

# DISTRIBUTION AND RELATIVE ABUNDANCE OF FISHES IN WISCONSIN

## III. Red Cedar River Basin

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**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 location of sampling stations on the 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 C. W. Greene (1935) for the 1900-31 period. He covered about 1,400 sampling stations. Since then, other collectors, notably Dr. George Becker (1959, 1964a, b, 1966, 1983), Professor Marlin Johnson (1970), and the students at the University of Wisconsin of 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 has now been completed in 17 and nearly completed in 1. 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 following reports are now available: Greater Rock River basin (Fago 1982), and Black, Trempealeau, and Buffalo river basins (Fago 1983a). 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 16,900 collections) have already, in over 200 cases, proven to be very useful to 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 3 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 Red Cedar River basin.

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By  
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## ABSTRACT

A statewide survey of the inland waters of Wisconsin was initiated by the Bureau of Research, Wisconsin Department of Natural Resources to establish a comprehensive data base on the distribution and relative abundance of all fish species. The Red Cedar River basin was sampled from 1975 through 1981 at 417 stations by research personnel and at 4 stations by fish management personnel. An additional 80 stations were partially sampled by fish management personnel and other collectors.

A total of 97 species was collected from the Red Cedar River basin. Included were the endangered crystal darter and the threatened Ozark minnow and blue sucker. Seven species on the Department's watch list were also collected.

Data from the 1975-81 period for the Red Cedar River basin were compared to those from the 1900-31 and the 1959-74 periods. Twenty-nine species were collected which had not been previously reported from the Red Cedar River basin. Two species have apparently been extirpated from the Red Cedar River basin.

This report includes numerous tables, distribution maps of the species, and discussion on many aspects of fish distribution in the Red Cedar 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 therefore recommended.

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**TABLE 1. Land area, streams, and lakes of the Red Cedar River basin.**

Land area (km <sup>2</sup> )	4,843
<b>Streams</b>	
Total no.	255
(Unnamed creeks or ditches)	(141)
Total length (km)	2,095
<b>Lakes/impoundments*</b>	
Total no.	293
Area (ha)	11,924
No. dams	41

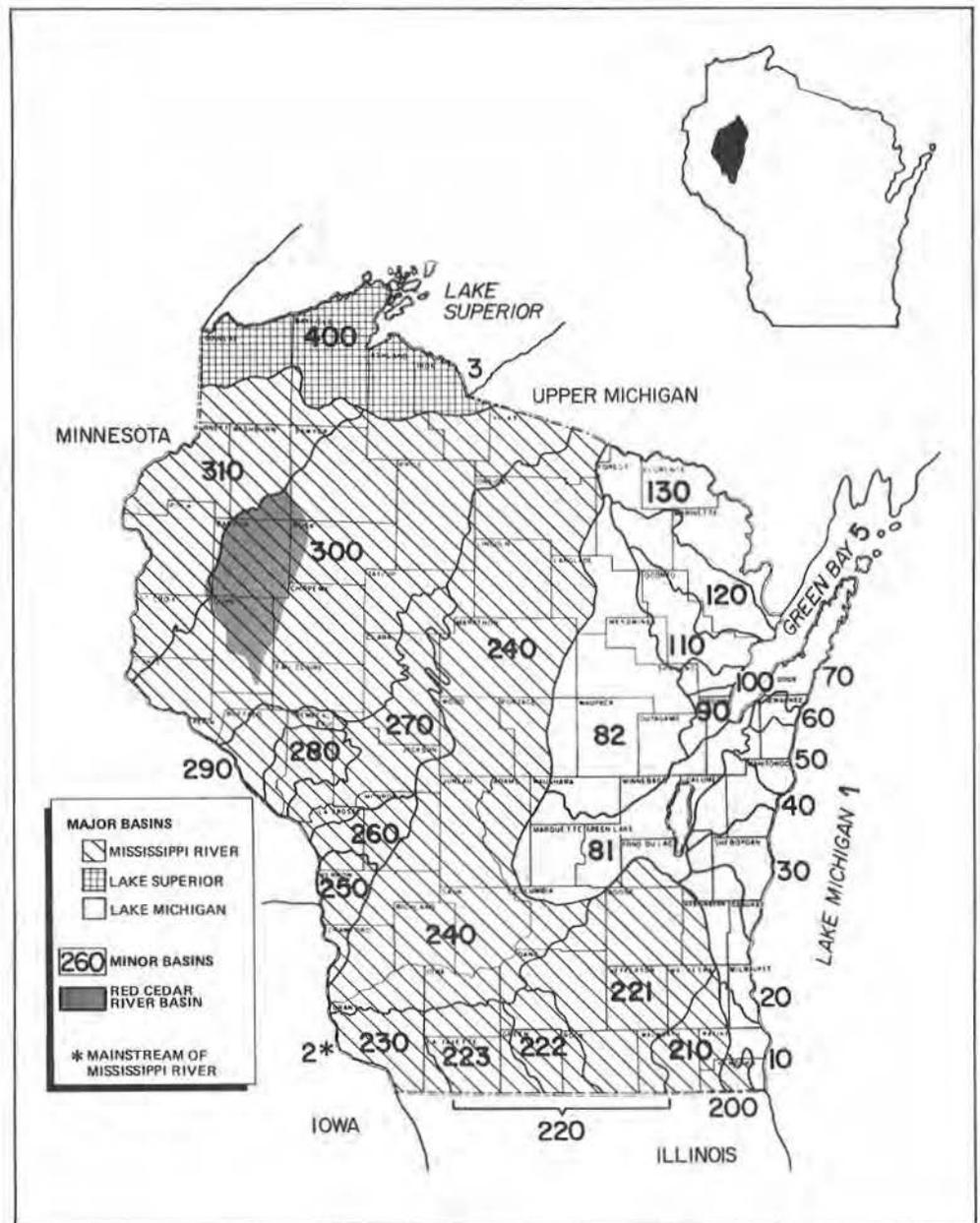
\* Impoundments are bodies of water with dams at their outlets.

