0	-	0	0	-	0	-	4	8	3	50	4	530
52.	Channel catfish	1	16 (1)	9	52 (25)	7	3	5 (15)	14	16 (3)	9	0	1	3	9 (1)	4	4	22 (16)	8	77 (29)	7	180
53.	Slender madtom (E)	4	4	2	16	2	0	0	-	0	-	0	0 (1)	-	11	5	4	4 (1)	2	27	2	580
54.	Stonecat	2	12	7	60	8	3	4	11	7	4	3	5	13	49	21	8	21	8	116	10	450
55.	Tadpole madtom	8	14	8	15	2	2	1	3	0	-	0	0	-	0	-	10	15	6	15	1	0
52.	Flathead catfish	2	0	-	0	-	0	0 (5)	-	1	1	0	0	-	1	t	2	0 (5)	-	2	t	-60
56.	Burbot	1	0	-	0 (2)	-	0	0	-	0	-	0	0	-	0	-	1	0	-	0 (2)	-	100
56.	Banded killfish	7	11	6	43	6	1	0	-	0	-	0	0	-	0	-	8	11	4	43	4	290
57.	Blackstripe topminnow	8	22	12	47	6	0	5	14	5	3	0	1	3	0	-	8	28	11	52	5	86
57.	Starhead topminnow (E)	0	0	-	0	-	0	2	5	1	1	0	0	-	0	-	0	2	1	1	t	-50
58.	Brook silverside	9	24 (2)	13	81 (12)	11	2	4	11	3	2	0	0	-	0	-	11	28 (2)	11	84 (11)	7	220
59.	Brook stickleback	11	45 (3)	25	155 (4)	21	3	11 (1)	30	80 (*1)	47	6	12	31	79	35	20	68 (4)	26	314 (5)	28	340
60.	White bass	6	11	6	51	7	0	0	-	0	-	0	0	-	0	-	6	11	4	51	5	360
60.	Yellow bass	1	5	3	32	4	0	0	-	0	-	0	0	-	0	-	1	5	2	32	3	540
61.	Rock bass	12	27	15	77	11	0	2	5	5	3	0	5	13	14	6	12	34	13	96	9	180
62.	Green sunfish	4	81	44	271	37	6	10	27	39	23	4	6	15	16	7	14	97	37	326	29	240
63.	Pumpkinseed	17	44	24	196	27	0	3	8	5	3	0	0	-	6	3	17	47	18	207	18	340
64.	Warmouth	2	1	1	9	1	0	0	-	1	1	0	0	-	0	-	2	1	t	10	1	900
64.	Orangespotted sunfish	0	21	11	19	3	0	9	24	7	4	0	5	13	7	3	0	35	14	33	3	-6
65.	Bluegill	12	77	42	325	44	1	10	27	16	9	0	10	26	19	8	13	97	37	360	32	270
-	Longear sunfish (T)	0	1	1	0	-	0	0	-	0	-	0	0	-	0	-	0	1	t	0	-	-100
66.	Smallmouth bass	7	14 (2)	8	63 (17)	9	2	16 (2)	43	38	22	4	14	36	43 (4)	19	13	44 (4)	17	144 (21)	13	240
67.	Largemouth bass	11	36 (10)	20	195 (62)	27	1	6 (3)	16	15 (2)	9	0	6 (1)	15	14 (2)	6	12	48 (14)	19	224 (66)	20	370
68.	White crappie	2	18	10	29	4	0	0	-	1	1	1	0	-	0	-	3	18	7	30	3	67
69.	Black crappie	11	42	23	142	19	4	7	19	14	8	0	0	-	10	4	15	49	19	166	15	240
-	Western sand darter	1	0	-	0	-	0	0	-	0	-	0	0	-	0	-	1	0	-	0	-	-100
-	Mud darter (W)	0	0	-	0	-	1	0	-	0	-	0	0	-	0	-	1	0	-	0	-	-100
70.	Rainbow darter	5	16	9	56	8	1	7	19	14	8	0	2	5	0	-	6	25	10	70	6	180
71.	Iowa darter	8	6	3	54	7	3	2	5	6	4	3	0	-	0	-	14	8	3	60	5	650
72.	Fantail darter	10	30	16	90	12	4	12	32	28	16	12	13	33	132	58	26	55	21	250	22	350
73.	Least darter (W)	5	7	4	25	3	0	7	19	6	4	0	0	-	0	-	5	14	5	31	3	120
74.	Johnny darter	20	60	33	210	29	8	24	65	102	60	19	31	79	146	64	47	115	44	458	40	300
75.	Banded darter	6	12	7	41	6	3	10	27	19	11	3	5	13	39	17	12	27	10	99	9	270
76.	Yellow perch	18	37 (12)	20	191 (63)	26	0	0	-	0 (1)	-	0	3	8	4	2	18	40 (12)	15	195 (64)	17	400
77.	Logperch	6	11	6	46	6	0	0	-	0	-	0	0	-	0	-	6	11	4	46	4	320
78.	Blackside darter	6	15	8	16	2	2	10	27	34	20	2	7	18	15	7	10	32	12	65	6	100
79.	Slenderhead darter	1	11	6	18	2	1	4	11	9	5	1	4	10	23	10	3	19	7	50	5	160
80.	Walleye	5	13 (7)	7	84 (52)	11	0	0 (1)	-	6 (3)	4	0	1	3	12	5	5	14 (8)	5	102 (55)	9	610
81.	Freshwater drum	0	5 (2)	3	18 (12)	2	0	0	-	0	-	0	0	-	0	-	0	5 (2)	2	18 (12)	2	330
82.	Mottled sculpin	3	6 (2)	3	26 (3)	4	2	7 (2)	19	51	30	1	7	18	38	17	6	20 (4)	8	115 (3)	10	390
No. of Species		88	86		93		53	61		72		35	47		61		96	94		102		
Total No. of Occurrences (Sum of number of species taken at each station)			1,804		6,903			538		1,738			458		2,612			2,800		11,253		

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

**t = less than 0.5%.

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

[2]Percent change over next most recent period in which it was taken (partial stations included in calculations).

TABLE 4. *List of collectors with number of species taken and total occurrences for samples from sub-basins of the Greater Rock River.*

Source of Data*	Rock (221)				Sugar (222)				Pecatonica (223)				Greater Rock (220)			
	1960-73		1974-81		1960-73		1974-81		1960-73		1974-81		1960-73		1974-81	
	No. Species	Total Occurrences	No. Species	Total Occurrences	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	34	109 (6)**	87	5,676 (82)	—	—	71	1,648 (95)	—	—	60	2,434 (83)	34	109 (4)	94	9,758 (87)
Fish Mgt. 1	54	528 (29)	72	1,127 (16)	11	39 (7)	28	90 (5)	3	3 (1)	34	178 (7)	56	570 (20)	76	1,396 (12)
Becker 2	61	555 (31)	—	—	40	163 (30)	—	—	40	288 (63)	—	—	74	1,006 (36)	—	—
Johnson 3	62	342 (19)	—	—	54	336 (63)	—	—	32	166 (36)	—	—	76	844 (30)	—	—
Seeburger 4	48	136 (8)	—	—	—	—	—	—	—	—	—	—	48	136 (5)	—	—
Milw. Pub. Mus. 5	34	105 (6)	—	—	—	—	—	—	—	—	—	—	34	105 (4)	—	—
UW-Madison 6	12	26 (1)	16	56 (1)	—	—	—	—	1	(1)	—	—	11	26 (1)	16	56 (t)
Comm. fish. 7	—	—	8	32 (1)	—	—	—	—	—	—	—	—	—	—	8	32 (t)
Sport fish. 8	3	3 (t)	8	12 (t)	—	—	—	—	—	—	—	—	3	3(t)	8	12 (t)
Grand total of occurrences		1,804		6,903		538		1,738		458		2,612		2,800		11,253

*Collectors identified at the end of Appendix A Table 16.
**Total occurrences are defined as the sum of the number of species taken at each station; percent of total occurrences in parentheses; t = less than 0.5%.

shiner, weed shiner, redfin shiner, northern redbelly dace, bullhead minnow, river carpsucker, bigmouth buffalo, river redhorse, flathead catfish, blackstripe topminnow, starhead topminnow, brook silverside, rock bass, pumpkinseed, warmouth, white crappie, and yellow perch*.

Differences Between Basins and Time Periods

Of the 72 species found in the Sugar River basin, 5 were not found in the Rock or Pecatonica River basins (Table 6).

Thirteen species of fish have not been previously reported for this basin (Table 7); however, for 4 species, natural reproduction in the basin is questionable.

Eleven species are apparently no longer present in the Sugar River basin. Eight of these were taken only before 1929, and 3 were most recently taken in the 1960-73 time period (Table 8).

The gravel chub had not been reported between 1909 and 1970 from this basin (Table 9).

*Natural reproduction in basin is questionable.

PECATONICA RIVER BASIN (223)

Species Found

A total of 61 species was taken from the 234 locations sampled in this basin (Table 3). This included 2 endangered (gravel chub and slender madtom), 2 threatened (Ozark minnow and black buffalo), and 1 watch species.

Reproducing Populations

In the Pecatonica River basin, 58 species are known to have reproducing populations. The presence of reproducing populations of 3 other species is questionable: (1) rainbow trout (no streams are known to have natural reproduction), (2) brook trout (only 1 adult was taken and stocking probably accounts for all fish in the basin), and (3) river shiner (only 2 specimens from Yellowstone Lake which may have been introduced during restocking of the lake or through unused fishermen's bait).

Common and Rare Species

The 5 most commonly found species (caught at the highest percentage of complete stations) were white sucker (87%), creek chub (83%), common shiner (70%), bluntnose minnow (66%), and Johnny darter (64%) (Table 3).

The 13 rarest species (caught at 5 or fewer of all the stations) were longnose gar, brook trout*, central mudminnow, goldfish, redside dace, silver chub, gravel chub, emerald shiner, river shiner*, Ozark minnow, black buffalo, flathead catfish, and yellow perch.

Differences Between Basins and Time Periods

Of the 61 species found in the Pecatonica River basin, only the black buffalo was not taken in either the Rock or Sugar River basins (Table 6).

Sixteen species of fish have not been previously reported for this basin (Table 7). However, rainbow trout, brook trout, and river shiner are included for which natural reproduction in the basin is questionable.

Six species are apparently no longer present in the Pecatonica River basin: the mimic shiner, bullhead minnow, white crappie, and Iowa darter were

*Natural reproduction in basin is questionable.

TABLE 5. *List of common and scientific names of all fish species cited in this report.*

Species Code	Common Name	Scientific Name
	Lampreys	Petromyzontidae
A03	Northern brook lamprey	*Ichthyomyzon fossor*
A05	American brook lamprey	*Lampetra appendix*
	Sturgeons	Acipenseridae
B01	Lake sturgeon	*Acipenser fulvescens*
	Gars	Lepisosteidae
D01	Longnose gar	*Lepisosteus osseus*
D02	Shortnose gar	*Lepisosteus platostomus*
	Bowfins	Amiidae
E01	Bowfin	*Amia calva*
	Freshwater eels	Anguillidae
F01	American eel	*Anguilla rostrata*
	Trouts	Salmonidae
I02	Cisco (lake herring)	*Coregonus artedii*
I19	Rainbow trout	*Salmo gairdneri*
I21	Brown trout	*Salmo trutta*
I22	Brook trout	*Salvelinus fontinalis*
	Mudminnows	Umbridae
K01	Central mudminnow	*Umbra limi*
	Pikes	Esocidae
L01	Grass pickerel	*Esox americanus vermiculatus*
L02	Northern pike	*Esox lucius*
L03	Muskellunge	*Esox masquinongy*
	Minnows and carps	Cyprinidae
M05	Stonerollers	*Campostoma spp.*
M06	Central stoneroller	*Campostoma anomalum*
M07	Largescale stoneroller	*Campostoma oligolepis*
M08	Goldfish	*Carassius auratus*
M09	Redside dace	*Clinostomus elongatus*
M12	Common carp	*Cyprinus carpio*
M14	Brassy minnow	*Hybognathus hankinsoni*
M15	Silvery minnow	*Hybognathus nuchalis*
M17	Silver chub	*Hybopsis storeriana*
M18	Gravel chub	*Hybopsis x-punctata*
M19	Hornyhead chub	*Nocomis biguttatus*
M20	Golden shiner	*Notemigonus crysoleucas*
M21	Pallid shiner	*Notropis amnis*
M22	Pugnose shiner	*Notropis anogenus*
M23	Emerald shiner	*Notropis atherinoides*
M24	River shiner	*Notropis blennius*
M27	Striped shiner	*Notropis chrysocephalus*
M28	Common shiner	*Notropis cornutus*
M29	Bigmouth shiner	*Notropis dorsalis*
M30	Pugnose minnow	*Notropis emiliae*
M31	Blackchin shiner	*Notropis heterodon*
M32	Blacknose shiner	*Notropis heterolepis*
M33	Spottail shiner	*Notropis hudsonius*
M34	Ozark minnow	*Notropis nubilus*
M35	Rosyface shiner	*Notropis rubellus*
M36	Spotfin shiner	*Notropis spilopterus*
M37	Sand shiner	*Notropis stramineus*
M38	Weed shiner	*Notropis texanus*
M39	Redfin shiner	*Notropis umbratilis*
M40	Mimic shiner	*Notropis volucellus*
M41	Suckermouth minnow	*Phenacobius mirabilis*
M42	Northern redbelly dace	*Phoxinus eos*
M43	Southern redbelly dace	*Phoxinus erythrogaster*
M44	Finescale dace	*Phoxinus neogaeus*
M45	Bluntnose minnow	*Pimephales notatus*
M46	Fathead minnow	*Pimephales promelas*
M47	Bullhead minnow	*Pimephales vigilax*
M48	Blacknose dace	*Rhinichthys atratulus*
M50	Creek chub	*Semotilus atromaculatus*
M51	Pearl dace	*Semotilus margarita*

Species Code	Common Name	Scientific Name
	Suckers	Catostomidae
N05	River carpsucker	*Carpiodes carpio*
N06	Quillback	*Carpiodes cyprinus*
N09	White sucker	*Catostomus commersoni*
N12	Lake chubsucker	*Erimyzon sucetta*
N13	Northern hog sucker	*Hypentelium nigricans*
N15	Bigmouth buffalo	*Ictiobus cyprinellus*
N16	Black buffalo	*Ictiobus niger*
N18	Silver redhorse	*Moxostoma anisurum*
N19	River redhorse	*Moxostoma carinatum*
N21	Golden redhorse	*Moxostoma erythrurum*
N22	Shorthead redhorse	*Moxostoma macrolepidotum*
N23	Greater redhorse	*Moxostoma valenciennesi*
	Bullhead catfishes	Ictaluridae
O05	Black bullhead	*Ictalurus melas*
O06	Yellow bullhead	*Ictalurus natalis*
O07	Brown bullhead	*Ictalurus nebulosus*
O08	Channel catfish	*Ictalurus punctatus*
O09	Slender madtom	*Noturus exilis*
O10	Stonecat	*Noturus flavus*
O11	Tadpole madtom	*Noturus gyrinus*
012	Flathead catfish	*Pylodictis olivaris*
	Codfishes	Gadidae
R01	Burbot	*Lota lota*
	Killifishes	Cyprinodontidae
S01	Banded killifish	*Fundulus diaphanus*
S02	Blackstripe topminnow	*Fundulus notatus*
S03	Starhead topminnow	*Fundulus notti*
	Silversides	Atherinidae
T01	Brook silverside	*Labidesthes sicculus*
	Sticklebacks	Gasterosteidae
U01	Brook stickleback	*Culaea inconstans*
	Temperate basses	Percichthyidae
V01	White bass	*Morone chrysops*
V02	Yellow bass	*Morone mississippiensis*
	Sunfishes	Centrarchidae
W04	Rock bass	*Ambloplites rupestris*
W05	Green sunfish	*Lepomis cyanellus*
W06	Pumpkinseed	*Lepomis gibbosus*
W07	Warmouth	*Lepomis gulosus*
W08	Orangespotted sunfish	*Lepomis humilis*
W09	Bluegill	*Lepomis macrochirus*
W10	Longear sunfish	*Lepomis megalotis*
W11	Smallmouth bass	*Micropterus dolomieui*
W12	Largemouth bass	*Micropterus salmoides*
W13	White crappie	*Pomoxis annularis*
W14	Black crappie	*Pomoxis nigromaculatus*
	Perches	Percidae
X04	Western sand darter	*Ammocrypta clara*
X05	Mud darter	*Etheostoma asprigene*
X07	Rainbow darter	*Etheostoma caeruleum*
X09	Iowa darter	*Etheostoma exile*
X10	Fantail darter	*Etheostoma flabellare*
X11	Least darter	*Etheostoma microperca*
X12	Johnny darter	*Etheostoma nigrum*
X14	Banded darter	*Etheostoma zonale*
X15	Yellow perch	*Perca flavescens*
X16	Logperch	*Percina caprodes*
X18	Blackside darter	*Percina maculata*
X19	Slenderhead darter	*Percina phoxocephala*
X22	Walleye	*Stizostedion vitreum vitreum*
	Drums	Sciaenidae
Y01	Freshwater drum	*Aplodinotus grunniens*
	Sculpins	Cottidae
Z01	Mottled sculpin	*Cottus bairdi*

TABLE 6. *Fish species found in one basin in the Greater Rock River basin but not in either of the other two, 1974-82.*

Rock (221)		Sugar (222)	Pecatonica (223)
Lake sturgeon	Pearl dace	North. brook lamprey	Black buffalo
Bowfin	Lake chubsucker	Weed shiner	
Cisco (lake herring)	Greater redhorse	Bullhead minnow	
Muskellunge*	Brown bullhead	River carpsucker	
Silvery minnow	Tadpole madtom	Starhead topminnow	
Pugnose shiner	Burbot		
Striped shiner*	Banded killifish		
Pugnose minnow	White bass		
Blackchin shiner	Yellow bass		
Blacknose shiner	Logperch		
Spottail shiner	Freshwater drum		
Mimic shiner			

*Naturally reproducing population questionable.

TABLE 7. *Fish species reported for the first time during the 1974-81 period from each of the basins in the Greater Rock River.*

Rock (221)	Sugar (222)	Pecatonica (223)	Greater Rock River (220)
River shiner*	North. brook lamprey*	Am. brook lamprey	North. brook lamprey*
River redhorse	Am. brook lamprey	Longnose gar	Silver chub
Greater redhorse	American eel	Rainbow trout*	Black buffalo
	Rainbow trout*	Brook trout*	River redhorse
	Brook trout*	Goldfish	Greater redhorse
	Goldfish	Silver chub	
	Silver chub	Gravel chub	
	North. redbelly dace	Golden shiner	
	Bigmouth buffalo	River shiner*	
	River redhorse	Black buffalo	
	Warmouth	Black bullhead	
	White crappie	Flathead catfish	
	Yellow perch*	Pumpkinseed	
		Black crappie	

*Naturally reproducing population questionable.

TABLE 8. *Fish species apparently no longer present in each basin of the Greater Rock River basin.*

	Last Period Species Was Recorded			
	Rock (221)	Sugar (222)	Pecatonica (223)	Greater Rock (220)
1900-28	Weed shiner Flathead catfish West. sand darter	Largescale stoneroller Silvery minnow Pallid shiner River shiner Blacknose shiner Mimic shiner Banded killifish Mud darter	Mimic shiner Bullhead minnow White crappie Iowa darter	Pallid shiner West. sand darter Mud darter
1929-59	Shortnose gar			Shortnose gar
1960-73	Finescale dace Bullhead minnow Longear sunfish	Emerald shiner Brown bullhead Tadpole madtom	Blackstripe topminnow Rainbow darter	Finescale dace Longear sunfish

TABLE 9. *Species reported prior to 1929 but not collected again until 1974-81.*

Rock (221)	Sugar (222)	Pecatonica (223)	Greater Rock (220)
Am. brook lamprey	Gravel chub	Redside dace	Am. brook lamprey
Striped shiner*		Ozark minnow	River shiner*
Blacknose shiner			Striped shiner*
Ozark minnow			Blacknose shiner
Quillback			Ozark minnow
Silver redhorse			Burbot
Burbot			

*Naturally reproducing population questionable.

taken only before 1929, and the blackstripe topminnow and rainbow darter were most recently taken in the 1960-73 time period (Table 8).

The redside dace and Ozark minnow were not taken between 1929 and 1973 from this basin (Table 9).

GREATER ROCK RIVER BASIN (220)

Species Found

In the Greater Rock River basin, over 230,000 specimens were captured and identified, representing 102 species, excluding grass carp and coho salmon (Table 10). Distribution maps for all 102 species are presented in Appendix C; each map shows the location of stations where the species was collected. Map numbers are shown in Table 3 for each species, and an index to maps is provided in the front of Appendix C.

Of the 96 species known to have reproducing populations in the Greater Rock River basin, 74 occurred in streams more than 50% of the time (Table 11). Of these, 42 occurred in streams 95% or more of the time. Only 4 species were never taken in streams. Of the 22 species taken more than 50% of the time in a lake environment, 12 were only taken in the Rock River basin, which has 98% of the lake surface area in the Greater Rock River basin. These 12 species are also 57% of the species known to have reproducing populations taken only in the Rock River basin. This clearly shows that the presence of lake environment helps to increase species diversity within a basin. The Rock River basin contains 57% of the total number of kilometers of streams and 67% of land area in the Greater Rock River basin, other factors which could be related to the higher number of species.

The large number of species and the number of times individual species were taken are reflected in the high number of occurrences recorded for the Greater Rock River basin — 11,253 (Table 3).

Reproducing Populations

In the Greater Rock River basin, 96 species are known to have reproducing populations. The presence of reproducing populations is questionable for 7 species (northern brook lamprey, rainbow trout, coho salmon, muskellunge, grass carp, river shiner, and striped shiner), and is impossible for the American eel.

TABLE 10. *Number of specimens of each species caught and number of stations for each species collected in the Greater Rock River basin, 1974-81.*

Common Name	No. Specimens*	No. Stations** <99	>98	"Unknown"
White sucker	24,000	604	97	13
Bluntnose minnow	18,000	458	94	
Creek chub	17,000	393	79	2
Common shiner	15,000	267	97	1
Stonerollers	14,000	140	92	
Common carp	11,000	286	69	11
Fantail darter	9,600	193	57	
Southern redbelly dace	7,700	170	44	
Johnny darter	7,500	438	19	1
Spotfin shiner	6,900	202	38	1
Fathead minnow	6,700	293	35	
Hornyhead chub	6,600	173	31	1
Bluegill	6,300	342	18	
Black bullhead	6,200	258	33	1
Brook stickleback	6,100	297	21	1
Central mudminnow	4,600	249	20	4
Bigmouth shiner	4,400	127	24	
Mottled sculpin	4,000	102	16	
Sand shiner	3,400	122	18	
Yellow perch	3,400	245	11	3
Largemouth bass	3,200	278	9	3
Blacknose dace	3,100	64	19	
Pumpkinseed	2,400	201	5	1
Northern pike	2,200	310	5	5
Shorthead redhorse	2,200	151	4	1
Green sunfish	2,200	323	2	1
Brook silverside	2,000	82	10	4
Northern hog sucker	1,700	109	3	
Pearl dace	1,600	43	6	
Rainbow darter	1,600	65	5	
Rosyface shiner	1,600	69	4	
Walleye	1,500	149	5	3
Brown trout	1,500	94	4	1
Golden shiner	1,400	115	7	
Stonecat	1,400	113	2	1
Banded darter	1,400	96	2	1
Mimic shiner	1,200	27	7	
Smallmouth bass	1,200	163	1	1
Blacknose shiner	1,100	40	7	
Golden redhorse	1,100	107	2	
Central stoneroller	1,100	231	1	1
Black crappie	1,000	165	1	
Yellow bullhead	930	144	1	1
Brassy minnow	900	89	1	1
Rock bass	860	93	2	1
Suckermouth minnow	670	60		
Northern redbelly dace	620	26	2	
Channel catfish	600	104	1	1
Quillback	590	65		
Silver redhorse	550	62		
Iowa darter	540	59		1
Bigmouth buffalo	490	50	2	
Logperch	470	46		
Banded killifish	460	42	1	
Emerald shiner	450	66	2	
Slenderhead darter	440	50		
Blackstripe topminnow	380	52		
Yellow bass	350	32		
Brown bullhead	340	49	1	
Least darter	340	30		
Ozark minnow	320	16		
Freshwater drum	310	27	1	2
Blackchin shiner	280	23	1	
Slender madtom	280	27		
White bass	260	51		
Bowfin	240	41	1	1
Rainbow trout	220	31	1	1
Orangespotted sunfish	210	33		
Spottail shiner	200	38		
Blackside darter	170	64		1
Gravel chub	150	18		
Lake chubsucker	140	22		2
Brook trout	130	9	1	
Largescale stoneroller	120	29		
American brook lamprey	110	30		
Redside dace	110	20		
Cisco (lake herring)	100	3	1	
Bullhead minnow	78	3		
White crappie	64	29		1
Warmouth	63	10		
Tadpole madtom	57	15		
Longnose gar	51	18		1
Grass pickerel	50	26		1
Redfin shiner	50	12		
Weed shiner	41	4		
Pugnose shiner	34	13		
Lake sturgeon	27	8		
River redhorse	18	6		
Goldfish	16	6		
Pugnose minnow	8	1		
Silvery minnow	7	1		
Greater redhorse	6	3		
American eel	5	5		
Silver chub	5	4		
River shiner	3	2		
Black buffalo	3	2		
Northern brook lamprey	2	1		
River carpsucker	2	1		
Flathead catfish	2	2		
Burbot	2	2		
Starhead topminnow	2	1		
Muskellunge	1	1		
Striped shiner	1	1		
Total	233,988	10,132	1,045	77

*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 11. *List of fish species** in the Greater Rock River basin for the period 1974-81 in the order of their occurrence from those taken only in a stream environment to those taken only in a lake environment.*

Common Name	Percent Occurrence In Streams	Percent Occurrence In Lakes	Common Name	Percent Occurrence In Streams	Percent Occurrence In Lakes
American brook lamprey	100	0	Yellow bullhead	89	11
Stonerollers	100	0	Johnny darter	89	11
Largescale stoneroller	100	0	Black bullhead	84	16
Goldfish	100	0	Blackstripe topminnow	83	17
Redside dace	100	0	Rainbow darter	83	17
Brassy minnow	100	0	Redfin shiner	82	18
Silvery minnow	100	0	Orangespotted sunfish	81	19
Silver chub	100	0	Smallmouth bass	81	19
Gravel chub	100	0	White crappie	81	19
Hornyhead chub	100	0	Bigmouth buffalo	80	20
Pugnose minnow	100	0	Common carp	78	22
Ozark minnow	100	0	Bluntnose minnow	78	22
Rosyface shiner	100	0	Green sunfish	76	24
Weed shiner	100	0	Tadpole madtom	73	27
Northern redbelly dace	100	0	Rock bass	73	27
Southern redbelly dace	100	0	Channel catfish	72	28
Blacknose dace	100	0	Northern pike	71	29
Pearl dace	100	0	Bullhead minnow	67	33
River carpsucker	100	0	River redhorse	67	33
Black buffalo	100	0	Brown bullhead	65	35
Greater redhorse	100	0	Walleye	65	35
Slender madtom	100	0	Bowfin	61	39
Starhead topminow	100	0	Golden shiner	57	43
Flathead catfish	100	0	Emerald shiner	56	44
Starhead topminnow	100	0	White bass	56	44
Banded darter	100	0	Grass pickerel	53	47
Central stoneroller	100	t*	Spottail shiner	52	48
Creek chub	100	t	Bluegill	48	52
Brown trout	99	1	Black crappie	48	52
Northern hog sucker	99	1	Logperch	48	52
Stonecat	99	1	Lake chubsucker	46	54
Brook stickleback	99	1	Pumpkinseed	46	54
Fantail darter	98	2	Least darter	45	55
Mottled sculpin	98	2	Largemouth bass	44	56
Bigmouth shiner	97	3	Iowa darter	38	62
Suckermouth minnow	97	3	Blackchin shiner	37	63
Shorthead redhorse	97	3	Blacknose shiner	36	64
Blackside darter	97	3	Brook silverside	35	65
Common shiner	96	4	Warmouth	30	70
Slenderhead darter	96	4	Yellow perch	27	73
Sand shiner	95	5	Longnose gar	22	78
Quillback	95	5	Freshwater drum	20	80
Silver redhorse	95	5	Banded killifish	16	84
Golden redhorse	95	5	Yellow bass	14	86
Central mudminnow	92	8	Mimic shiner	12	88
Fathead minnow	91	9	Lake sturgeon	0	100
White sucker	91	9	Cisco (lake herring)	0	100
Brook trout	90	10	Pugnose shiner	0	100
Spotfin shiner	89	11	Burbot	0	100

*t = less than 0.5%.

**Only species with naturally reproducing populations are listed.

Species Diversity

There were 69 stations (7%) in the Greater Rock River basin that had 20 or more species (36, 6%, Rock; 9, 6%, Sugar; 24, 11%, Pecatonica). Only 7 stations in the Greater Rock River basin had more than 25 species (5, Rock; 2, Sugar; 0, Pecatonica). The average number of species taken per station was 9 (8, Rock; 10, Sugar; 11, Pecatonica) (Fig. 4).

Common and Rare Species

The 6 most commonly found species (caught at the highest percentage of complete stations) were white sucker (57%), bluntnose minnow (49%), creek chub (42%), Johnny darter (40%), common shiner (32%), and bluegill (32%) (Table 3). The 6 most numerous species (most specimens caught) were white sucker (24,000), bluntnose minnow (18,000), creek chub (17,000), common shiner (15,000), stonerollers (*Campostoma* spp.) (14,000), and the common carp (11,000) (Table 10). The Johnny darter, which was 4th for the most commonly found species, was 9th in total number taken. The bluegill, which was tied with the common shiner for 5th most commonly found species, was 13th in total number taken.

A considerable number of species was taken at relatively few stations — 22 at 10 or fewer of all the stations, and 17 at 5 or fewer of all the stations. These 17 rarest species for the basin were: northern brook lamprey*, American eel, cisco, muskellunge*, silvery minnow, silver chub, river shiner*, striped shiner*, pugnose minnow, weed shiner, bullhead minnow, river carpsucker, black buffalo , greater redhorse, flathead catfish, burbot, and starhead topminnow (Table 3). The 17 rarest fish, based upon the lowest number of stations at which they were caught, were the same, except for 3 species, as the 17 for which the fewest specimens were taken (Table 10).

Differences Between Time Periods

There were 5 species of fish not previously reported from the Greater Rock River basin. They were northern brook lamprey*, silver chub, black buffalo, river redhorse, and greater redhorse (Table 7).

Six species are apparently no longer present in this basin. Three of these species were taken only before 1929:

*Natural reproduction in basin is questionable.

pallid shiner, western sand darter, and mud darter. The shortnose gar was taken only in 1948. The finescale dace and longear sunfish were most recently recorded during 1960-73 (Table 8).

There were 6 species not taken between 1929 and 1973. They were the American brook lamprey, river shiner, striped shiner, blacknose shiner, Ozark minnow, and burbot (Table 9).

One of the most important results of this study is the documentation of changes in the known distribution of species within each basin in 1974-81 as compared to previous periods. The changes for the Greater Rock River basin have ranged from decreases in the number of stations for 13 species and no change for 4 species, to increases for 86 species and the addition of 5 new species (Table 3). The decreases ranged from 100% for 6 species to 6% for the orangespotted sunfish. Previously, all species that decreased or had no change, except for the redfin shiner, the tadpole madtom, and the orangespotted sunfish, were very rare for they had been taken from only 1 or, at most, 5 stations. Considering the increase in sampling effort, this study indicates that they are now extirpated from the basin or present at only a very few locations. The increases averaged 440% and ranged from 67% for the white crappie to 3300% for the mimic shiner; these were due primarily to increased sampling effort and improved sampling gear and techniques. The increase in the number of streams and lakes which had complete stations over the 1960-73 time period was 250 and 43, respectively, while the increase over the 1900-28 period was 285 and 38, respectively. When the total number of stations sampled (excluding partial stations) is compared with the 1960-73 and 1900-28 periods, there is a 330% and 790% increase, respectively (Table 2).

Endangered Species

Four of the 8 fish species on the state's endangered species list were found in the Greater Rock River basin (Table 12). The **gravel chub** was taken at 18 stations on 4 rivers, the only locations for this species in the state (Append. C Map 16). Prior to this study, this species had been taken only at 2 locations, below the dam at Beloit on the Rock River in 1970 (Becker unpubl.) and on the Sugar River near Brodhead in 1908 by G. Wagner. We resampled both locations and found the gravel chub still present. The **slender madtom,** also found only in the Greater Rock River basin, was taken at 27 stations on 16 streams (Append. C Map 53). Prior to this study, it had only been taken from a 26-km

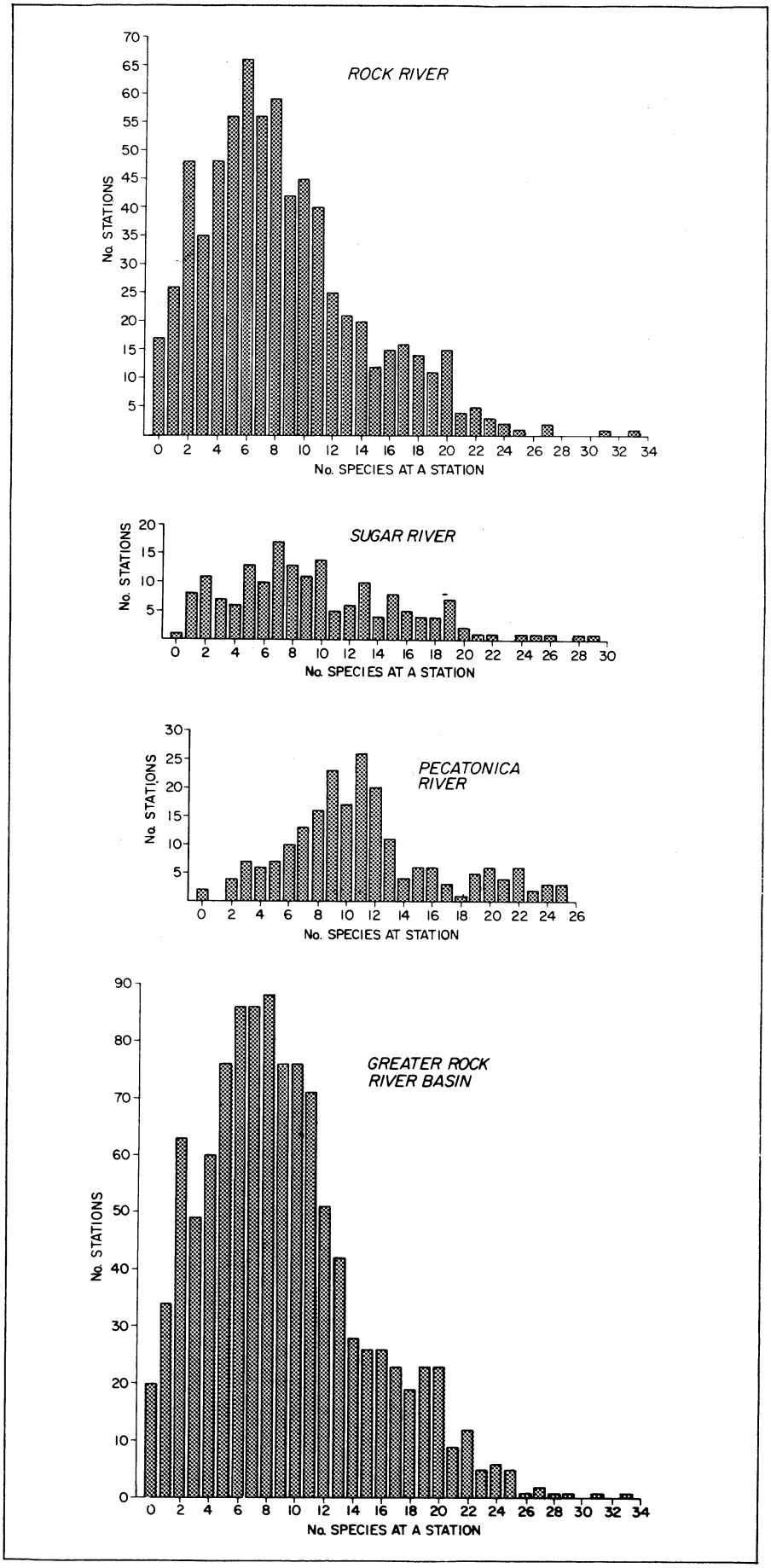
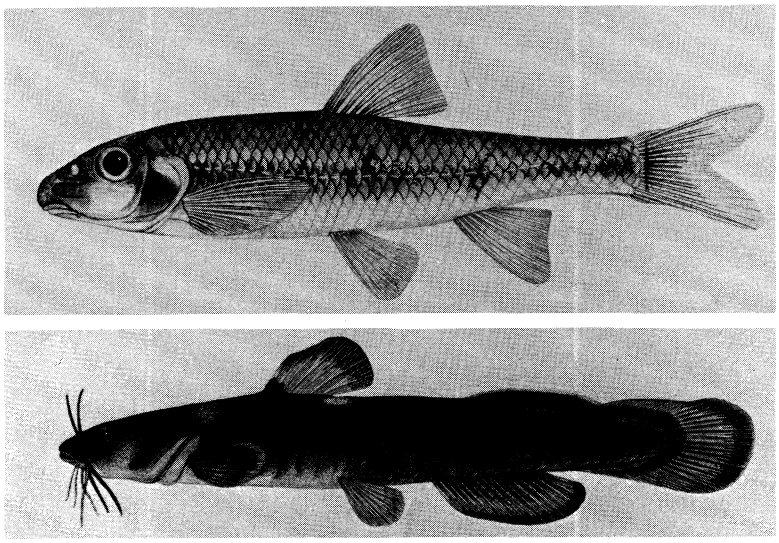
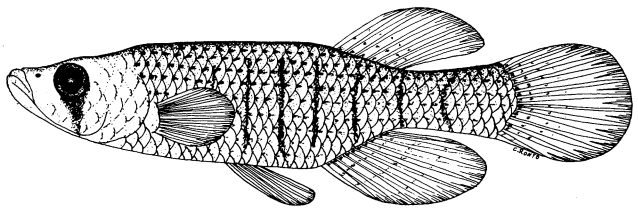


FIGURE 4. *Number of stations at which varying numbers of species were taken in the Greater Rock River basin and each sub-basin.*



The gravel chub (top) and the slender madtom (bottom) inhabit the riffle sections of streams. Both of these endangered fish have only been taken in the Greater Rock River basin.



The starhead topminnow, an endangered species in Wisconsin, prefers sloughs and backwaters of well-vegetated lakes.

TABLE 12. *Endangered species caught during 1974-81 in the Greater Rock River basin and records from stations in other Wisconsin basins since 1974.*

Endangered Species	Basin	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/ Station	No. Records From Other Basins*
Gravel chub	221	Rock River	Rock	2	17		0
		Turtle Creek	Rock	5	65		
	222	Sugar River	Rock	2	37		
		Sugar River	Green	6	28		
	223	Pecatonica R.	Green	1	1		
		Pecatonica R.	Lafayette	2	3		
		TOTAL		18	151	9	
Striped shiner	221	Rubicon River	Dodge	1	1	1	12 (20, 30, 210)
Slender madtom	221	Rock River	Jefferson	2	2		0
		Little Turtle Cr.	Walworth	1	2		
		Darien Creek	Walworth	1	1		
		Bark River	Jefferson	3	31		
		Bark River	Waukesha	4	81		
		Oconomowoc R.	Waukesha	3	82		
		Oconomowoc R.	Washington	1	3		
		Mason Creek	Waukesha	1	12		
	223	Pecatonica R.	Iowa	1	3		
		Dodge Br.	Iowa	1	1		
		Un. Creek	Iowa	1	1		
		Otter Creek	Lafayette	1	5		
		Wood Br.	Lafayette	1	6		
		Bonner Br.	Lafayette	2	22		
		Cottage Inn Br.	Lafayette	1	16		
		Mineral Point Br.	Iowa	1	4		
		Pedler Creek	Iowa	1	1		
		Livingston Br.	Iowa	1	3		
		TOTAL		27	276	10	
Starhead topminnow	222	Un. Ditch	Rock	1	2	2	8 (210,270)

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

stretch on the Bark River, 1 location on the Oconomowoc River, and 1 station on Mineral Point Branch. Only 2 specimens of the **starhead topminnow** were found in an unnamed drainage ditch off of the Sugar River (Append. C Map 57). We sampled the 2 locations at which this species had previously been taken but were unable to find them. Only 1 specimen of the **striped shiner** was found at 1 station in the Rubicon River (Append. C Map 21). Previously, this species had been reported in the early 1900's from the Badfish River, but our sampling on the river failed to collect it.

Habitat characteristics of 5 rare species caught at 3 or more stations are shown in Table 13. The gravel chub and slender madtom both tended to be found in riffle areas of small to moderate size warm water streams with slight to moderate turbidity.

Threatened Species

Two threatened species were taken from the Greater Rock River basin (Table 14). The **Ozark minnow** was taken at 17 stations in 9 streams (Append. C Map 26). In the 1920's, this species had been reported from 5 streams and we were able to to collect it in only 3 of them. Habitat characteristics of stations where the Ozark minnow was captured are shown in Table 13. A total of 3 **black buffalos** were taken at 2 stations on the Pecatonica River (Append. C Map 44). This species, which inhabits the bottoms of the main channels of larger rivers, has not been reported from the Greater Rock River basin before.

TABLE 13. *Characteristics of aquatic habitat for selected species taken in the Greater Rock River basin, 1974-81.*

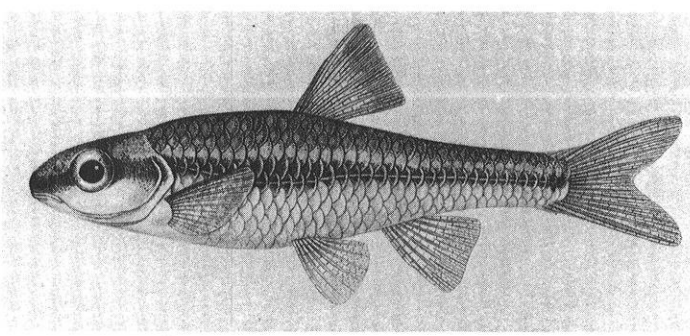
Species	Stream Width (m)	Avg. Stream Depth (m)	Velocity*	Turbidity*	Cond. (μmhos)	Temp. (F)
ENDANGERED						
Gravel chub	6-90	< 0.5 (riffle areas)	moderate to rapid	slight to moderate	500-1,000	53-75
Slender madtom	2-75	shallow riffles	moderate to rapid	slight	430 - 790	53-84
THREATENED						
Ozark minnow	4-21	0.6	sluggish to rapid	moderate	500 - 790	55-78
WATCH						
Pugnose shiner	(littoral zone with abundant aquatic vegetation)			clear	440 - 460	68-87
River redhorse	12-76	0.3-3	sluggish to moderate	moderately turbid to turbid	680 - 775	46-52

*Terms are defined in Appendix B.

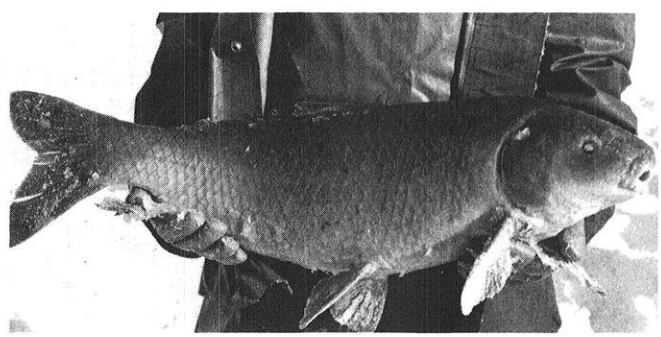
TABLE 14. *Threatened species caught during 1974-81 in the Greater Rock River basin and records from stations in other Wisconsin basins since 1974.*

Species	Basin	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/ Station	No. Records From Other Basins*
Ozark minnow	221	Turtle Creek	Rock	3	7		33
		Un. Creek	Rock	1	4		(230,300)
		Spring Brook	Rock	1	12		
		Little Turtle Creek	Walworth	2	34		
		Little Turtle Creek	Rock	2	149		
		Darien Creek	Walworth	3	12		
		Ladd Creek	Walworth	1	87		
		W. Br. Ladd Creek	Walworth	1	1		
		Un. Creek	Walworth	1	2		
	223	E. Br. Richland Creek	Green	2	15		
		TOTAL		17	323	19	
Black buffalo	223	Pecatonica River	Green	1	2		8
		Pecatonica River	Lafayette	1	1		(240)
		TOTAL		2	3	2	

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



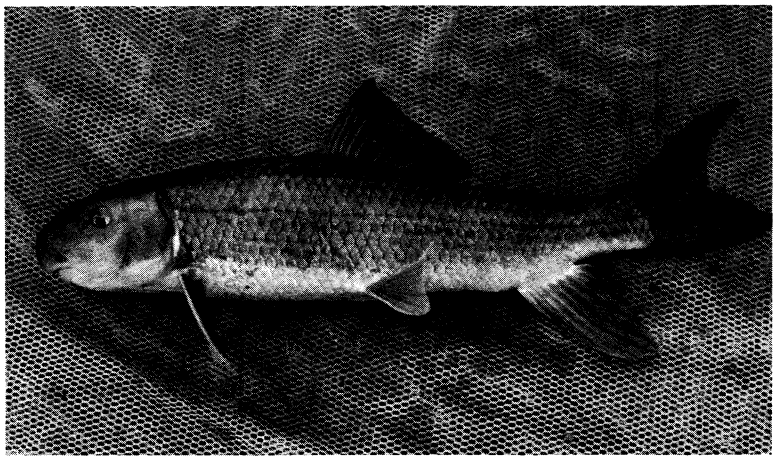
The Ozark minnow, now a threatened species, inhabits moderately fast streams with gravel bottoms. When this study began, it was on Wisconsin's endangered list.



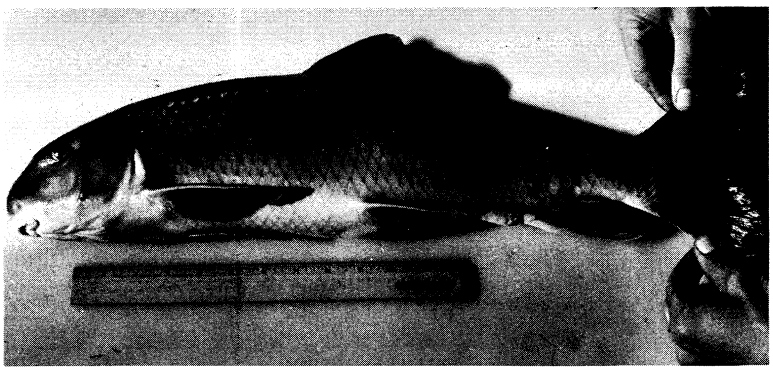
The black buffalo, presently on the threatened list, prefers the deep swift channels of larger rivers.

Watch Species

A total of 11 watch species was taken in the Greater Rock River basin (Table 15). A total of 27 **lake sturgeons** was taken from 8 stations in 4 lakes (Append. C Map 2). However, all specimens from 1 lake were taken during a chemical treatment operation. In the Greater Rock River basin, this species has not been found naturally occurring outside the Yahara River basin. Five **American eels** were taken at 5 locations in 3 rivers in the Rock River basin and in 1 lake in the Sugar River basin (Append. C Map 3). This species, which spawns in the Sargasso Sea, is a rare visitor to the Greater Rock River basin. The **redside dace** was taken at 20 stations in 15 streams (Append. C Map 12). Previously, this species had been taken in only 4 streams. The **pugnose shiner** was taken at 13 stations in 6 lakes (Append. C Map 19). Previously, this species had only been reported from 2 other lakes, but our sampling efforts failed to collect them in either lake. Habitat characteristics for this lake species are shown in Table 13. The **pugnose minnow** was taken at only 1 station from the Rock River (Append. C Map 23). Previously, it had been reported from 4 streams and 1 lake. Its distribution, therefore, appears to have declined. The **weed shiner** was taken at only 4 stations in 3 streams in the Sugar River basin (Append. C Map 30). In the 1920's, this fish was reported from 3 streams in the Rock River basin and from the Sugar River. Thus, it appears to have been extirpated from the Rock River basin. The **redfin shiner** was taken at 12 stations in 7 streams and 2 lakes. It had been taken previously at 13 streams and thus a decline in distribution is indicated. The **lake chubsucker** was taken at 24 stations in 8 lakes and 10 streams in the Rock River basin (Append. C Map 42). Previously, it had only been taken in 2 streams and 1 lake. The **river redhorse** was found at 2 general locations—1 at the Rock River at Watertown (4 stations) and the other at the Sugar River at Brodhead (2 stations) (Append. C Map 46). When the river between the 2 dams in Watertown was lowered in October of 1976, an intensive effort to remove all river redhorse resulted in the capture of 61 specimens. Previously, this species had only been taken in the St. Croix River by the Minnesota DNR. Habitat characteristics for this large river species are shown in Table 13. The **greater redhorse** was taken at 3 stations in 3 rivers in the Rock River basin (Append. C Map 46). It had not previously been reported from the Greater Rock River basin. The **least darter** was taken at 31 stations in 11 lakes and 11 streams (Append. C Map 73). Previously, it had been taken in 13 streams, but we failed to collect it in 9 of those streams. It appears that the distribution of this species has changed to some extent.



The river redhorse, presently on the watch list, inhabits fast, larger rivers. When this study began, it had only been taken at a couple of locations on the St. Croix River by the Minnesota DNR.



The greater redhorse, presently on the watch list, inhabits larger rivers and lakes. When this study began, it was on Wisconsin's endangered list.

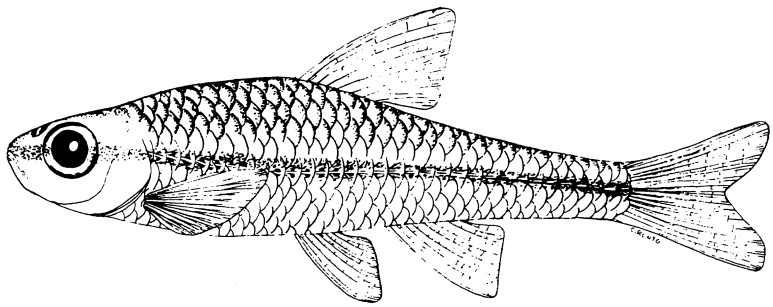
TABLE 15. *Watch species caught during 1974-81 in the Greater Rock River basin and records from stations in other Wisconsin basins since 1974.*

Species	Basin	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/ Station	No. Records From Other Basins*
Lake sturgeon	221	Lake Kegonsa	Dane	1	1		25
		Lake Monona	Dane	2	12		(5, 81, 82, 240,300
		Lake Mendota	Dane	4	7		310)
		Blue Spring Lake	Jefferson	1	7		
		TOTAL		8	27	3	
American eel	221	Rock River	Rock	1	1		36
		Yahara River	Dane	2	2		(5, 81, 240, 270, 280,
		Beaver Dam River	Dodge	1	1		300)
	222	Albany Lake	Green	1	1		
		TOTAL		5	5	1	
Redside dace	222	Raccoon Creek	Rock	3	29		97
		E. Fork Raccoon Cr.	Rock	1	1		(50, 90, 240, 270,
		Little Sugar River	Green	1	1		300)
		Little Sugar River	Dane	1	2		
		Hefty Creek	Green	2	14		
		Center Br. Hefty Cr.	Green	1	17		
		Ward Creek	Green	1	3		
		Spring Valley Creek	Green	1	6		
		Story Creek	Green	1	1		
		Story Creek	Dane	1	1		
		W. Br. Sugar River	Dane	1	1		
		Milum Creek	Dane	1	1		
		Flynn Creek	Dane	1	22		
		Deer Creek	Dane	1	7		
		Un. Creek	Dane	1	1		
		Dougherty Creek	Green	1	1		
		Syftestad Creek	Dane	1	2		
		TOTAL		20	110	6	
Pugnose shiner	221	Lake Ripley	Jefferson	4	4		44
		Lower Nemahbin Lake	Waukesha	2	14		(20, 81, 82, 210, 300,
		Rock Lake	Jefferson	1	2		310)
		Oconomowoc Lake	Waukesha	2	2		
		Okauchee Lake	Waukesha	1	1		
		Pike Lake	Washington	3	11		
		TOTAL		13	34	3	
Pugnose minnow	221	Rock River	Jefferson	1	8	8	124
							(81, 82, 2,, 210, 240, 270, 280, 300, 310)
Weed shiner	222	Sugar River	Rock	2	34		64
		Un. Ditch	Rock	1	6		(82, 120, 2, 240, 250,
		Taylor Creek	Rock	1	1		270, 290, 300)
		TOTAL		4	41	10	
Redfin shiner	221	Rock River	Rock	1	1		15
		Bass Creek	Rock	2	27		(20, 82, 90, 240, 300)
		Crawfish River	Dodge	1	1		
		Crawfish River	Columbia	1	2		
		Mud Creek	Dodge	1	6		
		Danville Millpond	Dodge	1	4		
	222	Sugar River	Green	2	6		
		Sylvester Creek	Green	1	1		
		Decatur Lake	Green	1	1		
		Ross Crossing Creek	Green	1	1		
		TOTAL		12	50	4	

TABLE 15. (Cont.)

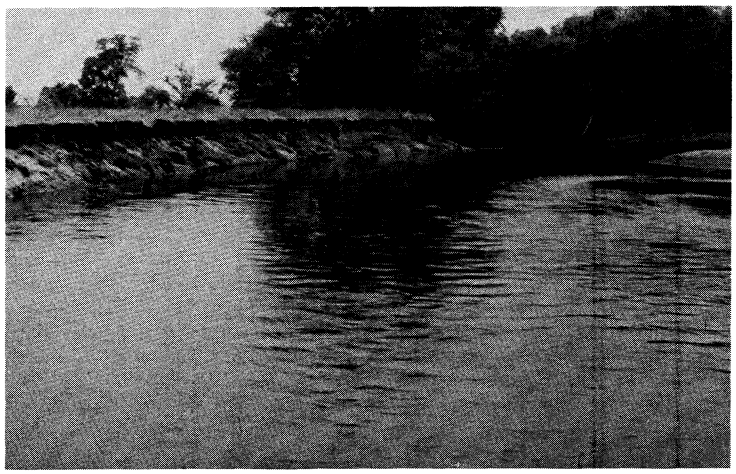
Species	Basin	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/ Station	No. Records From Other Basins*
Lake chubsucker	221	Beaver Lake	Waukesha	1	1		70
		Golden Lake	Waukesha	1	7		(10, 20, 30, **81, 82,**
		Pine Lake	Waukesha	1	2		200, 210)
		Turtle Creek	Walworth	1	15		
		Un. Creek	Jefferson	1	1		
		Lake Ripley	Jefferson	2	10		
		Bark River	Jefferson	1	2		
		Bark River	Waukesha	2	2		
		Scuppernong River	Waukesha	1	1		
		Lower Spring Lake	Jefferson	1	5		
		Duck Creek	Jefferson	1	4		
		Rome Millpond	Jefferson	1	-		
		Scuppernong Creek	Waukesha	1	5		
		Lower Nemahbin Lake	Waukesha	1	1		
		Rock Creek	Jefferson	1	8		
		Oconomowoc River	Waukesha	2	60		
		Okauchee Lake	Waukesha	3	8		
		Un. Channel	Waukesha	1	2		
		Mason Creek	Waukesha	1	1		
		TOTAL		24	135	6	
River redhorse	221	Rock River	Jefferson	3	9		64
		Rock River	Dodge	1	7		(82, 2, 210, 240, 270,
	222	Sugar River	Green	2	2		300, 310)
		TOTAL		6	18	3	
Greater redhorse	221	Rock River	Rock	1	1		90
		Turtle Creek	Rock	1	4		(5, 20, 40, 50, 82,
		Bark River	Jefferson	1	1		100, 110, 240, 300,
		TOTAL		3	6	2	**310)**
Least darter	221	Upper Genesee Lake	Waukesha	1	1		53
		Darien Creek	Walworth	1	4		(20, 82, 200, 210,
		Lake Ripley	Jefferson	2	2		270, 300, 310, 400)
		Otter Creek	Rock	1	18		
		Allen Creek	Jefferson	2	10		
		Whitewater Creek	Walworth	1	1		
		Un. Ditch	Waukesha	1	1		
		Crooked Lake	Waukesha	1	3		
		Lower Nemahbin Lake	Waukesha	3	125		
		Upper Nemahbin Lake	Waukesha	2	47		
		Lower Nashotah Lake	Waukesha	1	1		
		Upper Nashotah Lake	Waukesha	1	1		
		Rock Lake	Jefferson	1	2		
		Oconomowoc Lake	Waukesha	3	19		
		Ashippun River	Washington	1	1		
		Ashippun Lake	Waukesha	1	8		
		Rubicon River	Washington	1	2		
		Pike Lake	Washington	1	10		
	222	Raccoon Creek	Rock	2	13		
		E. Fork Raccoon Cr.	Rock	1	46		
		Norwegian Creek	Green	1	2		
		Norwegian Creek	Rock	1	8		
		Un. Creek	Green	1	10		
		TOTAL		31	335	11	

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



The pugnose shiner, a species presently on the watch list, prefers clear, weedy lakes. When this study began, it was on Wisconsin's endangered list.

East Fork Raccoon Creek (Sugar River basin)—looking upstream at habitat of the least darter.



Sugar River (at station mile 30.2)—looking upstream at the habitat of the gravel chub.

RECOMMENDATIONS

PRESENT 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.

FUTURE RESEARCH STUDIES

This series of reports on fish distribution does not deal generally with the ecological data collected during the 1974-81 period. 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 further areas for study and analysis.

PROTECTION OF ENDANGERED AND THREATENED SPECIES AND THEIR HABITATS

Gravel Chub and Slender Madtom. Protection should be given to the aquatic ecosystems in those locations in the Greater Rock River basin where the endangered gravel chub and slender madtom are found. This is especially important since these locations are the only ones in the state where these species have been found. Research should be done on their life history so that expansion of their range may become possible through their introduction into other suitable locations. Encouraging such research in the academic community would be very appropriate.

Striped Shiner. The entire Rubicon River basin should be resampled to determine if a reproducing population of the striped shiner exists. Any populations found should have their habitat protected.

Starhead Topminnow. Any manipulation of the aquatic environment in the Sugar River basin where the starhead topminnow was taken (Append. C Map 57) should take cognizance of the presence of the populations of this fragile endangered species.

Black Buffalo. Research should also be done on the life history of the black buffalo. The 3 specimens taken of this threatened species indicate that the population in the Pecatonica River is extremely low. A graduate thesis study of the life history and ecology of the relatively large population of the black buffalo in Lake Wisconsin should be encouraged.

Rock River at Watertown. The unique ecosystem that occurs between the dams on the Rock River in Watertown should be protected since the endangered slender madtom and the rare river redhorse occur there as well as 30 other species. Of all the statewide collections (over 5,300) made during this study, only 5 stations have contained more species.

UPDATING PRESENT RECORDS

District fish management personnel should in the course of routine surveys preserve (except paddlefish, lake sturgeon, and American eel) at least 1 specimen of each endangered, threatened, and watch species they observe and notify the Bureau of Research. This is especially important in basin nos. 300 (exclusive of the Red Cedar River), 240, 81, and 82, for which we have the least amount of data. 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

As noted previously, completion of a 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 nongame 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 16. *List of species reported from each basin in the Greater Rock River basin by collectors other than DNR research personnel.*

	Rock (221)		Sugar (222)		Pecatonica (223)	
Species Name	1960-73	1974-81	1960-73	1974-81	1960-73	1974-81
American brook lamprey	-	1	-	-	-	-
Lake sturgeon*	6,8	1,7,8	-	-	-	-
Longnose gar*	3,6	1,6	-	-	-	-
Shortnose gar	6	-	-	-	-	-
Bowfin*	1,2,3,5,6	1,6	-	-	-	-
American eel*	8	8	-	-	-	-
Cisco (lake herring)*	8	1,6,7	-	-	-	-
Rainbow trout*	1	1,8	-	1	-	-
Brown trout*	1	1,6,8	1,3	1	2	1
Brook trout*	1	1,8	-	-	-	-
Central mudminnow*	1,2,3,4,5	1,6	3	1	2,3	-
Grass pickerel	2,3,4,5	1	3	-	-	-
Northern pike*	1,2,3,4,5	1,6,7	1,3	1	1	1
Muskellunge*	6	1	-	-	-	-
Stonerollers	4,5	-	3	-	3	-
Central stoneroller	1,2,3	1	2	1	2	1
Largescale stoneroller	3	-	-	-	2	1
Goldfish*	3	-	-	-	-	1
Redside dace	-	-	3	-	-	1
Common carp*	1,2,3,4,5,6	1,6,7	1,2,3	1	1,2	1
Brassy minnow	3,4	1	2,3	-	2,3	1
Silvery minnow	3	-	-	-	-	-
Gravel chub	2	-	-	-	-	-
Hornyhead chub	1,2,3,4,5	1	3	-	2,3	1
Golden shiner	1,2,3,4,5	1	2,3	1	-	-
Pugnose shiner	5	-	-	-	-	-
Emerald shiner	1,2,3	1	2,3	-	3	-
Common shiner	1,2,3,4,5	1	2,3	1	2,3	1
Bigmouth shiner	3,4	1	2,3	1	2,3	1
Pugnose minnow	2,3,4	-	-	-	-	-
Blackchin shiner	3,4	1	-	-	-	-

TABLE 16. *(Cont.)*

Species Name	Rock (221)		Sugar (222)		Pecatonica (223)	
	1960-73	1974-81	1960-73	1974-81	1960-73	1974-81
Blacknose shiner	-	1	-	-	-	-
Spottail shiner	1,2,3	1	-	-	-	-
Ozark minnow	-	1	-	-	-	-
Rosyface shiner	4	1	2,3	-	2,3	1
Spotfin shiner	1,2,3,4	1	2,3	1	2,3	1
Sand shiner	1,2,3,4	1	2,3	1	2,3	1
Weed shiner	-	-	2	-	-	-
Redfin shiner	1,2	-	3	-	-	-
Mimic shiner	2	1	-	-	-	-
Suckermouth minnow	3,4	1	2,3	-	2,3	1
Northern redbelly dace	1,2,4	1	-	-	-	-
Southern redbelly dace	1,2,3,4	1	3	1	2,3	1
Finescale dace	1	-	-	-	-	-
Bluntnose minnow	1,2,3,4,5	1	2,3	1	2,3	1
Fathead minnow	1,2,3,4,5	1	2,3	1	2,3	1
Bullhead minnow	3	-	2	-	-	-
Blacknose dace	1,2,3,4	1	3	-	3	-
Creek chub	1,2,3,4,5	1	2,3	1	2,3	1
Pearl dace	1,4	1	-	-	-	-
River carpsucker	-	-	2	-	-	-
Quillback	-	-	2,3	-	2	1
White sucker*	1,2,3,4,5,6	1,6	1,2,3	1	2,3	1
Lake chubsucker*	1,3,5	1	-	-	-	-
Northern hog sucker*	1,2,4,5	1	2,3	-	2,3	-
Bigmouth buffalo	1,3	-	-	-	2	-
Silver redhorse	-	-	2,3	-	2	-
Golden redhorse	2,4	1	2,3	-	2	1
Shorthead redhorse	1,2	1	2,3	1	2,3	1
Black bullhead	1,2,3,4,5	1	2,3	1	-	-
Yellow bullhead	1,2,3,4,5	1	3	1	-	-
Brown bullhead	1,2	1	3	-	-	-
Channel catfish*	1,2,3,6	1,6,7	1,2,3	1	2	1
Slender madtom	3,5	-	-	-	6	-
Stonecat	1,2,4,5	1	3	-	2	1
Tadpole madtom	1,2,3	1	3	-	-	-
Flathead catfish*	-	-	1	-	-	-
Burbot*	-	6,8	-	-	-	-
Banded killifish	2,3,5	-	-	-	-	-
Blackstripe topminnow	1,2,3,4,5	1	2,3	-	3	-
Starhead topminnow	-	-	3	-	-	-
Brook silverside*	1,2,3,4,5	1	2	-	-	-
Brook stickleback*	1,2,3,4,5	1,6	1,3	1	2,3	1
White bass	2,3	1	-	-	-	-
Yellow bass	2,3	-	-	-	-	-
Rock bass	1,2,3,4,5	1	2,3	-	2	-
Green sunfish	1,2,3,4,5	1	2,3	1	2,3	1
Pumpkinseed	1,2,3,4,5	1	2,3	-	-	-
Warmouth	4	-	-	-	-	-
Orangespotted sunfish	2,4	1	2,3	-	2	1
Bluegill	1,2,3,4,5	1	2,3	-	2,3	-
Longear sunfish	2	-	-	-	-	-
Smallmouth bass*	1,2,3,4	1,8	1,2,3	1	2,3	1
Largemouth bass*	1,2,3,4,5,6	1,6,7,8	1,2,3	1	1,2,3	1
White crappie	1,2,3	1	-	-	-	-
Black crappie	1,2,3,4,5	1	2,3	-	-	-
Rainbow darter	1,2,3,4,5	1	2,3	-	3	-
Iowa darter	1,2,3	-	3	-	-	-
Fantail darter	1,2,3,4,5	1	3	-	2,3	1
Least darter	2,3,4	1	3	-	-	-
Johnny darter	1,2,3,4,5	1	2,3	1	2,3	1
Banded darter	2,3,4,5	1	2,3	-	2,3	-
Yellow perch*	1,2,3,6	1,6	-	1	3	-
Logperch	2,3,4	1	-	-	-	-
Blackside darter	1,2,3	1	2,3	-	2,3	1
Slenderhead darter	2	1	2	-	2	-
Walleye*	1,2,3,4,6	1,6,7	1	1	2	-
Freshwater drum*	2,3,6	1,6,7	-	-	-	-
Mottled sculpin*	1,3	1,6	1,3	1	2,3	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
2 = Dr. George Becker and his students
3 = Professor Marlin Johnson and his students
4 = Dr. George Seeburger and his students (1975)
5 = Milwaukee County Public Museum (unpubl. data)
6 = UW-Madison students (unpubl. data)
7 = Commercial fishermen
8 = Sport fishermen

M.B. | M.B. | M.B. MILE | FIRST ORDER MILE

SECOND | THIRD | FOURTH | FIFTH

SIXTH | SEVENTH | EIGHTH | NINTH

TENTH | ELEVENTH | STATION MILE

S.D. | GEAR | EFFORT | UP | DOWN | MO. | DAY | YR.

LOCATION

JAR | WTC | TOWN | RANGE | SEC. | 1/16 | 1/4 | CO.

WIDTH

L

M

U

DEPTH

L

M

U

VELOCITY

WATER TEMP. °F

CONDUCTIVITY umhos

TURBIDITY

PH

BOTTOM TYPE

CONCRETE	A
BEDROCK	B
HARDPAN	C
BOULDER	D
RUBBLE	E
GRAVEL	F
SAND	G
SILT & MUCK	H
CLAY	I
MARL	J
DETRITUS	K
RUBBISH	L
PEAT	M

AQUATIC VEG.

EMERGENT

SUBMERGENT

DUCKWEED

ALGAE (ATT)

ALGAE (FF)

STREAM BANK VEGETATION

CULTIVATED	A
FALLOW	B
UPLAND PASTURE	C
UPLAND MEADOW	D
UPLAND HARDWOOD	E
UPLAND CONIFER	F
UPLAND SHRUB	G
LOWLAND PASTURE	H
LOWLAND HARDWOOD	I
LOWLAND CONIFER	J
LOWLAND SHRUB	K
OPEN MARSH	L
CUT GRASSES	M
BEACH	N
LOWLAND MEADOW	O
OPEN WATER	P

WIS. DEPARTMENT OF NATURAL RESOURCES
FORM 8100-46
REV. 2-80

SPECIES | NO.

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

```
MINOR=223SELECTION=223                                          SOURCE=NOT 40 81 94 95 96 99      MILE ON ---------- PAGE  43
MIN. MONTH =      MAX. MONTH =      MIN. YEAR = 1950  MAX. YEAR = 1973   COUNTY = OR < 72

X12   JOHNNY DARTER                                        ETHEOSTOMA NIGRUM

          ----------O R D E R  M I L E A G E S----------
BASIN    MBM       1        2/7      3/8      4/9      5/10     6/11     MILE  LAKE OR STREAM NAME          WT NO SD GEF --DATE--TWRRNGSECQTQTCO

2 223 1434.8R  156.9L                                                   139.1  PECATONICA R                  2  2 46 5    6/27/60  2N 3E12SESESE33
2 223 1434.8R  156.9L                                                   182.4  PECATONICA R -MIFFLIN         2 11 46 5    8/15/62  5N 1E27SESESE25
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 8E29NWNE23
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 Cobal program (listing method B, Fig. 3, used here).*

MINOR=223SELECTION=223 SOURCE=NOT 40 81 94 95 96 99 MILE ON -------------- PAGE 50

		NUMBER OF STATIONS	PERCENT OF TOTAL STATIONS
I21	BROWN TROUT	1	2.56
K01	CENTRAL MUDMINNOW	4	10.26
M05	STONEROLLERS	13	33.33
M06	CENTRAL STONEROLLER	19	48.72
M07	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
N02	SUCKERS	1	2.56
N04	REDHORSES	1	2.56
N06	QUILLBACK	1	2.56
N09	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
S02	BLACKSTRIPE TOPMINNOW	1	2.56
U01	BROOK STICKLEBACK	12	30.77
W04	ROCK BASS	5	12.82
W05	GREEN SUNFISH	6	15.38
W08	ORANGESPOTTED SUNFISH	5	12.82
W09	BLUEGILL	10	25.64
W11	SMALLMOUTH BASS	14	35.90
W12	LARGEMOUTH BASS	6	15.38
X07	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
Z01	MOTTLED SCULPIN	7	17.95

TOTAL NUMBER OF SPECIES OCCURRENCES 441

# STATIONS/SD:							
SD-11= 0	SD-14,16= 0	SD-15,17,19= 0	SD-23-33= 0	SD-40= 0	SD-45,46= 283	SD-50= 0	SD-55,56= 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		TOTAL NUMBER OF SPECIES	45
(WITH MILE RULE)	39	TOTAL NUMBER OF HYBRIDS	1
(WITHOUT MILE RULE)	42	TOTAL NUMBER OF UNSPECIFIED	3

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

APPENDIX B: EXPLANATION OF THE WATER MILEAGE SYSTEM, MASTER STREAM AND LAKE FILE, AND MASTER FISH FILE

CONTENTS

INTRODUCTION

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 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 Figure 9. A detailed explanation of the system as exemplified in this figure is presented. An example of a page (Fig. 8) of the Master Fish File which uses the water mileage system to organize the biological and environmental data is then explained.

MASTER STREAM AND LAKE FILE

The location for any river or drainage lake (excluding landlocked lakes or landlocked systems) consists of a series of numbers (or codes). They specify its major basin, minor basin, and a series of river mileages which indicate the distance (in 10ths of miles) that the mouth of a river or lake is upstream from the beginning of the major basin in which it is located.

Mileages were determined through the use of a map wheel on 7 1/2 min (15 min where the 7 1/2 min has not been published) U.S. Geological Survey topographical maps.

Major Basin

Wisconsin is divided into 3 major basins. These 3 major basins and their corresponding code numbers are as follows:

Lake Michigan = 1
Mississippi River = 2
Lake Superior = 3

Under the heading "BASINS/MAJ" in Figure 9, a "2" appears indicating the Mississippi River basin.

Minor Basin

There are 30 minor basins in Wisconsin. The Lake Michigan basin has 13 (numbered 10 through 130) plus Lake Michigan proper, numbered 1, and Green Bay proper, numbered 5. The Mississippi River basin has 12 (numbered 200 through 310) plus the Mississippi River (Mainstem), numbered 2. The Lake Superior basin has 1 (numbered 400) plus Lake Superior proper, numbered 3 (Fig. 1).

One of Lake Michigan's minor basins (Fox River - 80) is subdivided into 2 sub-basins: 81 - Upper and Lower Fox River and 82 - Wolf River.

One of the Mississippi River's minor basins (Greater Rock River - 220) is subdivided into 3 sub-basins: 221 - Rock River (proper), 222 - Sugar River (includes Raccoon River), and 223 - Pecatonica River (Fig. 1).

The minor or sub-basin number is shown just to the right of the major basin number in Figure 9, under the heading "BASINS/MIN". In this ex-

ample, it is "222" indicating the Sugar River basin.

River Mileages

First Order Streams

The major basin mileage, under the heading "MB. MI.", locates the mouth of the 1st order stream. The major basin mileage is determined in this way:

(1) If the river is a tributary to Lake Michigan, its mileage is determined by the number of miles its mouth is up the shore from the Wisconsin-Illinois border. The letter "L" after the mileage indicates the river enters the west (left) shore of Lake Michigan.

(2) If the river is tributary to the Mississippi River, as in our example, its mileage is the number of miles its mouth is located upstream from the mouth of the Mississippi River. The "1434.8" in our example locates the mouth of the Rock River (Fig. 9). The letter "R" after this mileage indicates that the 1st order stream flows in on the right side* of the Mississippi.

(3) If the river is tributary to Lake Superior, its mileage is determined by the number of miles its mouth is east (to the right) of the mouth of the St. Louis River at Superior.

Second Through Twelfth Order Streams or Drainage Lakes

Mouths of 2nd through 12th order streams and drainage lakes are assigned a mile point based on the number of miles their mouths are upstream from the mouth of the river into which they flow. Thus, mileage on a 1st order stream indicates the mouth of a 2nd order stream or lake. These mileages are shown under the heading "ORDER MILEAGES 1 2 3 4/8 5/9 6/10 7/11". In the example under the heading "1", "156.9" locates the mouth of the Pecatonica River, and under "2", "9.2" locates the mouth of the Sugar River. The 1st through 7th order mileages are located on the 1st line of data for that stream or lake. If more orders are needed, they appear on the 2nd line of data for that body of water under the mileage for the 4th through 7th orders. The last space of each order is used for 1 of 7 reference codes. They are "R", "L", "X", "Y", "A", "O", or a blank.

The letter "R" is used for streams that enter the previous order stream on the right. If the stream enters on the left, the letter "L" is used. When 2 rivers join and form a new river, the tributary (fork) entering the new river on the right is assigned the letter "X" while the letter "Y" is used for the tributary entering on the left. If a lake has a named river flowing through it, tributaries flowing into the lake are given an "R" or "L" designation after their mileage corresponding to their position with respect to the main river flowing through the lake. When no such continuous main stream exists, the letter "A" usually follows the mileage for creeks or other lakes flowing into the lake. However, a few lakes were divided into left and right halves. If an inlet occurred at the upper point of division, the letter "A" follows the mileage for this inlet.

The letter "O" is used so that the computer will print out ".0" which is needed in a few instances to designate the mouth of certain rivers or lakes. The St. Louis River's major basin mileage "0.0O" is an example. The mileage for a dam or lake on a stream has a blank in this column since it is neither left or right of the stream.

When the mouth of a 2nd through 12th order stream occurs outside the boundaries of Wisconsin, the mileage from its mouth to the Wisconsin border is recorded as if this location were a lake or dam on the stream. Thus, for the Sugar River, "10.7" in the 3rd order (number of miles from mouth of Sugar River to the Wisconsin-Illinois border) is shown in Figure 9.

If unnamed streams connect 2 or more lakes in succession, the order does not increase for each successive unnamed stream or lake. Instead, the shortest mileage from the mouth of the inlet stream to the mouth of the outlet is added to the mileage of the 1st unnamed stream in the series.

Unnamed ditches connecting 2 or more streams are coded only as a tributary of the lower order stream.

Dams, falls, rapids, and points where streams cross state borders are also listed in the Master Stream and Lake File. All dams are given a mileage as if they were a lake on the stream.

Miles or Acres

The mileage for the mouth of a stream flowing into a lake is the shortest water mileage from the center of the lake's outlet to the mouth of the stream.

The total number of miles of the stream or acres of the lake or impoundment is shown under the heading "MI OR ACRES". The numbers are rounded to the nearest whole number.

Stream or Lake Name

The name of the stream, lake, or dam is taken from U.S. Geological Survey topographic maps (7 1/2 and 15 min), Wisconsin DNR's "Decisions on Names In Wisconsin" (Marsh 1981), and county surface water resources publications (71 out of 72 counties have been published), and is shown under the heading "STREAM OR LAKE NAME".

Dam Code

A code for the possibility of fish migrating upstream past a dam is shown under the heading "DC". The code numbers are: 0 = dam no longer in existence, 1 = not possible, 2 = possible (such as spring flood), 3 = highly probable, and 4 = beaver dam.

Water Type Code

All bodies of water are assigned 1 of 9 codes. They are: 0 = landlocked lakes; 1 = lakes or ponds; 2 = rivers, streams, or creeks; 3 = impoundments (any body of water with a dam controlling its water level); 4 = unknown or combination of any of the other types; 5 = backwater (of a stream); 6 = Wisconsin border crossing of a stream or lake; 7 = pools remaining from a "drying-up" stream; 8 = marsh; a blank = dam or lock. This code is shown under the heading "WT".

Township Description and County

In addition to receiving a series of mileage codes, each river and lake is also described by the town, range, section, quarter quarter section, and county in which its mouth lies. These data are shown in Figure 9, under the heading "LOCATION". All townships in Wisconsin are North. If the range is West, the letter "W" is used and the letter "E" if the range is East. An example of a quarter quarter section code is "SENE". This code means the southeast 1/4 of the northeast 1/4 of a particular section. The counties are arranged in alphabetical order and given a 2-digit code, e.g., Adams Co. is 1 and Wood Co. is 72. If a river has its mouth outside of the state, the county code becomes a state code with the following code numbers: Illinois = 80, Michigan = 85, Minnesota = 90, and Iowa = 95.

*Right and left sides are determined when facing upstream throughout this system of coding.

Landlocked Lakes

A landlocked lake is located with its proper major and minor code numbers. However, all other mileages are left blank. The town, range, section, quarter quarter section, and county of the lake is given just as for all other rivers or lakes.

Landlocked Systems

A landlocked system is a series of lakes and streams that do not flow above ground into the Mississippi River or Great Lakes. They have a "0.0O" in their major basin mileage and a number in the landlocked system space which is located right before the township.

MASTER FISH FILE

When a station is sampled, all data about the station are first recorded onto Form 8100-46 (Append. A Fig. 5). After all fish have been identified in the laboratory, the data are coded onto Form 8100-58 (Fig. 10), keyed onto tape, and entered into the Master Fish File.

The major and minor basins and the water mileage for a station are similar to those of a stream or lake in the Master Stream and Lake File. However, the data are arranged on the computer printout a little differently as exemplified in Figure 8. There are also some changes which occur between the name of the stream or lake and its township description. For landlocked lakes in the Master Stream and Lake File, the major and minor basin numbers appear, but the mileage orders are left blank; however for a sampling station, the township description which appeared in the Master Stream and Lake File appears in this space.

Station Location

The exact location of the station on the river or drainage lake is given by the station mileage. The exact location on a landlocked lake is given only by the township description located under the heading "STATION LOCATION". Station mileages on streams are determined by the number of miles upstream the station is located from the stream's mouth. The station's location is that part of the station which is farthest downstream. For stations at bridges, the station mile is at the bridge unless the station is started more than 0.05 mile (264 ft) downstream or upstream. The station mileage is shown under the heading "MILE". The space immediately following the station mileage can have 1 of 16 nonnumeric codes: "R", "S", "T", or "U" (all = right side of body of water sampled); "L", "M", "N", or "0" (all = left side of body of water sampled); "B" (area sampled is 100% downstream of bridge); "C" (area sampled is more than 50% but less than 100% downstream of bridge); "D" (area sampled is more than 50% but less than 100% upstream of bridge); "E" (area sampled is 100% upstream of bridge); "F" (area sampled is 50% upstream and 50% downstream of bridge); blank (no specific information on area sampled is given; however, it is usually mostly upstream of bridge and both sides of the body of water); "+" (area sampled is from a combination of stations usually in lakes under 200 acres); and "?" (station mileage is not precisely known). Four different rights and lefts are available since several locations on lakes can have the same water mileage from the mouth.

Station mileage on a drainage lake is determined in the same way the mileage is determined for a tributary coming into a lake. For a station on a landlocked lake over 200 acres, an arbitrary number ".1" is used for the station mileage of 1 station on the lake and the next station is assigned ".2", etc. Lakes under 200 acres normally have all sampling stations combined and lakes over 200 acres have stations separate. A combined sample is recorded as 1 station using the town-range-section system at either the center (for landlocked lakes) or the outlet of the lake for its location and is shown with a "+" in its station mileage. For boom or mini-shocking stations, a "+" is used when all or most of the lake is sampled. All stations at the exact same location have the same mileage code.

All stations in the Master Fish File have their station mileages recorded on the master set of topographic maps.

Source of the Data

The collector of the fish at a particular station is shown by a 2-digit code under the heading "SD" (Fig. 8). In order to group related collectors, 5 categories were created. They are: Historic (1900-50), Research, Fish Management, University of Wisconsin System, Miscellaneous.

Historic (1900-50) SD = 01-10
- 01 - Early Wisconsin fish collections (1900-31) reported by Greene (1935).
- 02 - Greenbank et al. (1940's) (from the University of Wisconsin-Madison Zoology Museum).

Research SD = 11-19
- 11 - Fish Distribution Study personnel.
- 12 - Fish Distribution Study's stocking.
- 13 - Other Research personnel - identified by proven ichthyologist.
- 14 - Fish Research (collecting done just for Fish Distribution Study, identification of specimens handle, as in "SD 33", their identification of sunfishes is accepted.; e.g., Tom Beard).
- 15 - Fish Research - similar to SD = 14 except it is a partial sample.
- 16 - Fish Research - sample identified by Fish Distribution Study personnel, except for same species as SD = 14.
- 17 - Other Research - similar to SD = 16 except it is a partial sample.
- 19 - Other Research personnel (not identified by Fish Distribution Study personnel).

Fish Management SD = 20-39, 94-96
- 23 - Youth Camp - identified by Fish Distribution Study personnel.
- 25 - Rock River Chemical Treatment to L. Koshkonong Power Plant site (identified by Fish Distribution Study personnel or Dr. G. Becker).
- 32*- Except for up to 35 species (depending on location in the state) that are assumed to be easily identifiable by all Fish Management personnel, all specimens were identified by Fish Distribution Study personnel.
- 33*- In addition to accepting Fish Management's identification of up to 35 species (mentioned above), their identification of other species is also accepted if at least 1 fish of that species was identified by Fish Distribution Study personnel. Therefore, while species should be accurate, numbers of specimens caught may not be accurate.
- 36 - Similar to 33 except that Fish Distribution personnel did not receive specimens of 1 or more reported species (excluding the 35 accepted species). Therefore, the specimens had

*Computer printouts of total number of fish for a species may not be the same as Fish Management's records due to fish returned to the water.

to be generalized to family or genus.*

94 - Fish Management survey (based on reports only).

95 - Literature not based on any particular survey, e.g., Surface Water Resource publications.

96 - Restocking of fish after chemical treatment.

University of Wisconsin System
SD = 40-74

40 - U.W. Madison students
45 - U.W. Stevens Point students
46 - Dr. George Becker
47 - U.W. Stevens Point, Dr. Coble & students
50 - Dr. Norden & U.W. Milwaukee students
55 - Dr. George Seeburger
56 - U.W. Whitewater students
60 - U.W Waukesha students
61 - Prof. Marlin Johnson & U. W. students
65 - U.W. Parkside students
66 - U. W. Eau Claire, Dr. Crowe
70 - Beloit College students
71 - Dr. J. Lutz
72 - Prof. Held & U.W. La Crosse students

Miscellaneous SD = 75-93, 97-99

75 - Milwaukee Public Museum
76 - ENCAP, Inc., Dr. Greenfield, Dekalb Univ.
77 - Dairyland Power Cooperative, La Crosse
78 - Northern States Power Co.
79 - N.U.S. Corp., Pittsburg, PA
80 - Bio Test, Inc., Chicago, IL
81 - Dames and Moore, Park Ridge, IL
82 - Wis. Electric Power Co., Milwaukee, WI
83 - Upper Mississippi River Conservation Comm.
84 - Illinois Natural History Survey, Urbana, IL
86 - Commercial Fishermen, identified by Fish Distribution Study or Dr. G. Becker
88 - Iowa Coop. Fish Research Unit, Ames, IA
89 - Minn. DNR
90 - U.S. Fish and Wildlife
91 - Michigan DNR
92 - Michigan DNR, identified by Univ. of Michigan
97 - U.S. Army Corps of Engineers
98 - Commercial fishermen
99 - Unknown collector (e.g., sport fisherman).

Gear and Effort

Type of gear is shown under the heading "G", and an estimate of the effort is shown under the heading "EF". When the effort was unknown, it is left blank.

Code	Gear Description	Effort Description
1 =	DC boom shocker	0.1 of miles shocked (1 mile = 1.0)
2 =	DC stream shocker	0.01 of miles shocked (e.g. 100 yd = .06)
3 =	DC backpack shocker	0.01 of miles shocked
4 =	Survey seine	Area covered (acres)
5 =	Small-mesh seine	Area covered (ft^2 /100 x hauls) 100 ft x 15 ft/100 = 1500/100 = 15 99 means anything greater than 98
6 =	Gill, trammel & entanglement net	Length of net (ft/ 10 x days)
7 =	Fyke, hoop, trap & drop net	Nets x days in water
8 =	Mini boom shocker	0.1 of miles shocked
9 =	Trawl	Minutes x hauls
A =	Dip net	Left blank
B =	Long line shocker	0.01 of miles shocked
C =	Poison	0.1 of miles/ poisoned
D =	Hook and line, spear, & arrow	Left blank
E =	Minnow trap	Traps x days
F =	Pond net	Nets x days
G =	Miscellaneous (found dead, winterkill, etc.)	Left blank
H =	Combination of gear	Left blank
I =	Boom shocker mini boom shocker	0.1 of miles shocked
J =	Slat trap	Traps x days in winter
K =	Any type of shocking gear + any type of net	Left blank
L =	Any type of shocking gear+ any type of seine	Left blank
M =	Any type of net+ any type of seine	Left blank
N =	Combination of any type of net	Left blank
O =	Combination of any type of seines	Left blank
P =	Combination of any type of shocking gear	Left blank
Q =	AC boom shocker	0.1 of miles shocked (1 mile = 1.0)
R =	AC stream shocker	0.01 of miles shocked (e.g. 100 yd = 0.06)
S =	AC backpack shocker	0.01 of miles shocked
T =	AC long line shocker	0.01 of miles shocked

Date

. The date on which the sample was taken is shown under the heading "DATE". Thus, 6/23/75 would mean 23 June 1975.

Township Description

The town, range, section, quarter quarter section, and county are shown under the heading "STATION LOCATION".

Jar Code

Usually a station jar was kept with a few specimens of each of the species and the remaining specimens were given to the Milwaukee Public Museum for curation. The station jars were temporarily housed at the Nevin Fish Hatchery in Madison. A jar code was used to record information on the fish kept. These codes are shown in Figure 8 under the heading "JAR", which is on the 2nd line of data for a station. When a jar had been kept, a "1" was used. It was left blank, or a zero was used, when the jar had not been kept. If 1 or more specimens were kept for a synoptic collection, a "2" was used. If both a station jar and a synoptic collection were kept, a "3" was used.

Water Type Code

Stations are given a water type code, which is the same as the codes described in the Master Stream and Lake File. They are shown on the 2nd line of data after the Jar Code under the heading "WT".

Fish Species Data

On the 3rd line of data for a station appears the total number of species ("SP"), hybrids ("HY"), and unspecified categories ("UNSP") captured. An unspecified category is one that is used for specimens that were not identified down to species. On this same line of data, after the heading "FISH", the fish species' codes and number of specimens taken is given. The fish species code is composed of alphabetical characters which are unique for each family and 2 numeric characters which are unique for each species, hybrid, or unspecified category in the family. Table 5 shows the codes for all species taken in the Greater Rock River basin. If more than 98 fish were captured, a 99 is given. A "+" or blank in this space means the number is unknown. Each station can have up to 44 specimens.

Ecological Data

Ecological data were recorded onto Form 8100-46 (Append. A Fig. 5), only for stations sampled by Research's Fish Distribution Study personnel. In the Greater Rock River basin, ecological data were recorded for 713 of the 1,015 stations sampled. These data will not be addressed in this report. An example of the data appears in Figure 8; 4 lines in parentheses are located on the farthest right quarter of the printout. The reason for including a description of the types of data collected and their descriptions is to inform the reader of the type of data available. Blanks in the listing indicate the data were not taken.

First Line

Stream Width. The estimated average lower, mean, and upper widths of the sampling station are recorded in feet. Three spaces are allowed for each average with a blank between each average. In the example (Fig. 8), the mean was not recorded.

Stream Depth. The estimated average lower, mean, and upper depths of the stream's main channel in the area actually sampled are recorded down to 10ths of feet. Each average has 3 spaces without a decimal point and is separated by a blank. In the example, "40" equals 4.0 and the mean was not recorded.

Second Line

Velocity. The first space on this line is used to record 1 of 4 codes:

"0" - None - No perceptive current.

"1" - Sluggish - Current scarcely perceptible in most of the stream and little turbulence. Current less than 1/2 ft/sec. Sand ripples on bottom not evident; bottom smooth, except for rocks.

"2" - Moderate - Current evident; moderate turbulence from helical movements and deflection. Generally, sand ripples on bottom and little white water evident. Velocity more than 1/2 ft/sec, but not more than 1 1/2 ft/sec.

"3" - Rapid - Strong current evident, strong turbulence from helical movements and deflection, and white water where bottom is covered with course materials; strong sand ripples. Velocity more than 1 1/2 ft/sec.

Water Temperature. The water temperature in degrees Fahrenheit taken just below the surface is recorded in the 3rd and 4th spaces of the 2nd line.

Conductivity. The conductivity (usually temperature compensated) was measured with a conductivity meter in μmhos and is recorded in spaces 6-9. The conductivity in the example was not recorded.

Turbidity (Visibility). For stations where the water's depth is equal to or over 4 ft, a Secchi disk is lowered to 4 ft and brought up slowly until it becomes visible. A number "1" through "4" is used to record the turbidity in the 12th space.

"1" - Clear - Secchi disk visible at a depth of over 4 ft.

"2" - Slightly turbid - Secchi disk becomes visible between 2 and 4 ft.

"3" - Moderately turbid - Secchi disk becomes visible between 1 and 2 ft.

"4" - Turbid - Secchi disk becomes visible only at a depth of less than 1 ft.

For stations where the water's depth is under 4 ft, the secchi disk is lowered until it disappears. If it disappears before it reaches the bottom, the appropriate number ("1" through "4") is recorded. If it does not disappear, the appropriate letter ("A" through "H") is used to record the turbidity.

Station's Water Depth	Letter	Secchi Disk on Bottom
Less than 1 ft	"A"	Not distinct - moderately turbid
	"B"	Distinct - clear
1 to 1.9 ft	"C"	Not distinct - moderately turbid
	"D"	Distinct - clear
2 to 2.9 ft	"E"	Not distinct - slightly turbid
	"F"	Distinct - clear
3 to 3.9 ft	"G"	Not distinct - slightly turbid
	"H"	Distinct - clear

Aquatic Vegetation. One of the 4 following code numbers is used to describe each of the 5 types of aquatic vegetation in spaces 15-18:

"0" - None - None observed.

"1" - Scarce - Occasional plants or only small clumps of plants noted.

"2" - Common - Sizable beds at intervals.

"3" - Abundant - Thick frequent beds covering more than 50% of the stream bottom.

Emergent - Plants rising above the water surface, usually found growing in shallow water areas or along the shoreline of lakes and ponds. Common examples include cattails, water lilies, arrowhead, water smartweed, or watershield.

Submergent - Plants in which the main portion of the plant is under the water surface. They usually are attached or rooted to the lake or pond bottom. These plants are commonly coontail, milfoil, bladderwort, pondweeds, or waterweed.

Duckweed - Plants which float freely on the surface of the water.

Algae - (attached) - A group of small, primitive chlorophyll-bearing plants distinguished by their lack of true leaves and flowers. Attached to substrate such as rocks.

Algae - (free floating) - Same as algae (attached) but free floating.

Third Line

Bottom Type. A combination of up to 8 different bottom type codes each followed by its percent occurrence can be listed. The percent of the bottom type is rounded to the nearest ten without the zero (e.g., F4 = 40% gravel). For less than 5% the letter "T" is used and for 100% the number "0".

"A" - Concrete - Stream has been channelized and bottom is poured concrete.

"B" - Bedrock - Solid rock forming a continuous surface.

"C" - Hardpan - A compacted surface consisting of cemented bottom materials.

"D" - Boulder - Rocks 12 inches in diameter.

"E" - Rubble - Rocks from 3-12 inches in diameter.

"F" - Gravel - Stones from 0.125 to 3 inches in diameter.

"G" - Sand - Particles ranging from .0625 mm to 1.9 mm inclusive. Will feel rough between fingers.

"H" - Muck and Silt - Particles from .0039 mm to .0624 mm. Generally this is fine material which feels greasy between fingers. This includes organic materials.

"I" - Clay - Particles less than .0039 mm usually forming a dense gummy surface.

"J" - Marl - Deposits of calcium carbonate. Usually whitish in color. Fizzes profusely when weak hydrochloric acid (muriatic acid) is applied to a sample.

"K" - Detritis - Dead organic matter covering bottom. This would include

sticks, leaf skeletons, and other items.

"L" - Rubbish - Items deposited by man, such as tires, bottles, cans, and fencing.

"M" - Peat.

Fourth Line

Streambank Vegetation (Habitat). This refers to vegetation present generally from the water's edge up to approximately 16 ft on either side of the stream. The 16 ft can be extended somewhat if there is some other habitat that has a significant effect upon the stream. Since this is a report for a single station, it should be descriptive of only vegetation for that station.

The streambank vegetation is listed in the same manner as bottom type. A combination of 8 different streambank vegetation types (code and percent) are possible.

"A" - Cultivated - Presence of row crops such as corn, oats, etc.

"B" - Fallow - Cultivated land that has lain idle one or more growing seasons.

"C" - Upland* pasture - Grazed land.

"D" - Upland meadow - Area supporting only grasslike vegetation or leafy ground cover of nonwoody types, such as reed canary grass.

"E" - Upland hardwood - Area supporting deciduous trees such as hard maple, basswood, oak, black cherry, fruit trees, yellow and white birch, popples, and others over 15 ft in height.

"F" - Upland conifer - Area supporting evergreens such as white pine, red pine, jack pine, spruce, or balsam fir.

"G" - Upland shrubs - Species such as red osier dogwood, spirea, elderberry, other berry bushes, and other woody plants and trees with low total height (under 15 ft), such as tag alder, box elder, willow, and ninebark.

"H" - Lowland** pasture - Grazed land which becomes hummocky with extended use.

"I" - Lowland hardwood - Area supporting species such as silver or soft maple, green ash, swamp white oak, river birch, willow, cottonwood, and box elder over 15 ft in height.

"J" - Lowland conifer - Area supporting species such as tamarack, white cedar, and black spruce.

"K" - Lowland shrub - Area supporting species such as red osier dogwood, spirea, elderberry, other berry bushes, and other woody plants and trees with low total height (under 15 ft) such as tag alder, box elder, willow, and ninebark.

"L" - Open marsh - Very wet area supporting only grasslike vegetation such as sedges or leafy ground cover or nonwoody types including cattails and rushes.

"M" - Cut grasses - Area supporting various types of grasses that are cut periodically by man, such as lawn grasses.

"N" - Beach - Sandy swimming beaches and gravel parking lots.

"O" - Lowland Meadow - Same as upland meadow but not well drained.

"P" - Open water - Such as in the middle of a large river or lake that is away from any shore.

*Upland refers to substrate that is well drained.

**Lowland refers to substrate that is wet.

FISH MASTER FILE (MARK 4) - MILE OFF PAGE 1

BASIN	JAR WT MBM	ORDER MILEAGES 1	2/7	3/8	4/9	5/10	6/11	MILE	STREAM OR LAKE NAME	SD	G	EF	DATE	STATION LOCATION T*NRNGSECQTQTCO
2 222	C	1N	10E	27 NW	SW 54			+	SUGAR R -OXBOW	46	5		8/ 0/63	1N10E27NWSW54
	SP=04 HY=00 UNSP=00	FISH	M20 +	U05 +	S02 +	W08 +								
2 222	1434.8R 2	156.9L	.7R	6.9R				2.3	E FORK RACCOON CR	61	5		12/12/65	1N12E31NWSE54
	SP=13 HY=00 UNSP=02	FISH	M04 +	M05 +	M14 +	M28 +	M29 +	M41 +	M43 + M45 + M50 +					
			N09 +	U01 +	X10 +	X12 +	X14 +	X18 +						
2 222	1434.8R 3 2	156.9L	.7R	6.9R				2.4	E FORK RACCOON CR	11	2	06	5/15/74	1N12E31SWNE54
	SP=15 HY=01 UNSP=01	FISH	A05 4	I21 10	L02 6	L07 1	M05 6	M12 1	M28 1 M29 1 M45 13					
			M50 2	N09 28	W05 3	W09 1	X10 11	X12 25	X14 2 Z01 6					
2 222	1434.8R 2	156.9L	.7R	6.9R	2.7P			1.5	UN CR (CHAMBERLIN SPRINGS)	71	5		10/ 5/77	1N12E29SWNW54
	SP=08 HY=00 UNSP=00	FISH	M06 1	M29 27	M43 10	M48 29	M50 99	N09 3	U01 5 X12 11					
2 222	1434.8R 3 2	156.9L	.7R	6.9R	2.7R			3.8	UN CR	11	3	06	5/15/74	1N12E21NWNW54
	SP=07 HY=00 UNSP=01	FISH	M05 99	M43 19	M46 4	M48 75	M50 53	N09 30	U01 8 X12 2					
2 222	1434.8R 1 2	156.9L	.7R	6.9R				3.2	E FORK RACCOON CR	11	2	05	11/ 5/75	1N12E31NENW54
	SP=17 HY=00 UNSP=01	FISH	A05 2	K01 6	L01 2	M05 33	M28 2	M45 11	M46 3 M48 20	M50	16		(006 030 0 40)	
			N09 47	W05 10	W09 6	X07 1	X10 30	X12 25	X14 2 X18 10	Z01	27		(1 49 3 0001)	
													(ET F1 G2 H5 I2)	
													(D3 FT K4 M2 O1)	
2 222	1434.8R 2	156.9L	.7R	6.9R				3.3	E FORK RACCOON CR	61	5		6/10/65	1N12E31NENW54
	SP=07 HY=00 UNSP=01	FISH	M05 +	M28 +	M39 +	M43 +	M45 +	M50 +	N09 + X10 +					
2 222	1434.8R 3 2	156.9L	.7R	6.9R				7.8	E FORK RACCOON CR	11	2	06	5/15/74	1N11E12SESW54
	SP=16 HY=00 UNSP=01	FISH	I21 2	K01 2	M05 99	M09 1	M43 99	M45 99	M46 5 M48 79	M50	99			
			N09 99	U01 99	W05 5	W08 1	X10 99	X11 46	X12 61 Z01 2					
2 222	1434.8R 3 2	156.9L	.7R					10.7	RACCOON CR	11	2	06	7/ 0/74	1N11E35SENW54
	SP=19 HY=00 UNSP=01	FISH	L02 8	M05 15	M12 7	M19 6	M28 32	M36 27	M45 54 M46 6	M50	3			
			N09 11	O05 1	O06 13	O10 2	U01 2	W04 2	W05 2 W06 1	X12	3			
			X14 4	X18 4										
2 222	1434.8R 2	156.9L	.7R					10.7	RACCOON CR	61	5		6/10/65	1N11E35SENW54
	SP=12 HY=00 UNSP=00	FISH	K01 +	L02 1	M39 +	M45 +	N09 +	O05 +	O06 + S02 + U01 +					
			W05 +	X12 +	X18 +									

FIGURE 8. *Sample page from the Master Fish File using a Mark IV program (listing method A, Fig. 3, used here).*

STREAM & LAKE FILE - MASTER PAGE 1

BASINS MAJ	BASINS MIN	ORDER MI.	ORDER 1	ORDER 2	ORDER 3	MILEAGES 4/8	MILEAGES 5/9	MILEAGES 6/10	MILEAGES 7/11	MI OR ACRES	STREAM OR LAKE NAME	D C	W T	LOCATION TWN	LOCATION RNG	LOCATION SEC	LOCATION QTQT	LOCATION CO
2	222									33	L HARRIETT	0		5N	9E	9	NWNW	13
2	222									10	MORSE POND	0		6N	8E	3	SESW	13
2	222										SUGAR R -OXBOW	0		1N	10E	27	NWSW	54
2	222	1434.8R	156.9L	.7R						11	RACCOON CR	2		46N	1E	22		80
2	222	1434.8R	156.9L	.7R	6.9R					7	E FORK RACCOON CR	2		46N	1E	8		80
2	222	1434.8R	156.9L	.7R	6.9R	1.4					E FORK RACCOON CR WI-IL BD	6		1N	12E	31	SESW	54
2	222	1434.8R	156.9L	.7R	6.9R	2.7R				4	UN CR (31-3,CHAMBERLIN SPR.	2		1N	12E	31	SWNE	54
2	222	1434.8R	156.9L	.7R	9.5						RACCOON CR WIS-ILL BD	6		1N	11E	35	SESE	54
2	222	1434.8R	156.9L	.7R	11.4						DAM-RACCOON CR-MILLPOND			1N	11E	34	NENE	54
2	222	1434.8R	156.9L	.7R	11.7R					3	UN CR	2		1N	11E	27	SWSE	54
2	222	1434.8R	156.9L	.7R	11.7R	.3R				3	UN CR	2		1N	11E	27	NWSE	54
2	222	1434.8R	156.9L	9.2R						76	SUGAR R	2		28N	11E	11		80
2	222	1434.8R	156.9L	9.2R	10.7						SUGAR R WIS-ILL BD	6		1N	10E	36	SESW	54
2	222	1434.8R	156.9L	9.2R	10.8L					.9	GREEN DRAINAGE SYSTEM	2		1N	10E	36	SESW	54
2	222	1434.8R	156.9L	9.2R	10.8L	6.4R				1	UN CR	2		1N	9E	25	SENE	54
2	222	1434.8R	156.9L	9.2R	11.2R					3	UN DITCH	2		1N	10E	36	NWSW	54
2	222	1434.8R	156.9L	9.2R	11.2R	.7R				1	UN DITCH	2		1N	10E	36	NENW	54
2	222	1434.8R	156.9L	9.2R	11.7R					2	UN DITCH	2		1N	10E	35	SENE	54
2	222	1434.8R	156.9L	9.2R	16.0L					6	UN DITCH	2		1N	10E	28	NESW	54
2	222	1434.8R	156.9L	9.2R	18.8L						SUGAR R -W CHANNEL	2		1N	10E	20	SWNE	54
2	222	1434.8R	156.9L	9.2R	18.8L	.5L				1	UN DITCH	2		1N	10E	20	SWNW	54
2	222	1434.8R	156.9L	9.2R	19.8R					13	TAYLOR CR	2		1N	10E	18	SESE	54
2	222	1434.8R	156.9L	9.2R	19.8R	1.8R				10	WILLOW CR (NORTH)	2		1N	10E	7	NESW	54
2	222	1434.8R	156.9L	9.2R	19.8R	1.8R	6.7R			4	UN CR	2		1N	10E	11	SWNE	54
2	222	1434.8R	156.9L	9.2R	19.8R	1.8R	8.1R			1	UN CR	2		1N	10E	1	NWNW	54
2	222	1434.8R	156.9L	9.2R	19.8R	5.7R				7	SWAN CR	2		2N	10E	30	NESE	54
2	222	1434.8R	156.9L	9.2R	21.8L					1	UN CR	2		1N	9E	13	SENW	23

FIGURE 9. *Sample page from the Master Stream and Lake File.*

DEPARTMENT OF NATURAL RESOURCES — FISH OR STREAM DATA INPUT — FORM 8100-58 REV. 4-81

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) __ __ __ __ __

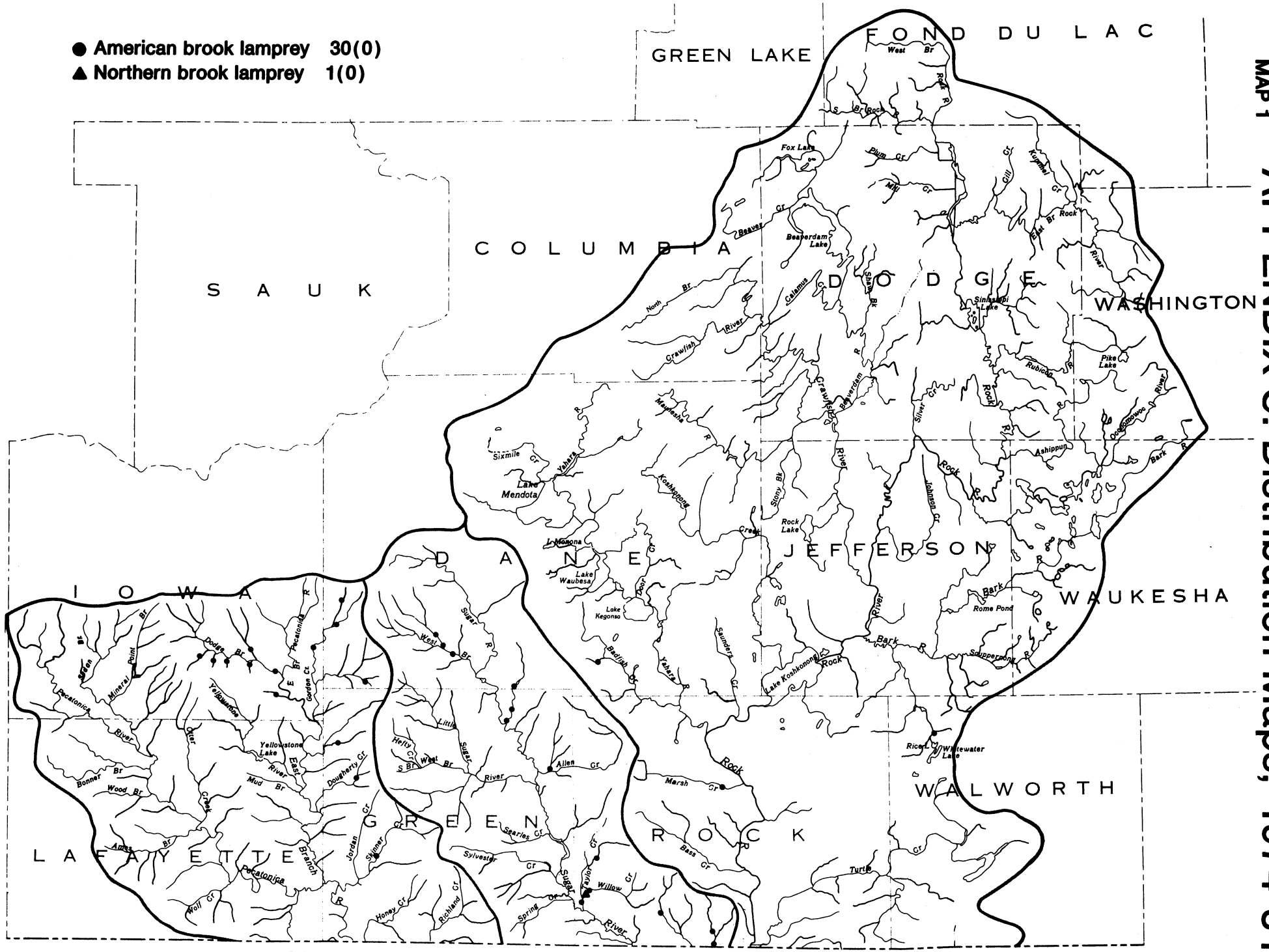
33) __ __ __ __ __ 34) __ __ __ __ __ 35) __ __ __ __ __ 36) __ __ __ __ __

37) __ __ __ __ __ 38) __ __ __ __ __ 39) __ __ __ __ __ 40) __ __ __ __ __

41) __ __ __ __ __ 42) __ __ __ __ __ 43) __ __ __ __ __ 44) __ __ __ __ __

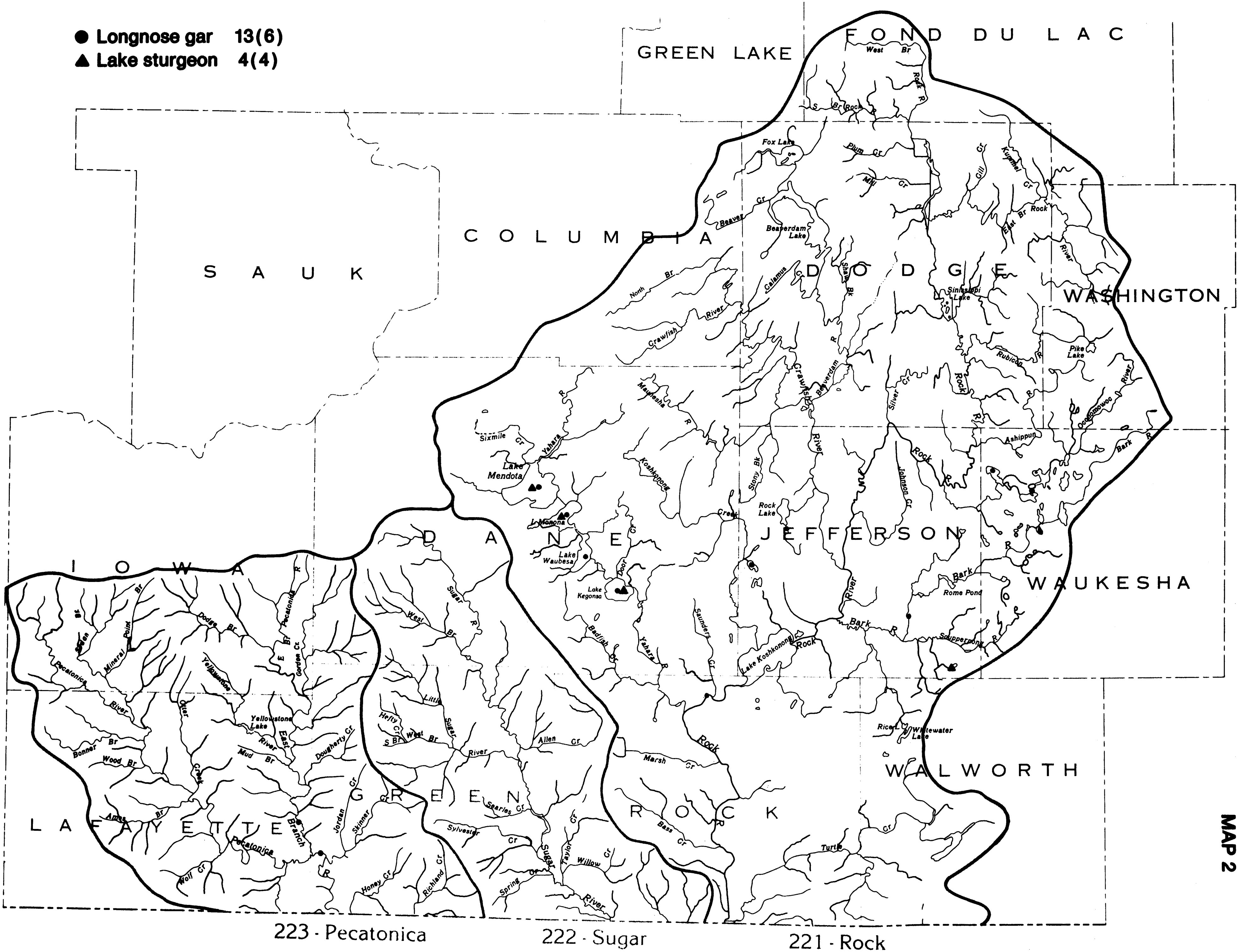
FISH ONLY

FIGURE 10. *Example of Fish and Stream Data Input form (8100-58).*



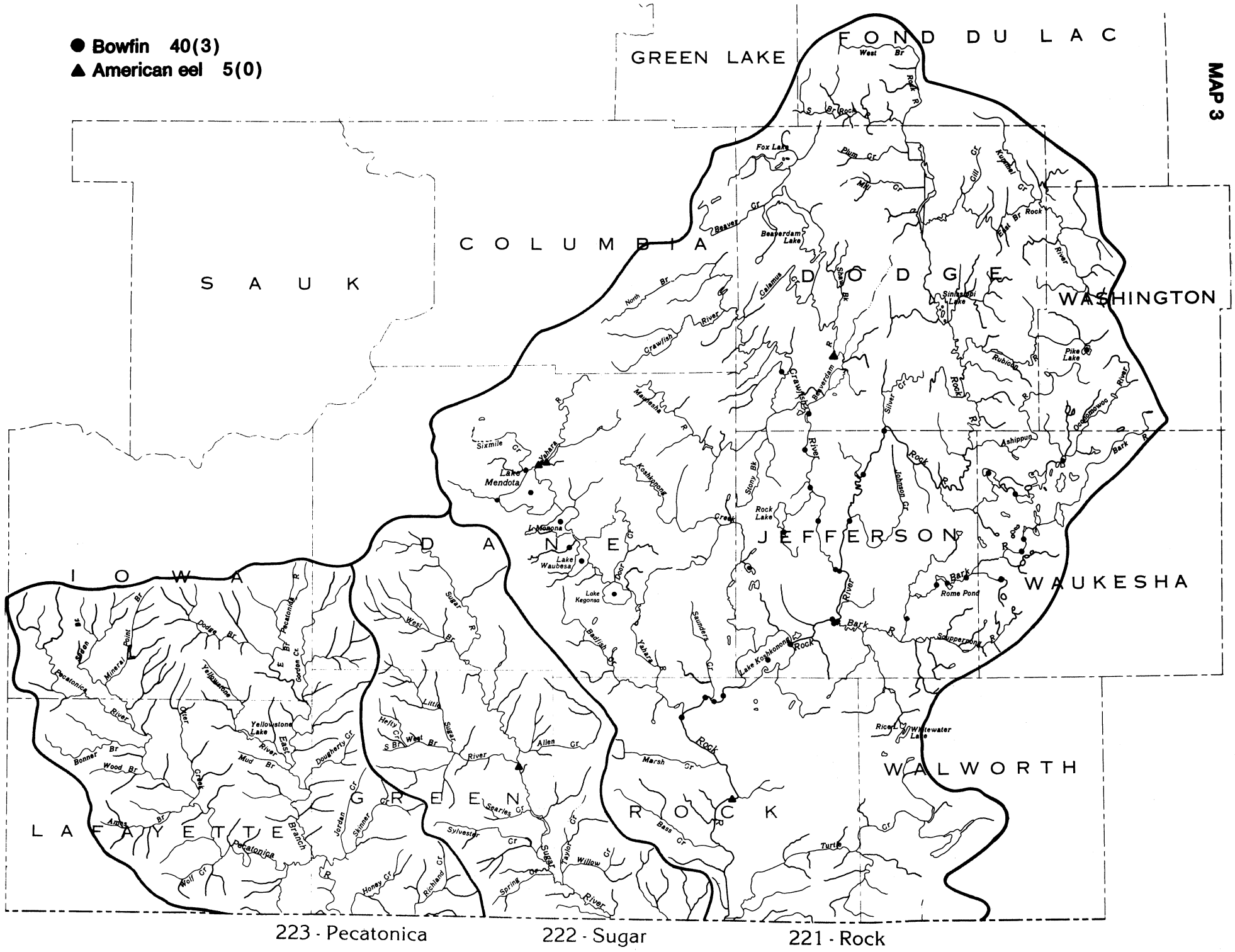
MAP 1

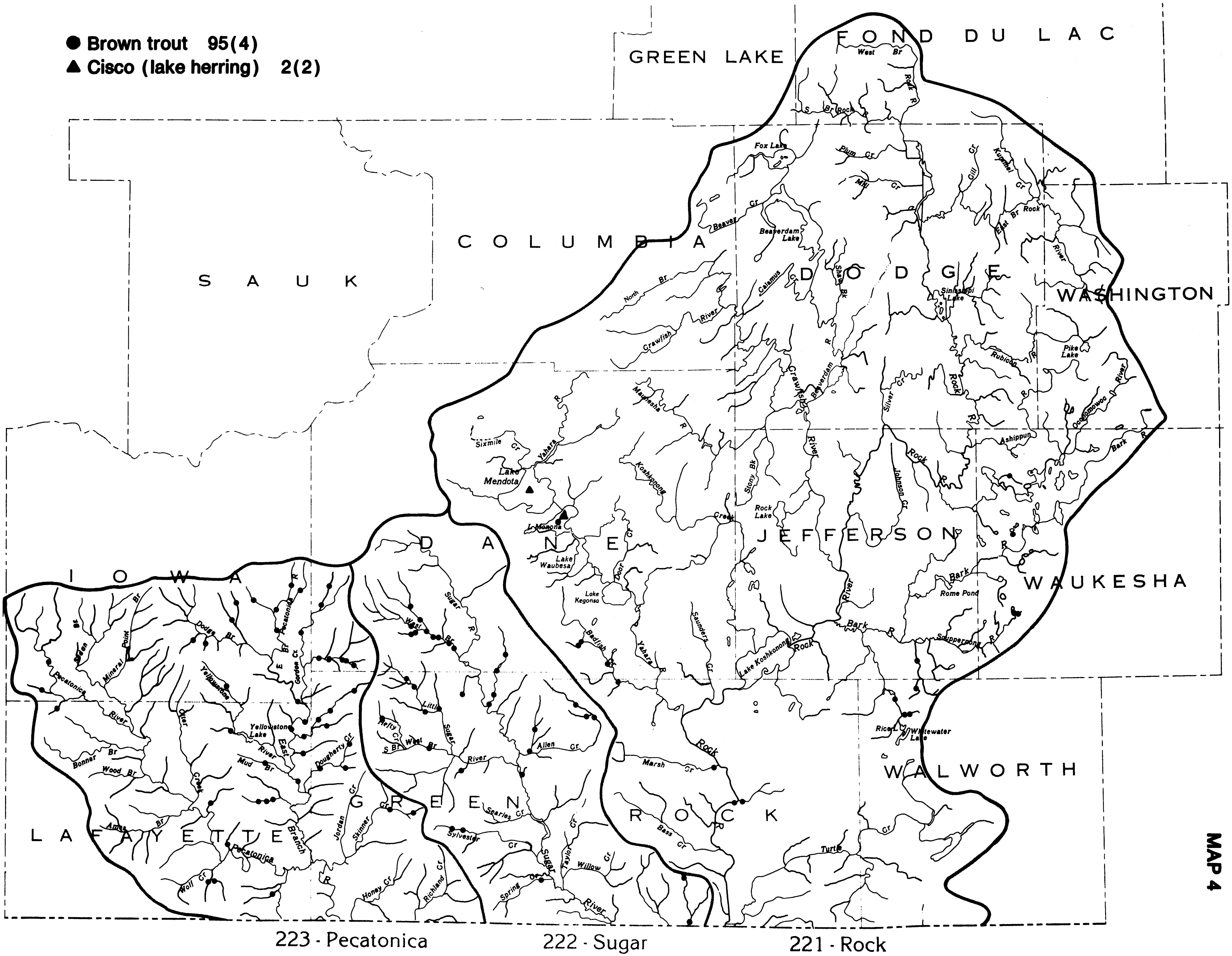
APPENDIX C: Distribution Maps, 1974-81



● Longnose gar 13(6)
▲ Lake sturgeon 4(4)
GREEN LAKE
FOND DU LAC
SAUK
COLUMBIA
DODGE
WASHINGTON
IOWA
DANE
JEFFERSON
WAUKESHA
LAFAYETTE
GREEN
ROCK
WALWORTH
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
L. Monona
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Yellowstone Lake
Rice L.
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock

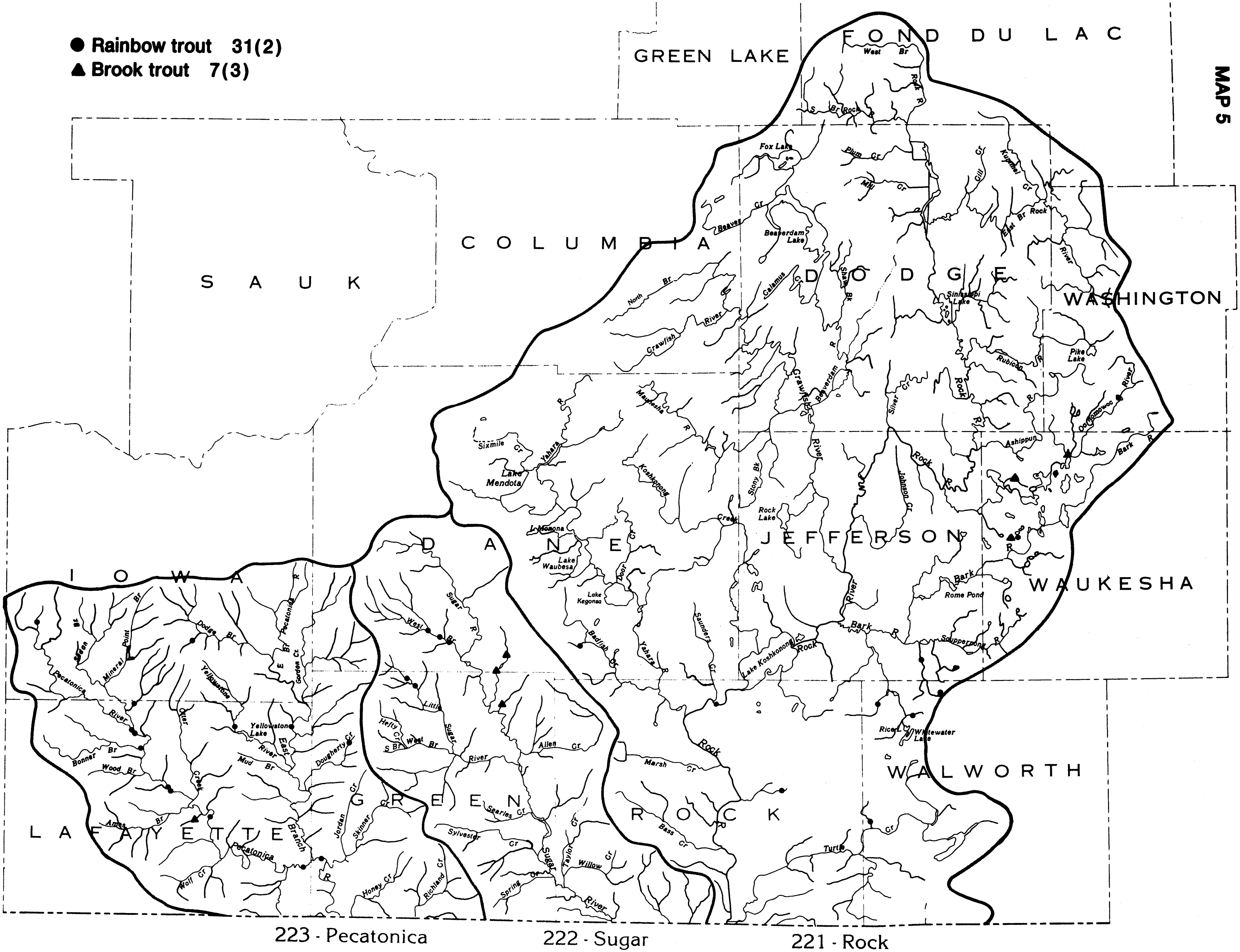
MAP 2


● Bowfin 40(3)
▲ American eel 5(0)
MAP 3
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock

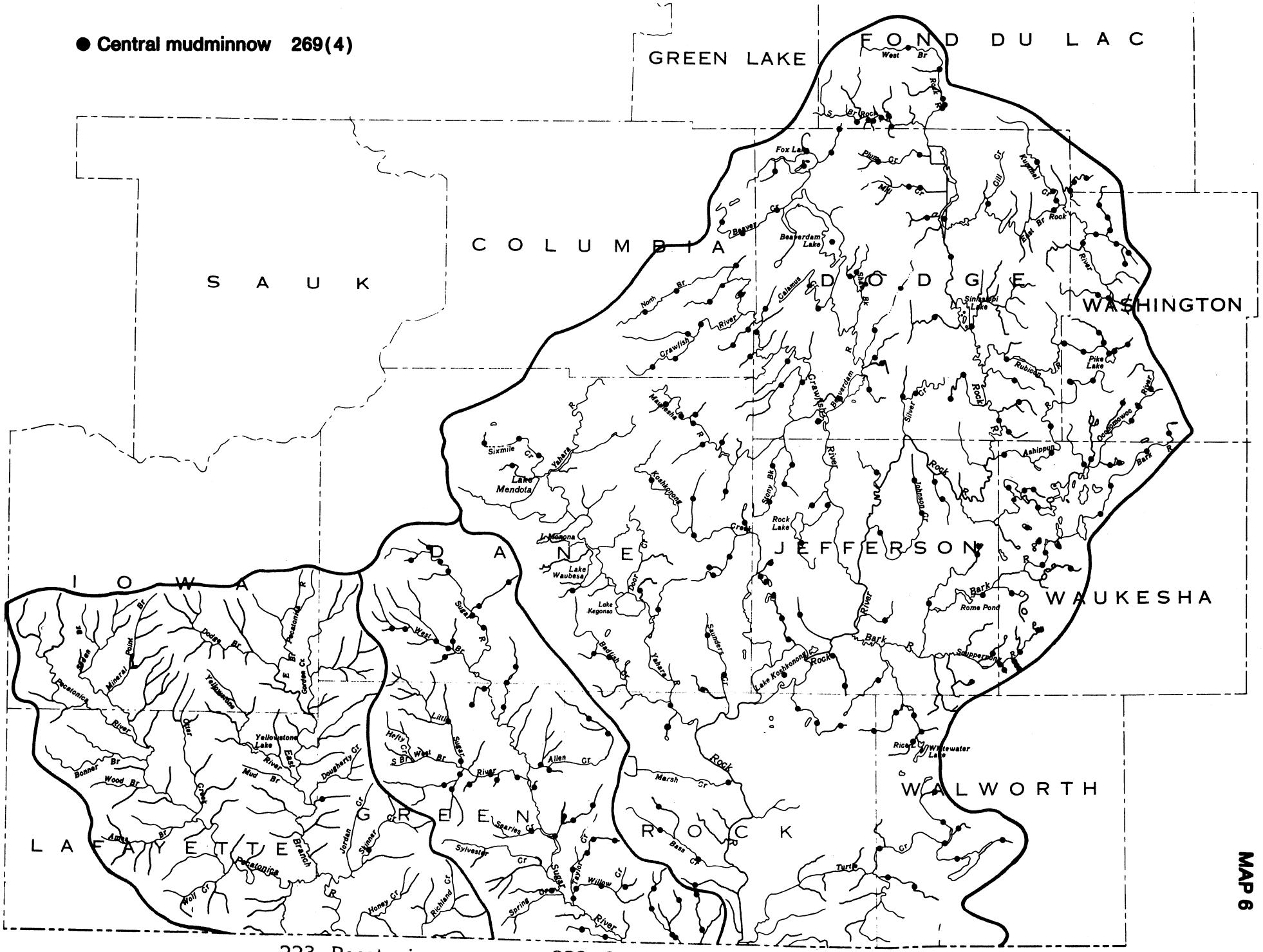

● Brown trout 95(4)
▲ Cisco (lake herring) 2(2)
GREEN LAKE
FOND DU LAC
SAUK
COLUMBIA
DODGE
WASHINGTON
DANE
JEFFERSON
WAUKESHA
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Lake Mendota
L Monona
Lake Waubesa
Lake Kegonsa
Lake Koshkonong
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Rock Lake
Rome Pond
Rice L
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

MAP 4

MAP 5

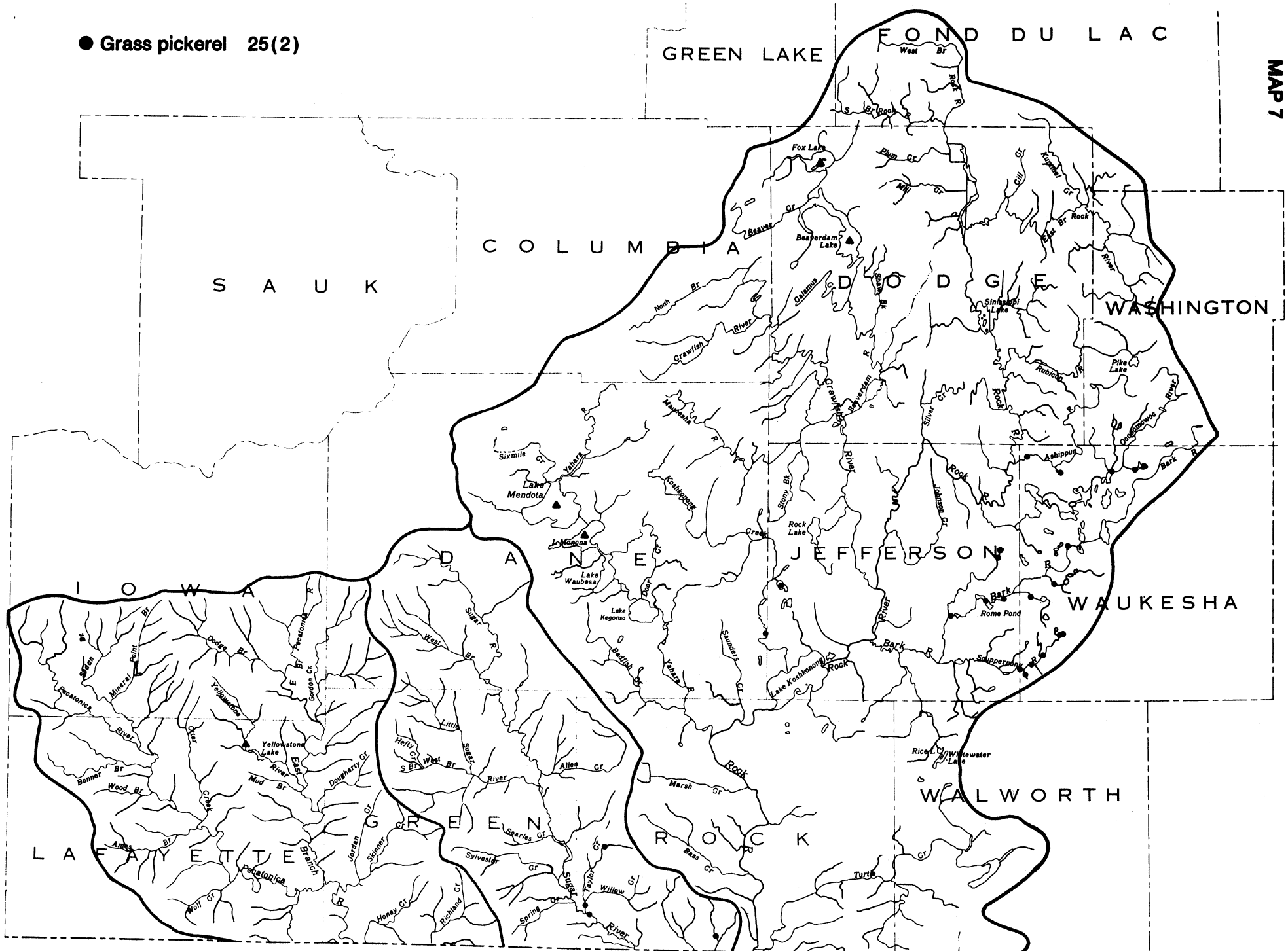

● Rainbow trout 31(2)
▲ Brook trout 7(3)
FOND DU LAC
GREEN LAKE
SAUK
COLUMBIA
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
L. Monona
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Yellowstone Lake
Whitewater Lake
Rice L.
223 - Pecatonica
222 - Sugar
221 - Rock

● **Central mudminnow 269(4)**

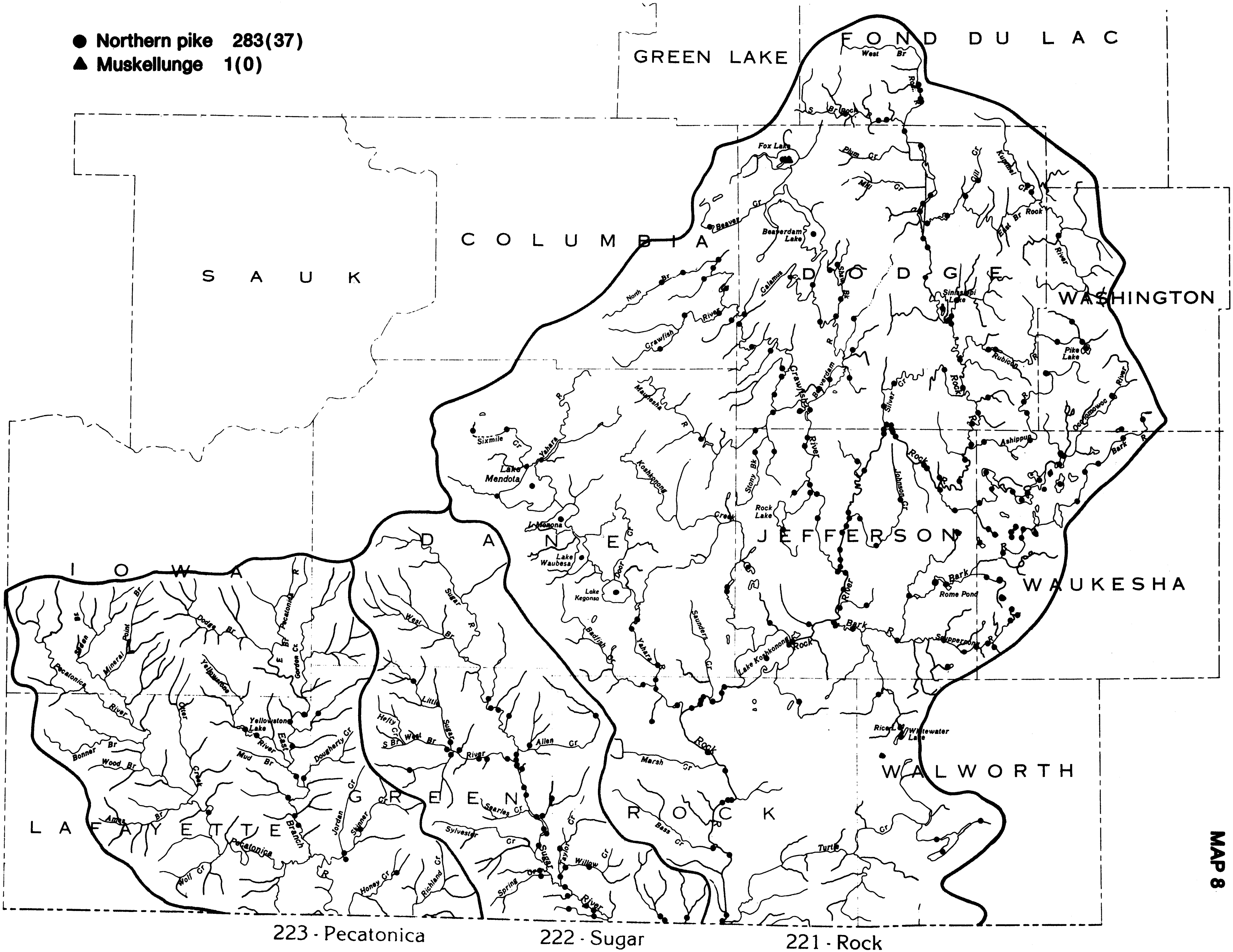


MAP 6

● Grass pickerel 25(2)



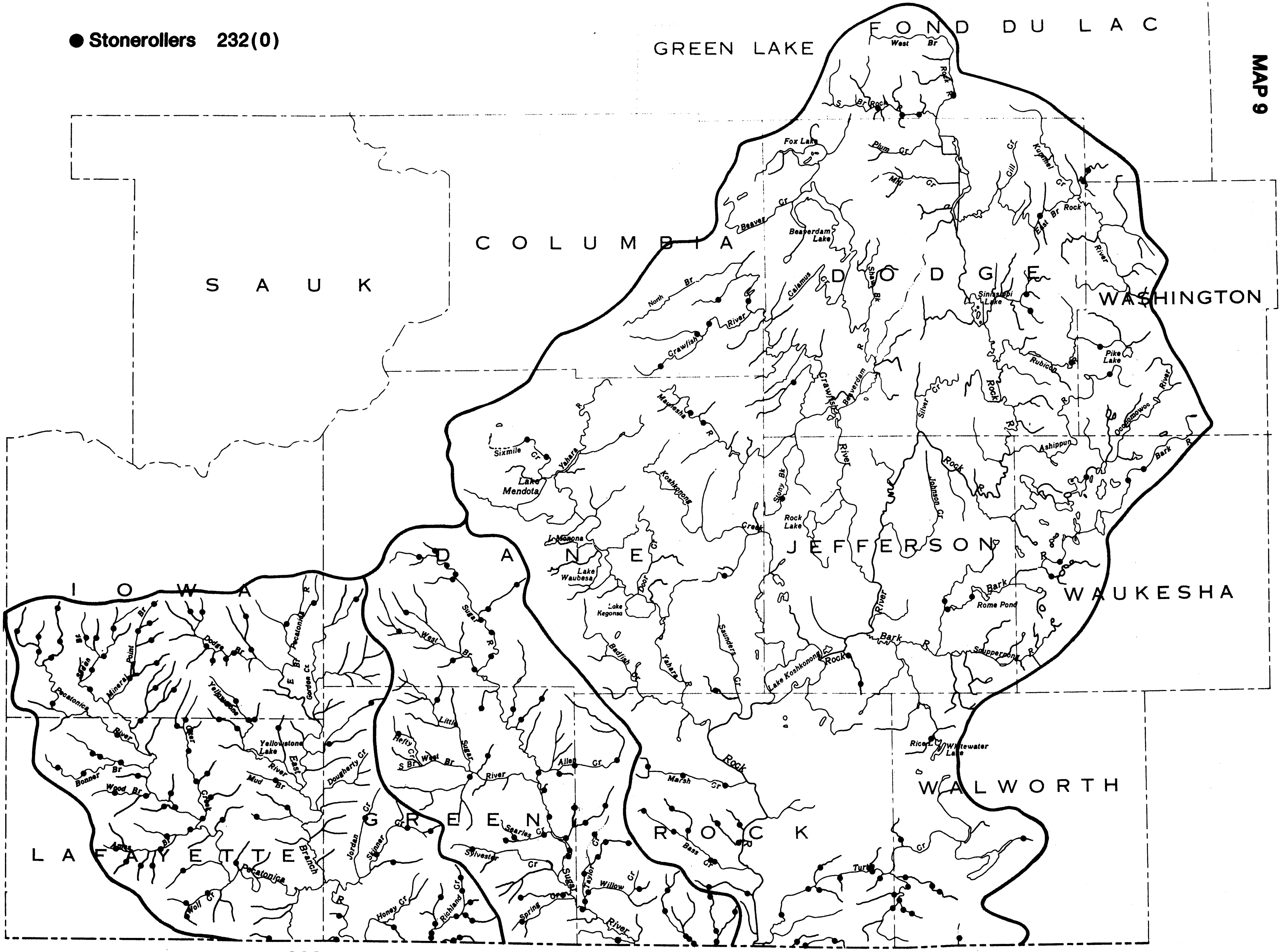
MAP 7


● Northern pike 283(37)
▲ Muskellunge 1(0)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
Lake Mendota
Lake Monona
Lake Waubesa
Lake Kegonsa
Lake Koshkonong
Beaverdam Lake
Fox Lake
Sinissippi Lake
Pike Lake
Rock Lake
Rome Pond
Rice L.
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

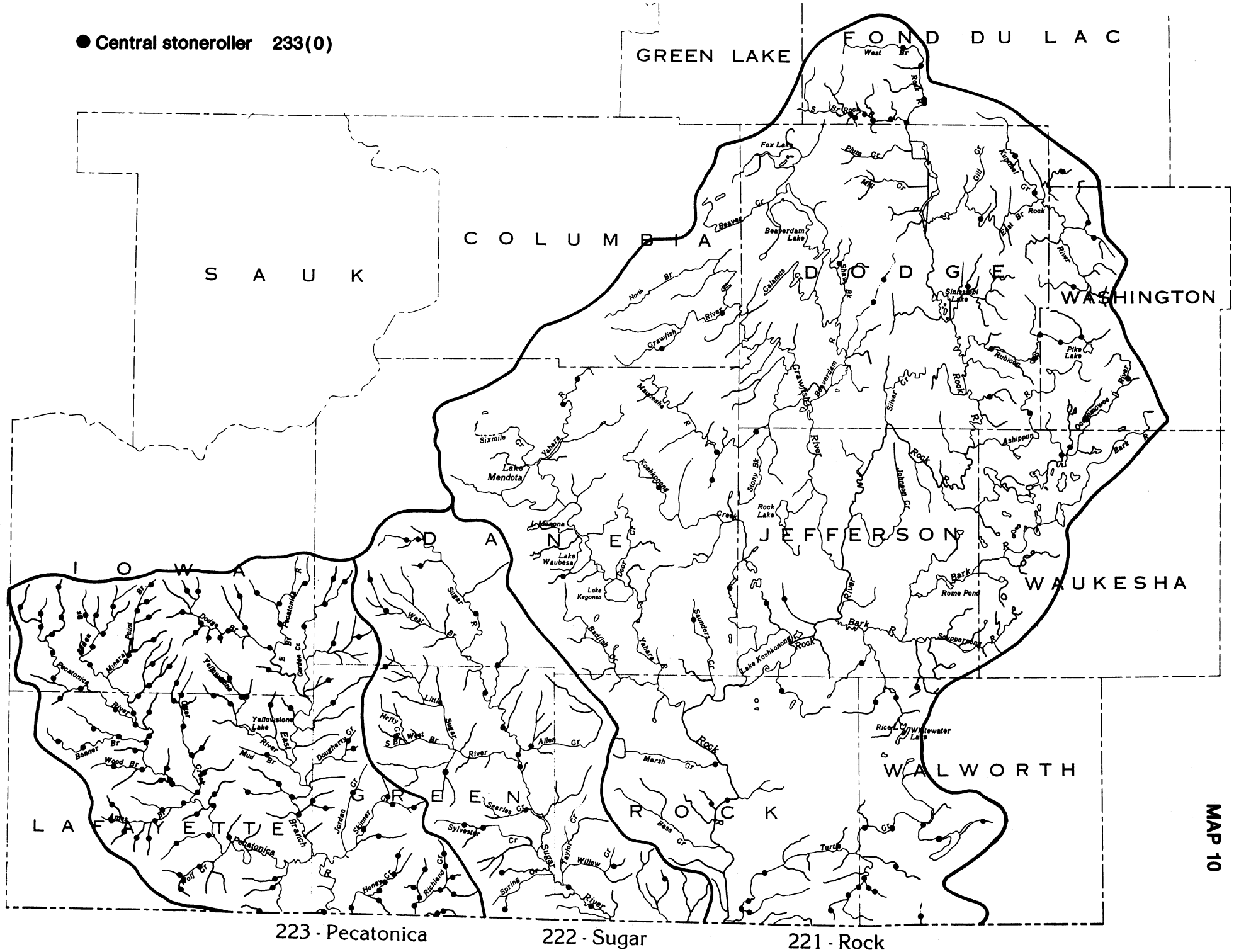
MAP 8

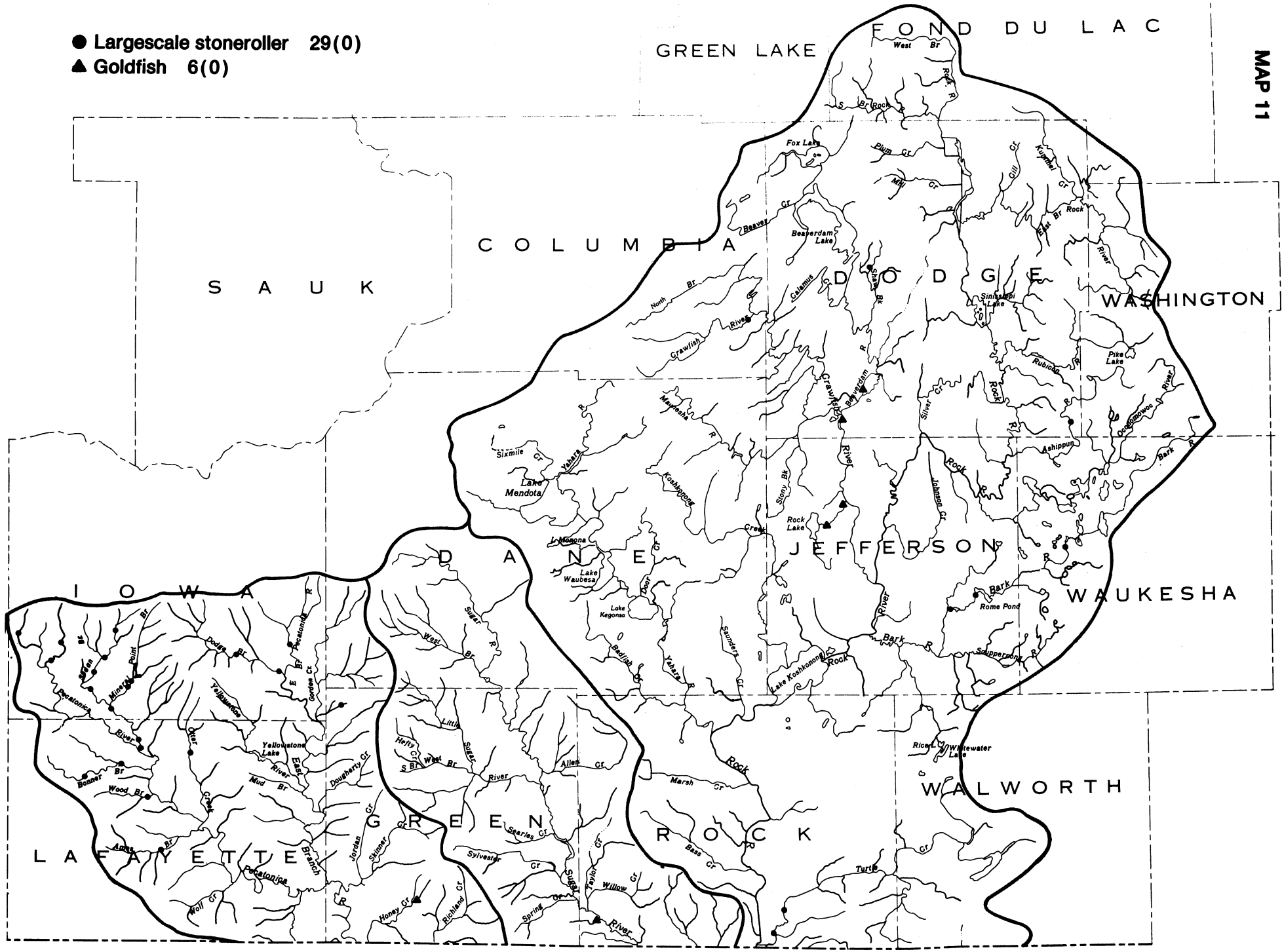
● Stonerollers 232(0)

MAP 9

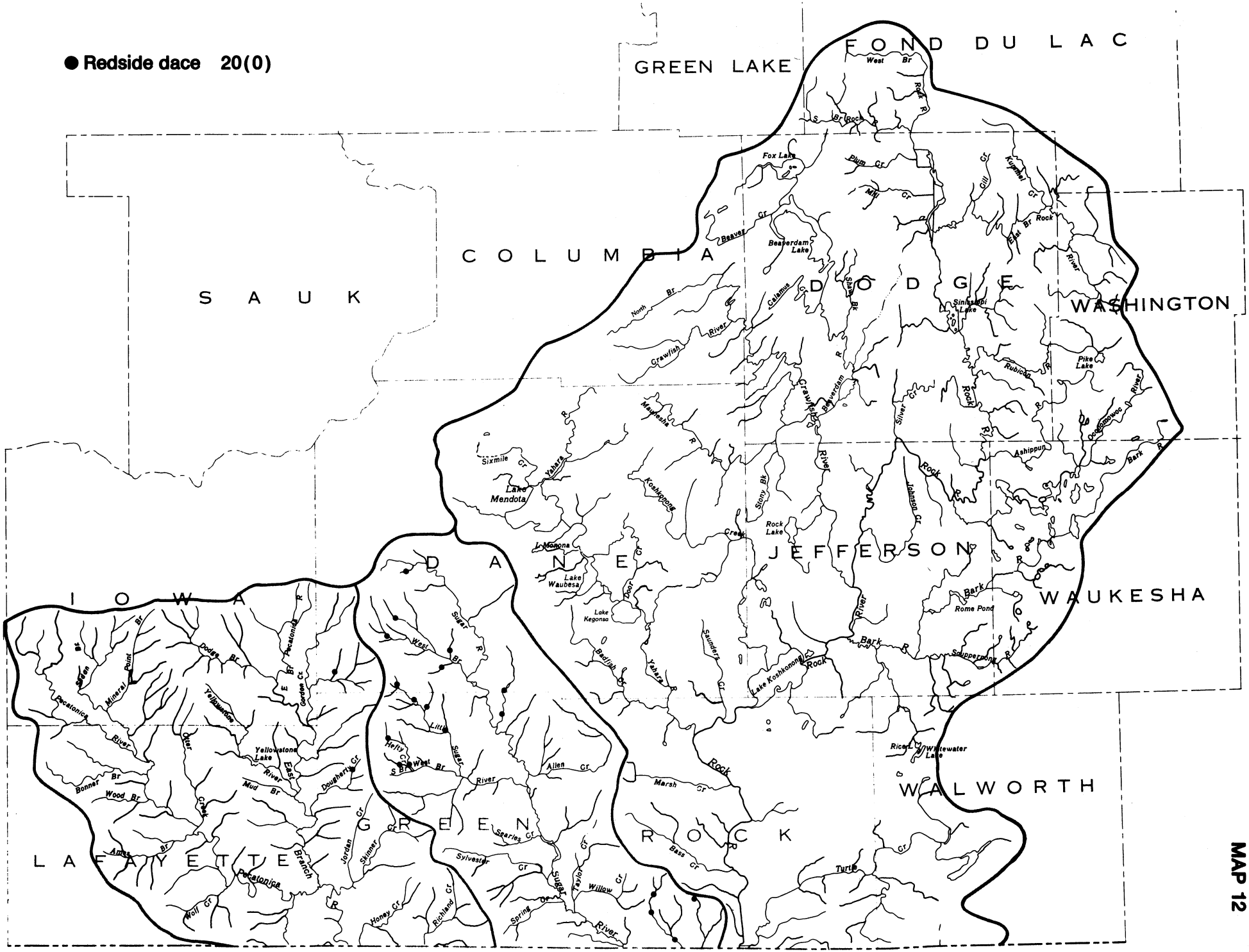


223 - Pecatonica 222 - Sugar 221 - Rock


● Central stoneroller 233(0)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
IOWA
DANE
JEFFERSON
WAUKESHA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaver Dam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock
MAP 10

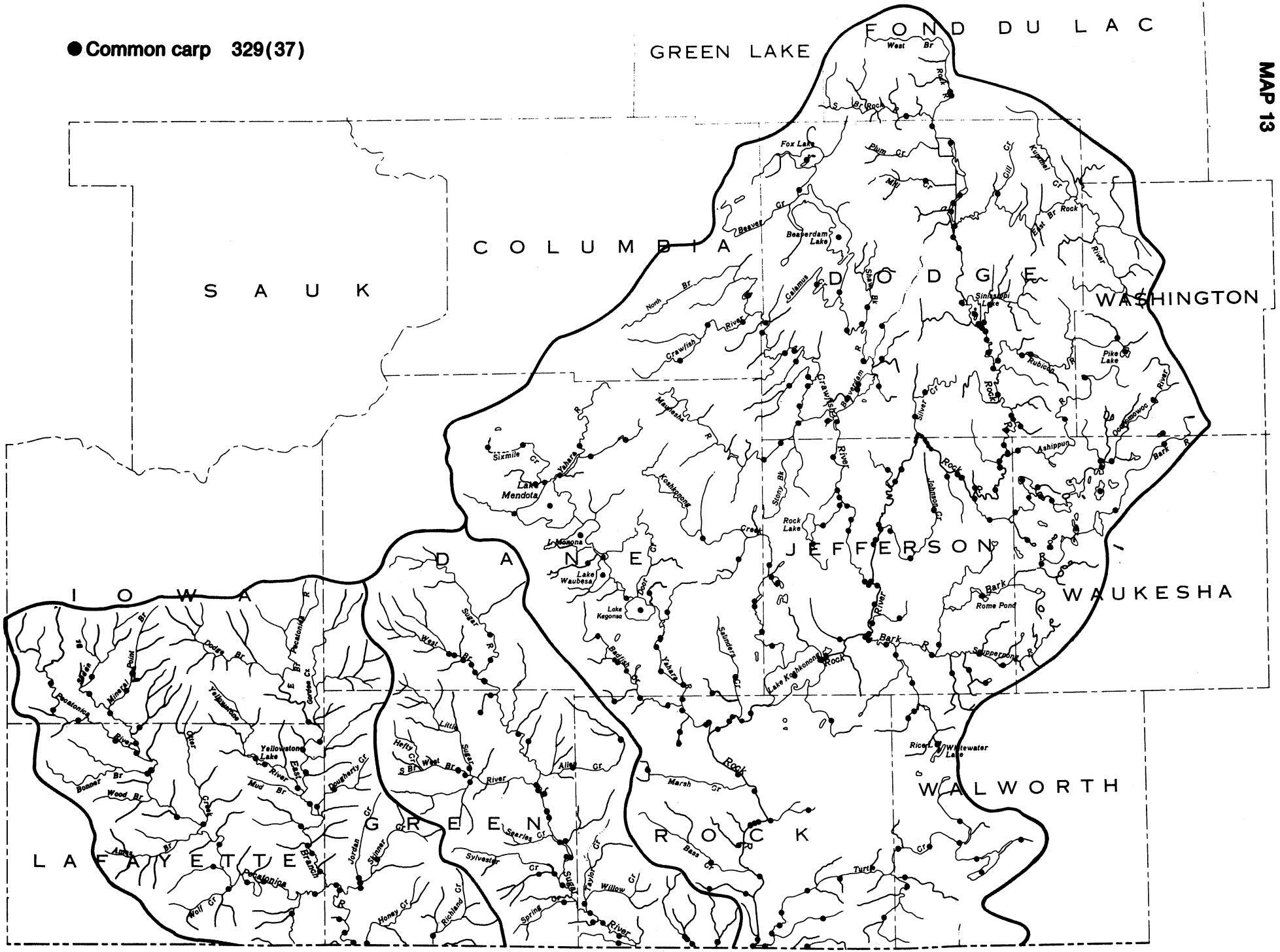

● Largescale stoneroller 29(0)
▲ Goldfish 6(0)
MAP 11
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
WALWORTH
ROCK
GREEN
LAFAYETTE
IOWA
DANE
Fox Lake
Beaverdam Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Pike Lake
Ashippun
Sinissippi Lake
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

● **Redside dace 20(0)**

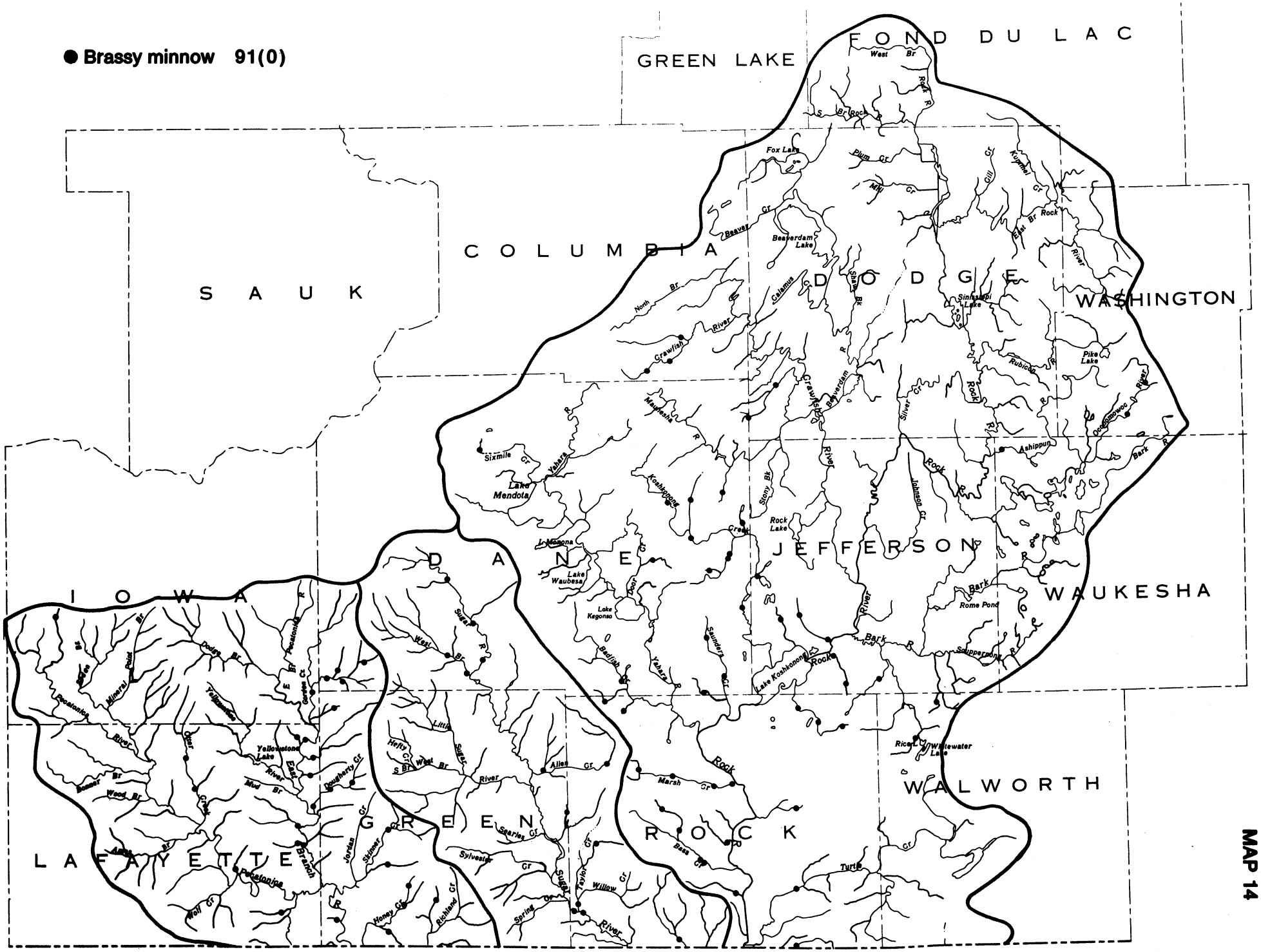


223 - Pecatonica 222 - Sugar 221 - Rock

MAP 12

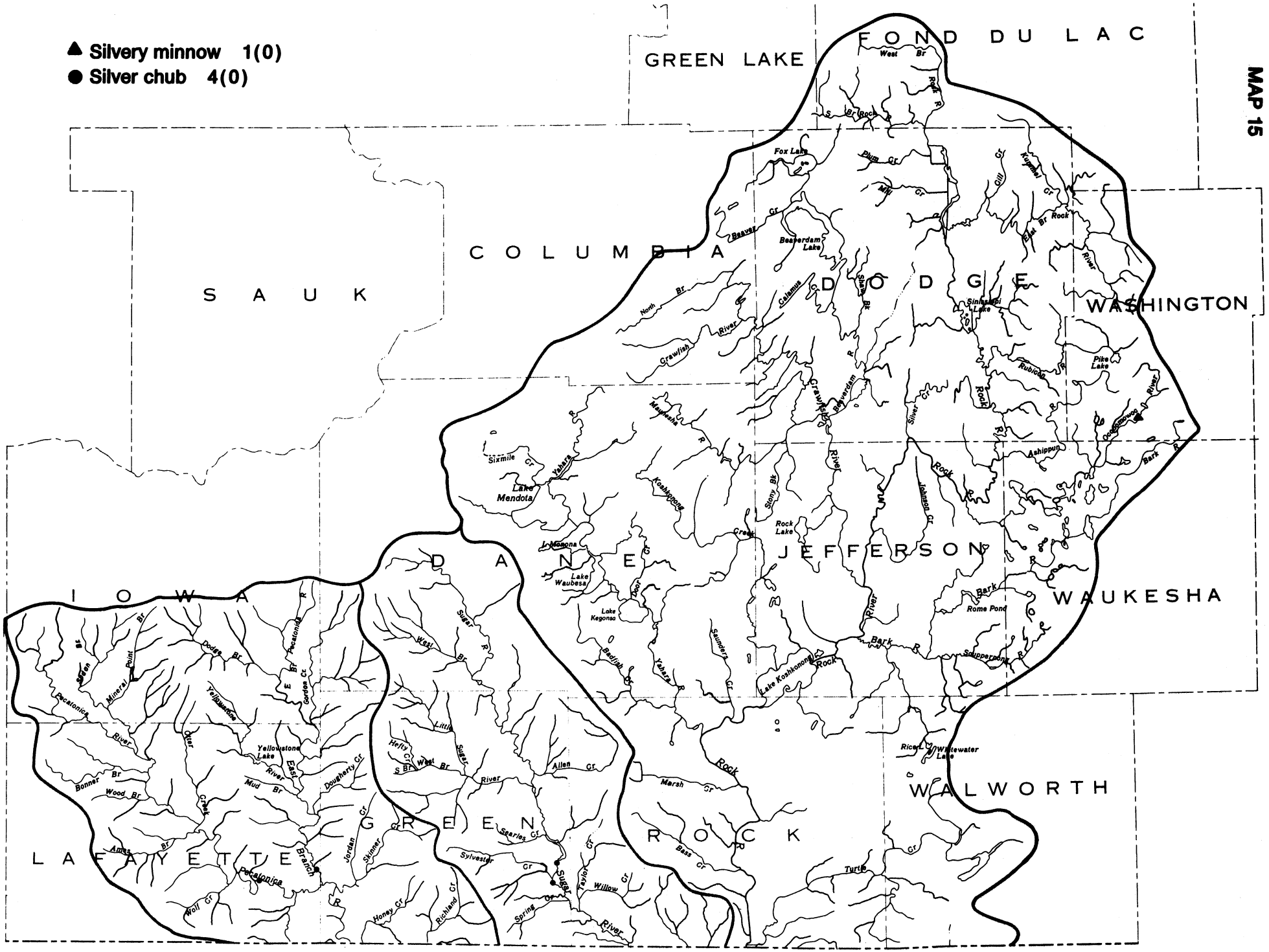

● Common carp 329(37)
MAP 13
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rice L.
Whitewater Lake
Sinissippi Lake
Pike Lake
Rome Pond
223 - Pecatonica
222 - Sugar
221 - Rock

● **Brassy minnow 91(0)**

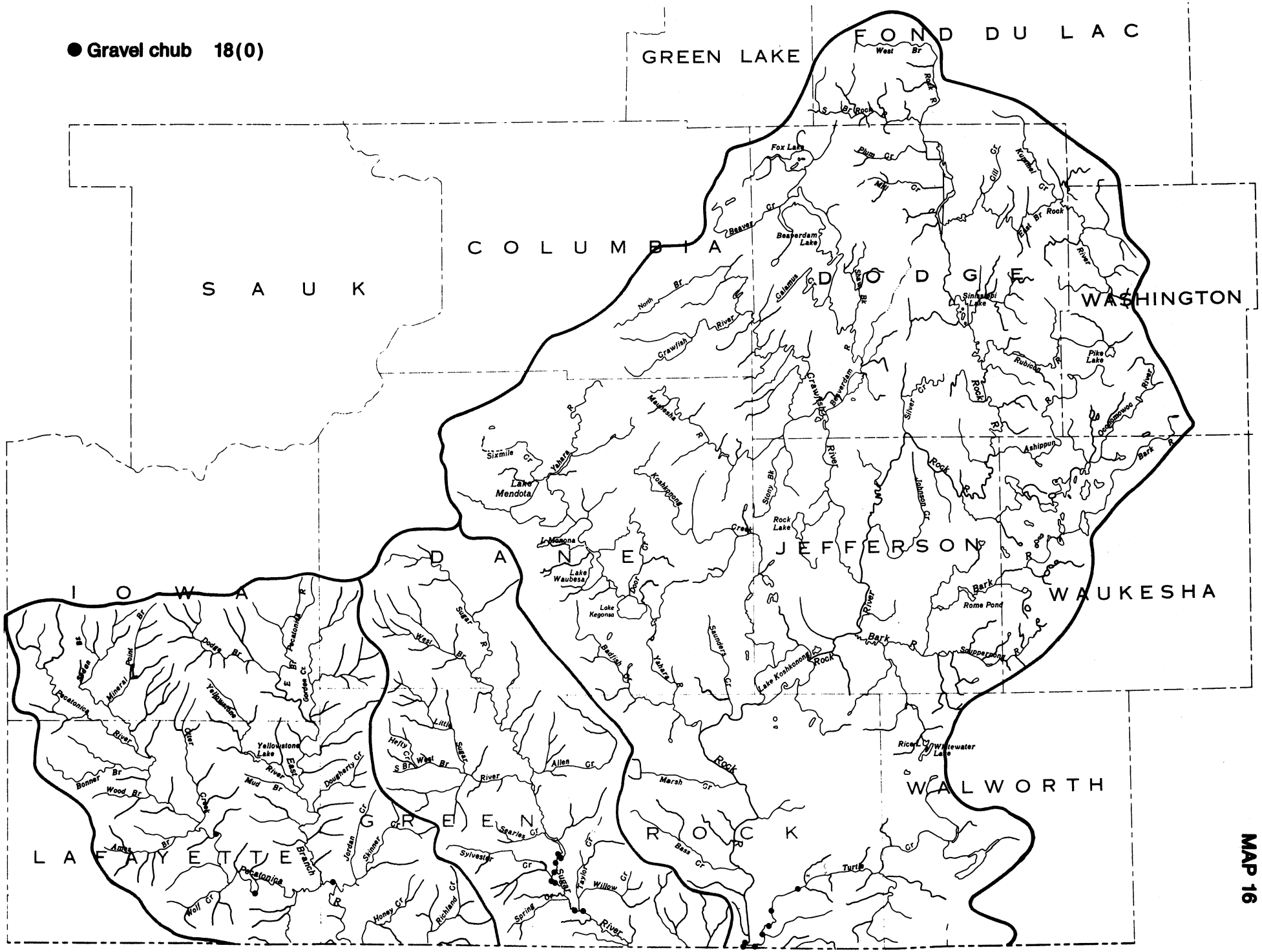


223 - Pecatonica 222 - Sugar 221 - Rock

MAP 14

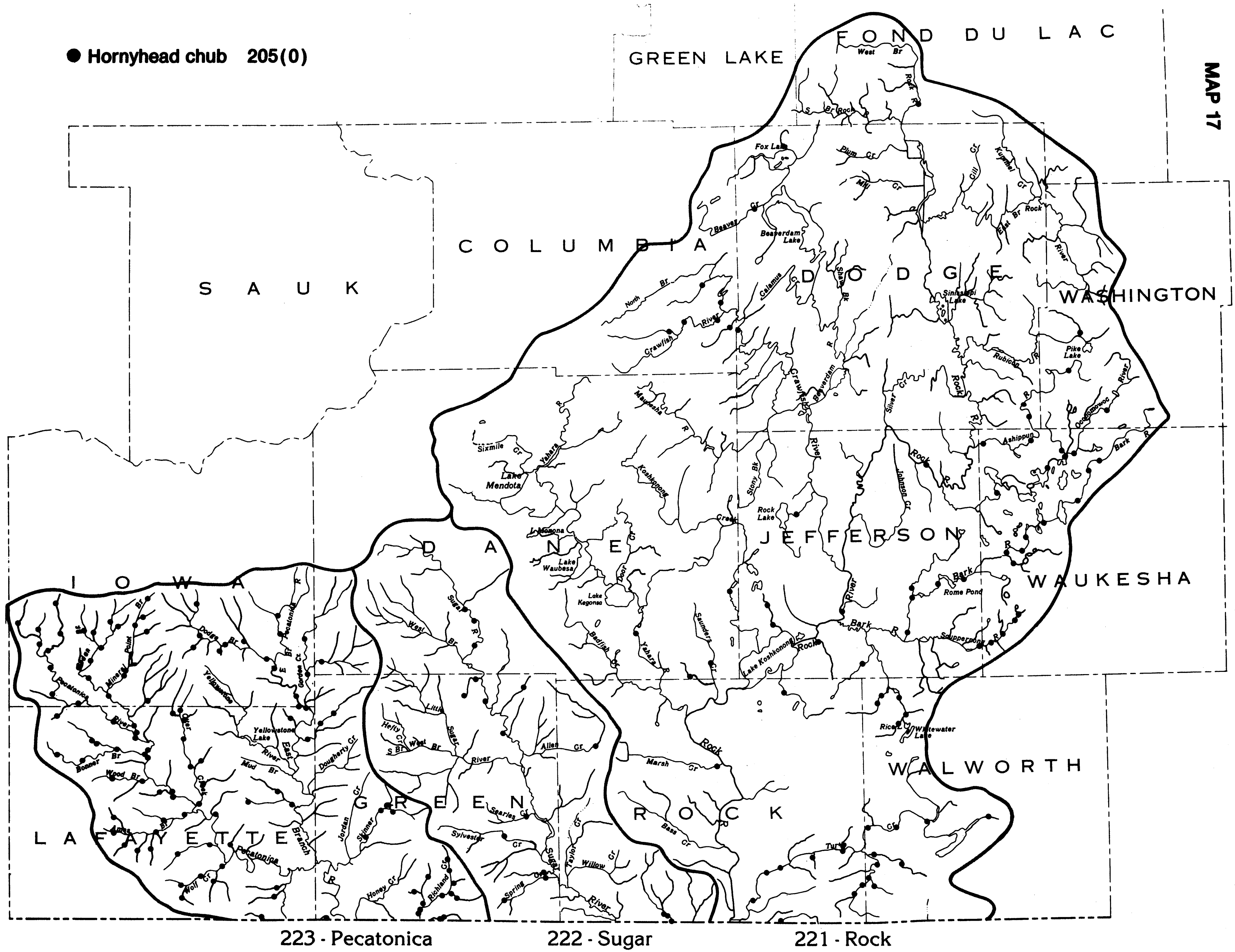

▲ Silvery minnow 1(0)
● Silver chub 4(0)
MAP 15
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
WALWORTH
ROCK
GREEN
LAFAYETTE
IOWA
DANE
Fox Lake
Beaverdam Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Pike Lake
Sinissippi Lake
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock

● **Gravel chub 18(0)**

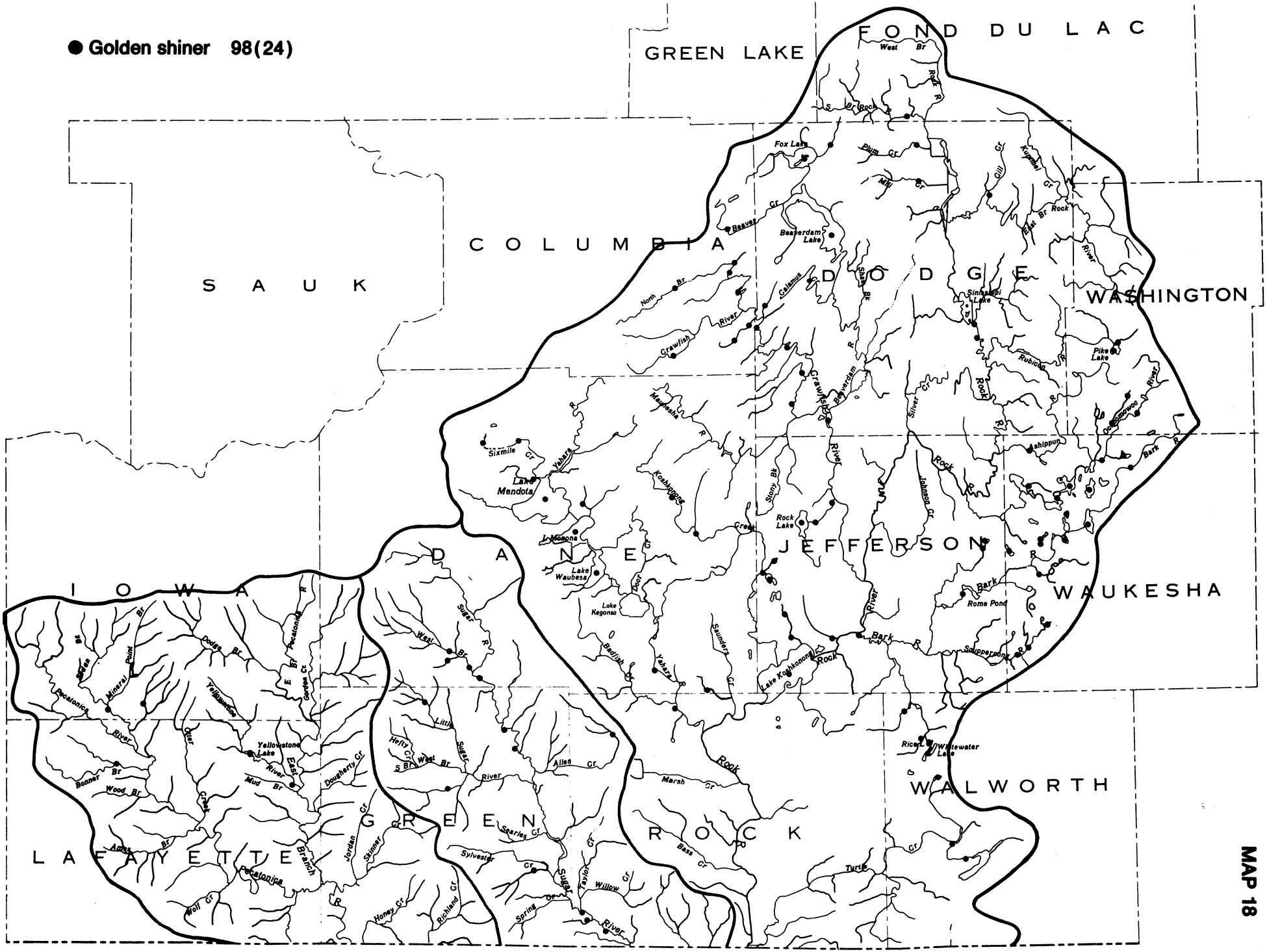


223 - Pecatonica 222 - Sugar 221 - Rock

MAP 16

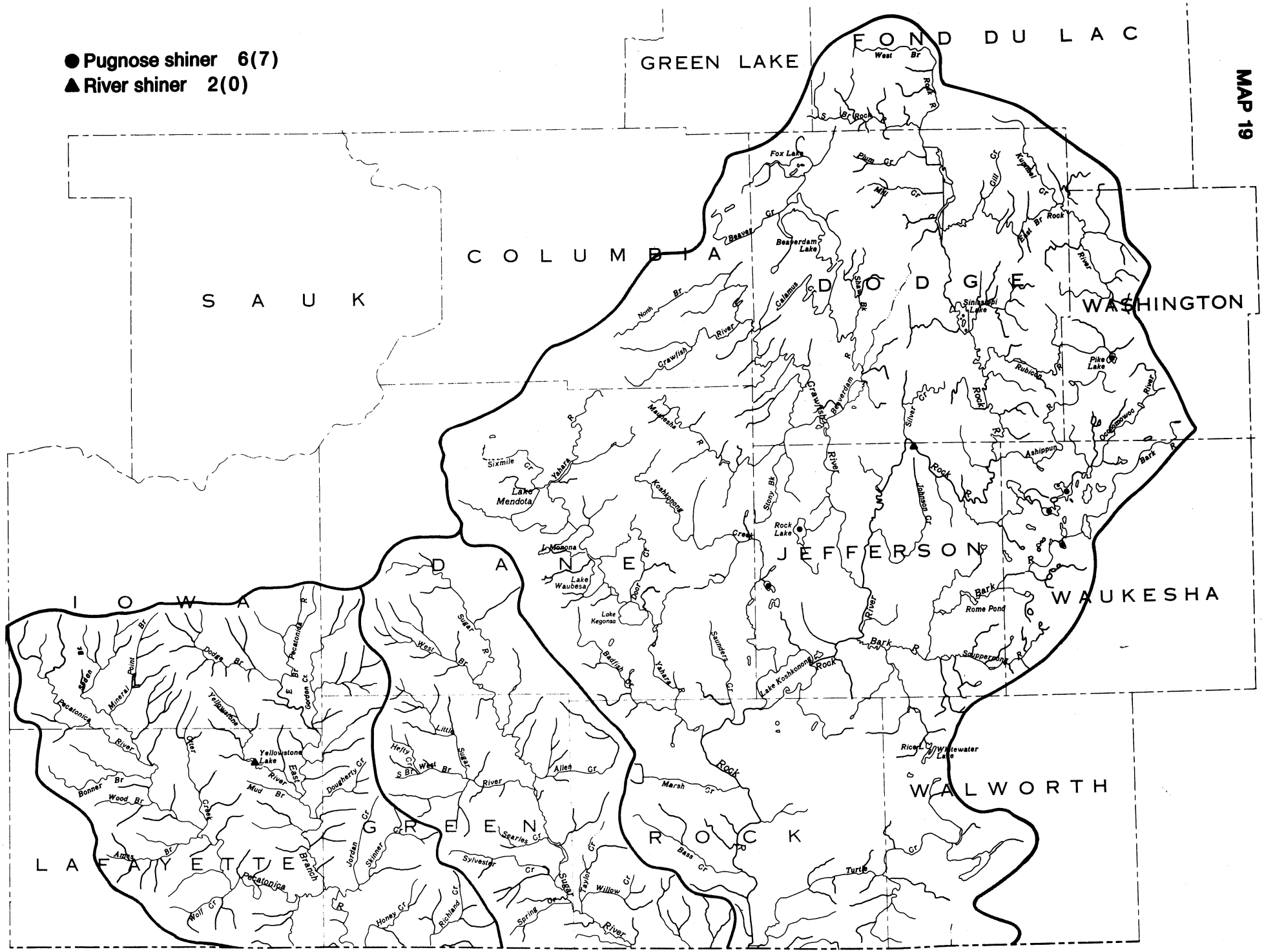

● Hornyhead chub 205(0)
MAP 17
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
DANE
IOWA
JEFFERSON
WAUKESHA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock

● **Golden shiner 98(24)**

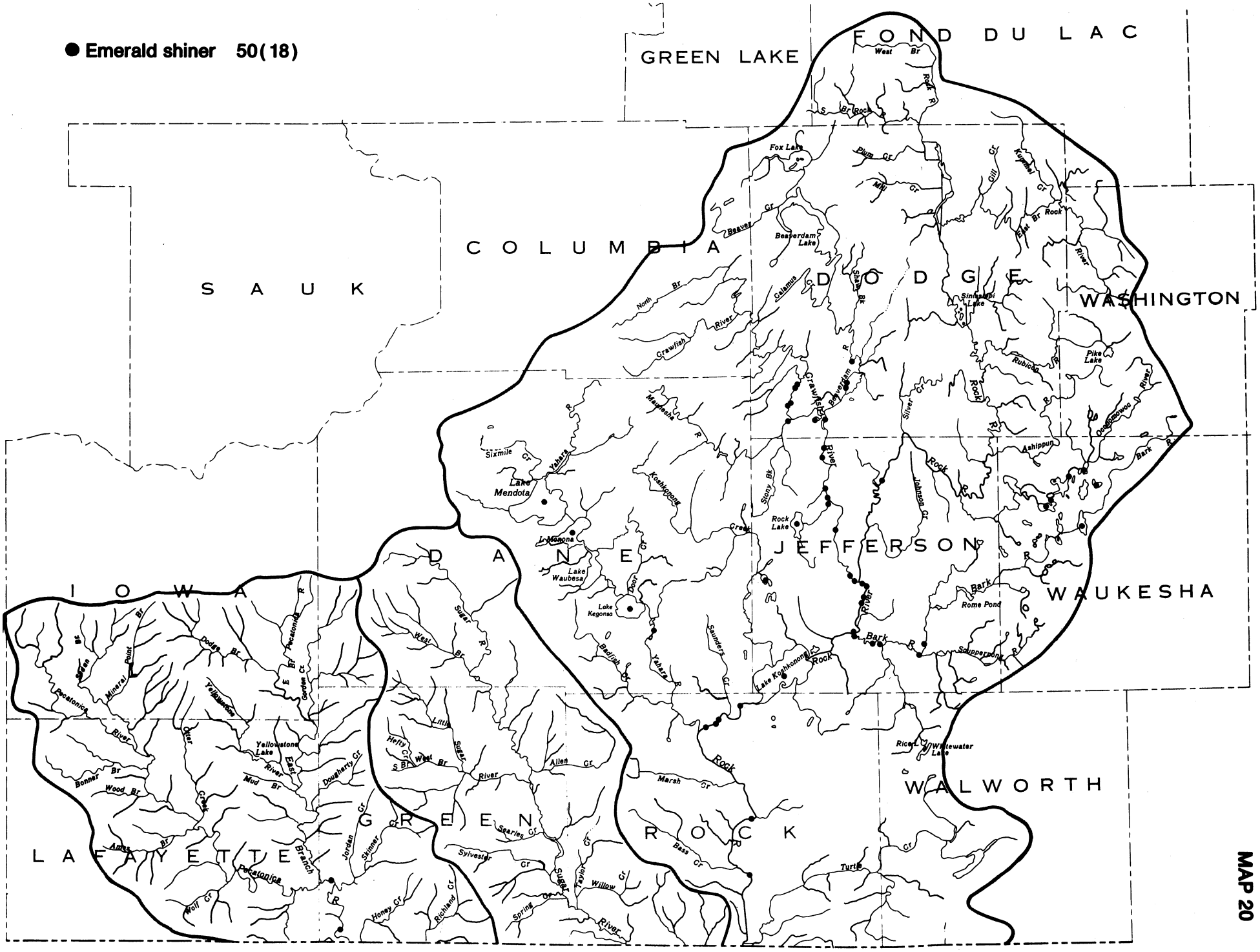


223 - Pecatonica 222 - Sugar 221 - Rock

MAP 18

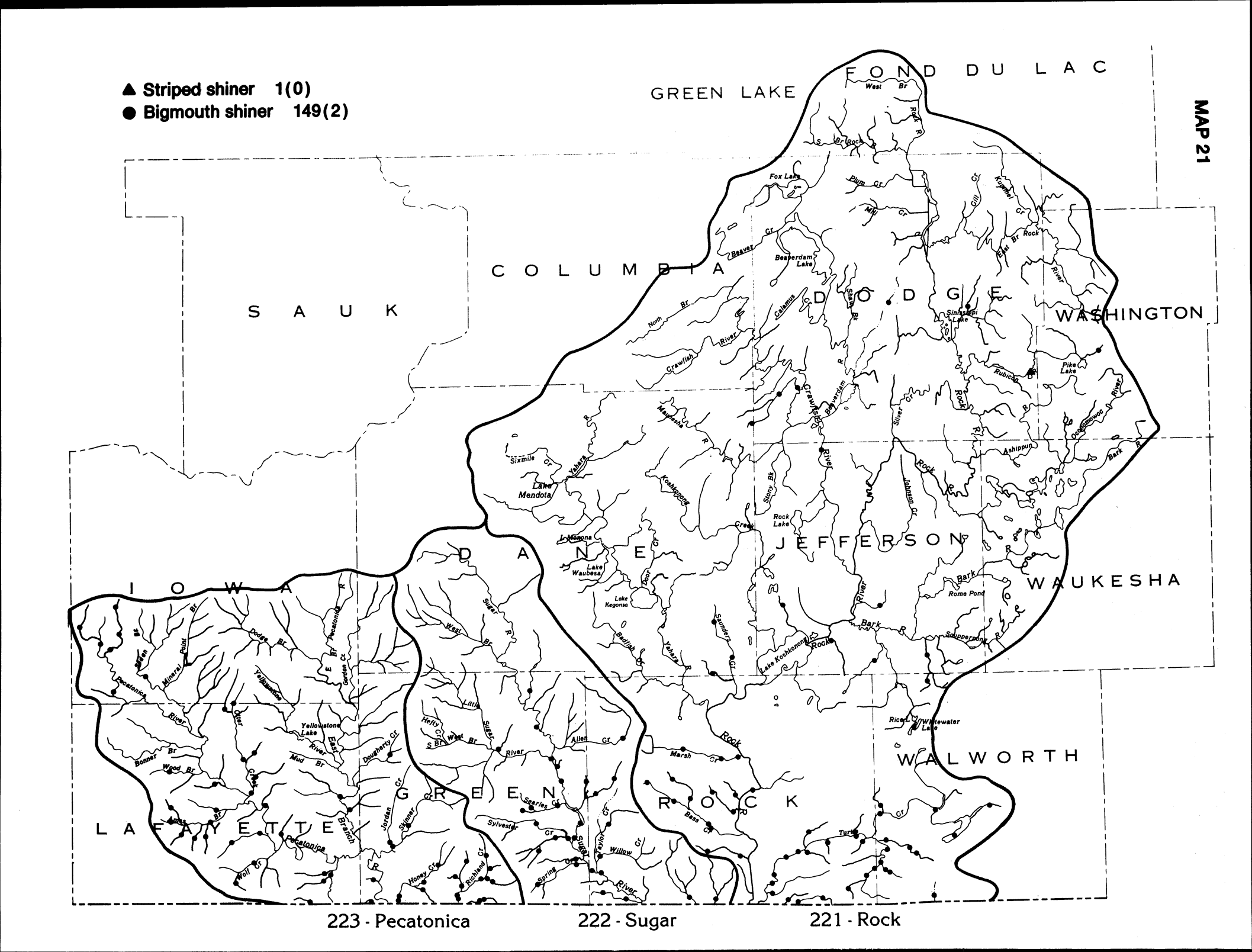

● Pugnose shiner 6(7)
▲ River shiner 2(0)
MAP 19
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
IOWA
DANE
JEFFERSON
WAUKESHA
LAFAYETTE
GREEN
ROCK
WALWORTH
223 - Pecatonica
222 - Sugar
221 - Rock

● **Emerald shiner 50(18)**

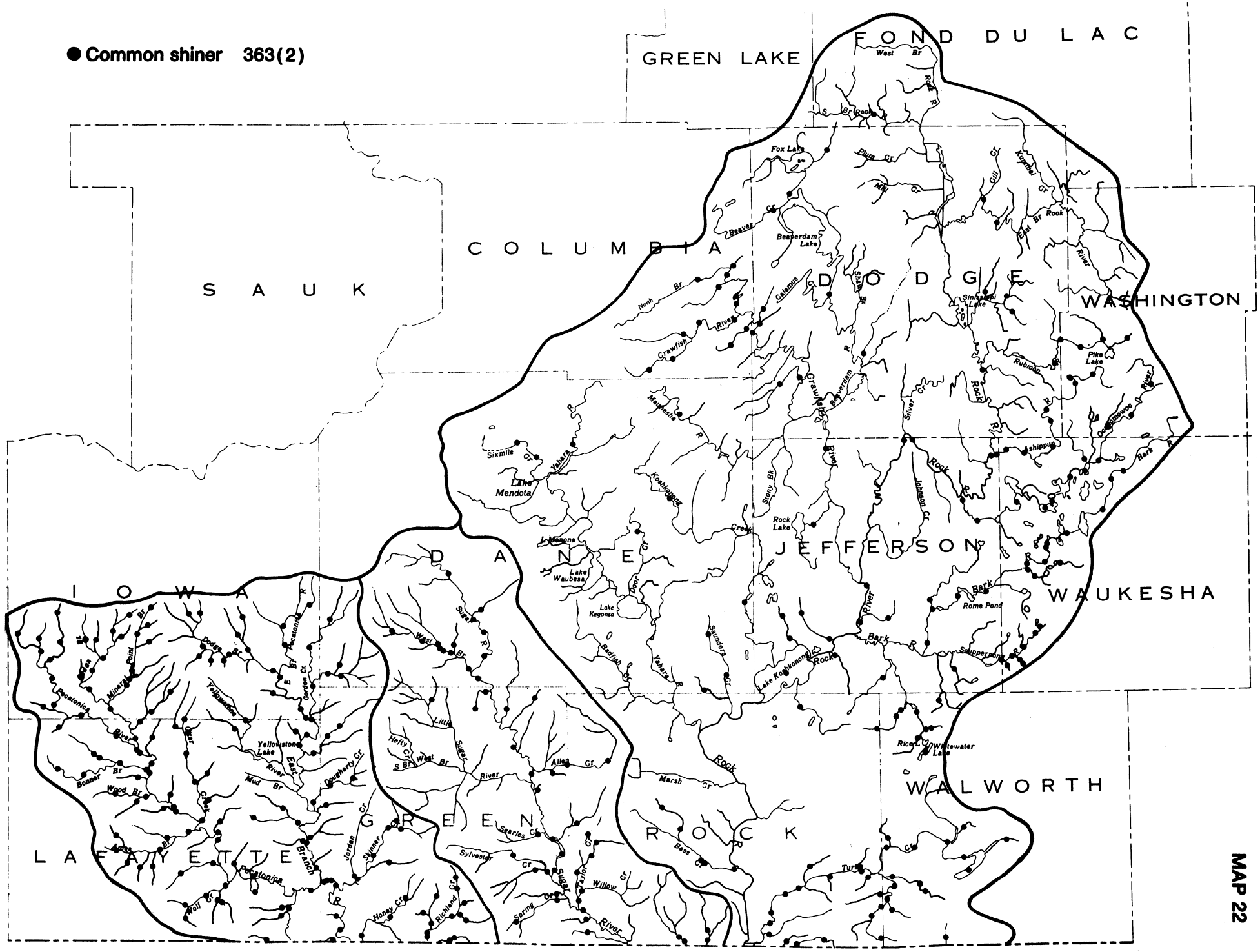


223 - Pecatonica 222 - Sugar 221 - Rock

MAP 20

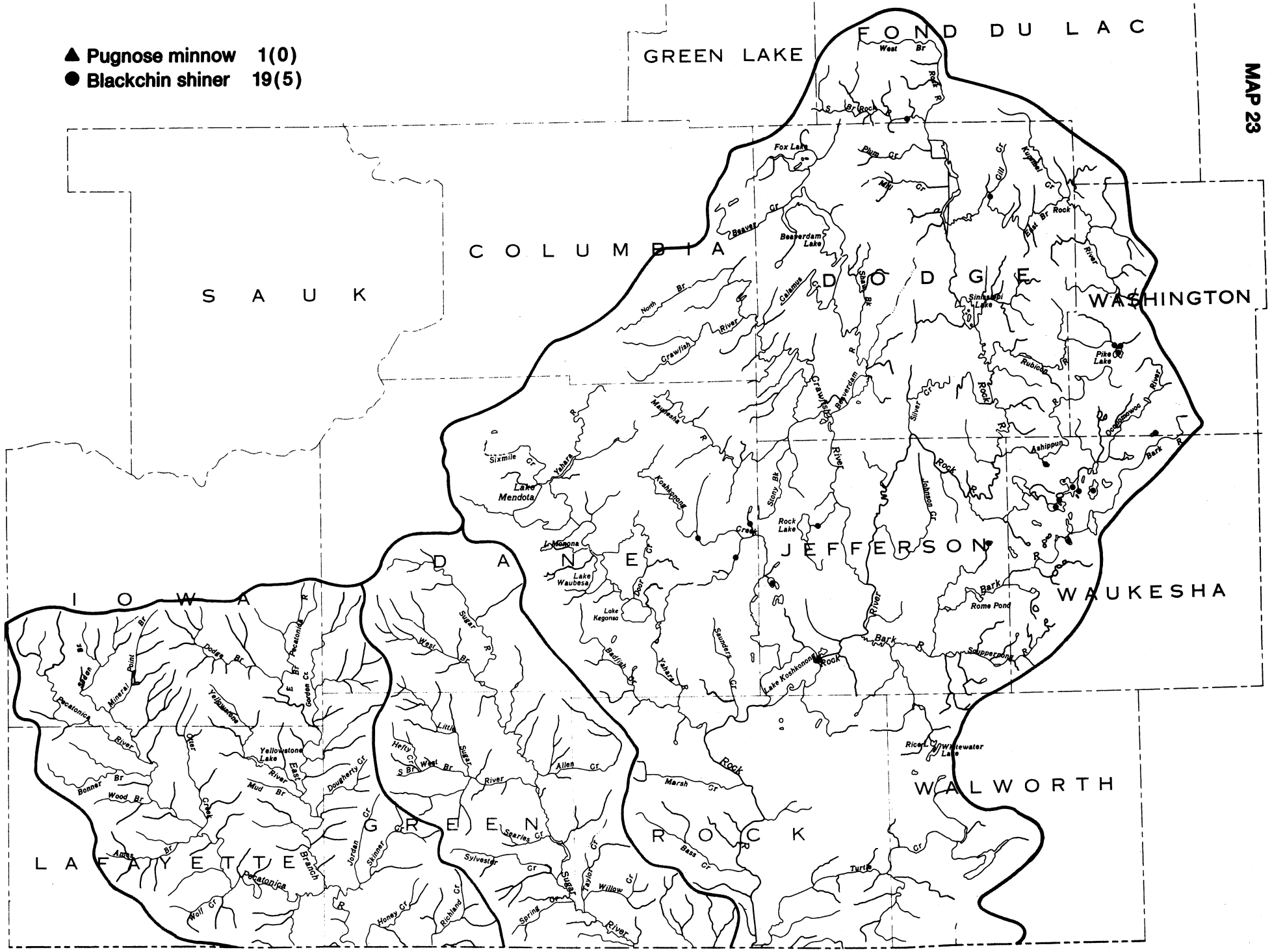

▲ Striped shiner 1(0)
● Bigmouth shiner 149(2)
MAP 21
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock

● **Common shiner 363(2)**

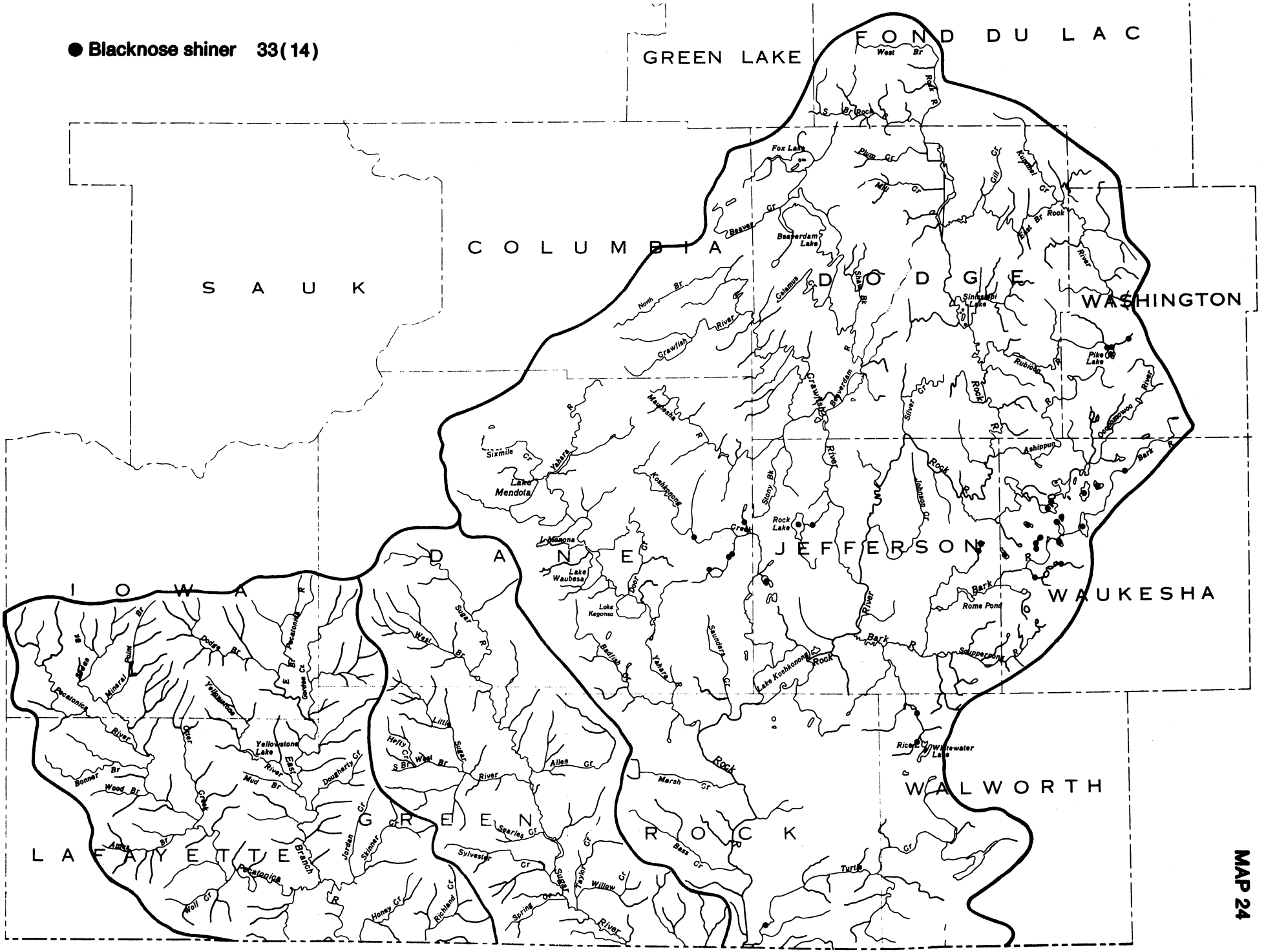


223 - Pecatonica 222 - Sugar 221 - Rock

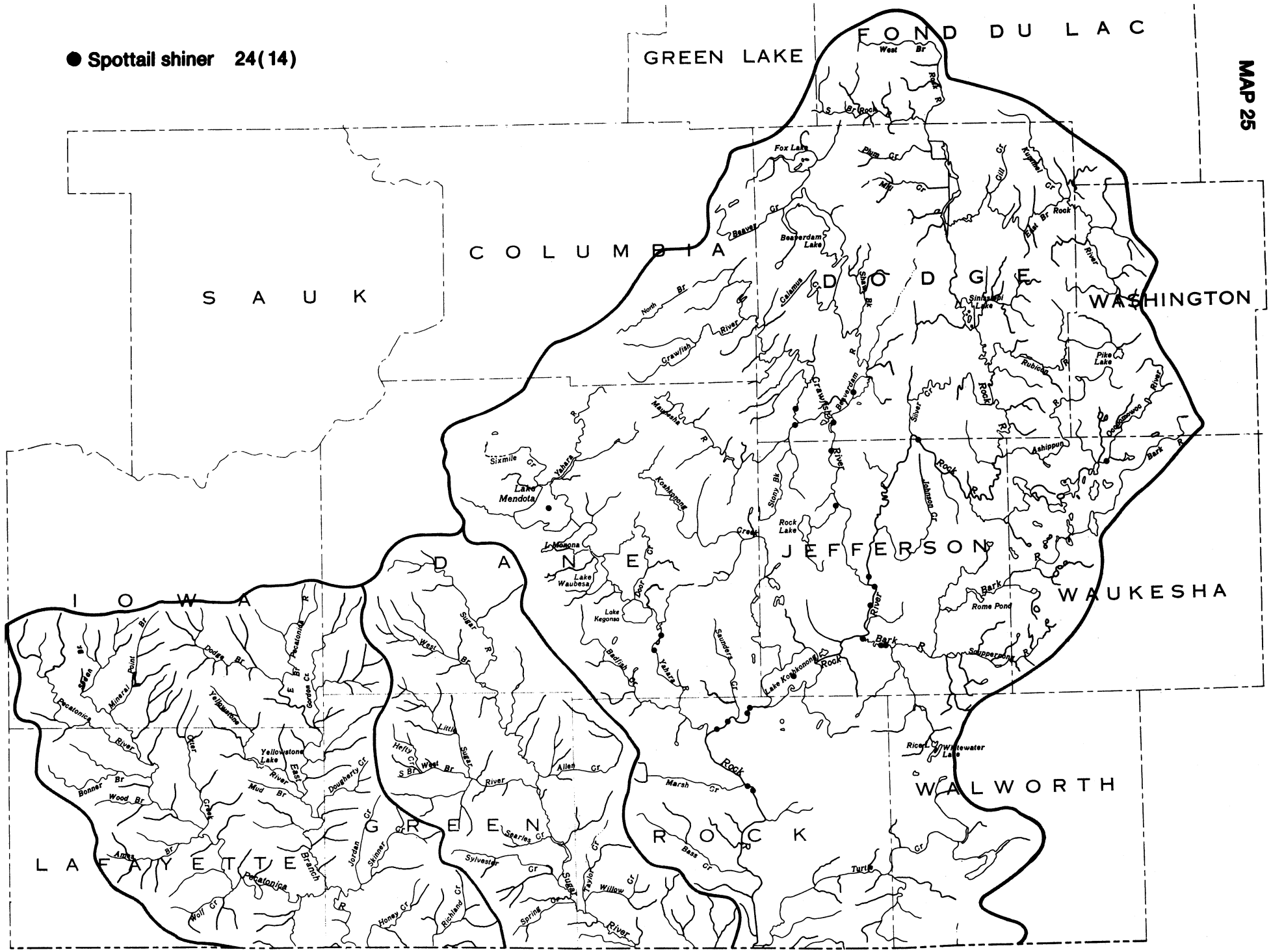
MAP 22


▲ Pugnose minnow 1(0)
● Blackchin shiner 19(5)
MAP 23
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaver Dam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
Rock Lake
Lake Koshkonong
Lake Waubesa
Lake Kegonsa
Rome Pond
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

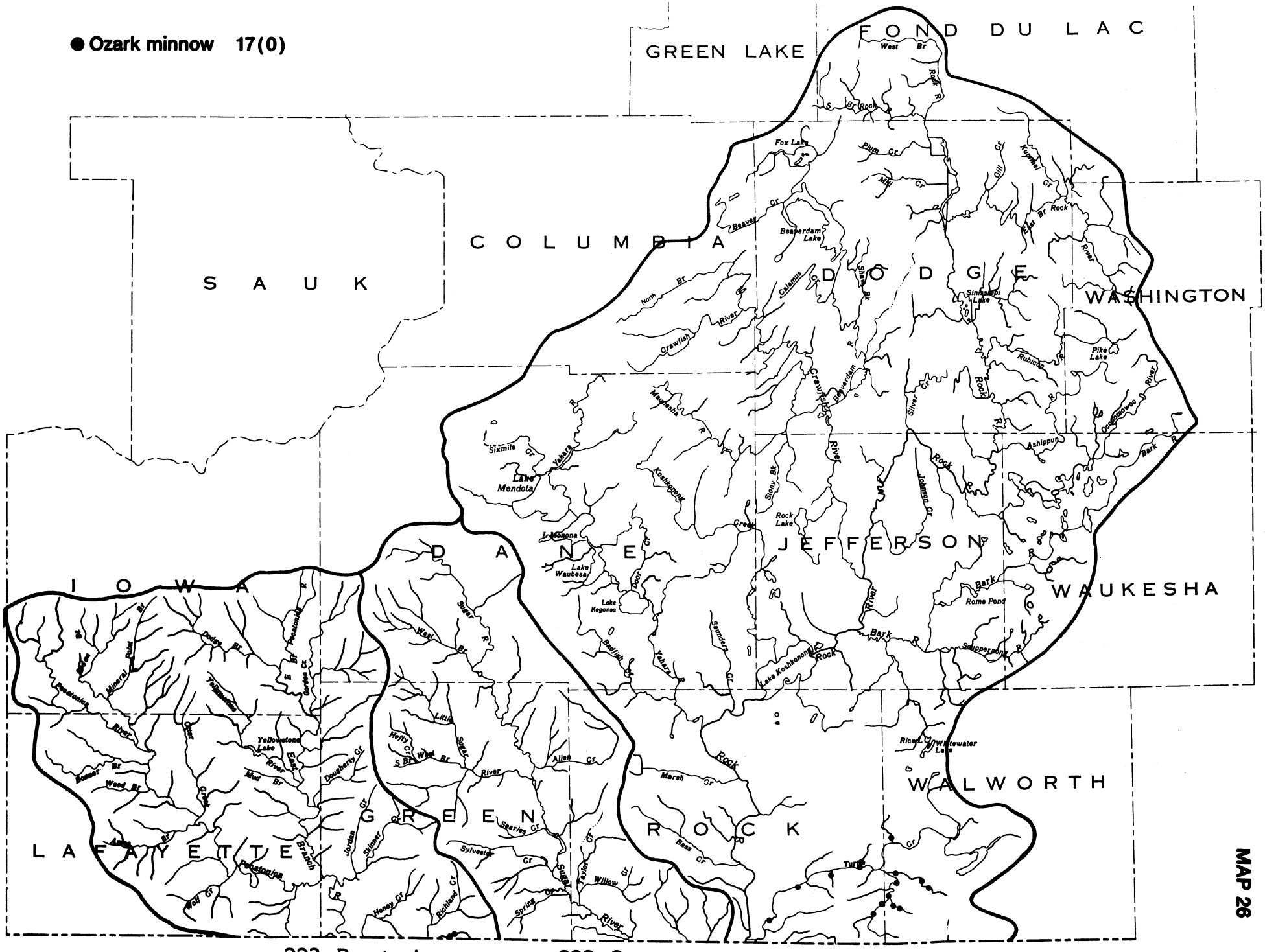
● **Blacknose shiner 33(14)**



MAP 24

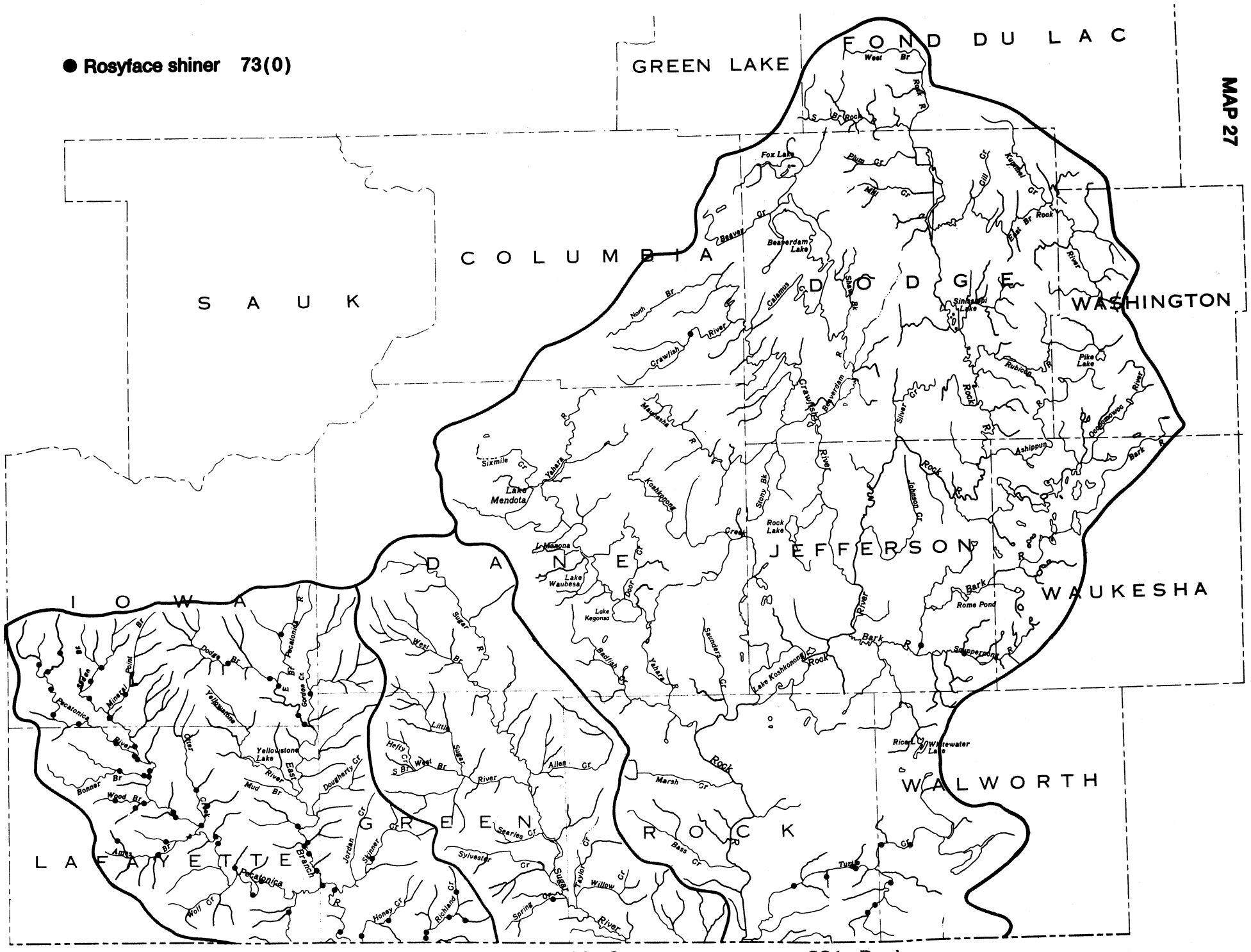

● Spottail shiner 24(14)
MAP 25
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Beaverdam Lake
Fox Lake
Sinissippi Lake
Pike Lake
Ashippun
Whitewater Lake
Yellowstone Lake
Crawfish River
Rock River
Yahara River
Sugar River
Pecatonica River
Bark River
Koshkonong Creek
Johnson Cr
Allen Cr
Marsh Cr
Bass Cr
Turtle Cr
Willow Cr
Spring Cr
Sylvester Cr
Searles Cr
Jordan Cr
Skinner Cr
Honey Cr
Richland Cr
Wolf Cr
Doughterty Cr
Mud Br
Bonner Br
Wood Br
Amen Br
Dodge Br
Mineral Point Br
Sandy Br
Garden Ck
Saunders Cr
Badfish Cr
Deer Cr
Hefty Cr
Taylor Cr
Silver Cr
Stony Br
Saukippong R
223 - Pecatonica
222 - Sugar
221 - Rock

● **Ozark minnow 17(0)**



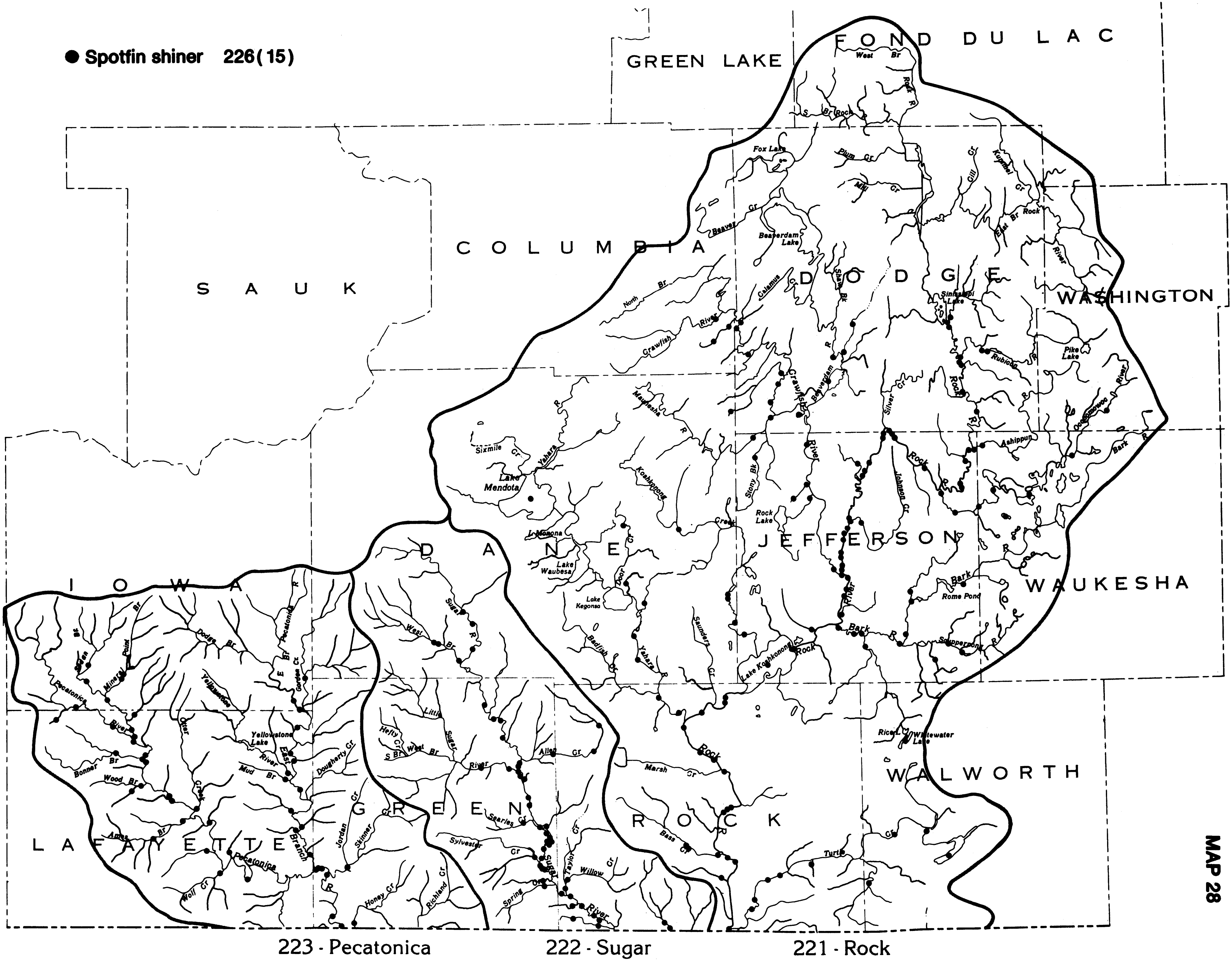
MAP 26

● **Rosyface shiner 73(0)**

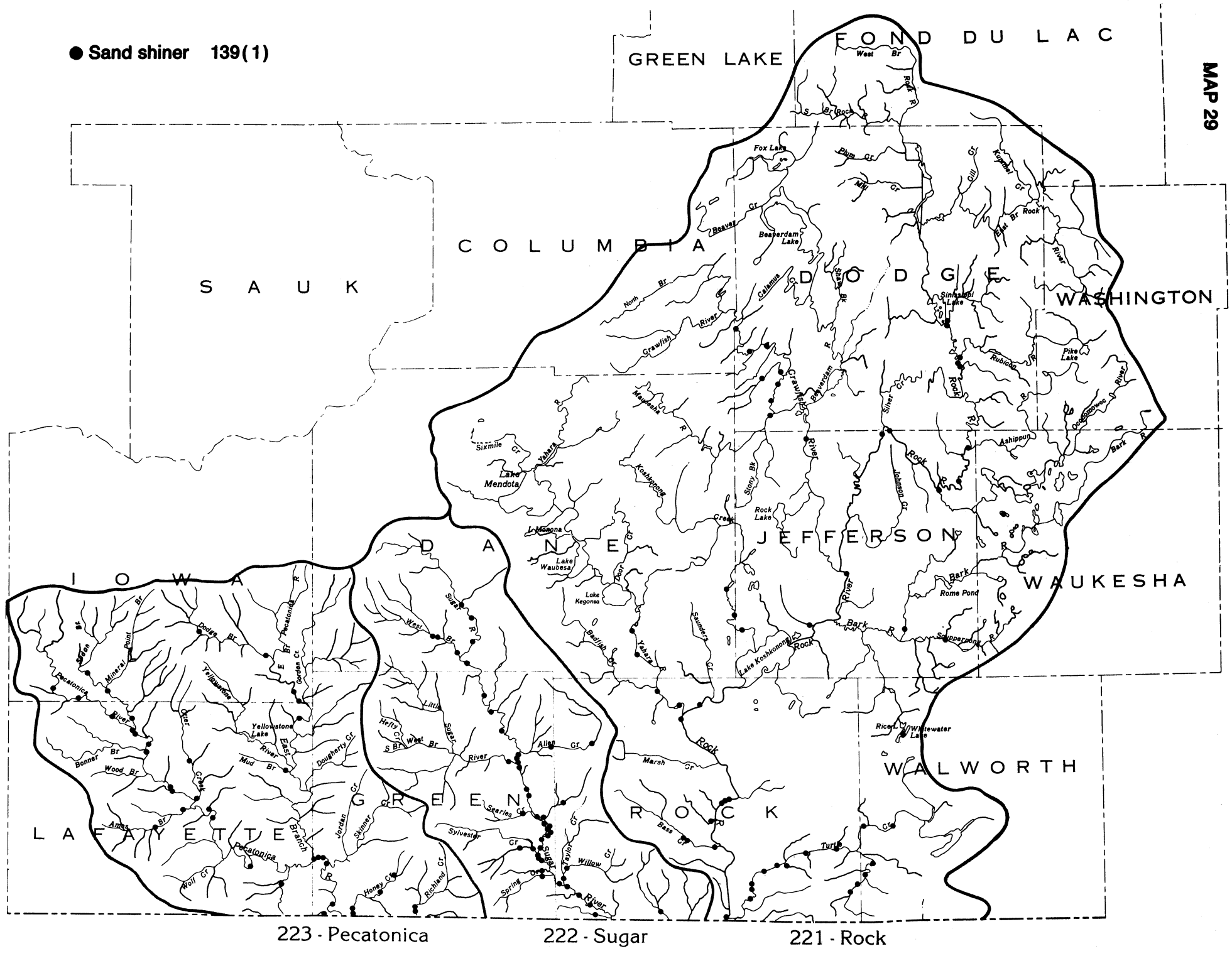


223 - Pecatonica 222 - Sugar 221 - Rock

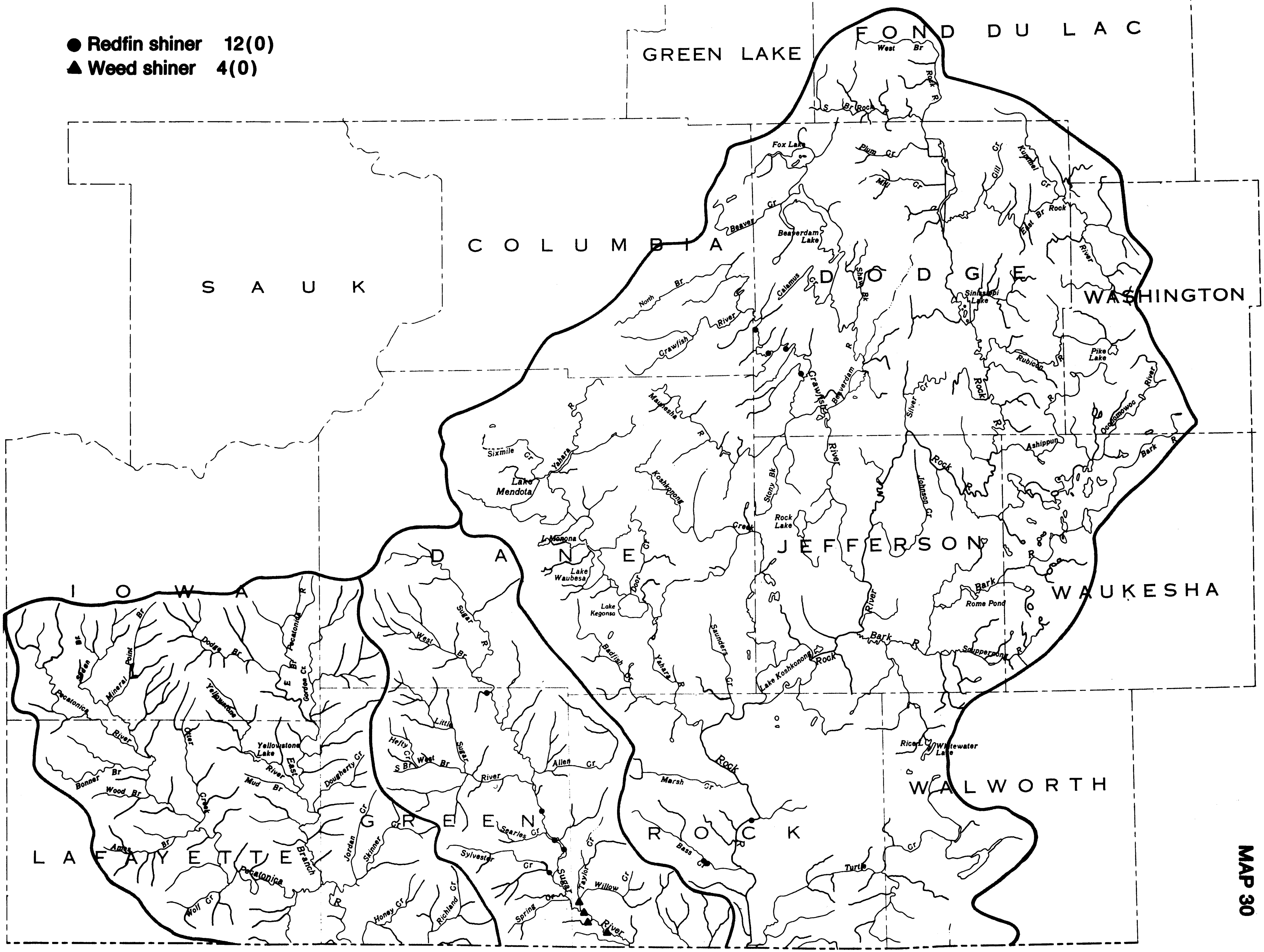
MAP 27


● Spotfin shiner 226(15)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
DANE
JEFFERSON
WAUKESHA
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock

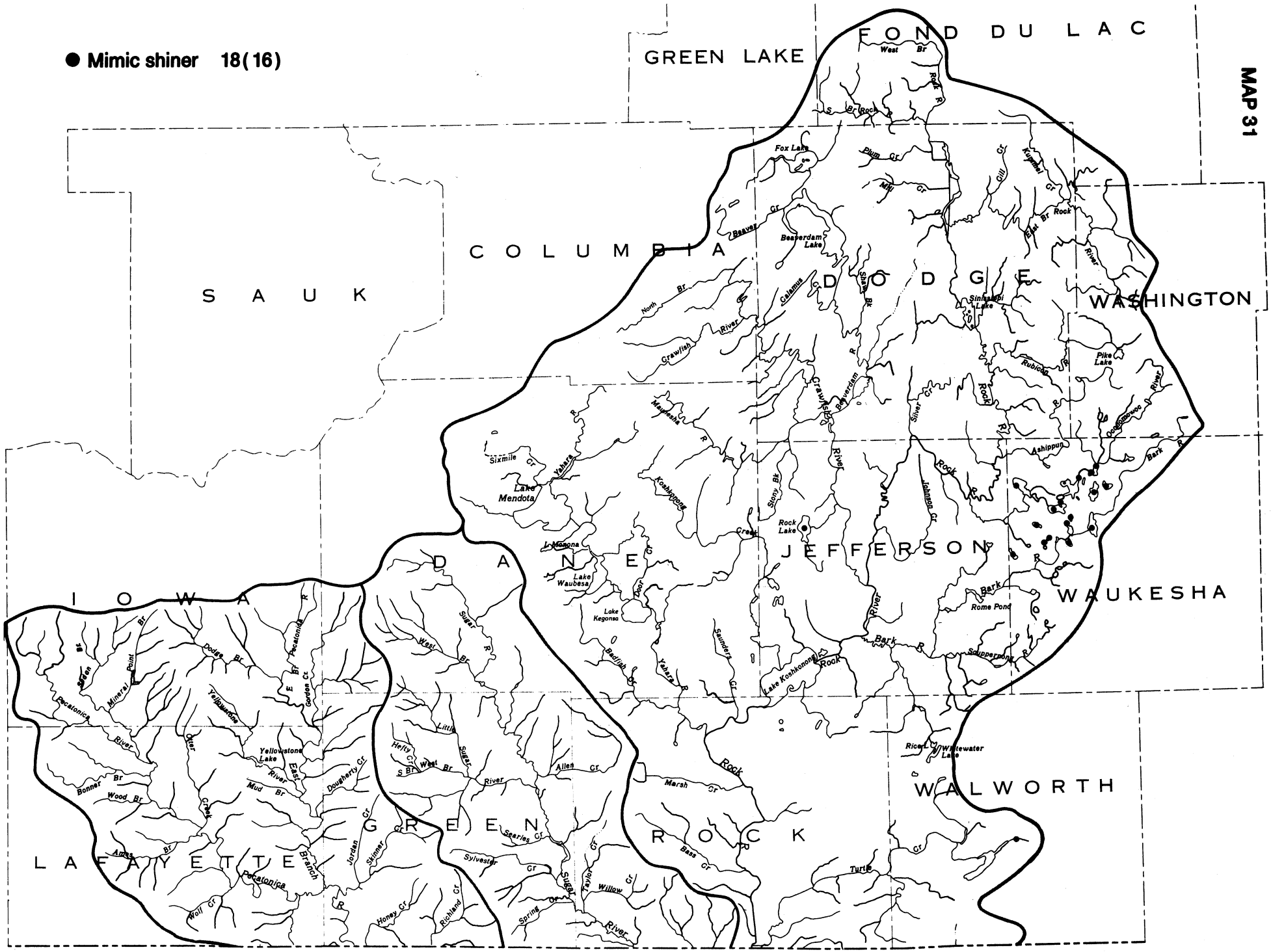
MAP 28


● Sand shiner 139(1)
MAP 29
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
West Br Rock R
Fox Lake
Plum Cr
Gill Cr
Kvamme Cr
Mill Cr
Beaver Cr
Beaverdam Lake
East Br Rock River
North Br Crawfish River
Calamus Cr
Shaw Bk
Sinnissippi Lake
Rubicon R
Pike Lake
Crawfish R
Maunesha R
Bark River
Silver Cr
Rock R
Ashippun
Sixmile Cr
Yahara R
Lake Mendota
Koshkonong Creek
Stony Bk
Rock Lake
Johnson Cr
Door Cr
Lake Waubesa
Lake Kegonsa
Badfish Cr
Saunders Cr
Lake Koshkonong
Rome Pond
Scuppernong R
Rice L
Whitewater Lake
Marsh Cr
Bass Cr
Turtle Cr
Sugar River
West Br Sugar R
Little Sugar R
Allen Cr
Searles Cr
Sylvester Gr
Taylor Cr
Willow Cr
Spring Cr
Jordan Cr
Skinner Cr
Honey Cr
Richland Cr
Wolf Cr
Pecatonica River
East Br Pecatonica R
Gordon Cr
Dodge Br
Mineral Point Br
Garden Br
Yellowstone Lake
Yellowstone River
Otter Creek
Mud Br
Dougherty Cr
Bonner Br
Wood Br
Amess Br
Branch
Hefty Cr
S Br
223 - Pecatonica
222 - Sugar
221 - Rock

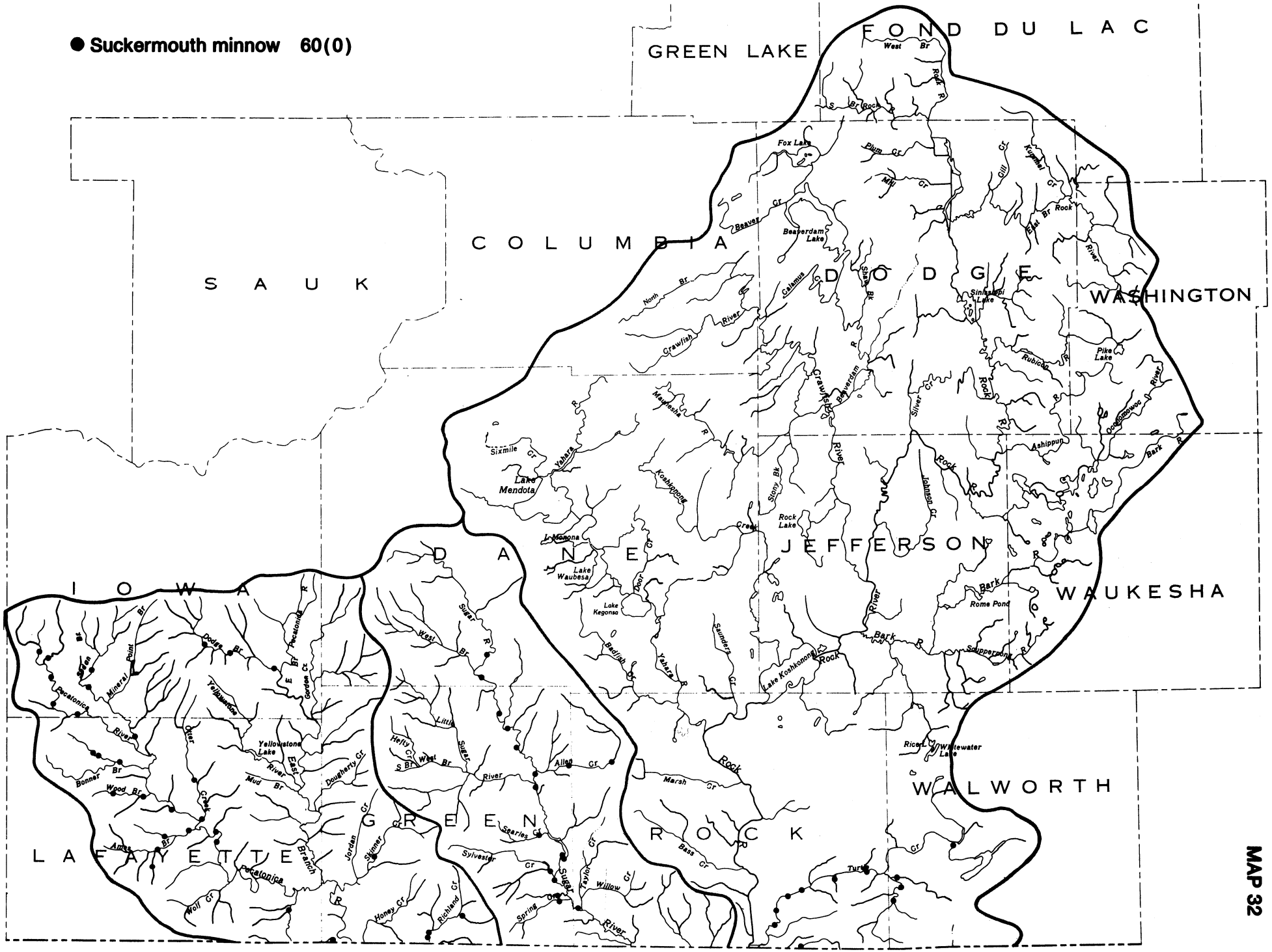
● Redfin shiner 12(0)
▲ Weed shiner 4(0)



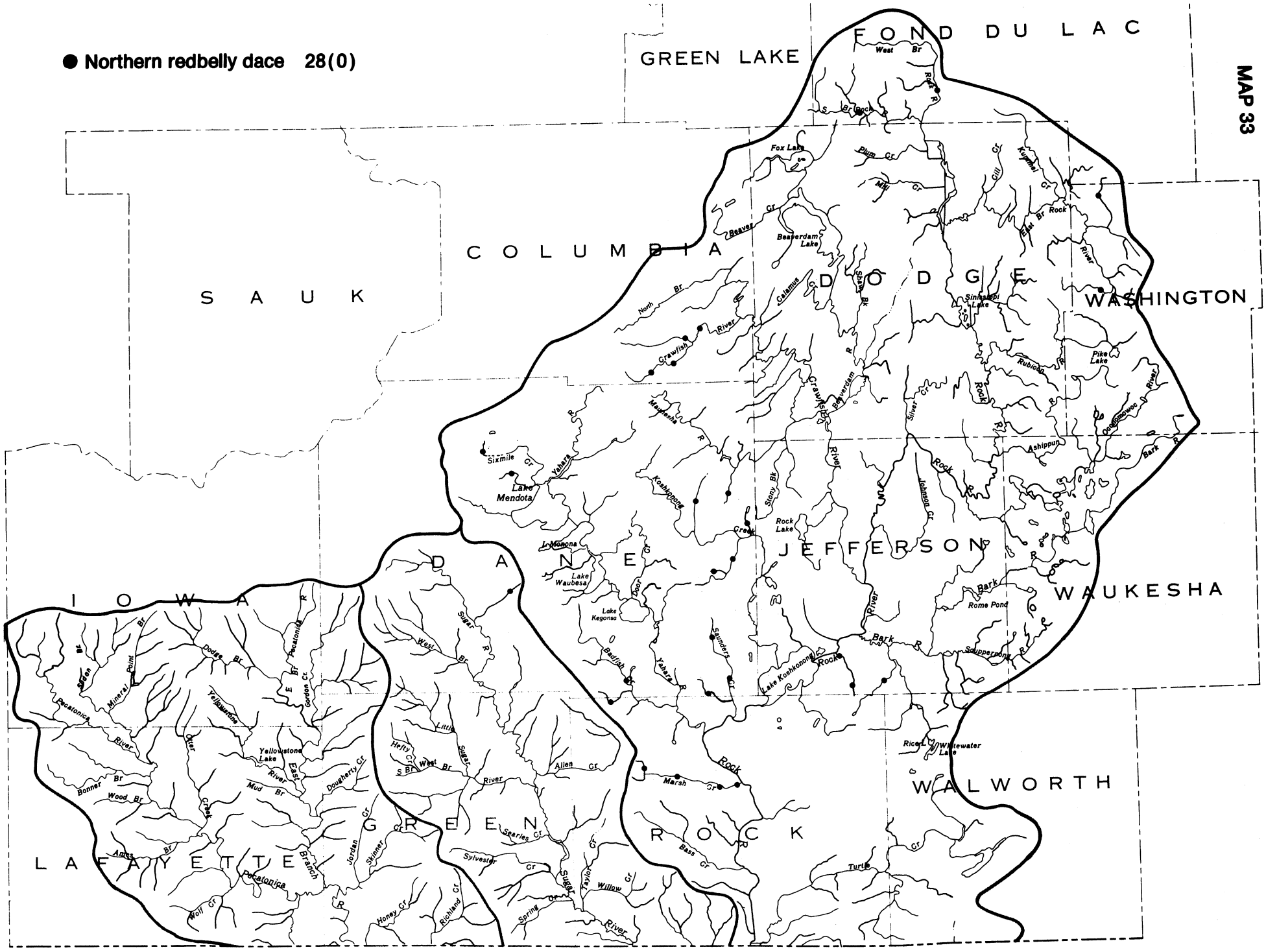
MAP 30


● Mimic shiner 18(16)
MAP 31
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
WAUKESHA
JEFFERSON
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock

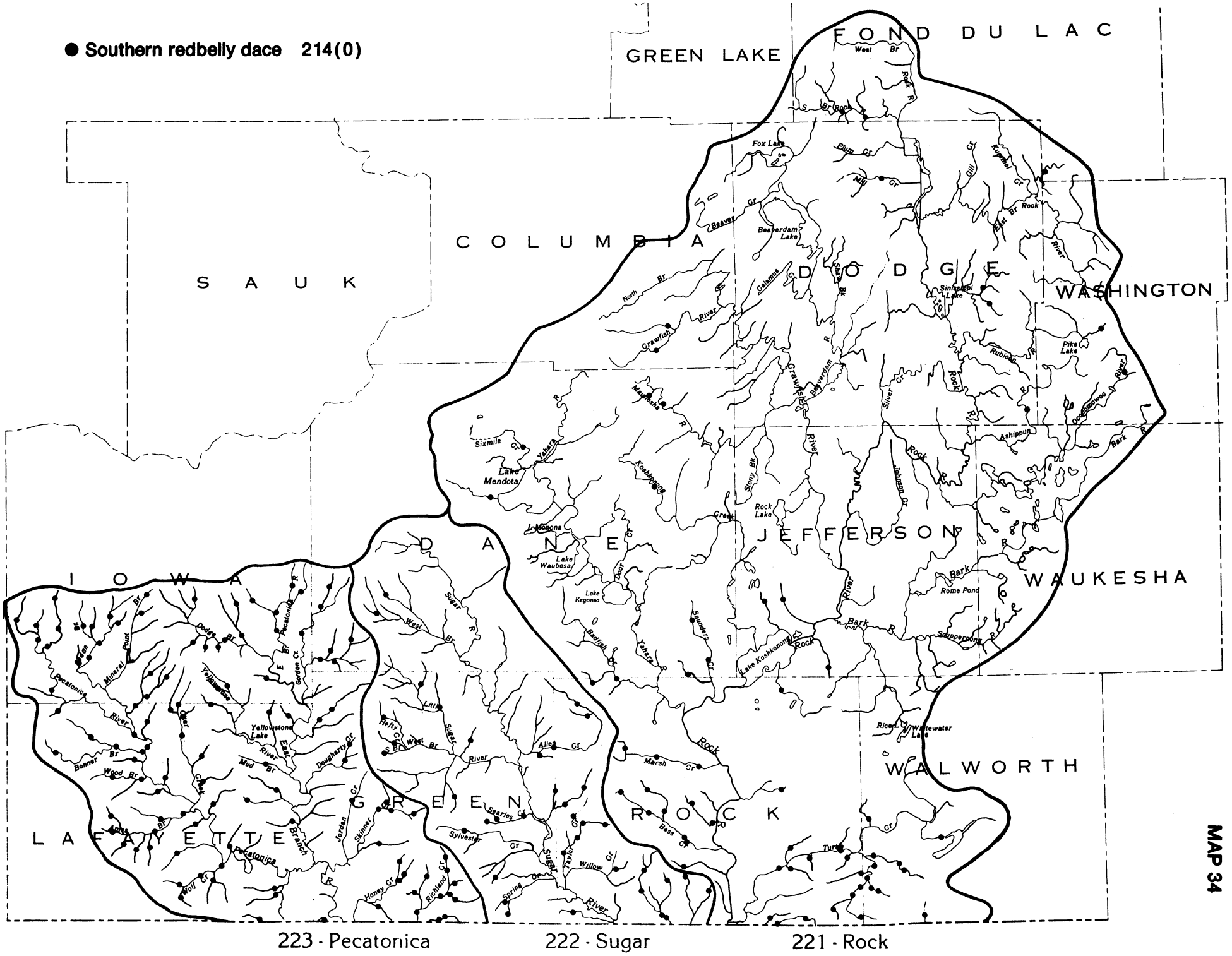
● **Suckermouth minnow 60(0)**



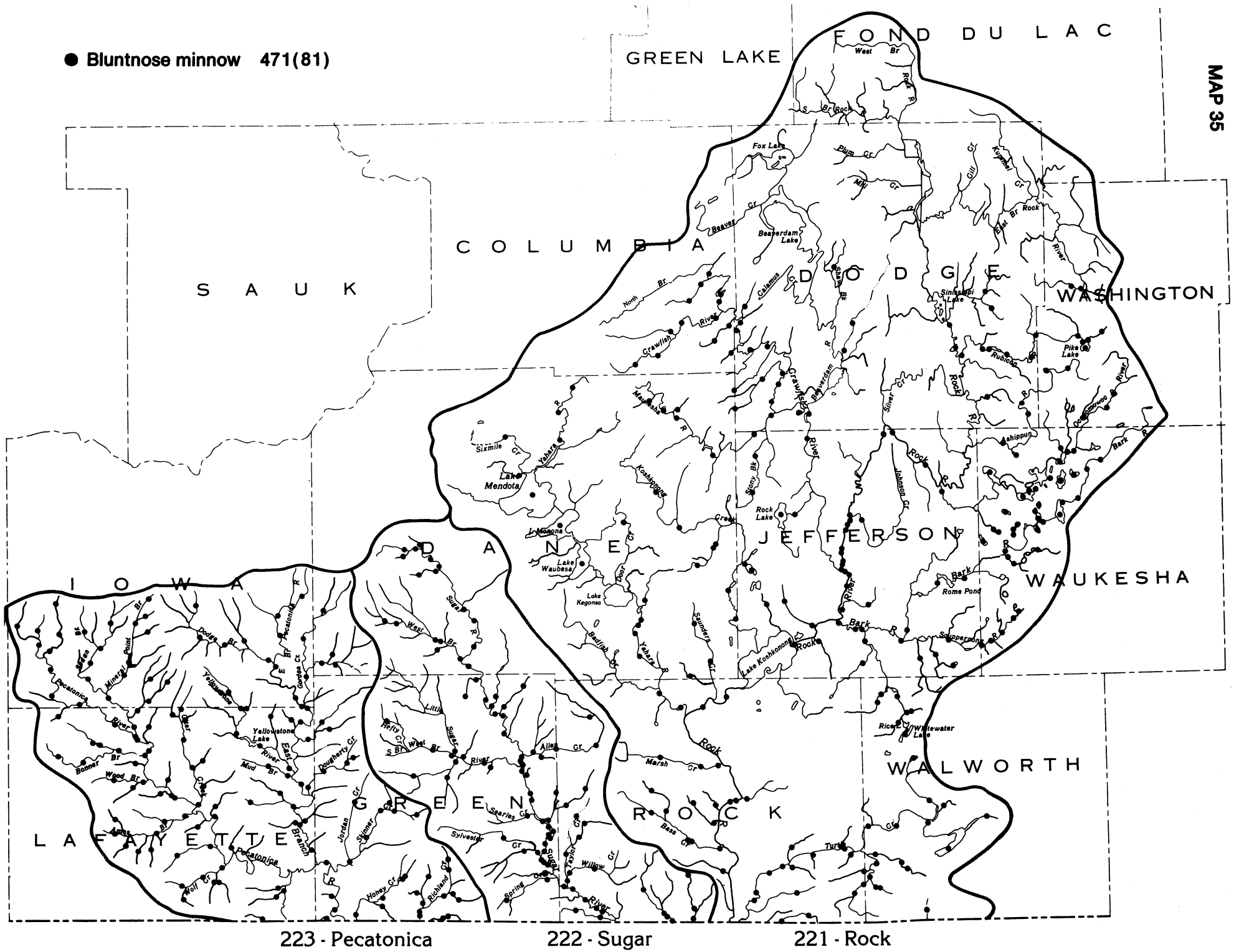
MAP 32


● Northern redbelly dace 28(0)
MAP 33
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Rome Pond
Lake Koshkonong
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

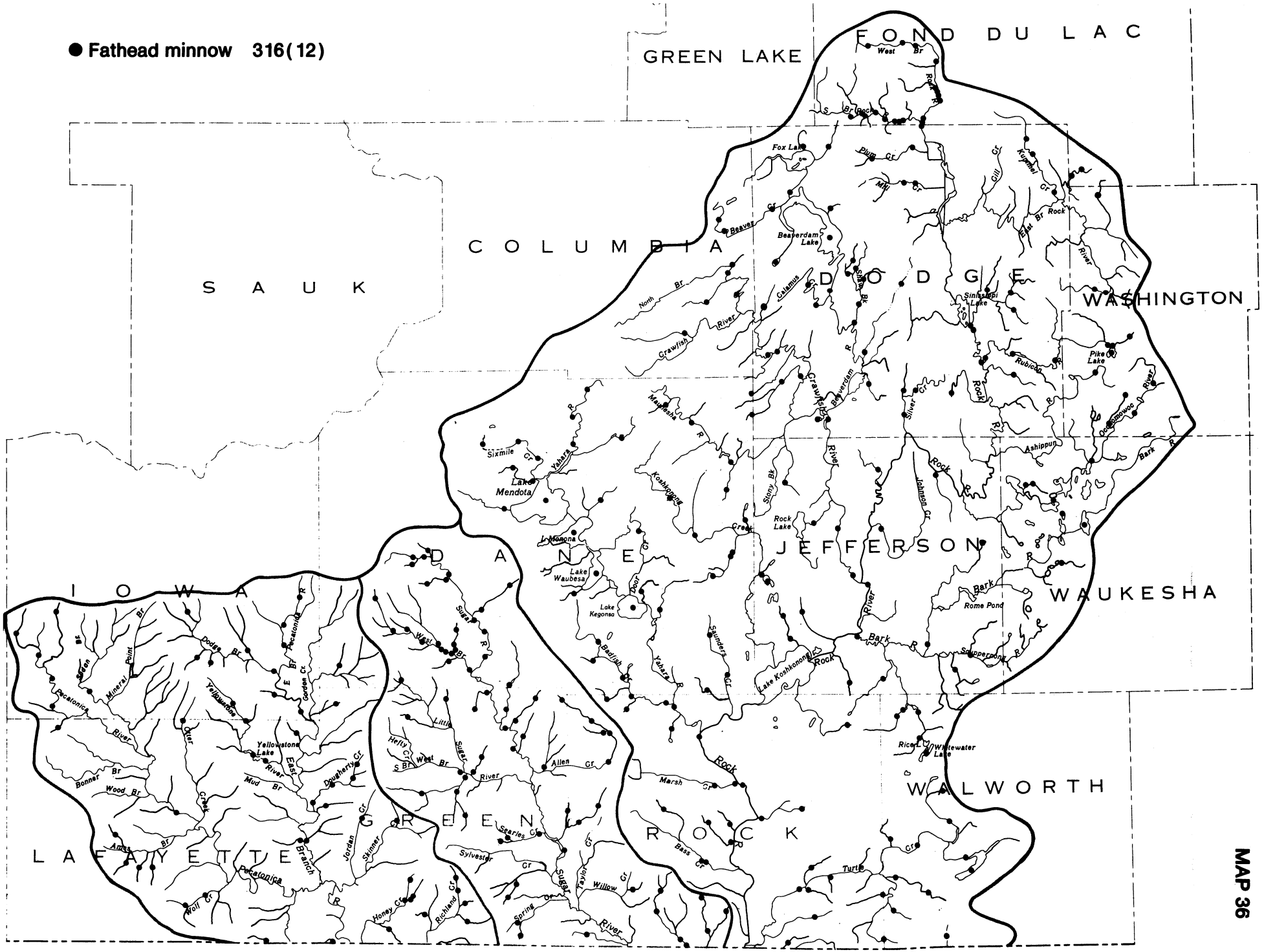
● **Southern redbelly dace 214(0)**



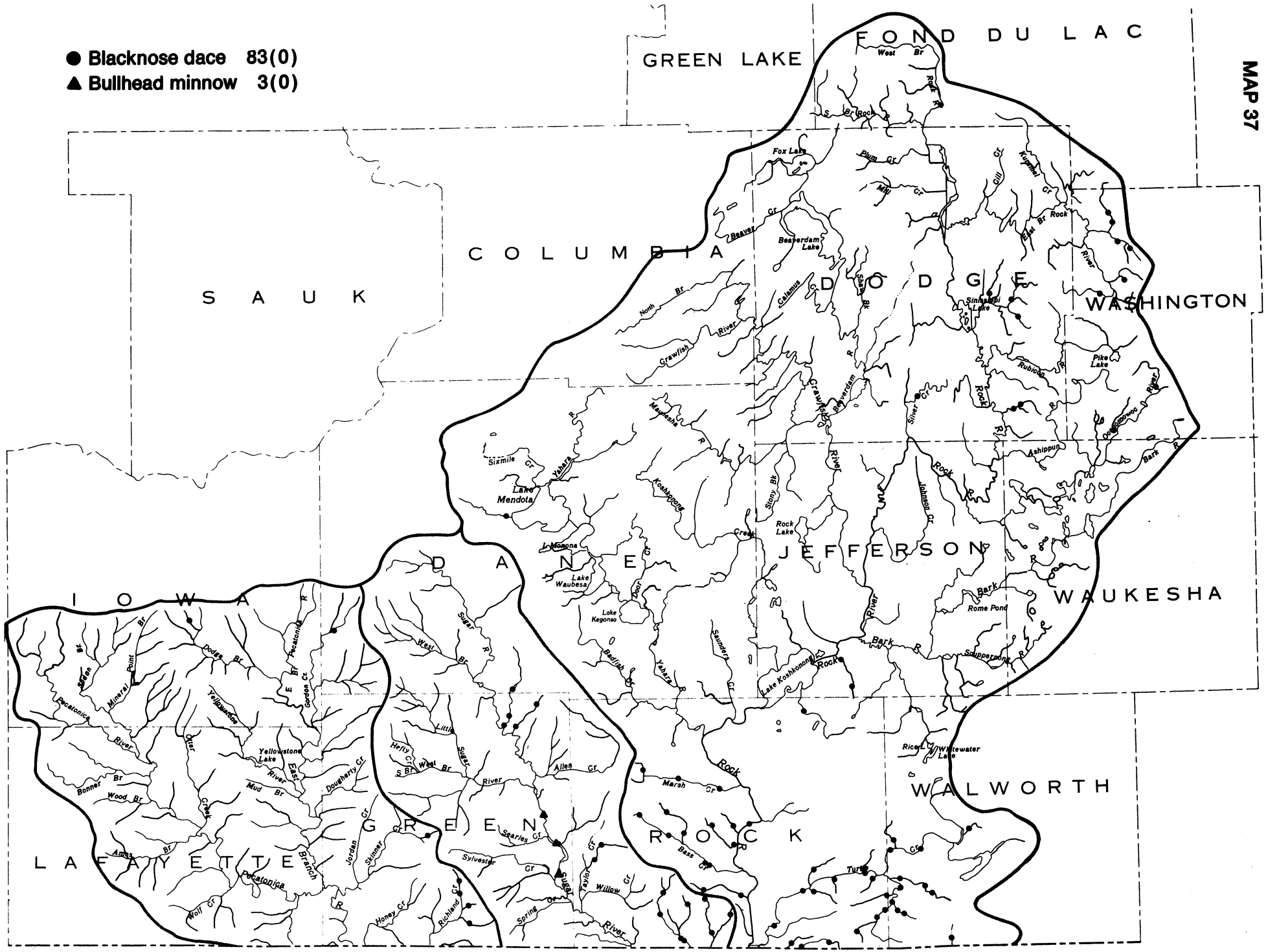
MAP 34


● Bluntnose minnow 471(81)
MAP 35
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Rome Pond
Lake Koshkonong
Whitewater Lake
Pike Lake
Sinissippi Lake
223 - Pecatonica
222 - Sugar
221 - Rock

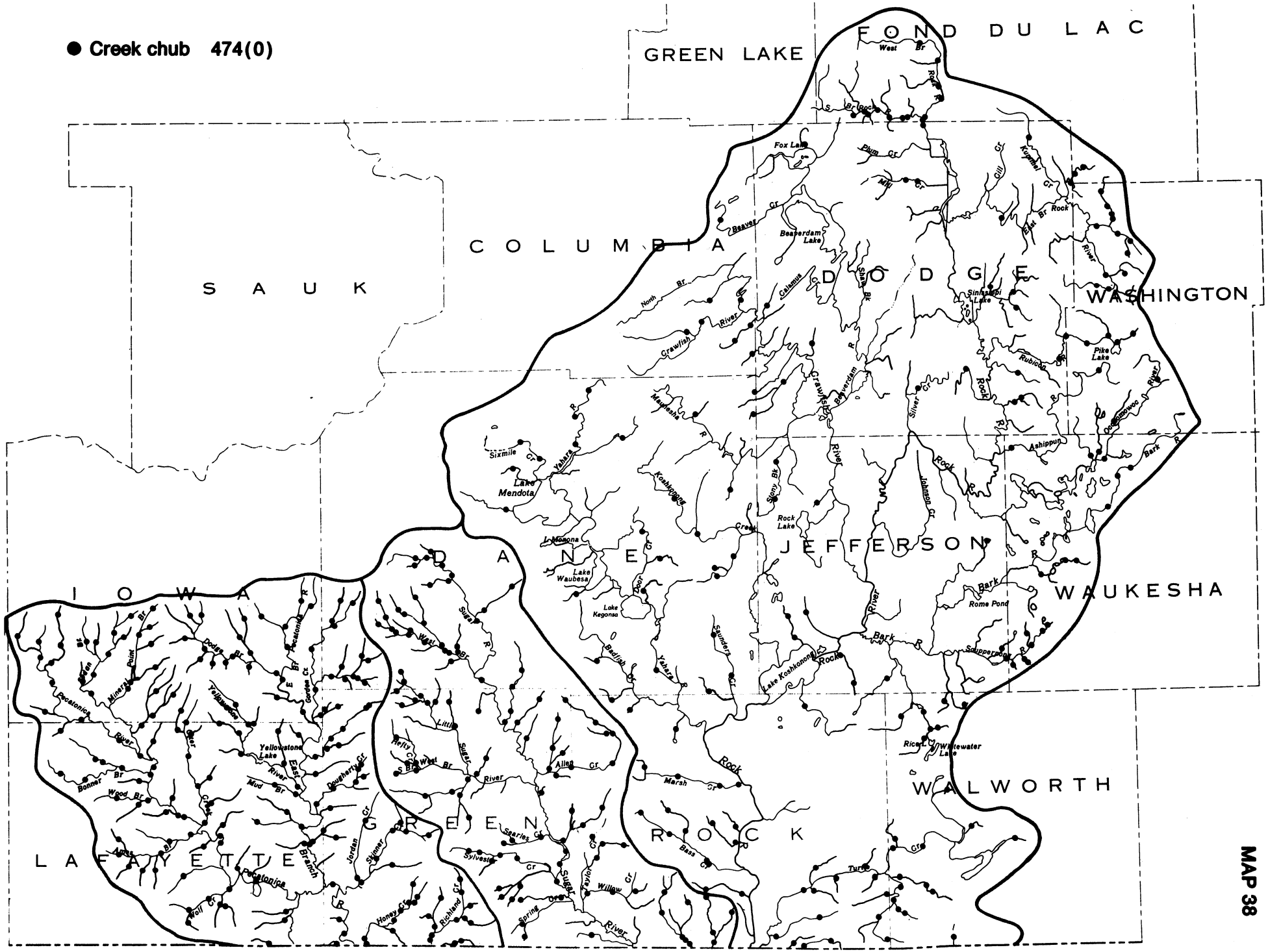
● **Fathead minnow 316(12)**



MAP 36

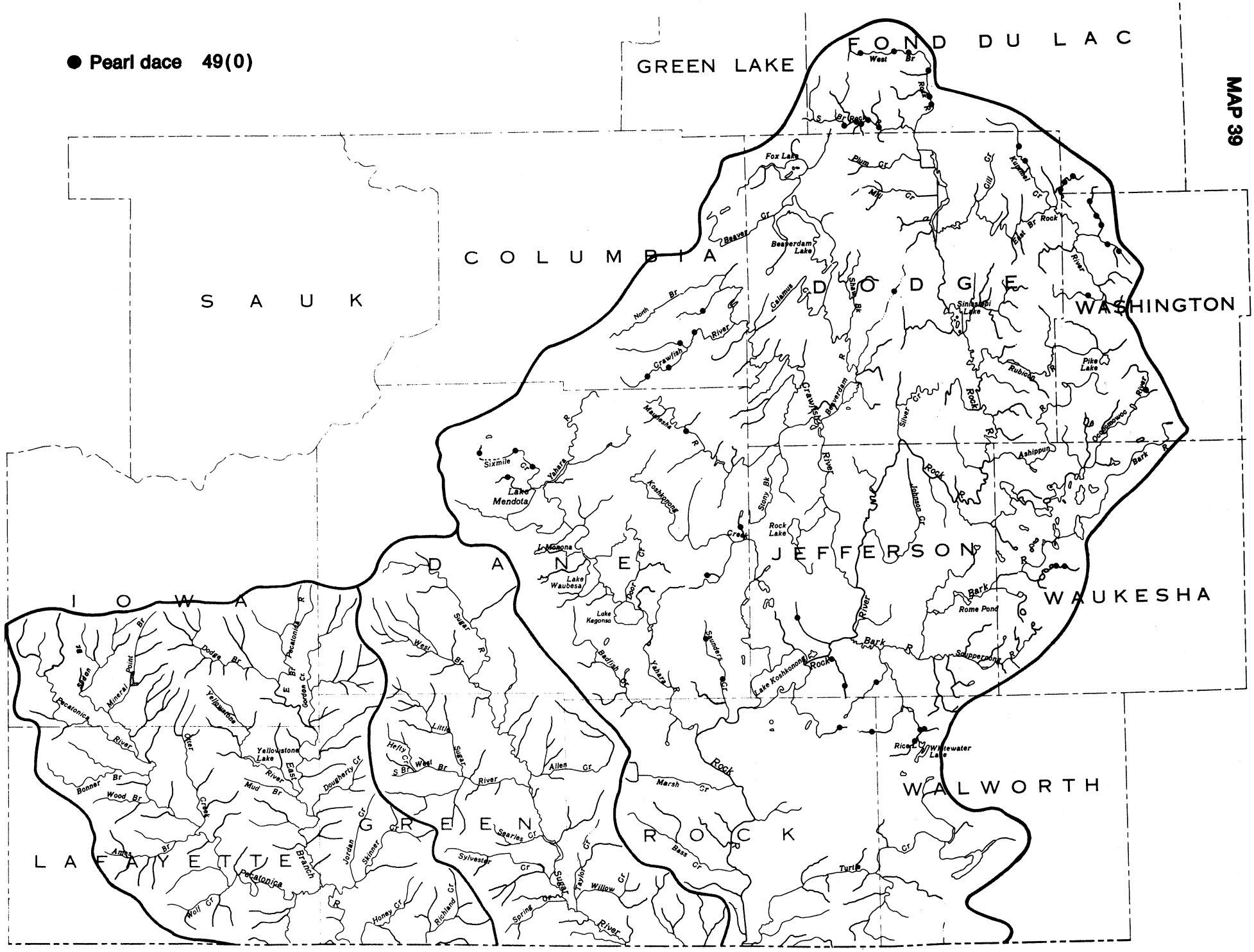

● Blacknose dace 83(0)
▲ Bullhead minnow 3(0)
MAP 37
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Rome Pond
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

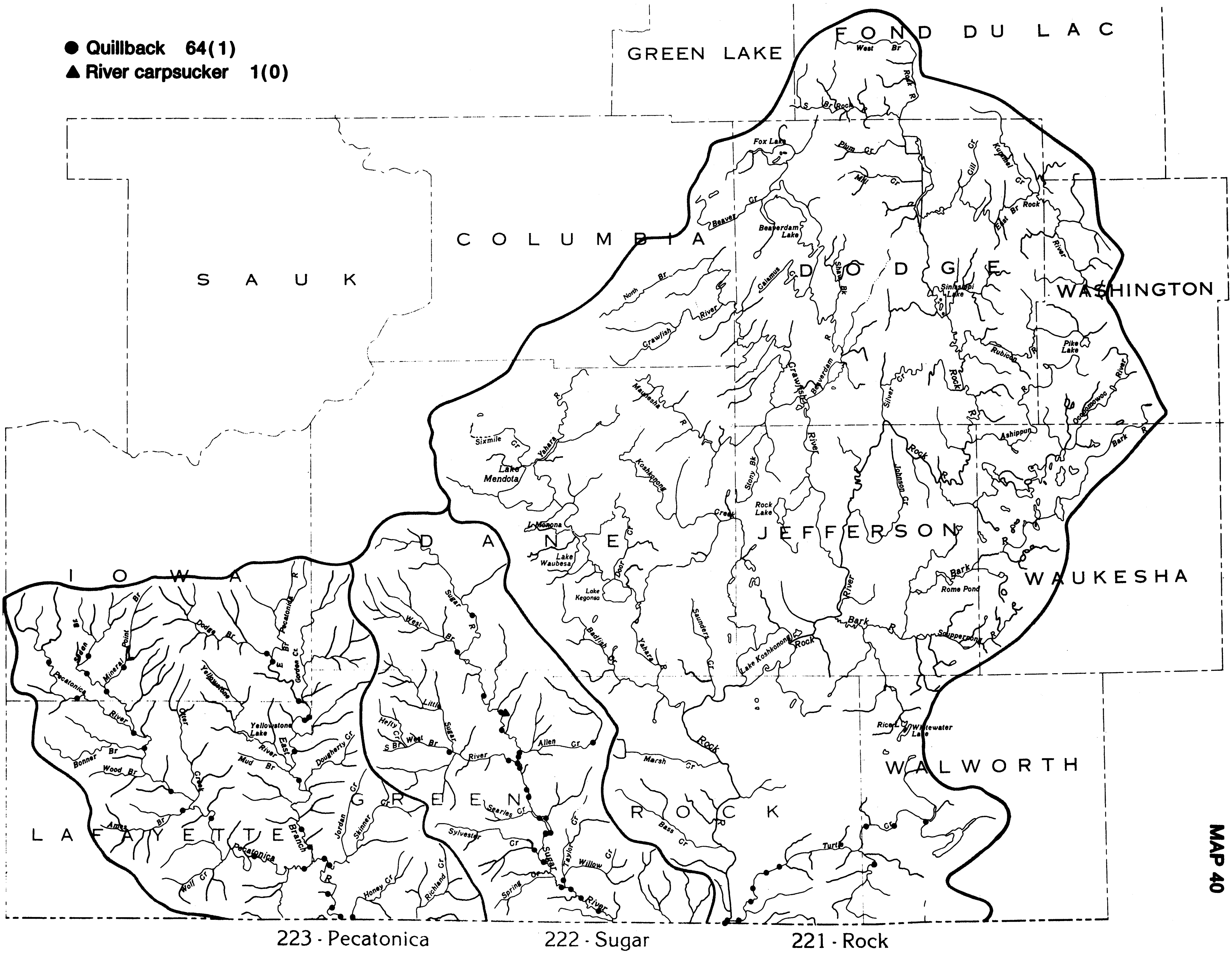
● **Creek chub 474(0)**

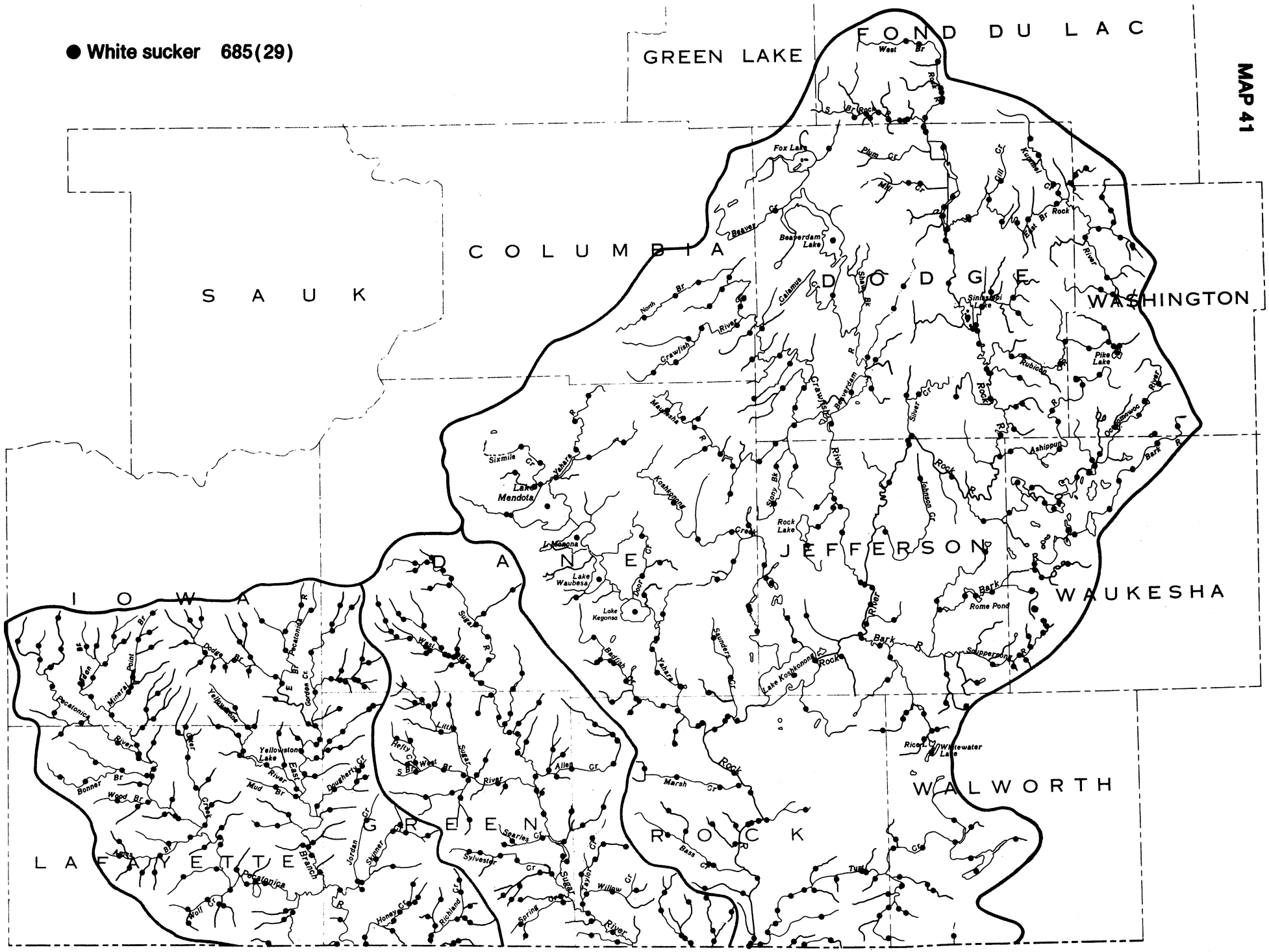


223 - Pecatonica 222 - Sugar 221 - Rock

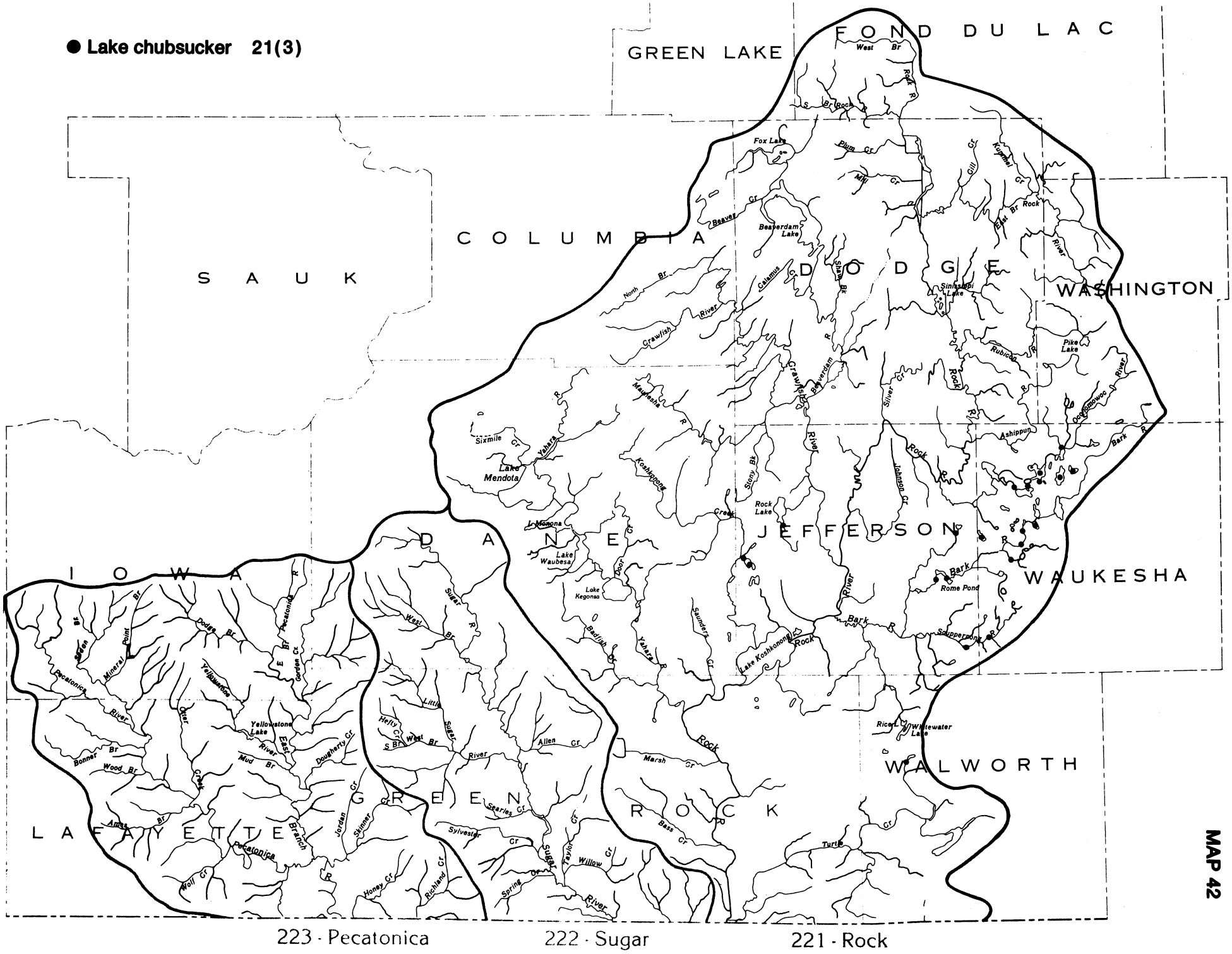
MAP 38


● Pearl dace 49(0)
MAP 39
FOND DU LAC
GREEN LAKE
SAUK
COLUMBIA
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaver Dam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Rome Pond
Lake Koshkonong
Whitewater Lake
Crawfish River
Rock River
Bark River
Yahara River
Sugar River
Pecatonica River
223 - Pecatonica
222 - Sugar
221 - Rock

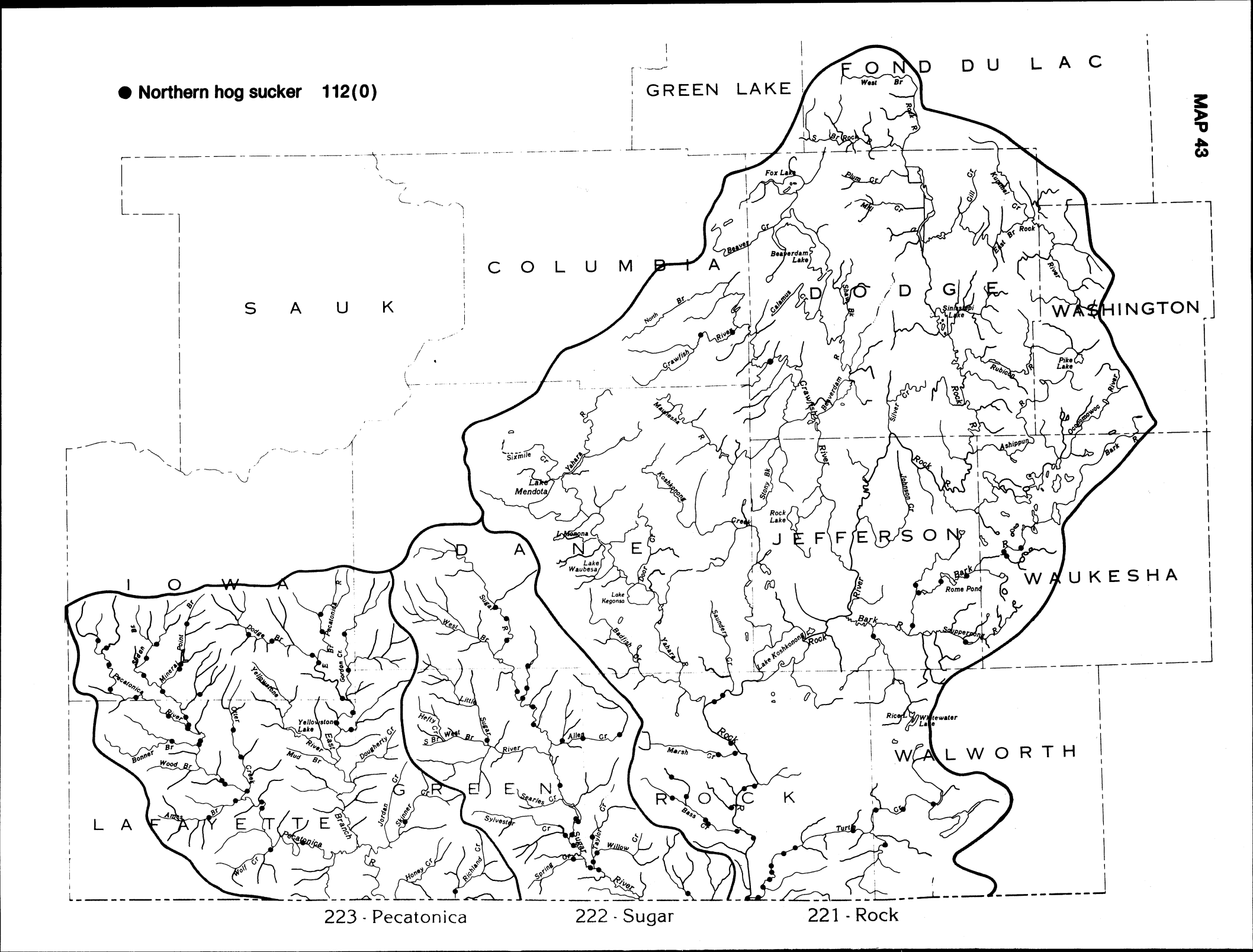

● Quillback 64(1)
▲ River carpsucker 1(0)
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock
MAP 40

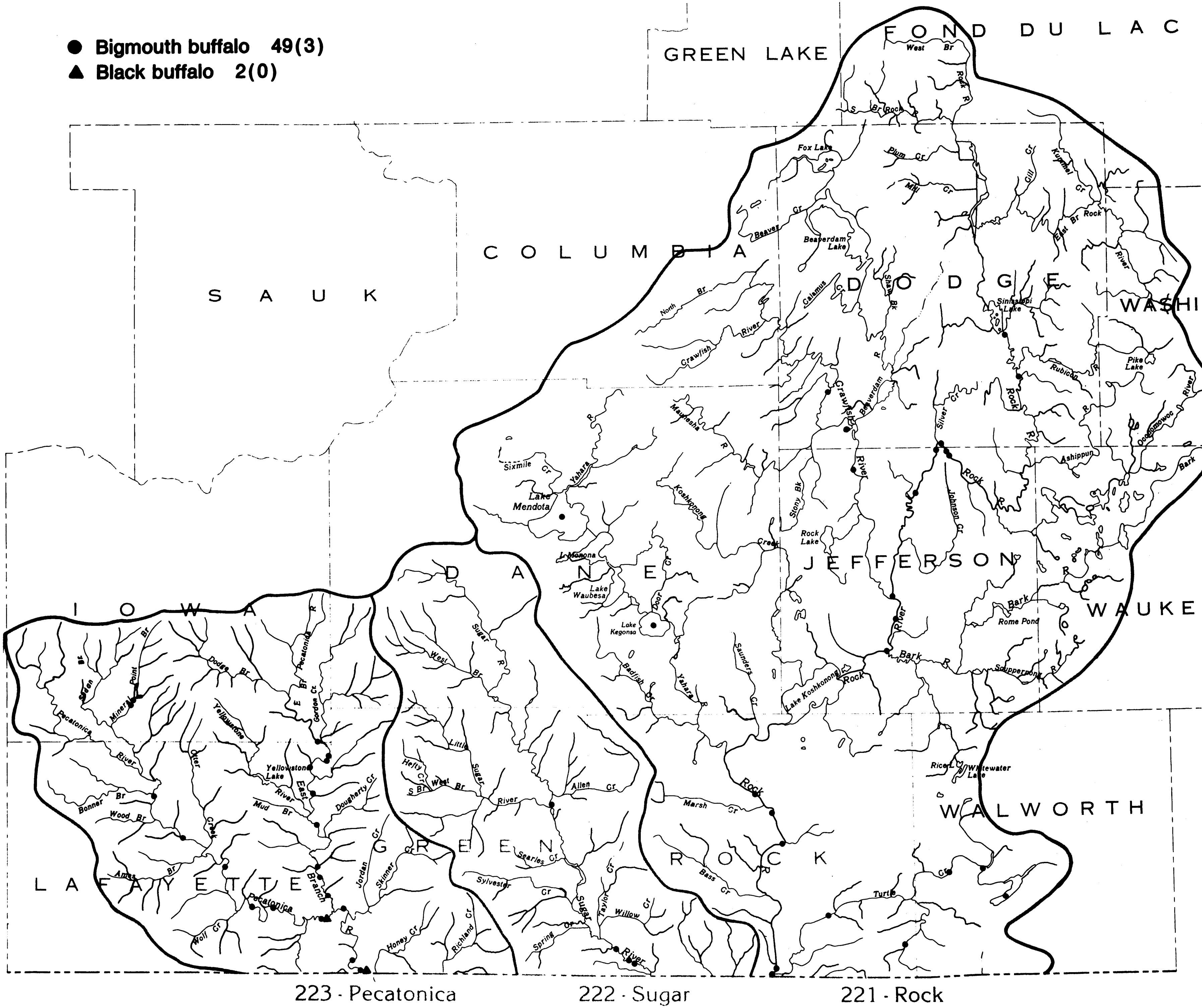

● White sucker 685(29)
MAP 41
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
Fox Lake
Beaverdam Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Pike Lake
Sinissippi Lake
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock

● **Lake chubsucker 21(3)**

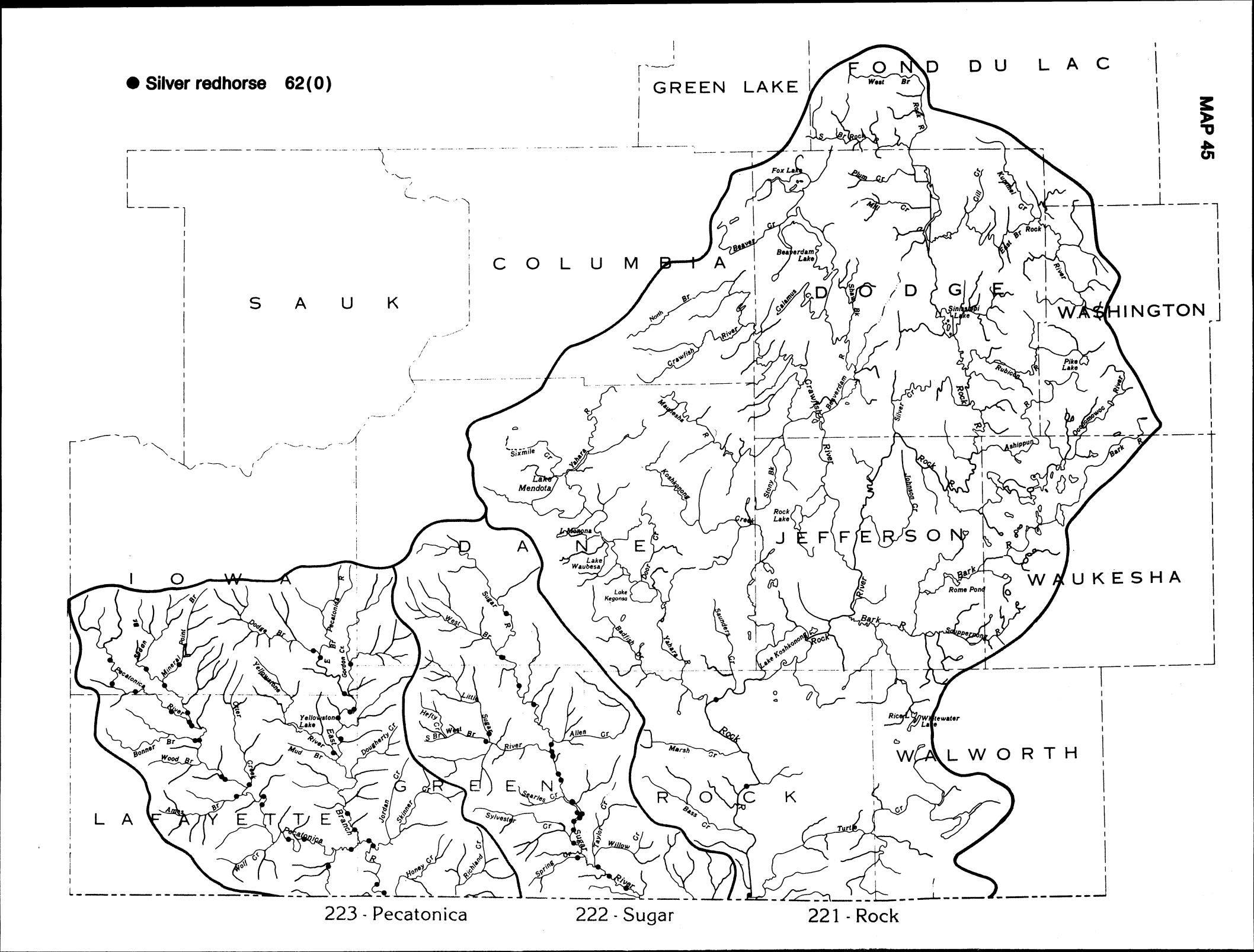


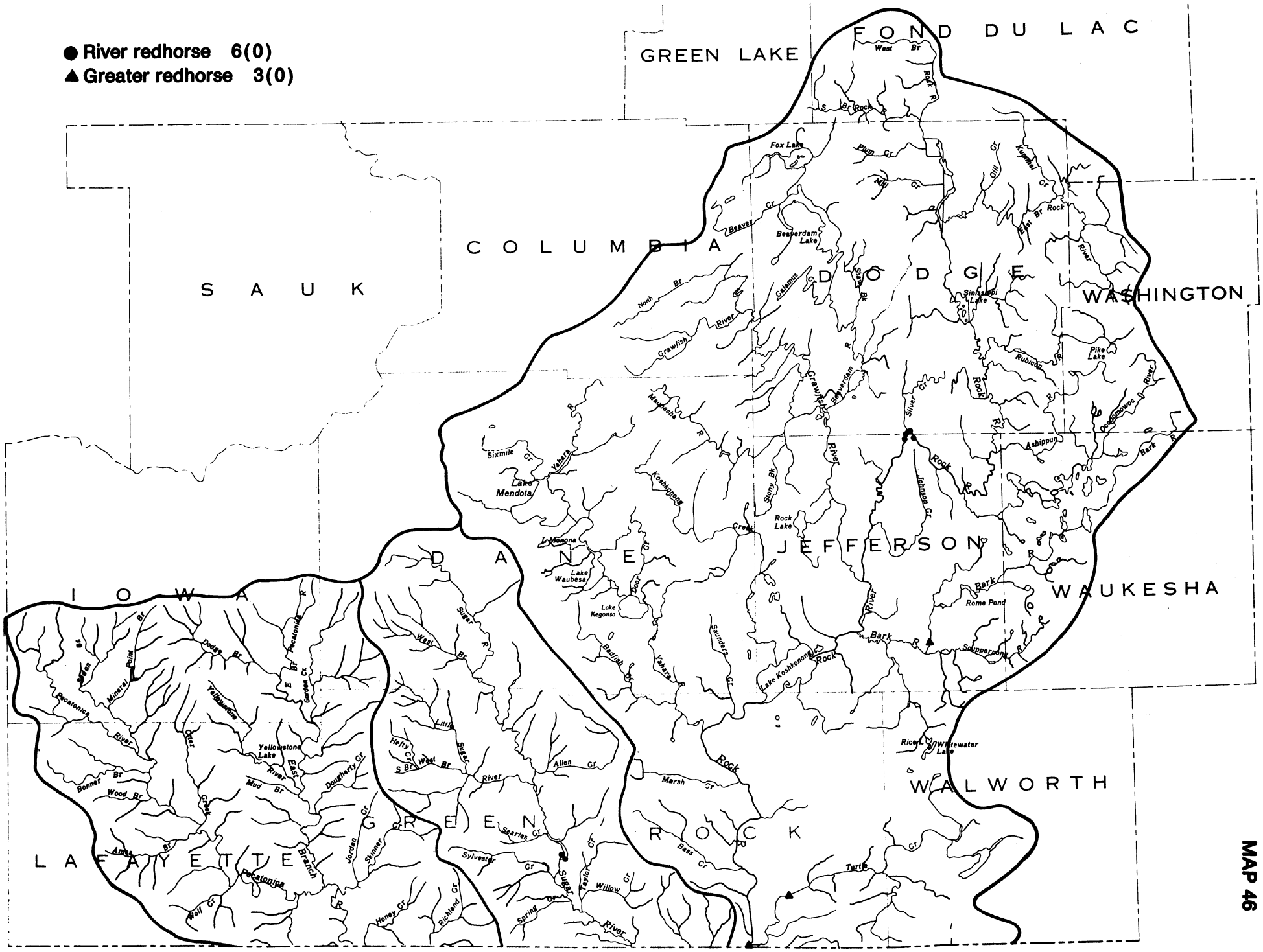
MAP 42


● Northern hog sucker 112(0)
MAP 43
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock


● Bigmouth buffalo 49(3)
▲ Black buffalo 2(0)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
223 - Pecatonica
222 - Sugar
221 - Rock

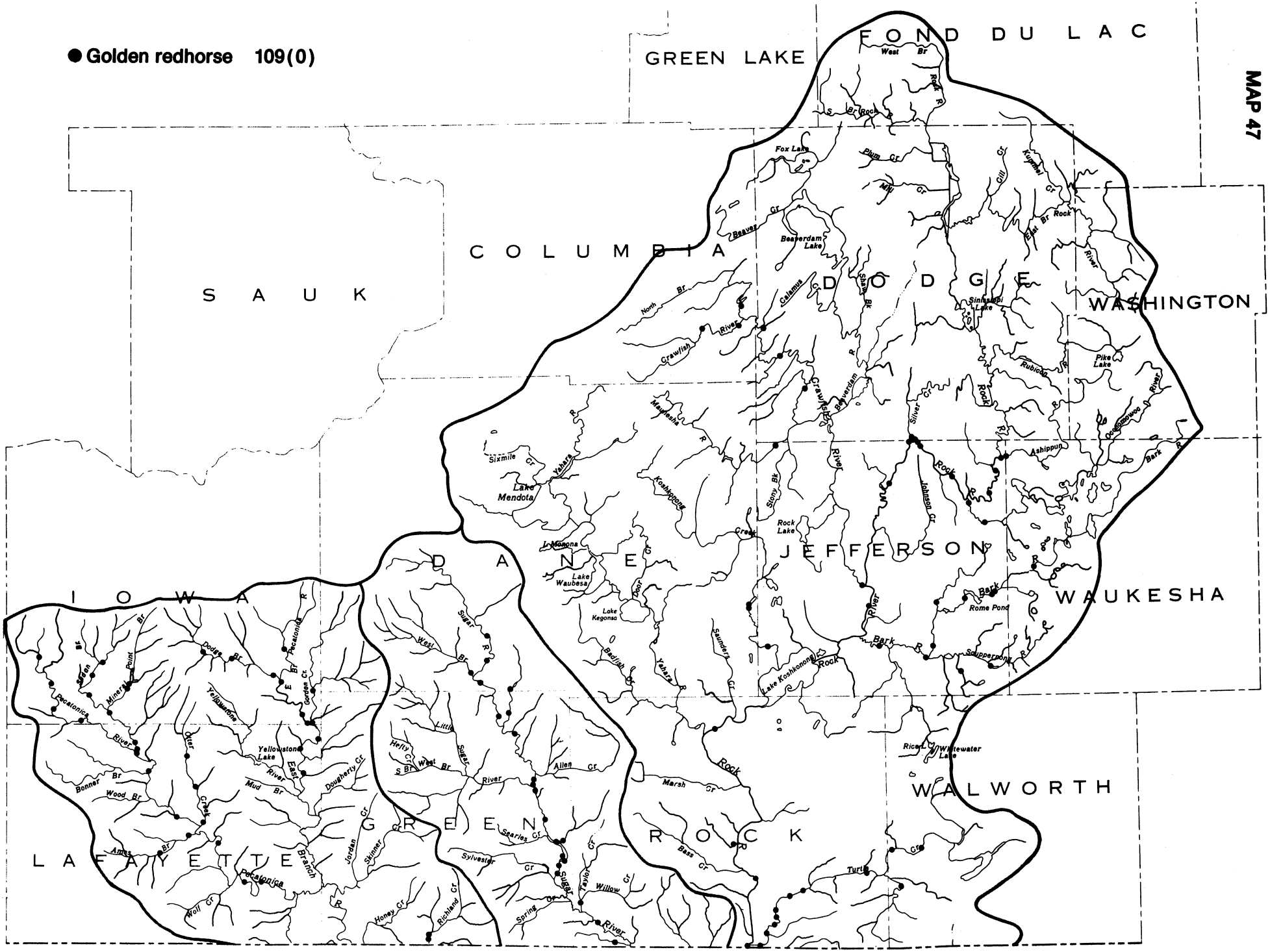
MAP 44


● Silver redhorse 62(0)
MAP 45
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock


● River redhorse 6(0)
▲ Greater redhorse 3(0)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Rome Pond
Lake Koshkonong
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

MAP 46

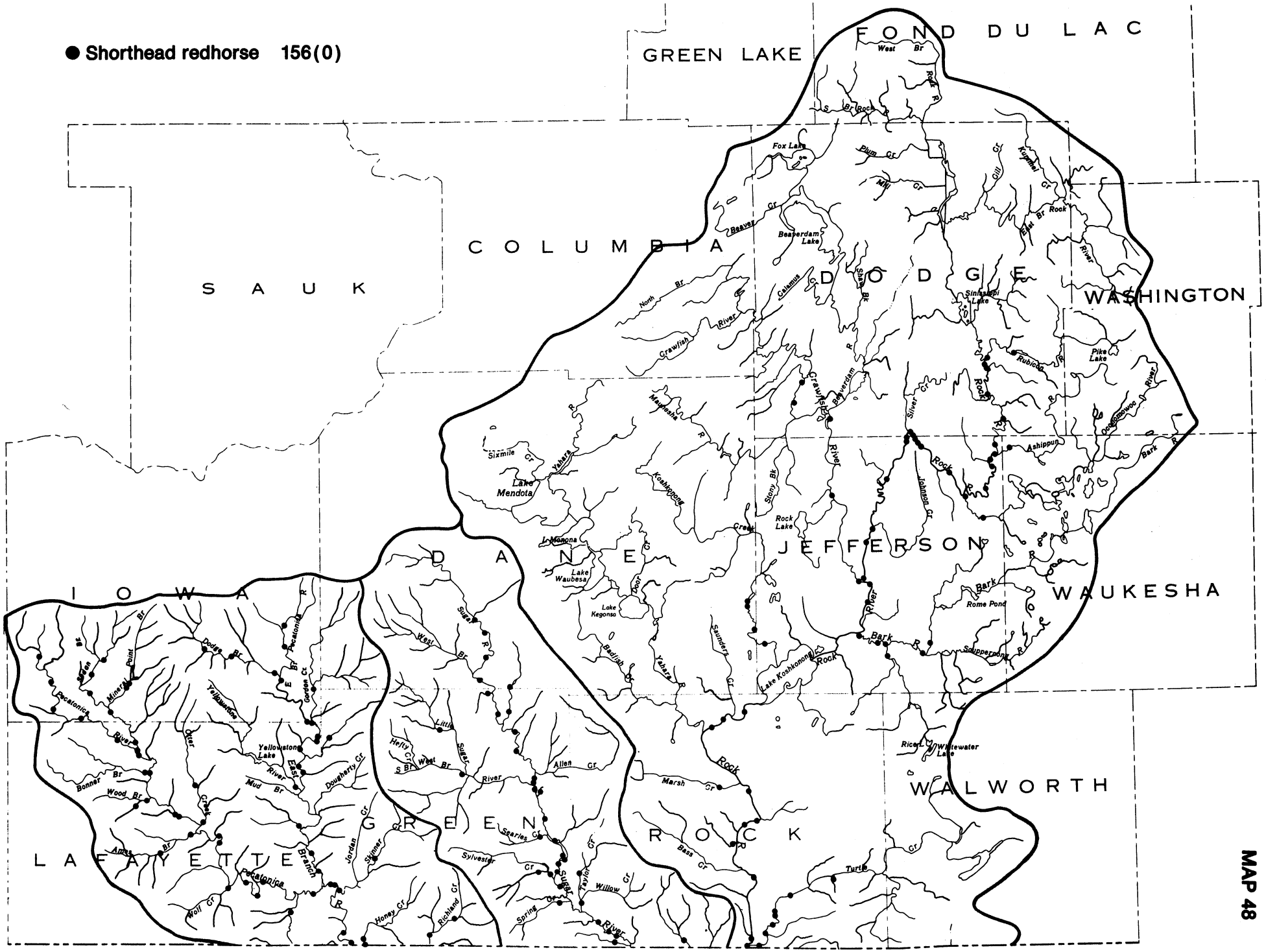
● **Golden redhorse 109(0)**



223 - Pecatonica 222 - Sugar 221 - Rock

MAP 47

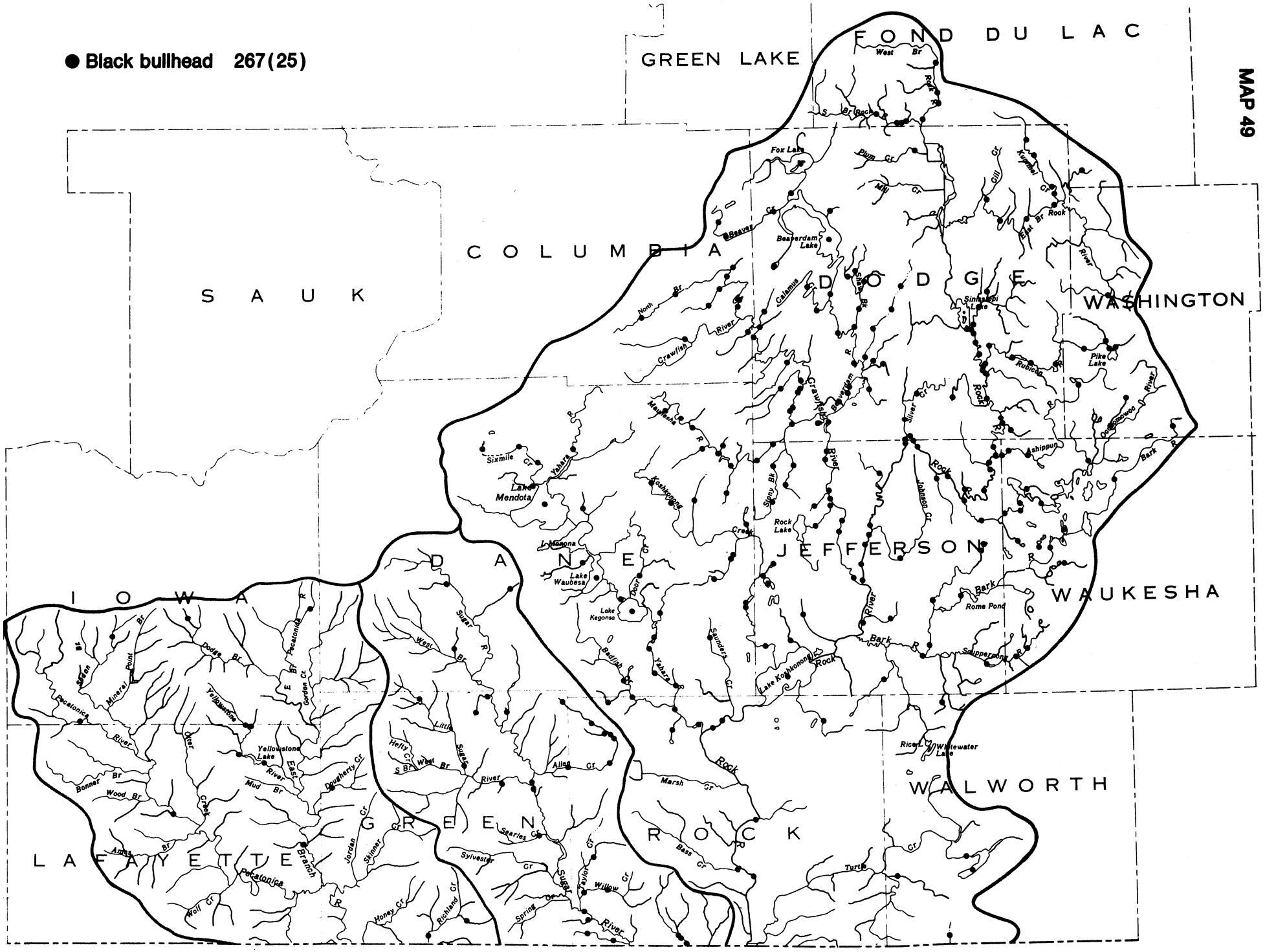
● **Shorthead redhorse 156(0)**



223 - Pecatonica 222 - Sugar 221 - Rock

MAP 48

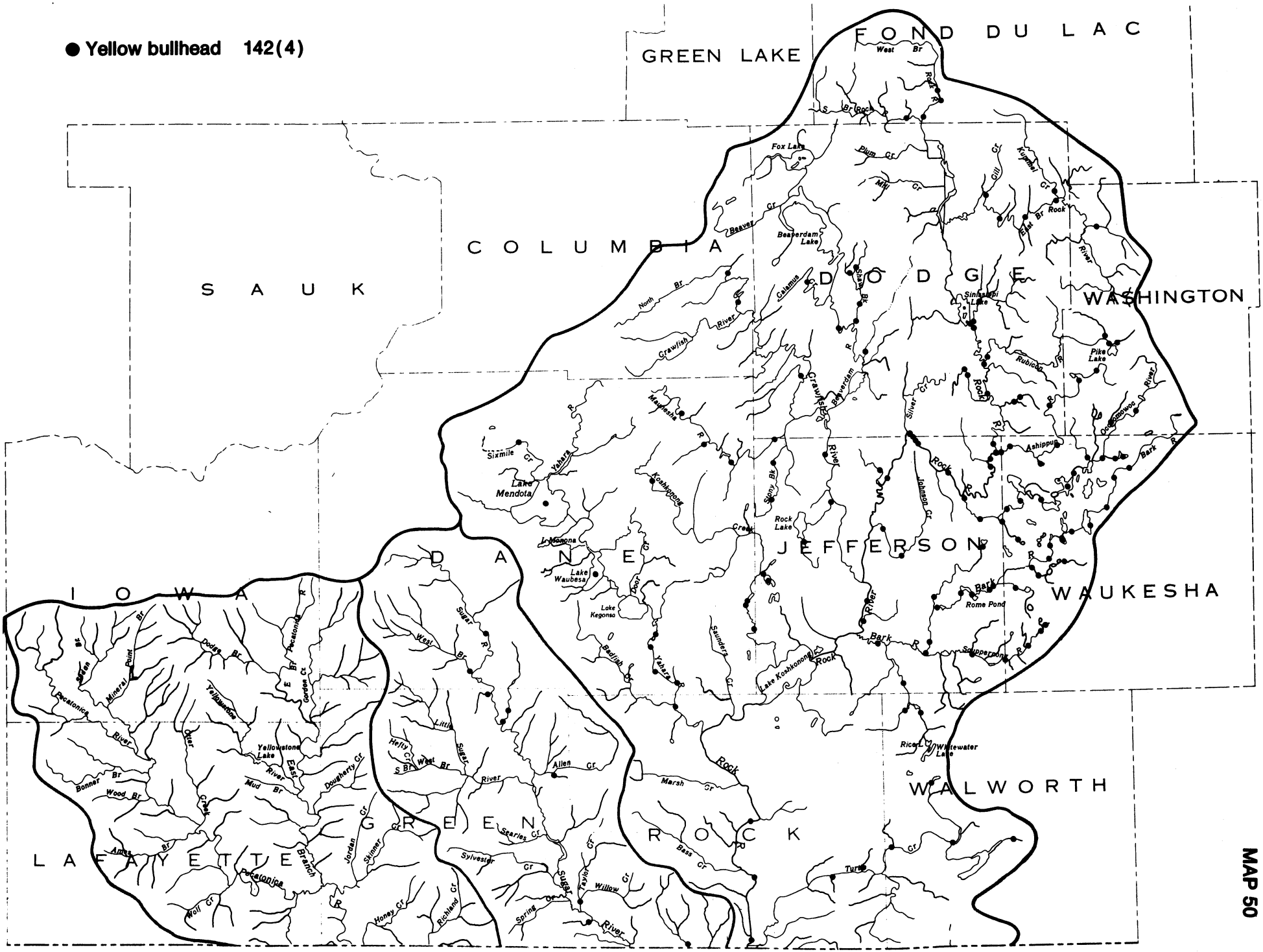
● Black bullhead 267(25)



223 - Pecatonica 222 - Sugar 221 - Rock

MAP 49

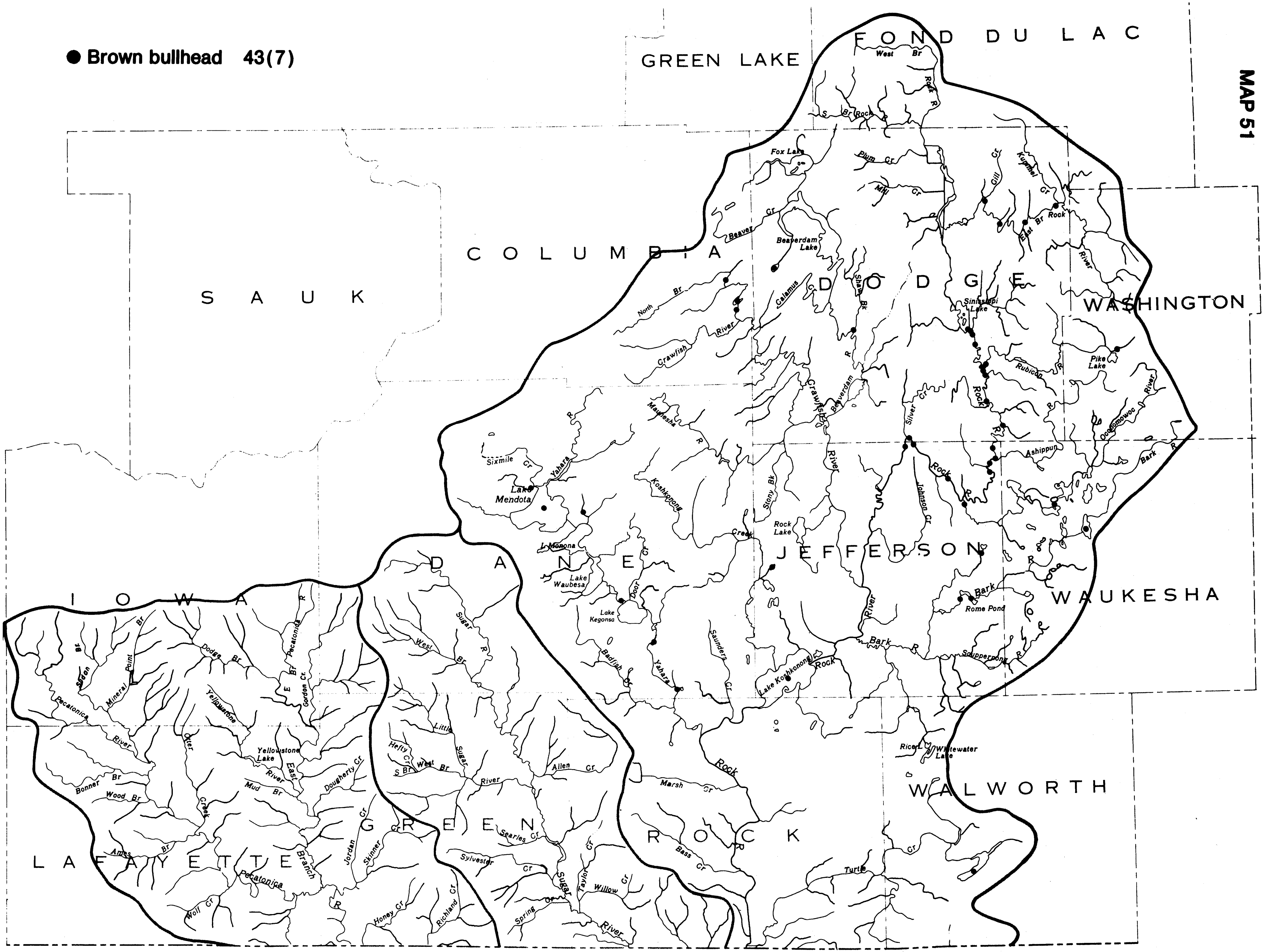
● **Yellow bullhead 142(4)**

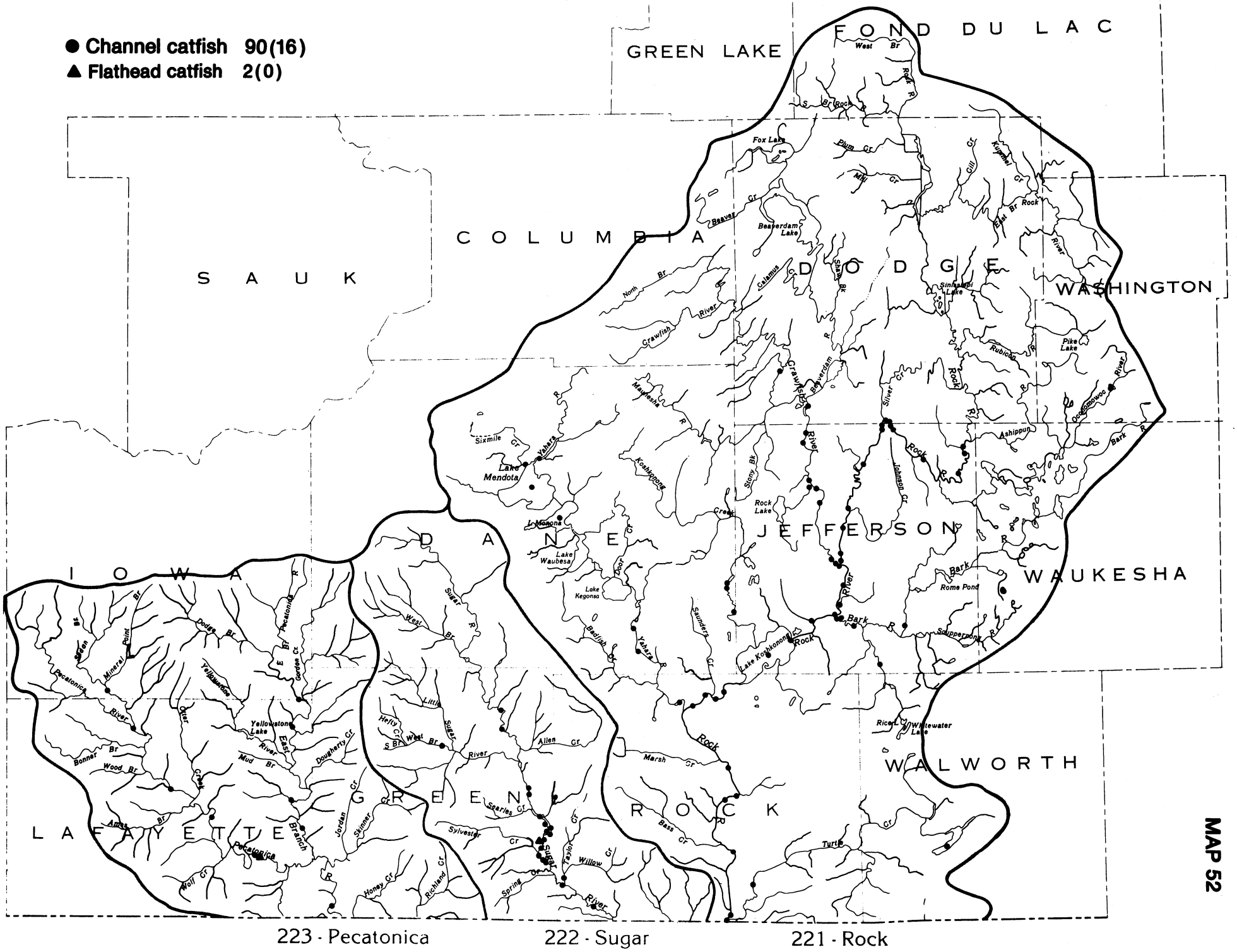


223 - Pecatonica 222 - Sugar 221 - Rock

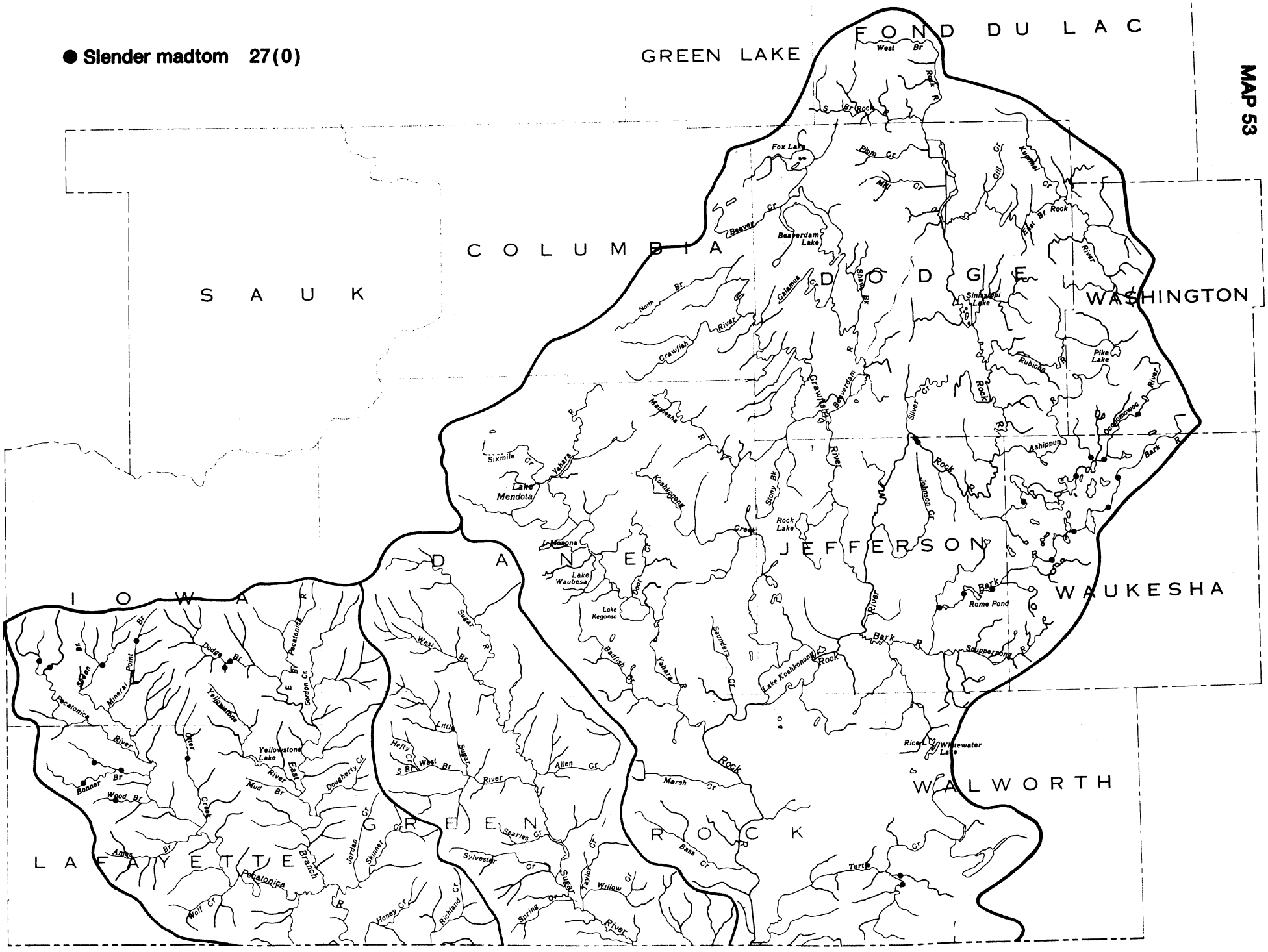
MAP 50

MAP 51


● Brown bullhead 43(7)
FOND DU LAC
GREEN LAKE
SAUK
COLUMBIA
DODGE
WASHINGTON
DANE
JEFFERSON
WAUKESHA
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
L. Monona
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Rice L.
Whitewater Lake
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

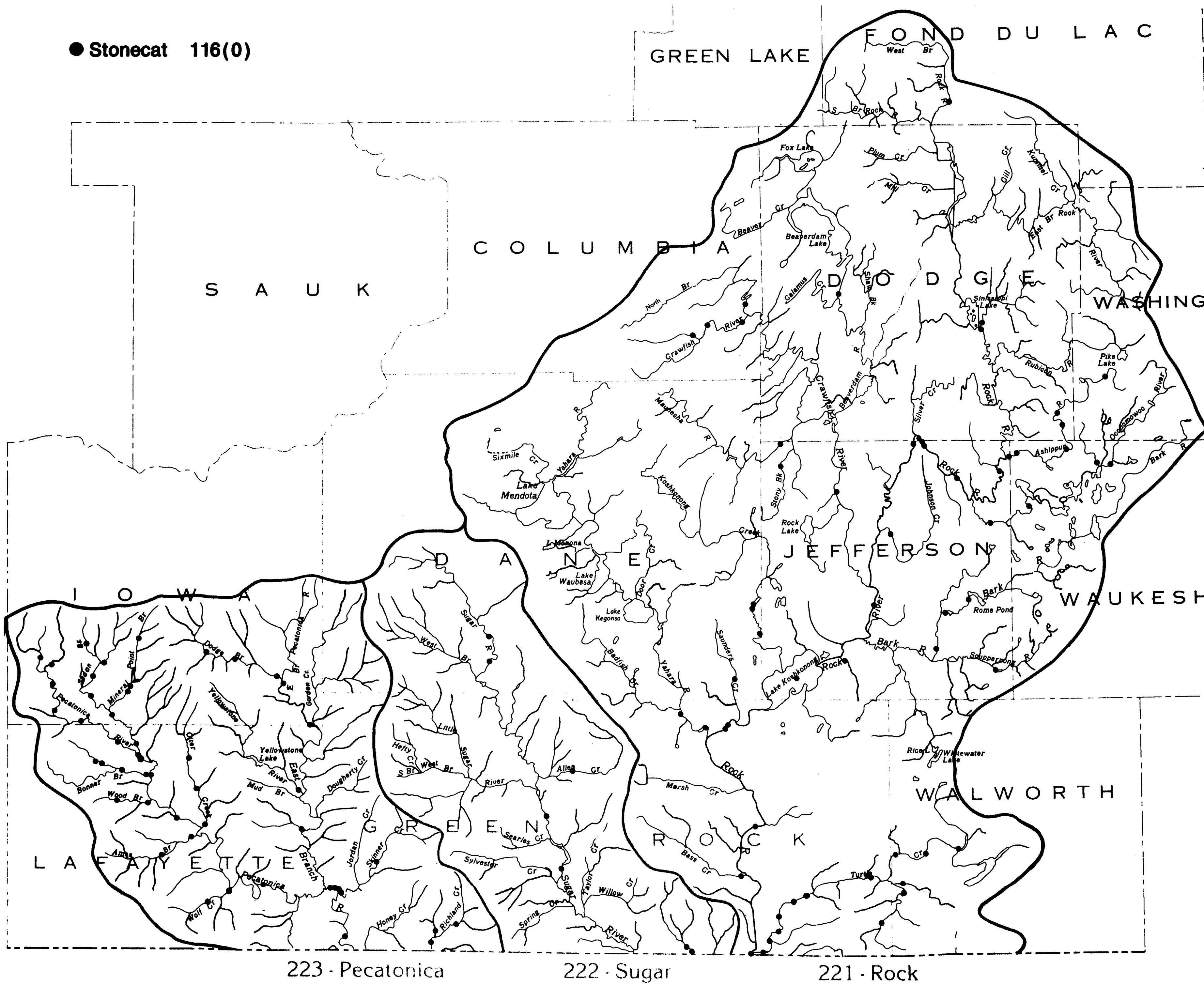

● Channel catfish 90(16)
▲ Flathead catfish 2(0)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Lake Mendota
Lake Monona
Lake Waubesa
Lake Kegonsa
Rock Lake
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Rome Pond
Lake Koshkonong
Yellowstone Lake
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock
MAP 52

● **Slender madtom 27(0)**

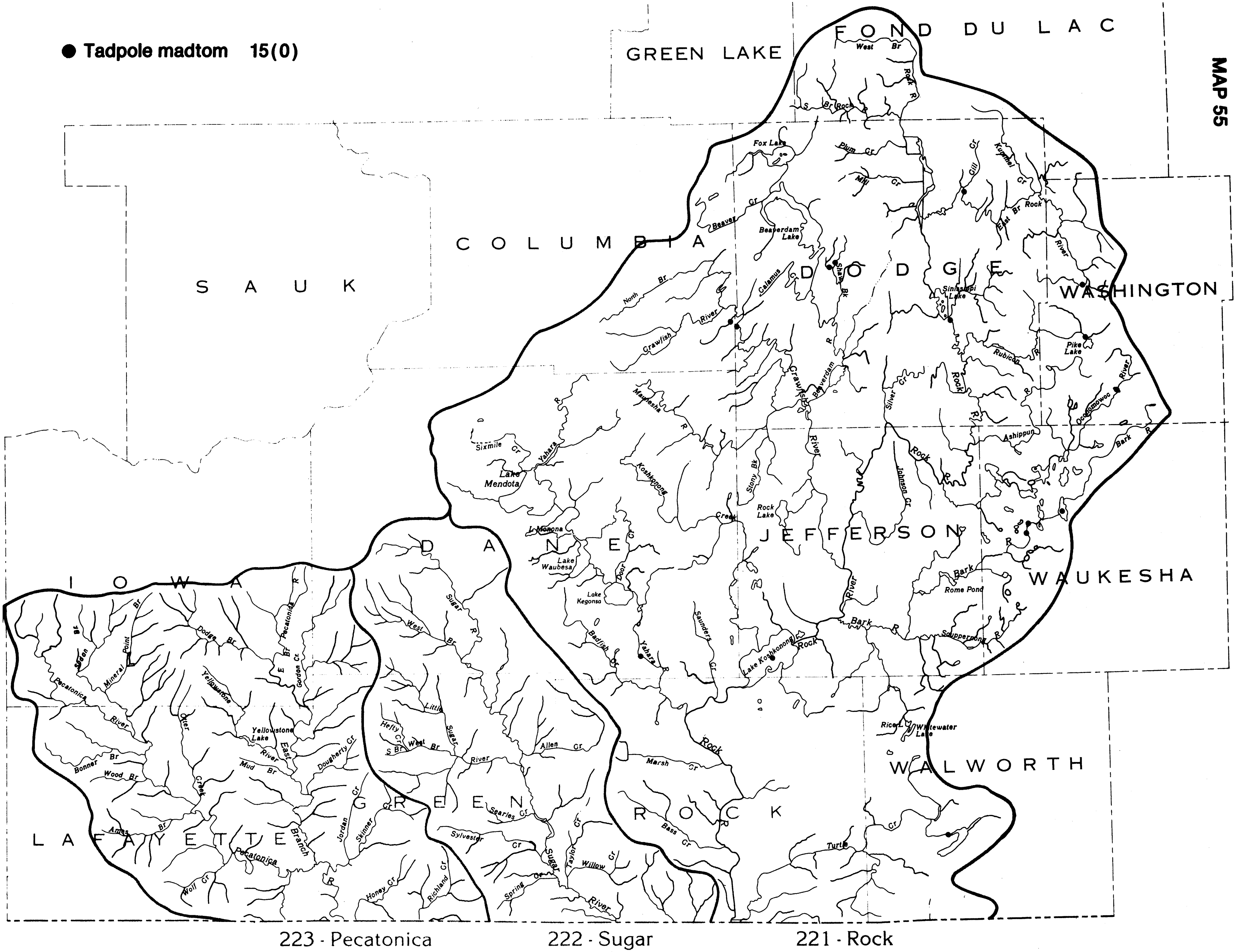


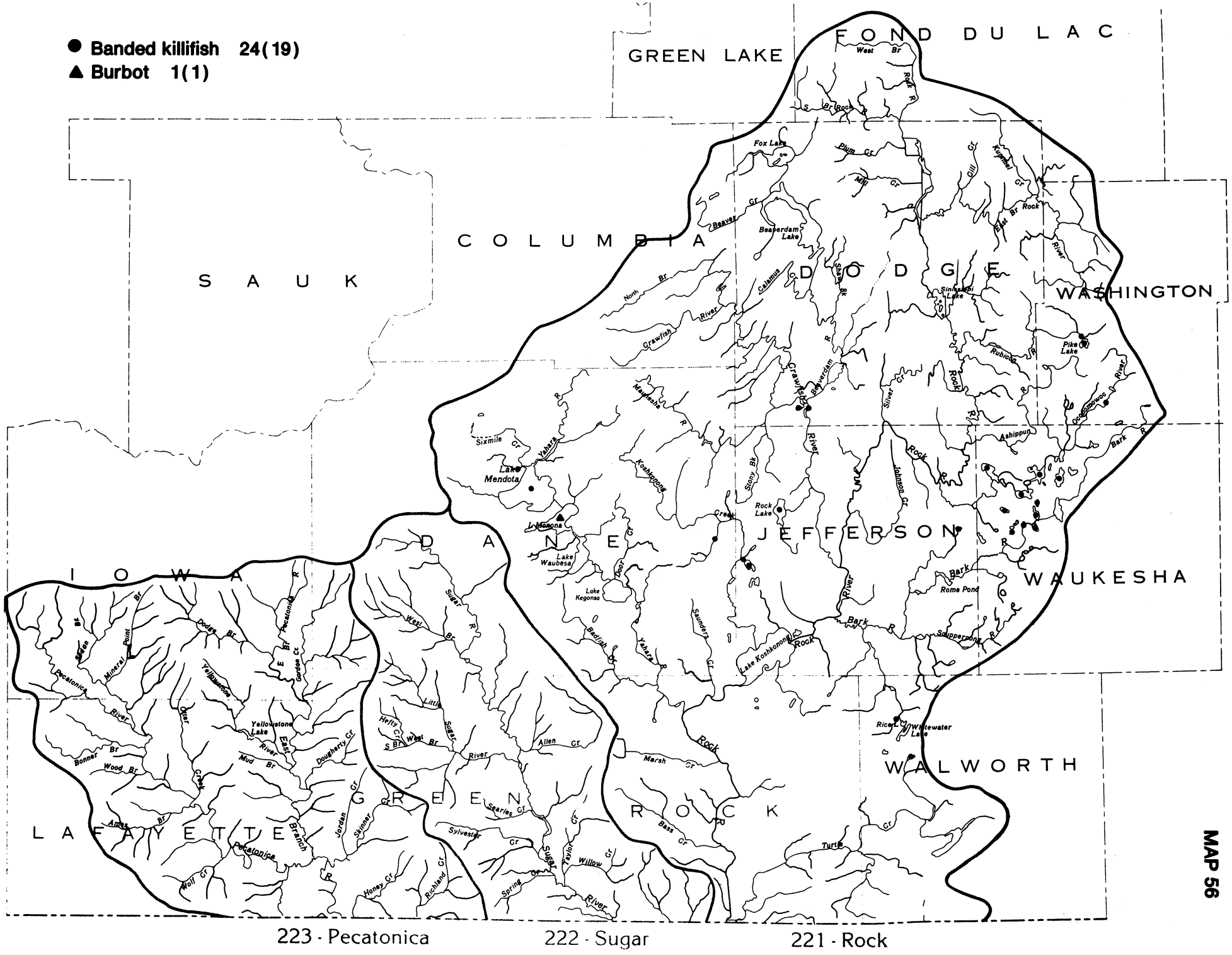
223 - Pecatonica 222 - Sugar 221 - Rock

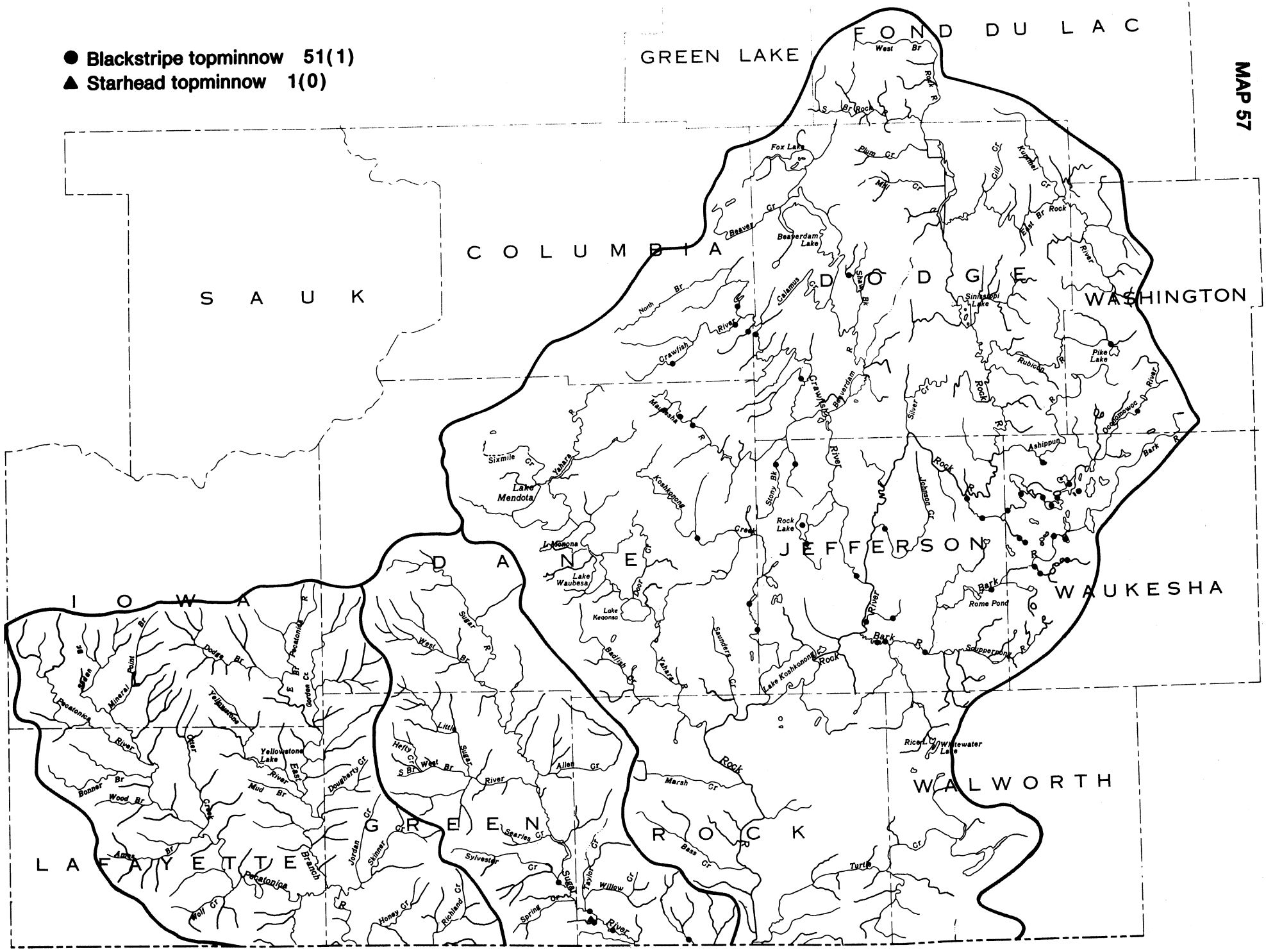
MAP 53


● Stonecat 116(0)
GREEN LAKE
FOND DU LAC
SAUK
COLUMBIA
DODGE
WASHINGTON
JEFFERSON
DANE
IOWA
WAUKESHA
LAFAYETTE
GREEN
ROCK
WALWORTH
Lake Mendota
L. Monona
Lake Waubesa
Lake Kegonsa
Lake Koshkonong
Beaverdam Lake
Fox Lake
Sinissippi Lake
Pike Lake
Rock Lake
Rome Pond
Yellowstone Lake
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock

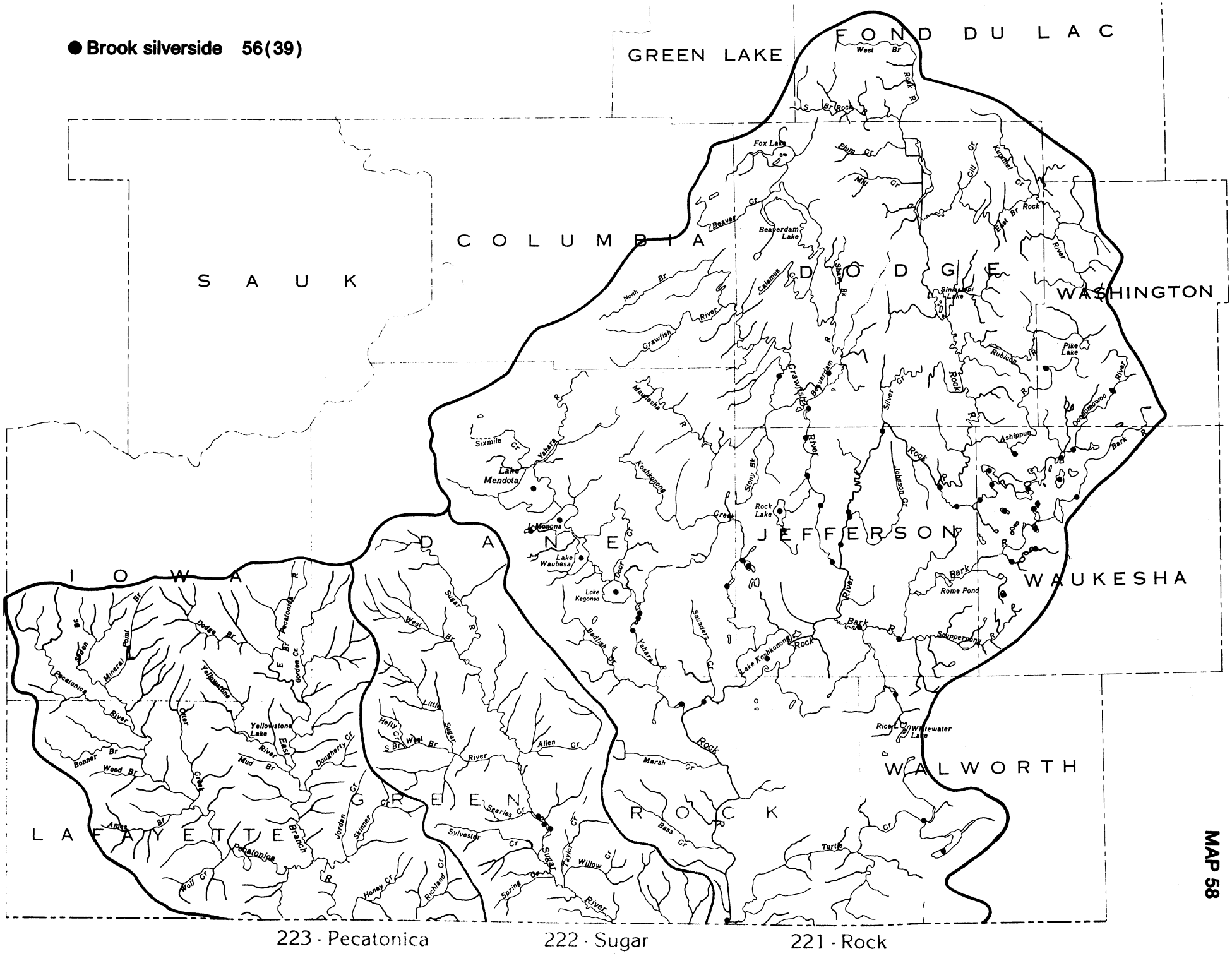
MAP 54


● Tadpole madtom 15(0)
MAP 55
GREEN LAKE
FOND DU LAC
SAUK
COLUMBIA
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
223 - Pecatonica
222 - Sugar
221 - Rock

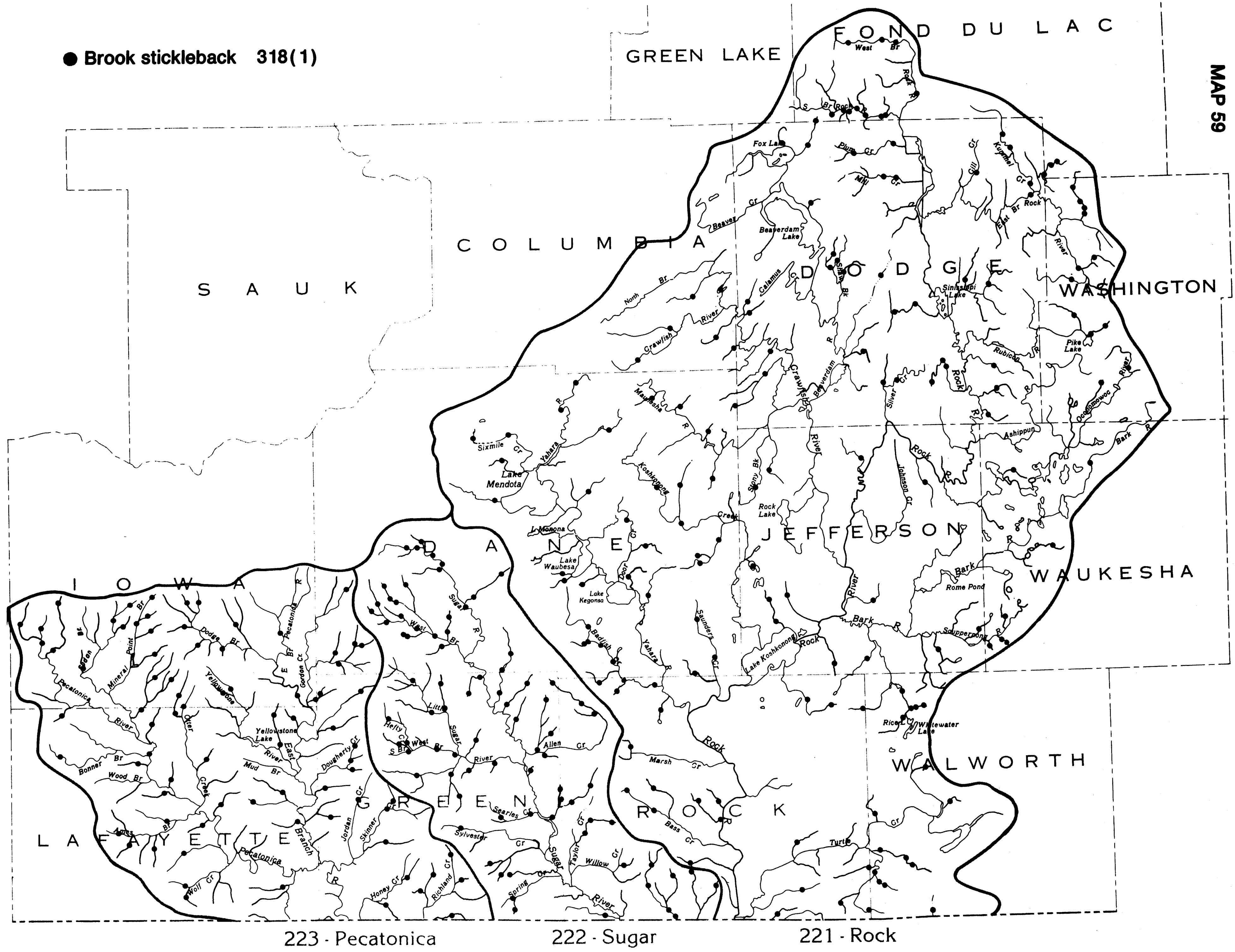

● Banded killifish 24(19)
▲ Burbot 1(1)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rice Lake
Whitewater Lake
Sinissippi Lake
Pike Lake
Rome Pond
223 - Pecatonica
222 - Sugar
221 - Rock
MAP 56


● Blackstripe topminnow 51(1)
▲ Starhead topminnow 1(0)
MAP 57
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Lake Mendota
Lake Waubesa
Lake Kegonsa
Lake Koshkonong
Rock Lake
Rome Pond
Pike Lake
Beaverdam Lake
Fox Lake
Sinissippi Lake
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock

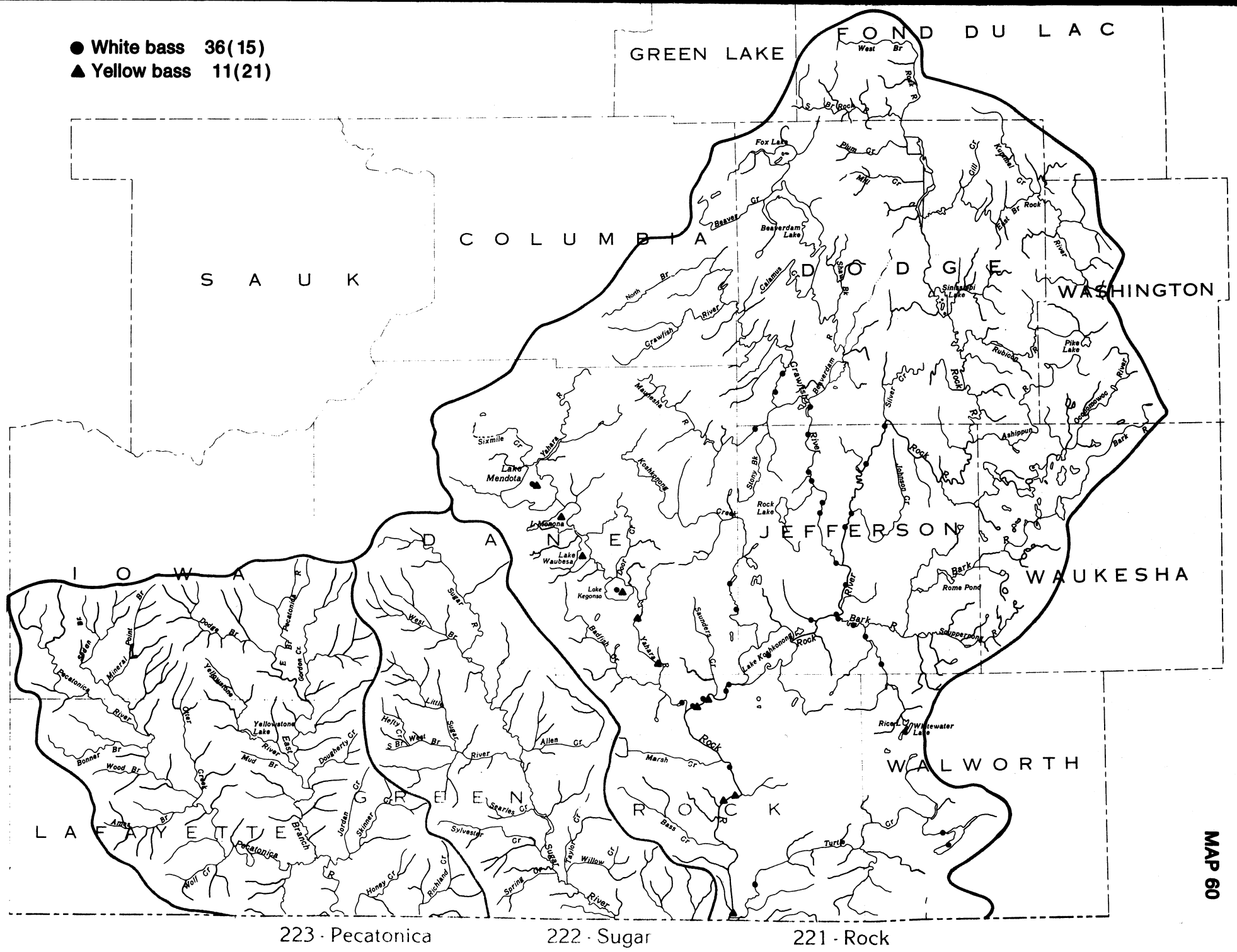
● **Brook silverside 56(39)**

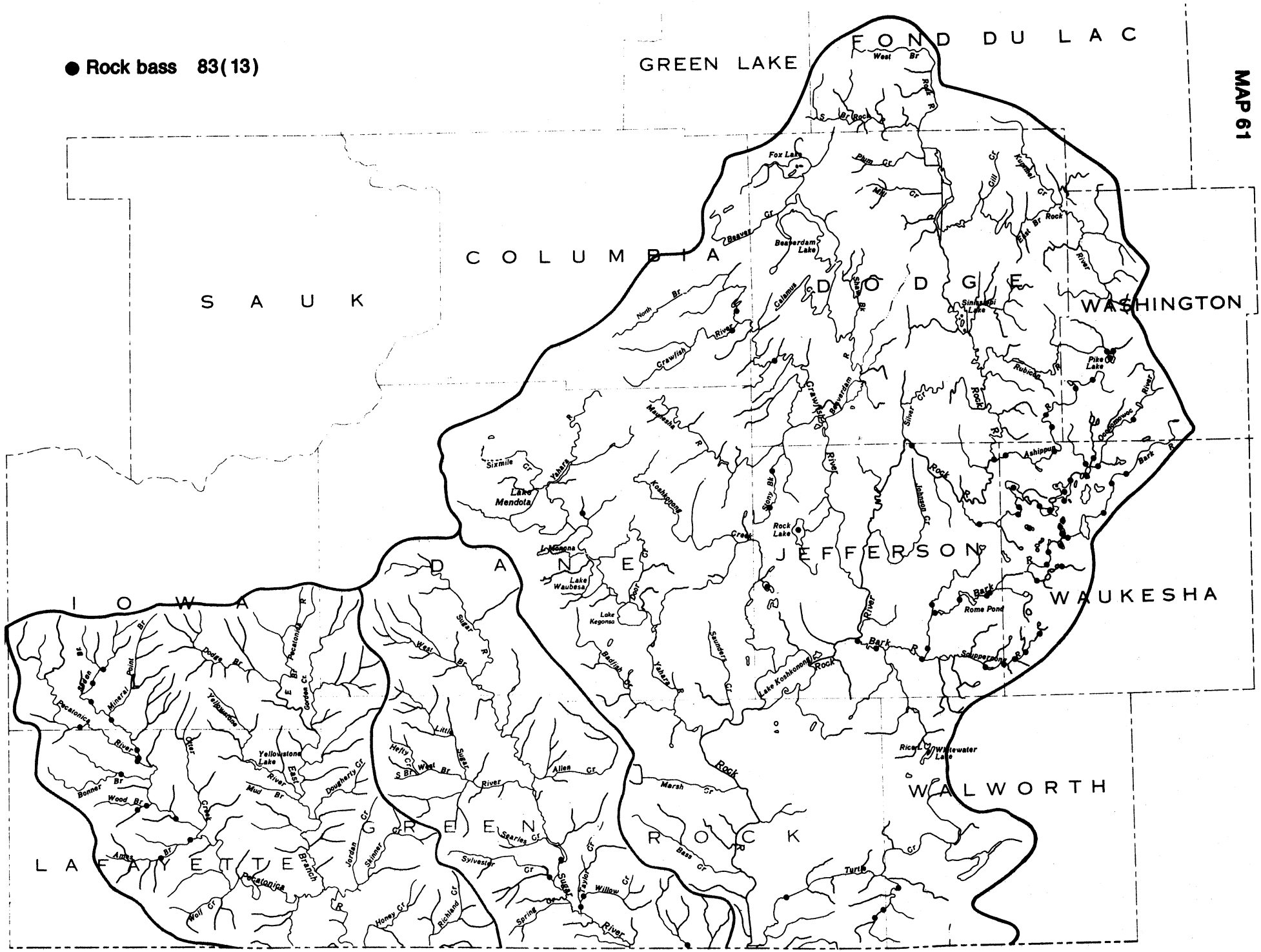


MAP 58

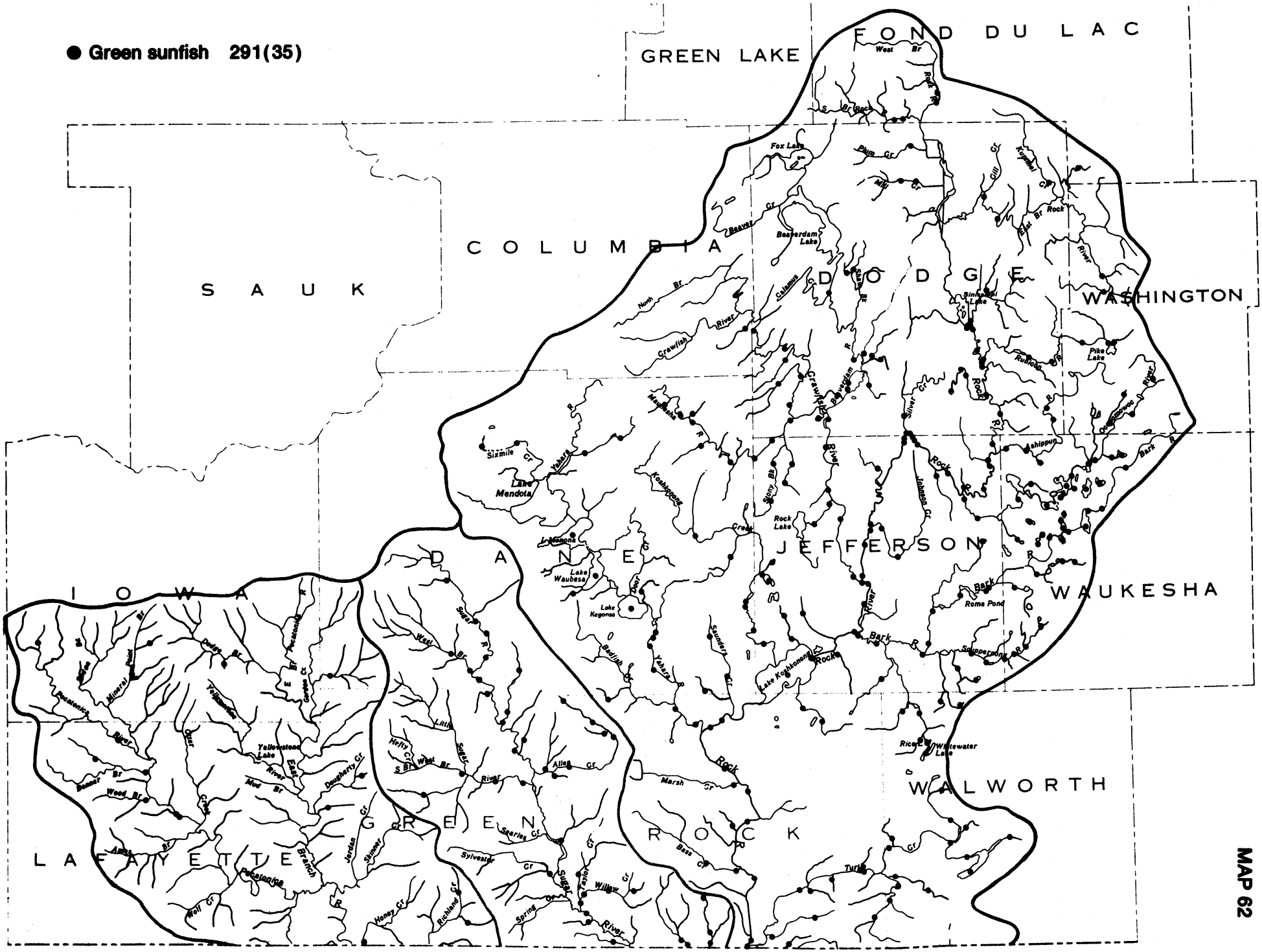


● Brook stickleback 318(1)
MAP 59
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
223 - Pecatonica
222 - Sugar
221 - Rock


● White bass 36(15)
▲ Yellow bass 11(21)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
WALWORTH
IOWA
LAFAYETTE
GREEN
ROCK
DANE
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rice L.
Whitewater Lake
Rome Pond
Yellowstone Lake
223 · Pecatonica
222 · Sugar
221 · Rock
MAP 60

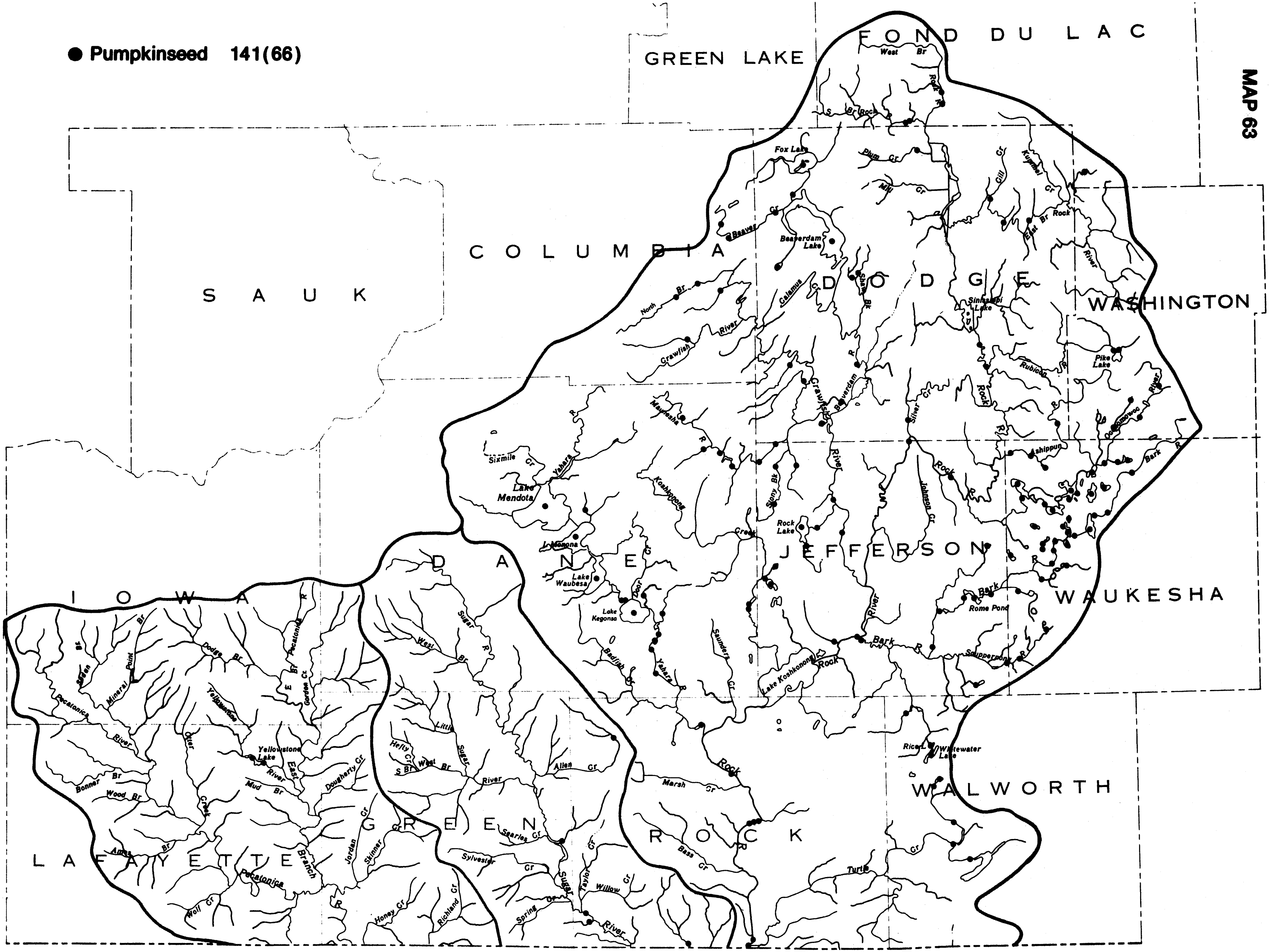

● Rock bass 83(13)
MAP 61
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock

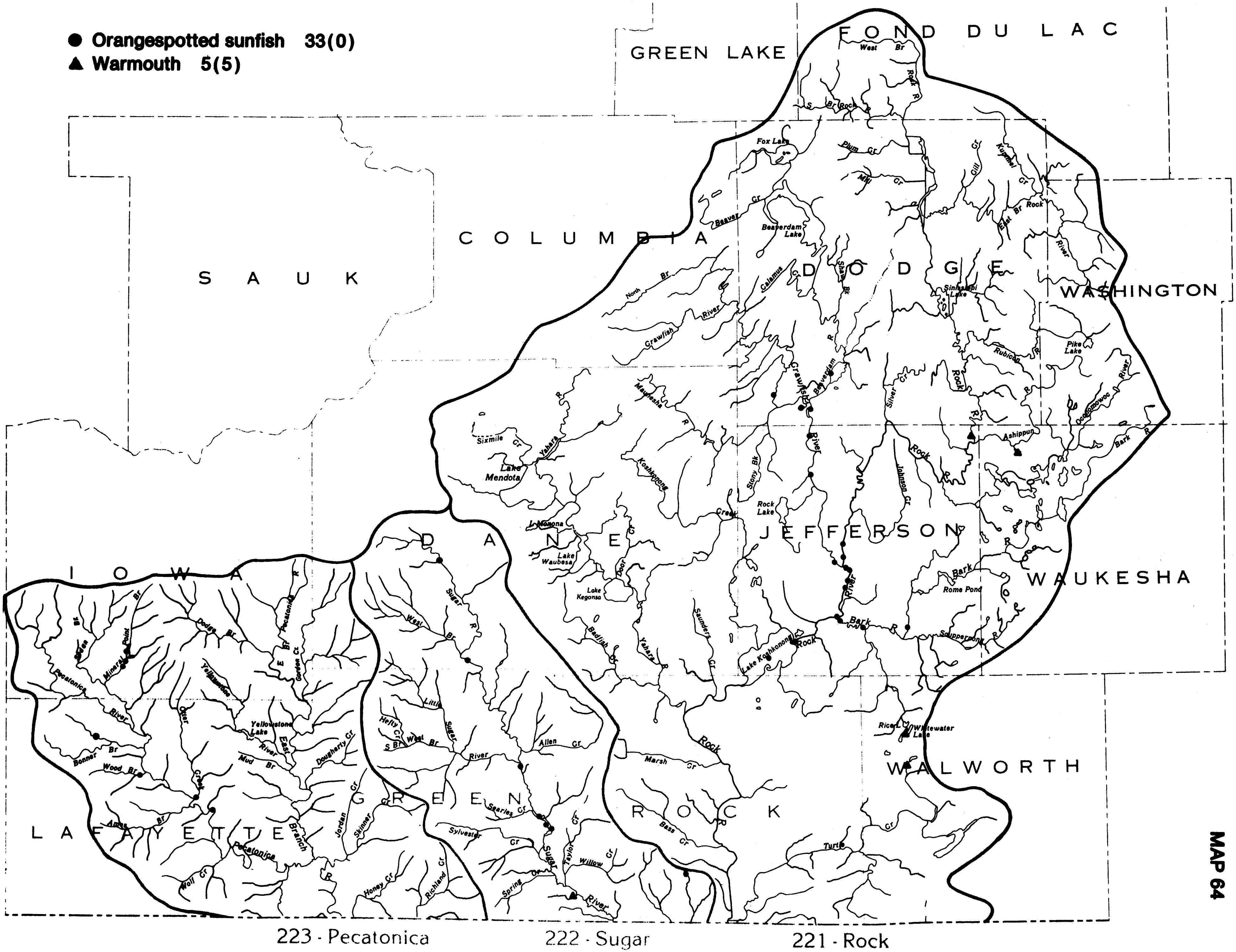
● **Green sunfish 291(35)**



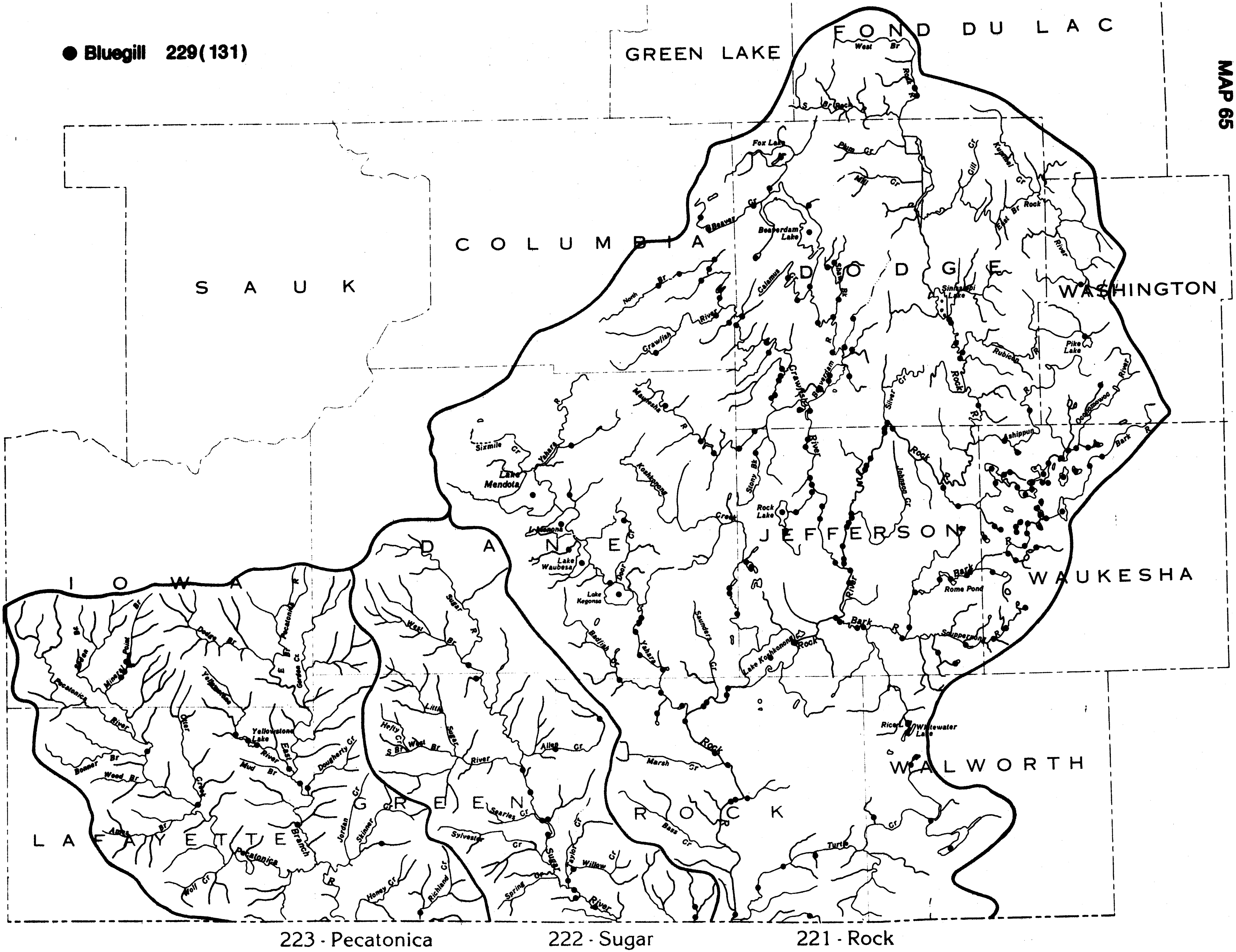
223 · Pecatonica 222 · Sugar 221 · Rock

MAP 62


● Pumpkinseed 141(66)
MAP 63
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
IOWA
DANE
JEFFERSON
WAUKESHA
LAFAYETTE
GREEN
ROCK
WALWORTH
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
L. Monona
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Rice L.
Whitewater Lake
Yellowstone Lake
223 · Pecatonica
222 · Sugar
221 · Rock

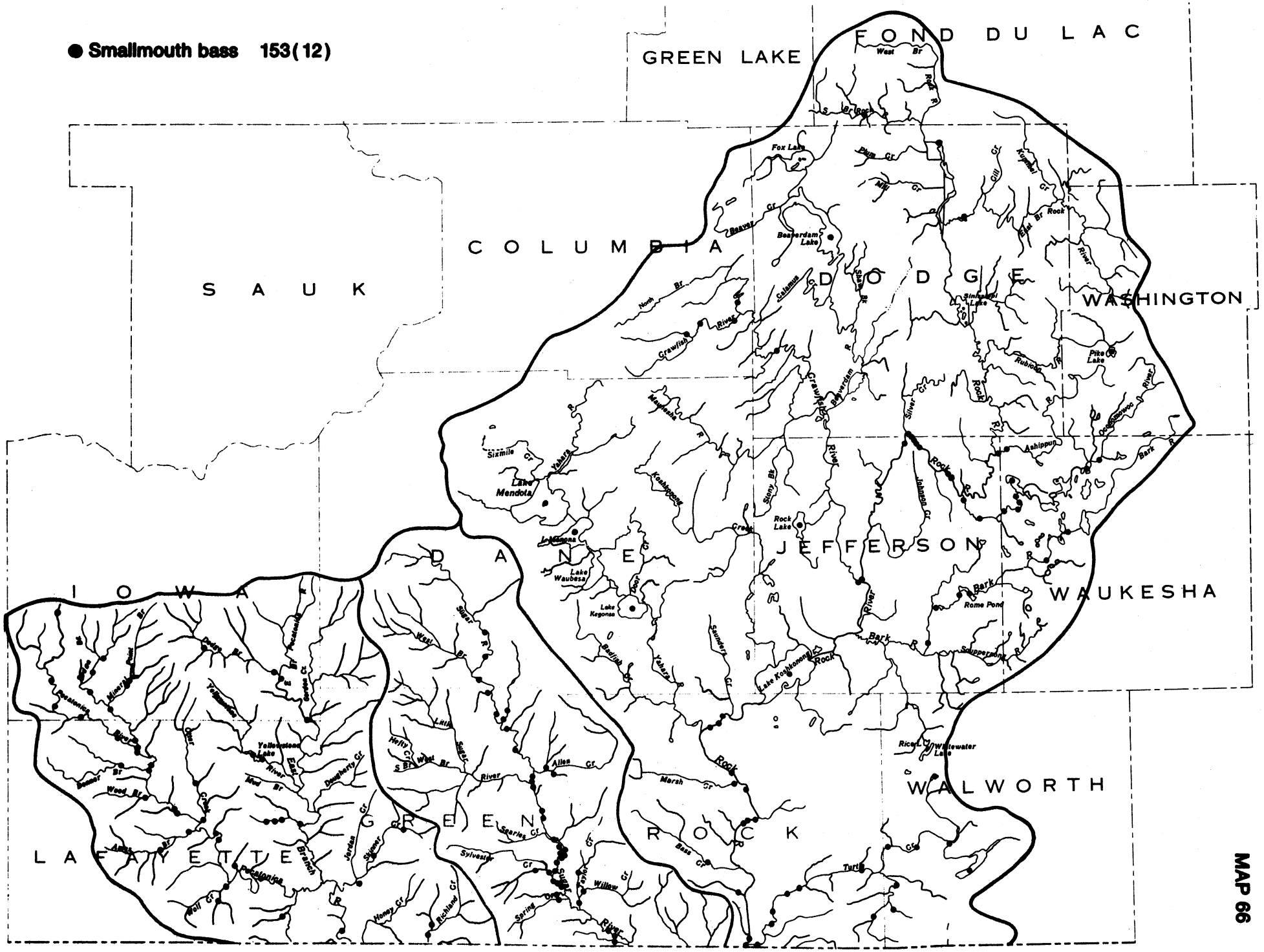

● Orangespotted sunfish 33(0)
▲ Warmouth 5(5)
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock

MAP 64

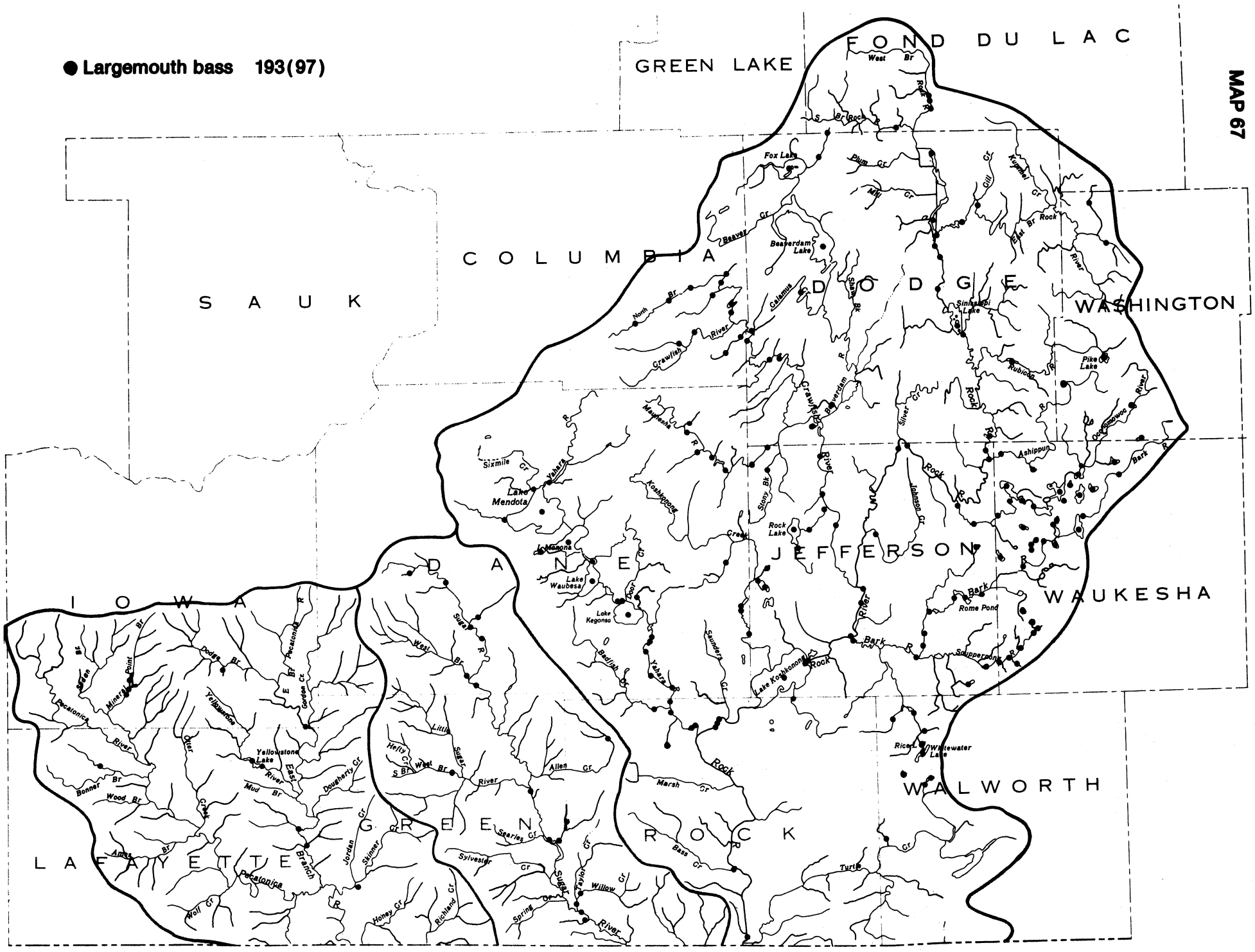


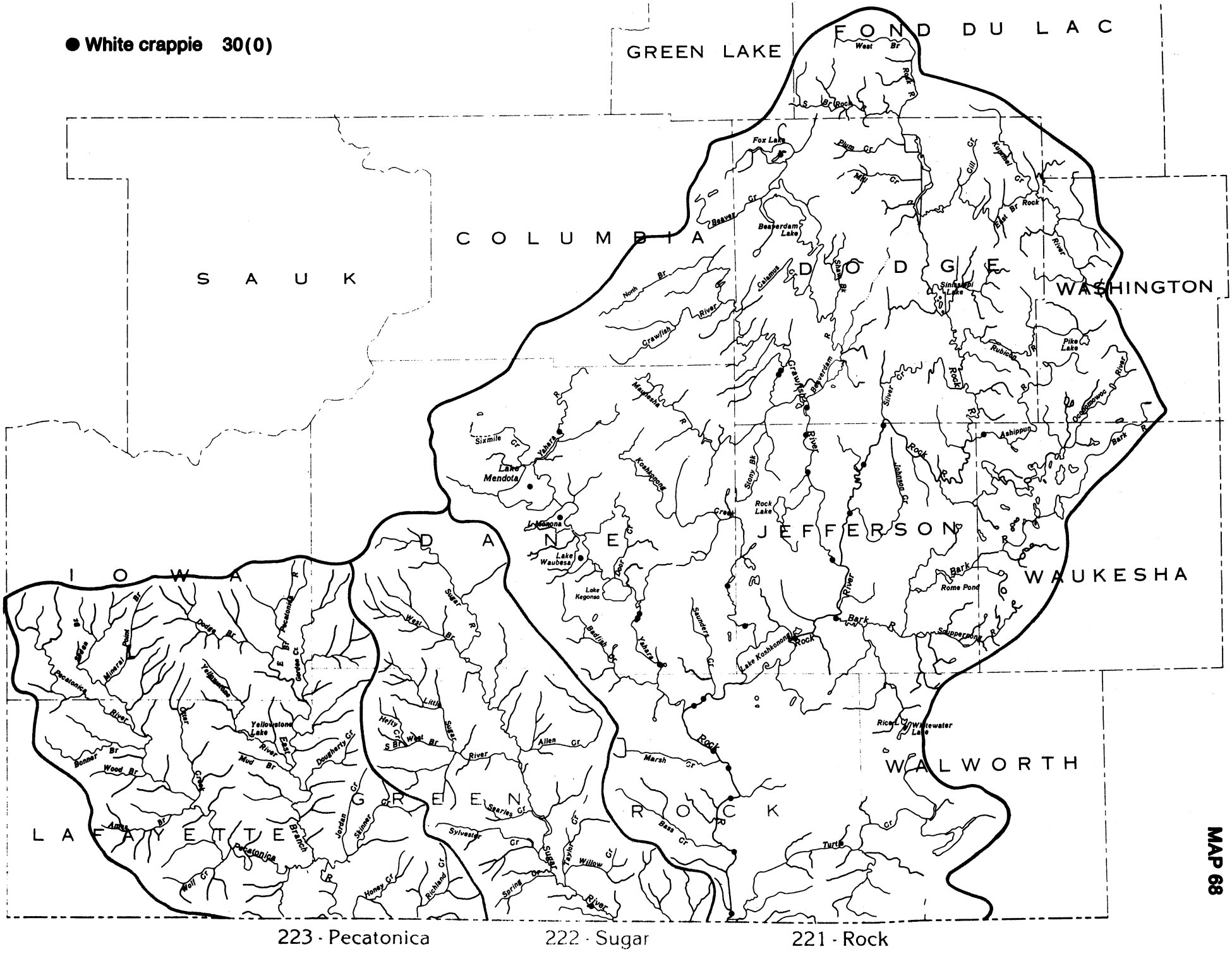
● Bluegill 229(131)
MAP 65
GREEN LAKE
FOND DU LAC
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
Lake Mendota
Lake Waubesa
Lake Kegonsa
Lake Koshkonong
Beaverdam Lake
Fox Lake
Rock Lake
Sinissippi Lake
Pike Lake
Whitewater Lake
Rome Pond
Yellowstone Lake
223 - Pecatonica
222 - Sugar
221 - Rock

● **Smallmouth bass 153(12)**

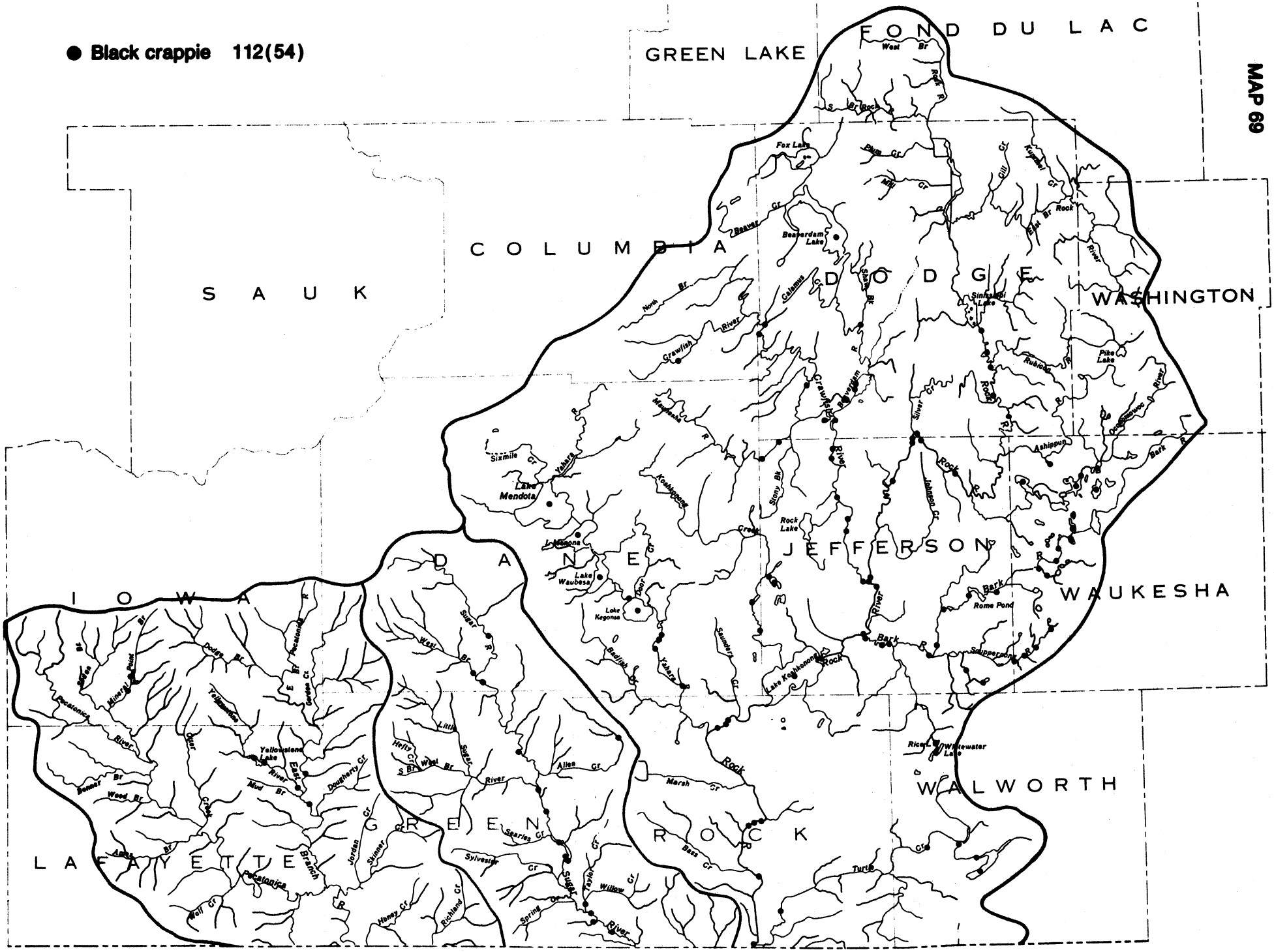


MAP 66

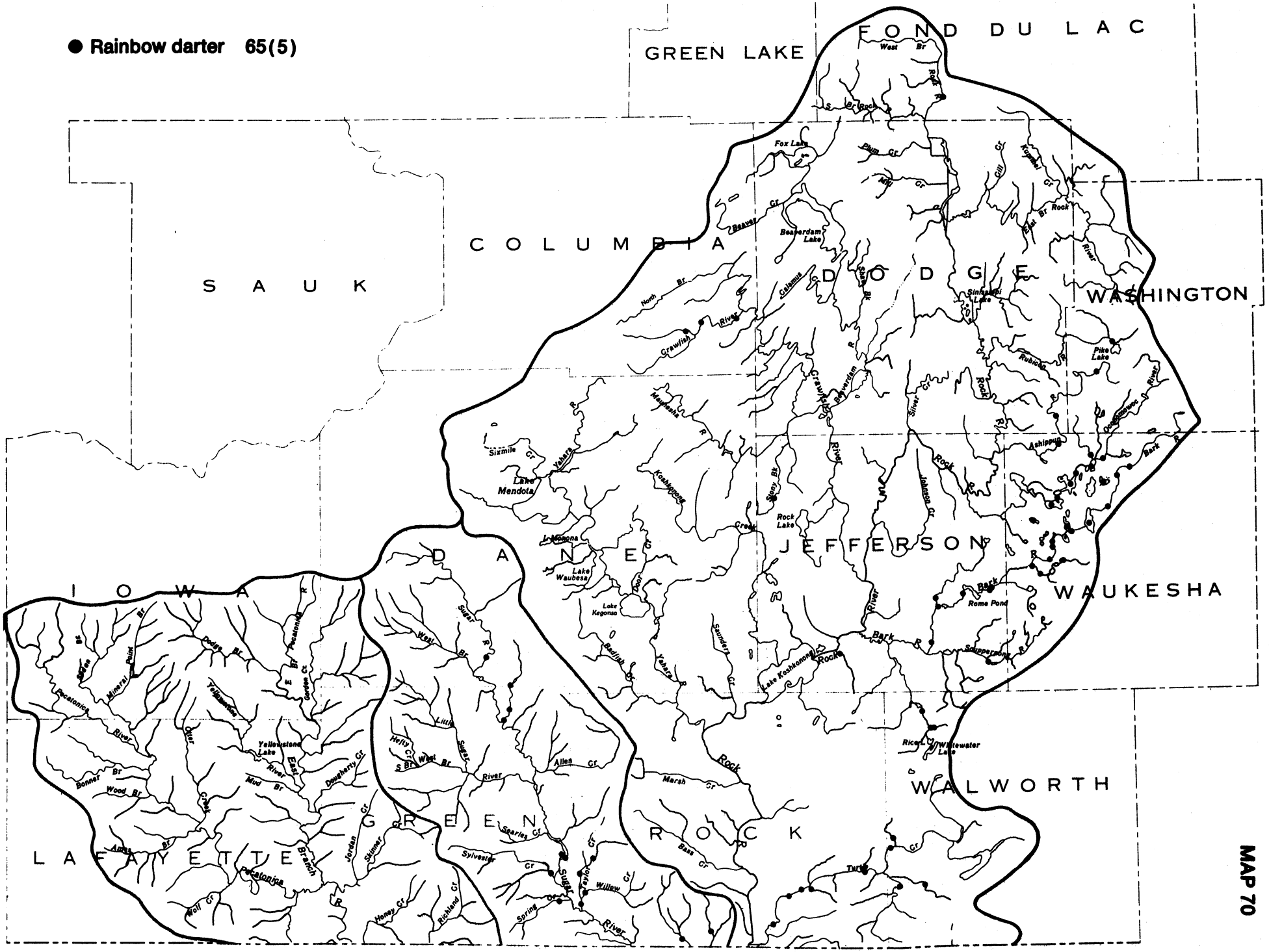

● Largemouth bass 193(97)
MAP 67
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
223 - Pecatonica
222 - Sugar
221 - Rock


● White crappie 30(0)
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
WAUKESHA
JEFFERSON
DANE
IOWA
GREEN
ROCK
WALWORTH
LAFAYETTE
Lake Mendota
Lake Waubesa
Lake Kegonsa
Lake Koshkonong
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Rock Lake
Rome Pond
Whitewater Lake
Yellowstone Lake
Crawfish River
Rock River
Yahara River
Sugar River
Pecatonica River
223 - Pecatonica
222 - Sugar
221 - Rock
MAP 68

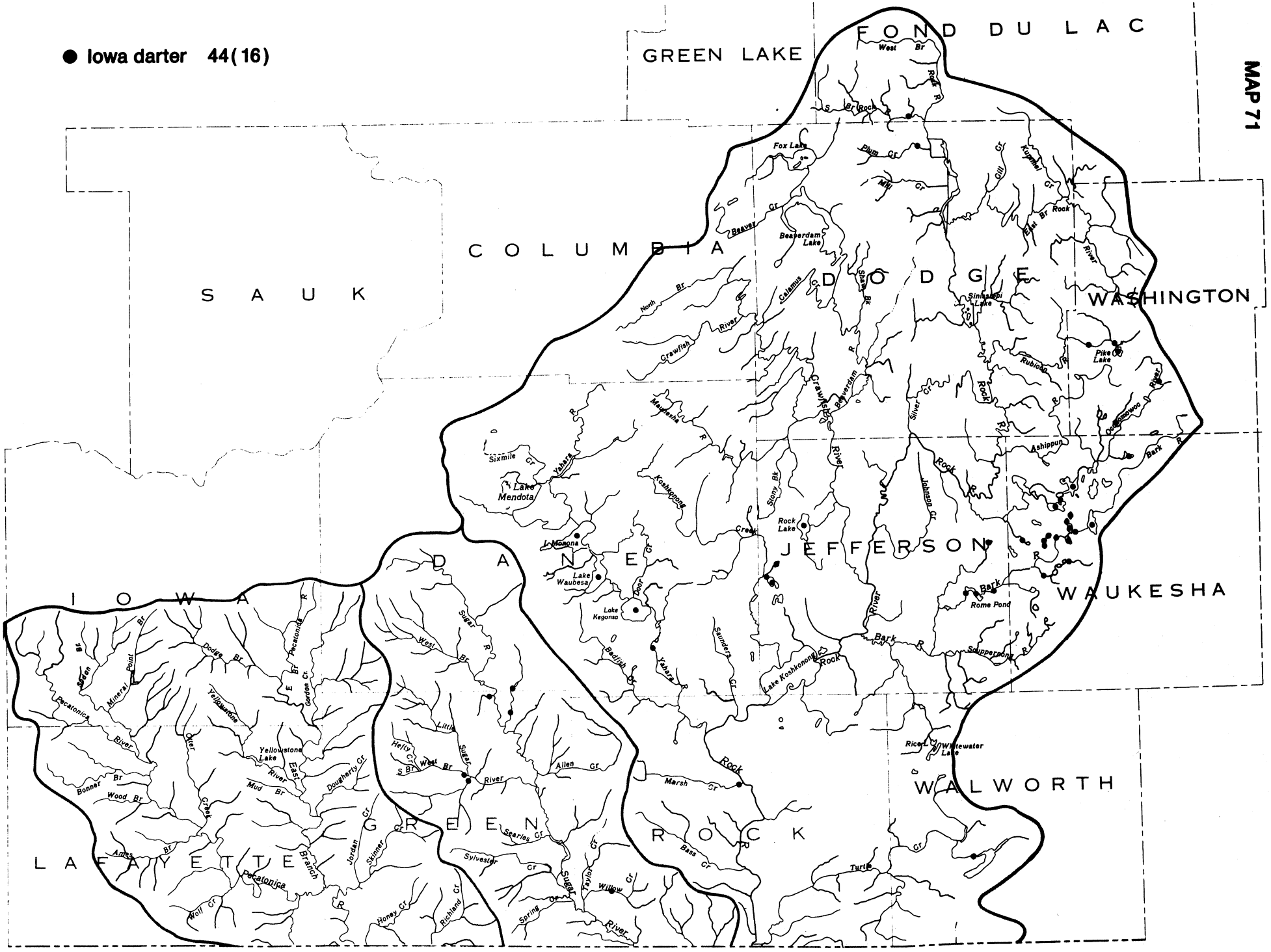
● **Black crappie 112(54)**



● **Rainbow darter 65(5)**



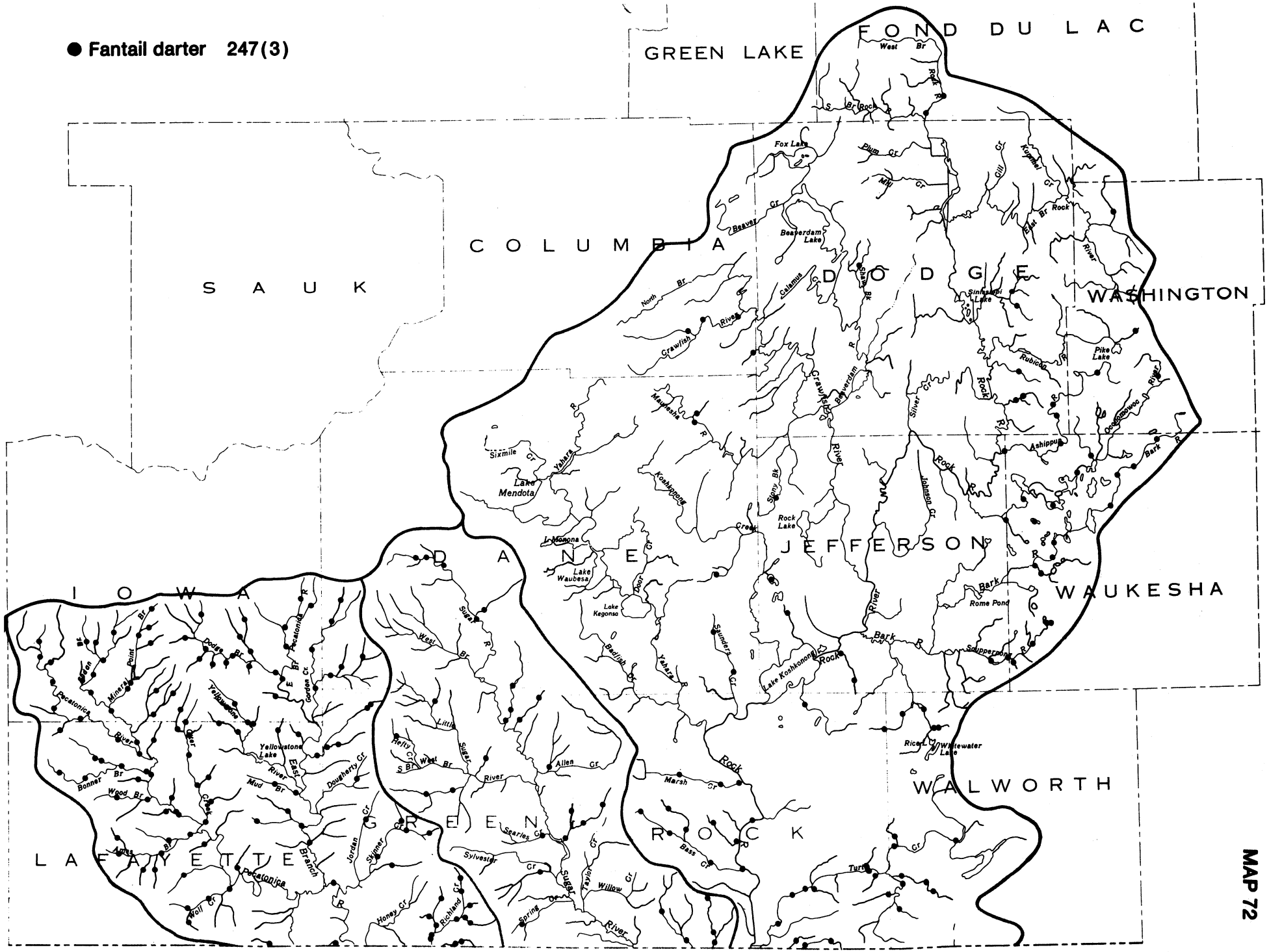
● Iowa darter 44(16)



223 - Pecatonica 222 - Sugar 221 - Rock

MAP 71

● **Fantail darter 247(3)**

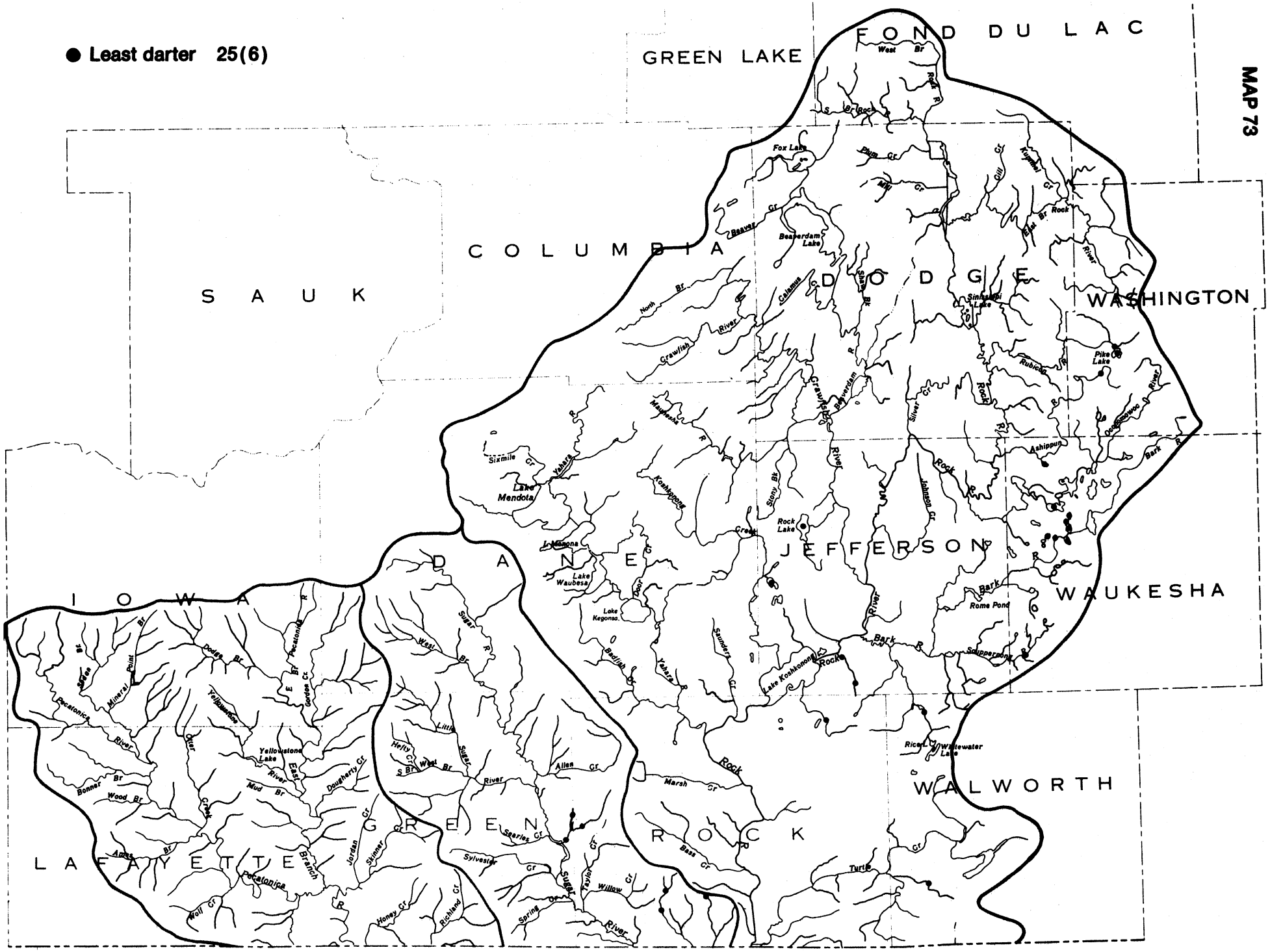


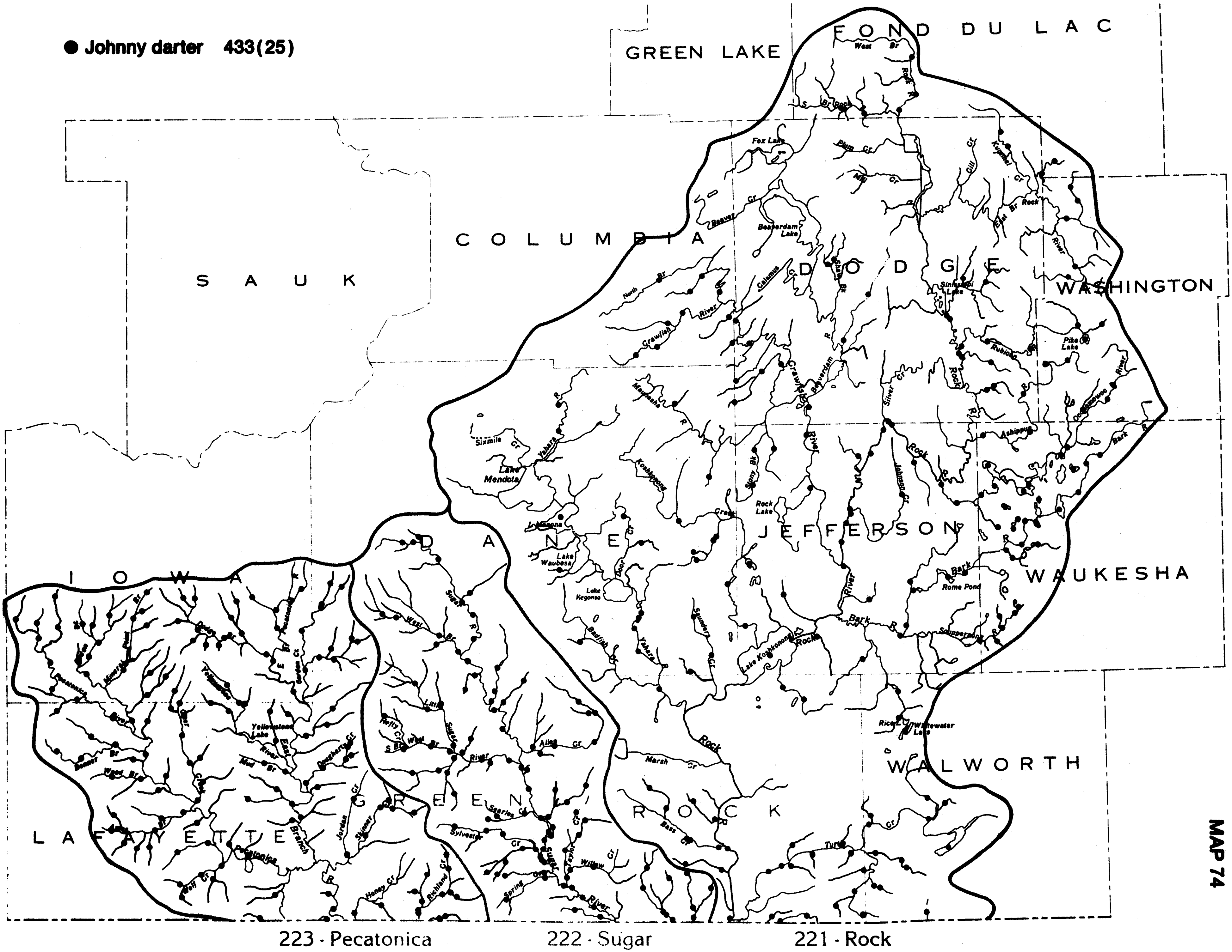
223 - Pecatonica 222 - Sugar 221 - Rock

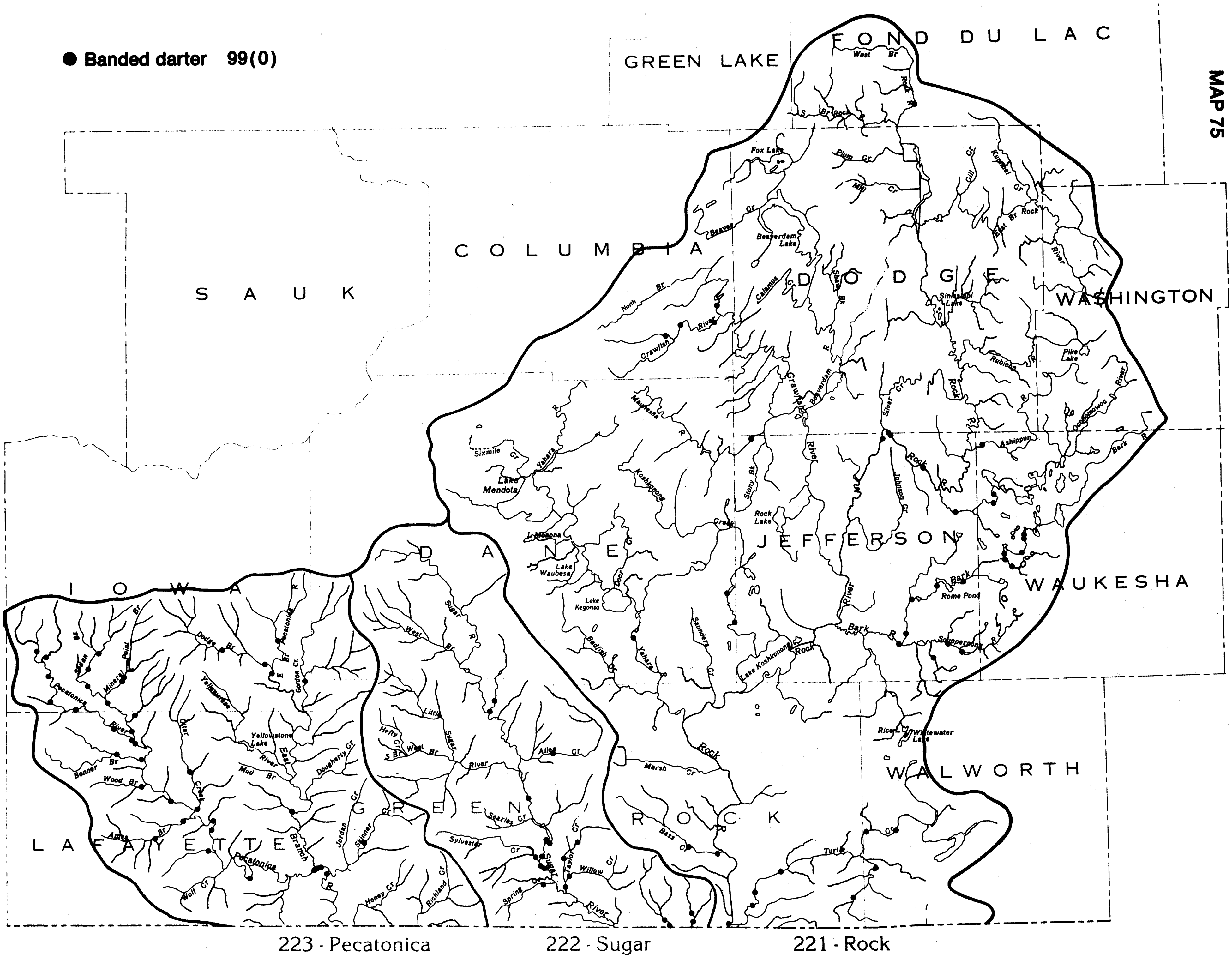
MAP 72

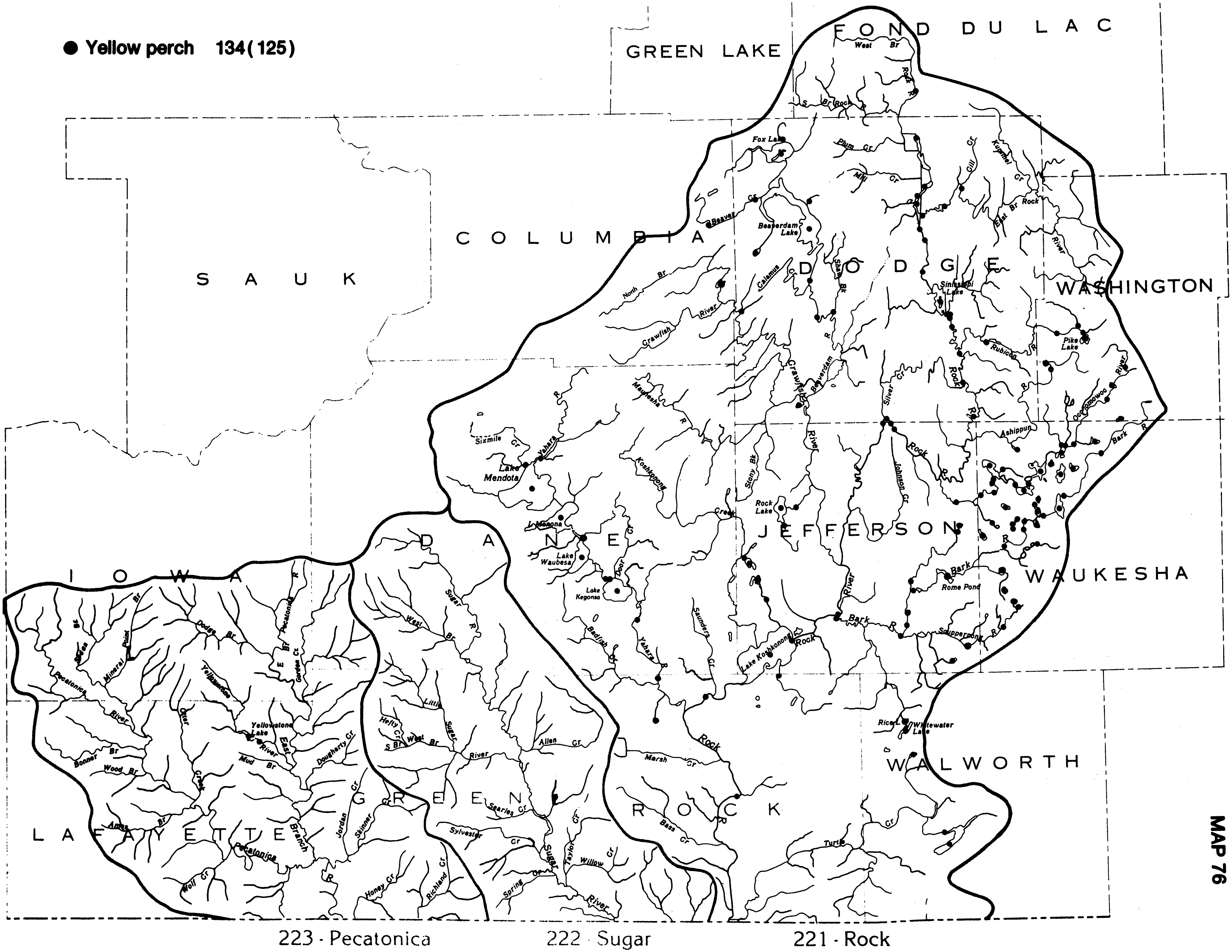
● **Least darter 25(6)**

MAP 73



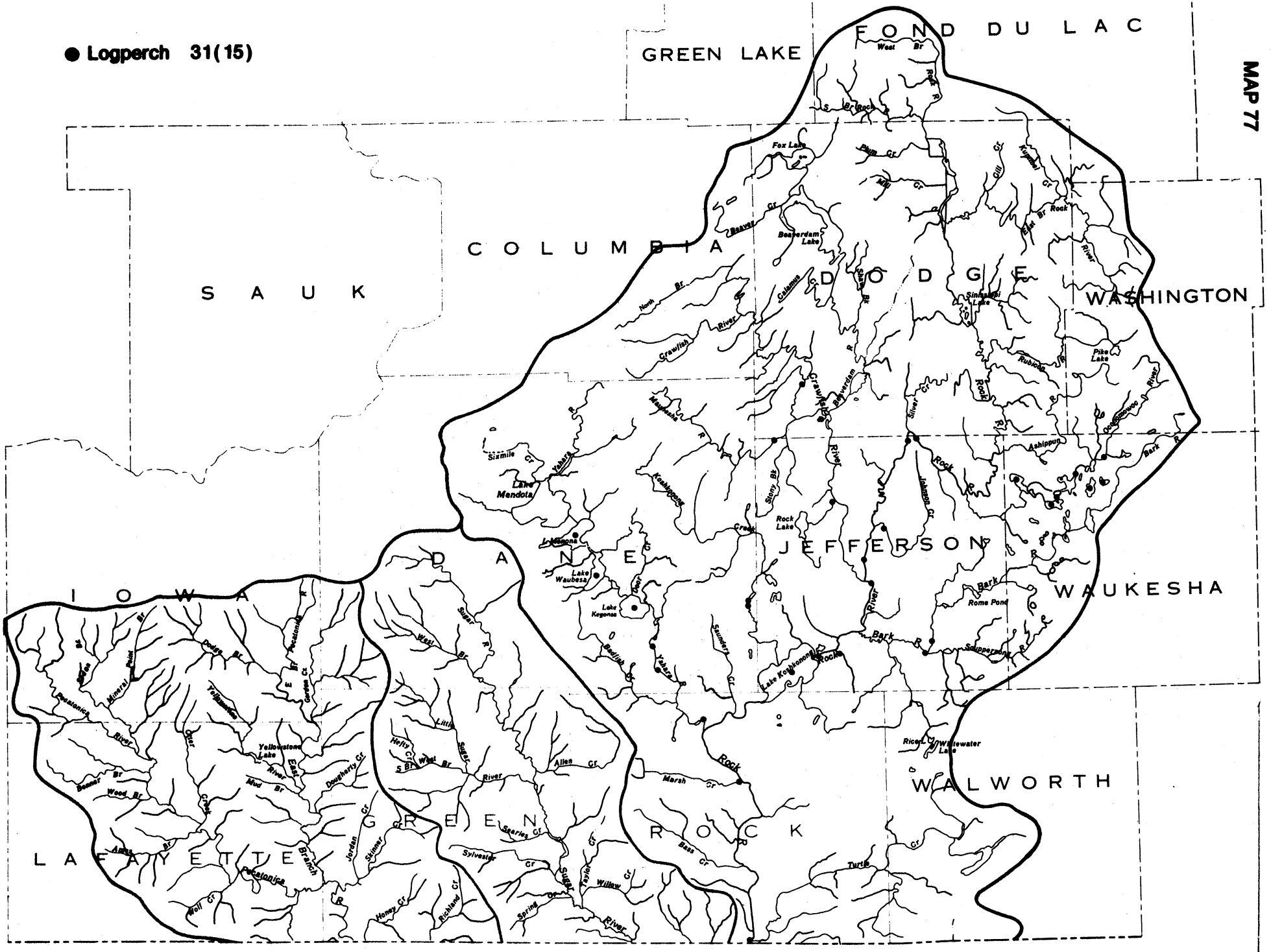

● Johnny darter 433(25)
GREEN LAKE
FOND DU LAC
SAUK
COLUMBIA
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
DANE
IOWA
LAFAYETTE
GREEN
ROCK
WALWORTH
223 · Pecatonica
222 · Sugar
221 · Rock
MAP 74


MAP 75
● Banded darter 99(0)
FOND DU LAC
GREEN LAKE
SAUK
COLUMBIA
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
IOWA
DANE
GREEN
ROCK
WALWORTH
LAFAYETTE
Fox Lake
Beaverdam Lake
Sinissippi Lake
Pike Lake
Lake Mendota
L Monona
Lake Waubesa
Lake Kegonsa
Rock Lake
Lake Koshkonong
Rome Pond
Yellowstone Lake
Whitewater Lake
Rock R
Crawfish River
Yahara R
Sugar R
Pecatonica R
Bark R
Oconomowoc River
Ashippun
Rubicon R
Scuppernong R
Turtle Cr
Bass Cr
Marsh Cr
Allen Cr
Koshkonong
Maunesha R
Door Cr
Badfish Cr
Saunders Cr
Johnson Cr
Stony Bk
Silver Cr
Calamus Cr
Shaw Bk
Beaver Cr
Plum Cr
Mill Cr
Gill Cr
Kummel Cr
East Br Rock
West Br
S Br Rock
Sixmile Cr
Little Sugar River
Hefty Cr
West Br
Searles Cr
Sylvester Cr
Spring Cr
Taylor Cr
Willow Cr
Honey Cr
Richland Cr
Skinner Cr
Jordan Cr
Dougherty Cr
Mud Br
Otter Creek
Wood Br
Bonner Br
Ames Br
Wolf Cr
Yellowstone River
Mineral Point Br
Dodge Br
Gordon Cr
223 - Pecatonica
222 - Sugar
221 - Rock



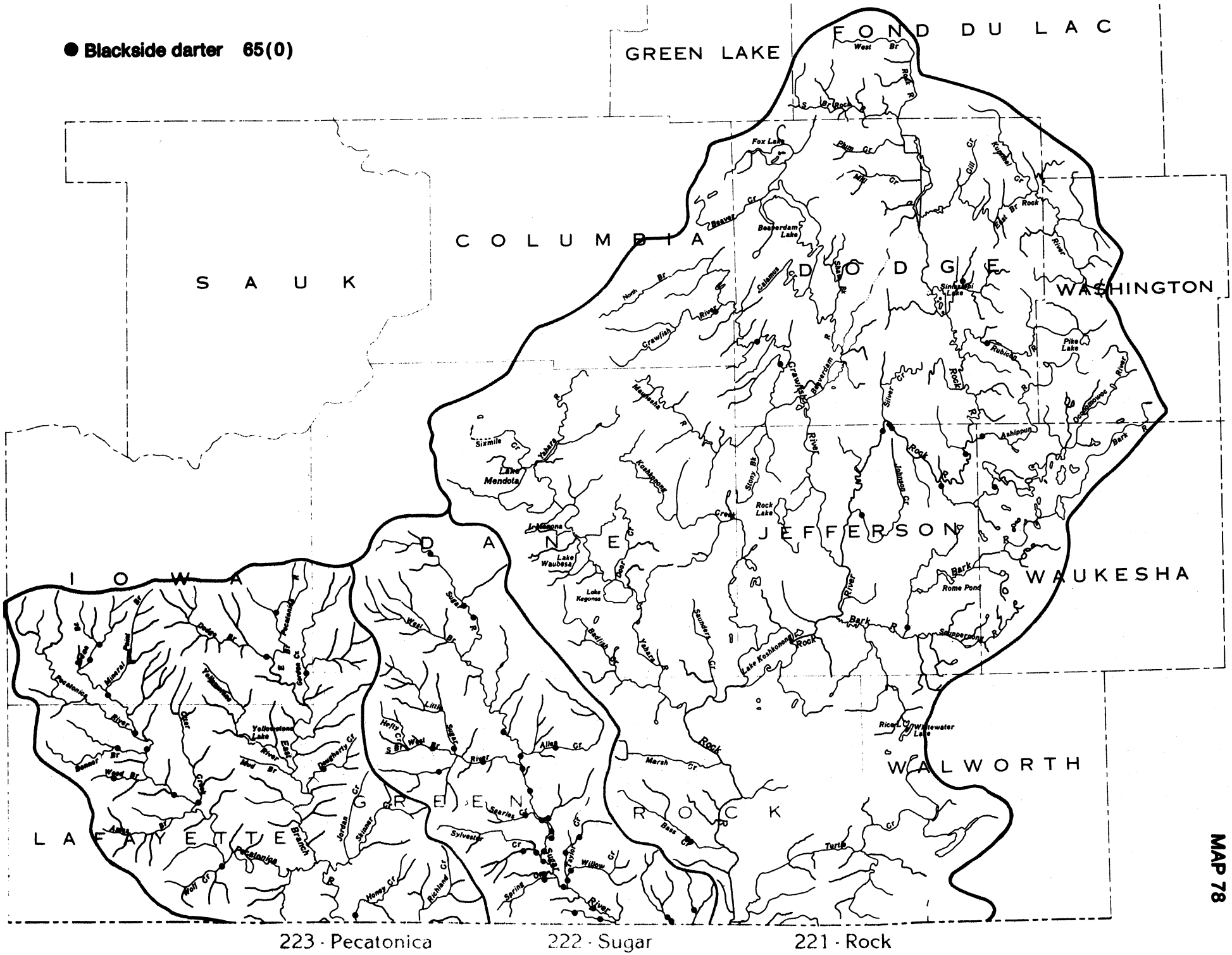
● Yellow perch 134(125)
GREEN LAKE
FOND DU LAC
SAUK
COLUMBIA
DODGE
WASHINGTON
IOWA
DANE
JEFFERSON
WAUKESHA
LAFAYETTE
GREEN
ROCK
WALWORTH
Lake Mendota
Lake Monona
Lake Waubesa
Lake Kegonsa
Lake Koshkonong
Beaverdam Lake
Fox Lake
Sinissippi Lake
Pike Lake
Rock Lake
Rome Pond
Yellowstone Lake
Rice L.
Whitewater Lake
223 - Pecatonica
222 - Sugar
221 - Rock
MAP 76

● **Logperch 31(15)**



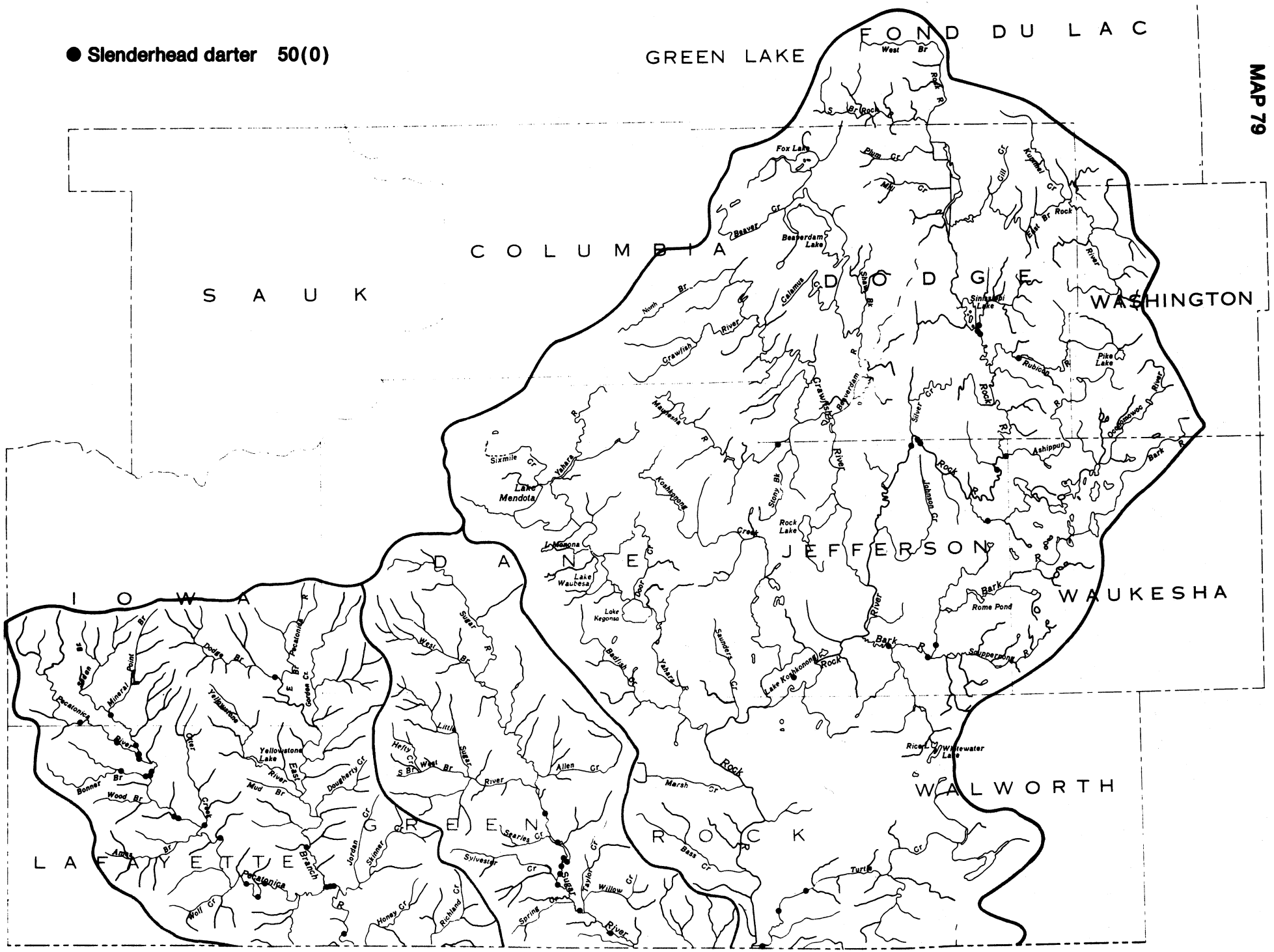
223 - Pecatonica 222 - Sugar 221 - Rock

● **Blackside darter 65(0)**



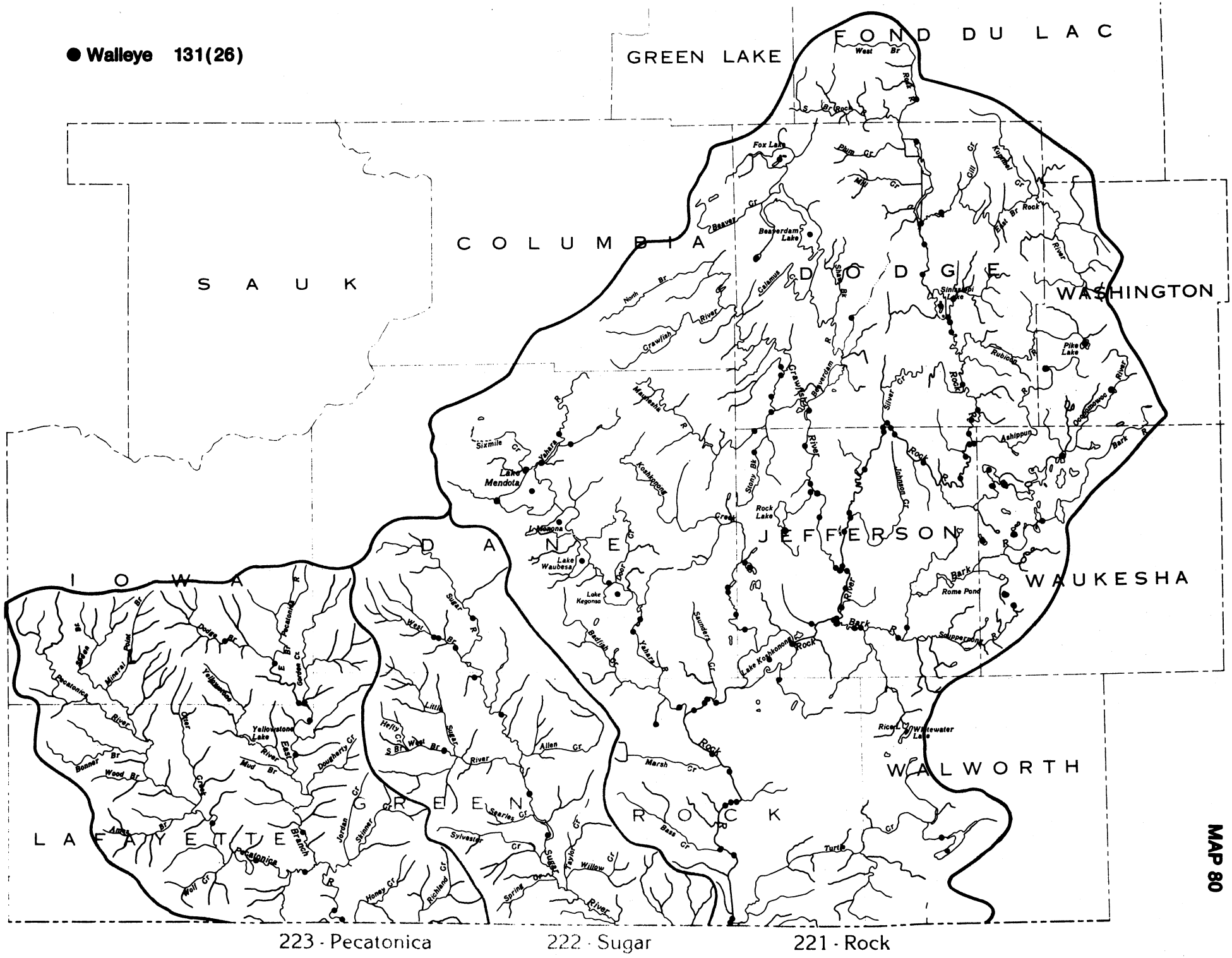
MAP 78

● **Slenderhead darter 50(0)**



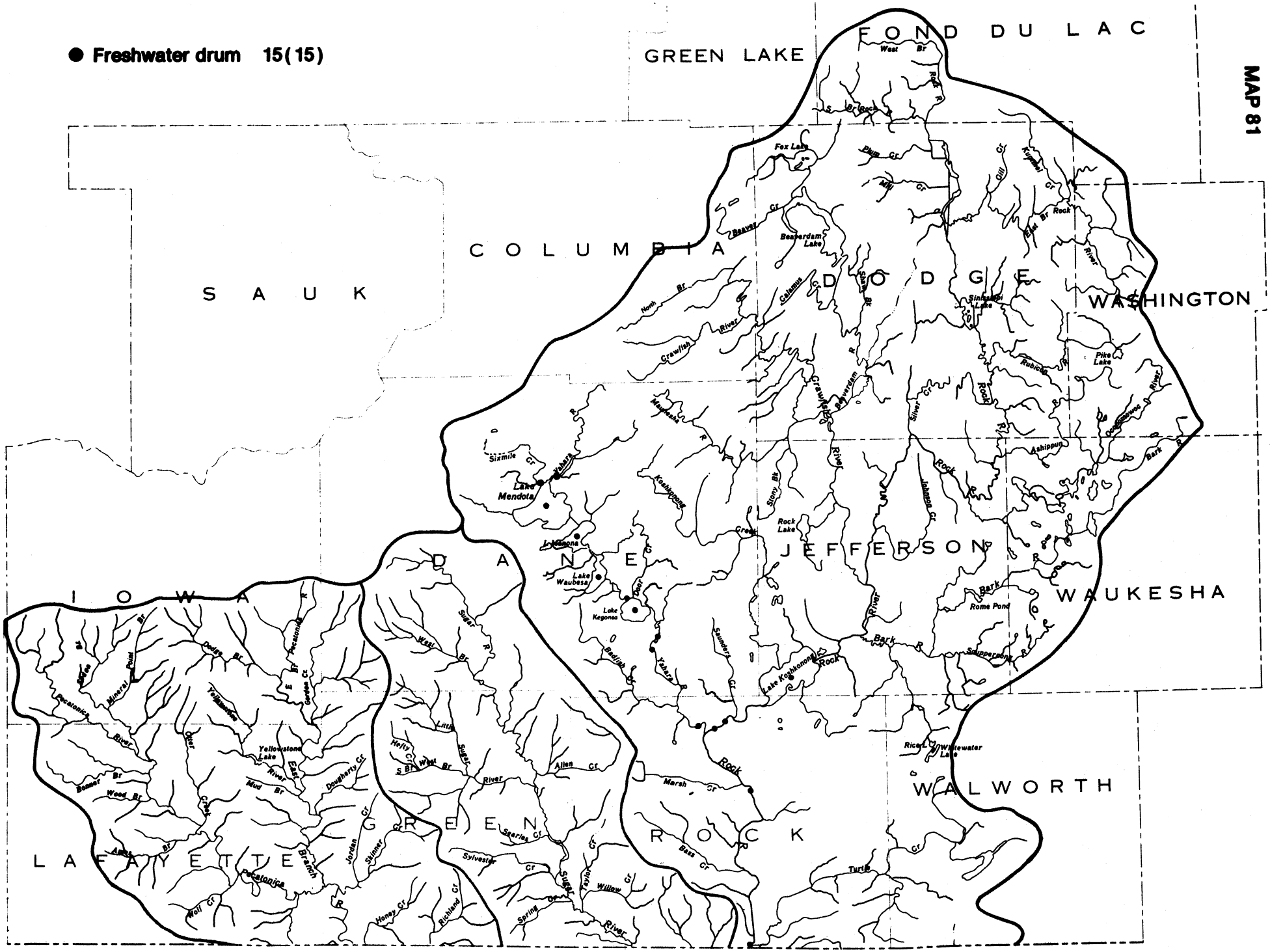
223 - Pecatonica 222 - Sugar 221 - Rock

MAP 79

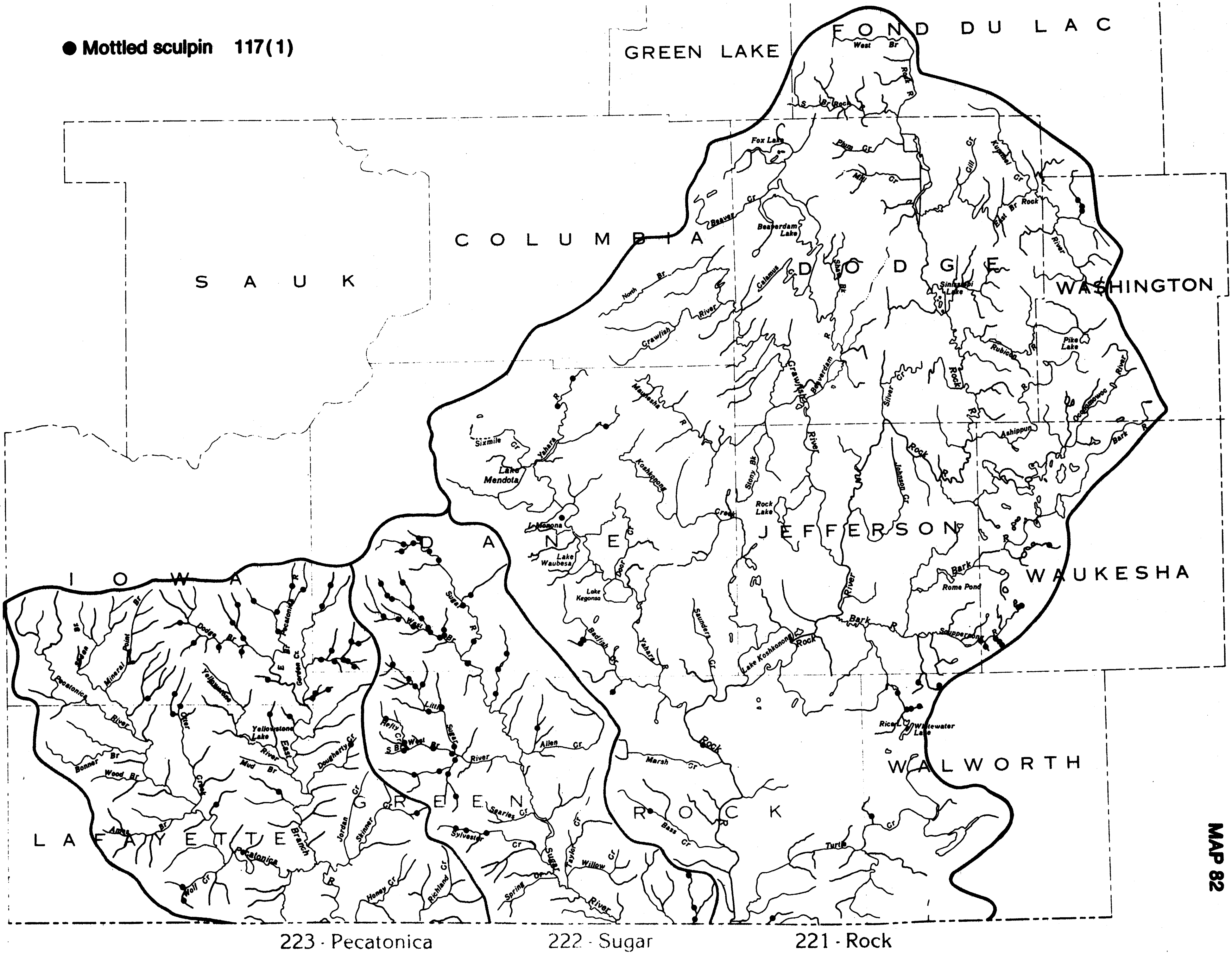

● Walleye 131(26)
FOND DU LAC
GREEN LAKE
COLUMBIA
SAUK
DODGE
WASHINGTON
JEFFERSON
WAUKESHA
WALWORTH
IOWA
DANE
GREEN
ROCK
LAFAYETTE
West Br
Rock R
S Br Rock R
Fox Lake
Beaverdam Lake
Beaver Cr
Duck Cr
Mill Cr
Gill Cr
Koyabel Cr
East Br Rock
Rock River
North Br Crawfish River
Calamus Cr
Shaw Bk
Sinissippi Lake
Rubicon R
Pike Lake
Crawfish R
Beaverdam R
Silver Cr
Rock R
Ashippun R
Bark R
Oconomowoc River
Sixmile Cr
Yahara R
Lake Mendota
Koshkonong Creek
Maunesha R
Stony Br
Rock River
Johnson Cr
Rock Lake
L Monona
Lake Waubesa
Lake Kegonsa
Badfish Creek
Yahara R
Saunders Cr
Lake Koshkonong
Rock R
Bark R
Rome Pond
Scuppernong R
Rice L
Whitewater Lake
Marsh Cr
Bass Cr
Turtle Cr
Sugar R
West Br
Little Sugar R
Helty Cr
S Br
West Br
Sugar River
Allen Cr
Seeries Cr
Sylvester Cr
Spring Cr
Taylor Cr
Willow Cr
Sugar River
Richland Cr
Honey Cr
Wall Cr
Jordan Cr
Skinner Cr
Pecatonica River
Apple Br
Branch
Pecatonica
Dougherty Cr
Mud Br
Wood Br
Bonner Br
Yellowstone Lake
Yellowstone River East
Outer Creek
Gordon Cr
Pecatonica River
Dodge Br
Mineral Point Br
Spafford Br
Pecatonica River
223 - Pecatonica
222 - Sugar
221 - Rock
MAP 80

● **Freshwater drum 15(15)**

MAP 81



223 - Pecatonica 222 - Sugar 221 - Rock



● Mottled sculpin 117(1)

MAP 82

INDEX TO MAPS

*- = No map prepared since species not collected during the 1974-81 period.

METRIC-ENGLISH AND ENGLISH-METRIC CONVERSIONS

1 km = 0.6214 mile
1 km^2 = 0.3861 $miles^2$
1 ha = 2.47 acres
1 cm = 0.3937 inches (0.328 ft)
1 m^3 = 35.21 ft^3

1 ft = 30.48 cm
1 mile = 1.609 km
1 acre = 0.4047 ha

ACKNOWLEDGMENTS

The study of the distribution of fish in the Greater Rock River basin represents the efforts and cooperation of a number of people for several years.

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Recognition is given to Tom Waldo for his efforts in writing many of the computer programs used in the storage and retrieval of the study's data.

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