## STUDY AREA

The Red Cedar River basin is a sub-basin of the Chippewa River basin (300), located in the northwestern portion of Wisconsin (Fig. 1). It encompasses parts of the following counties: Barron, Chippewa, Dunn, Polk, Rusk, Sawyer, St. Croix, and Washburn. The watershed contains an area of approximately 4,843 km<sup>2</sup> (Holmstrom 1982). Within this area, we have defined 255 streams with a total length of 2,095 km (Table 1)\*. Of these, 141 are unnamed creeks and ditches. There are 293 lakes\*\* in the basin, with a total area of 11,924 ha. The average size is 41 ha with only 14 over 150 ha.

The average annual precipitation within the Red Cedar River basin is 74 cm (71-76 cm) (Wisconsin DNR 1971). The average gradient for the Red Cedar River (179 km in length) is 87 cm/km. The average discharge at Menomonie, which includes 94% of the drainage area, is 35 m<sup>3</sup>/sec (U.S. Geol. Surv. 1982). We determined from the data collected at our sampling stations that the Red Cedar River's stream bottom is composed of primarily sand, gravel, and rubble with limited areas of boulder, muck and silt.

The major land use in this basin is agriculture (64%), primarily dairy farming. Second in importance is forest land with approximately 27% (Wisconsin DNR 1971, and Sather and Threinen 1962, 1964).



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



*Red Cedar River upstream of the Highway 25 bridge west of Downs ville at high water.*



*Red Cedar River upstream of Highway 25 bridge west of Downs ville showing the low water level and bedrock stream bottom.*

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

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

Lyle Christenson

Ronnie Masterjohn



*Red Cedar River in Menomonie looking downstream of Lake Menomin dam.*

Howard Snow



*Red Cedar River in Menomonie looking downstream of railroad trestle.*

## METHODS

### Data Sources and Time Periods

All collections are divided into 3 time periods: 1900-31, 1959-74, and 1975-81. The earlier records provide the basis for assessment of change over time in distribution of fish species within the 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, except for the 1900-31 period, depending on how the samples were taken: complete (those in which all species collected were recorded and identified), and partial (those in which sampling effort and/or species identification were incomplete and therefore did not yield adequate assessment of total species composition).

**1900-31 Period.** Collections from this period were made at 14 stations by a number of collectors. They included R. R. Pope, W. E. Dickman, E. P. Creaser, S. N. Jones, G. Wagner, and P. Okkelberg (names taken from original field notes). Most specimens from these collections were verified by Dr. Carl Hubbs or Dr. C. W. Greene and

cited by Greene (1935). Seventy-one percent of the stations were sampled in 1928 or 1931. The stations sampled were located on 7 streams and 5 lakes in this basin (Table 2). Thoroughness of sampling effort was unknown, and therefore calculation of percent occurrence of each species was not attempted (Table 5).

**1959-74 Period.** Complete collections from the period were made at 29 stations on 16 streams and 3 lakes in this basin (Table 2). An additional 125 partial stations increased the number of streams sampled by 31 and lakes by 13. The data from these partial samples were kept separate in Table 2 and not included in the percentages of total stations sampled presented in Table 5. These partial samples came from written records provided by fish management and the N.U.S. Corporation (North. States Power Co. 1974).

The complete samples from this basin (all collected in 1973-74) were collected by the following: Milwaukee Public Museum (unpubl. data)—16 stations; Dr. George Becker and his students (unpubl. data and 1983)—7 stations; Wisconsin DNR Bureau of Research—6 stations.

Total occurrences are defined as the sum of the number of species captured at each station. For example, if a collector took 10 species at one station, 20 at

another, and 30 at another, the total species occurrences would be 60. This information has been calculated for collections since 1959, and reveals the volume of data from both complete and partial samples used (Table 3). For the earliest period, only a grand total of occurrences was calculated (Table 5). Total occurrences increased from 132 for the 1900-31 period to 660 for the 1959-74 period for the Red Cedar River basin. During 1959-74, total occurrences for the Red Cedar River basin numbered 660, 54% of which were accounted for by fish management personnel. Collections by the Milwaukee Public Museum and Dr. Becker and his students provided 34 species not taken by fish management in the Red Cedar River basin (Table 3 and Append. A Table 16).

**1975-81 Period.** Complete collections from this period were made at 421 sampling stations (99% collected in 1975-76) on 91 streams and 42 lakes in the Red Cedar River basin (Table 2). There were an additional 80 partial collections which increased the number of streams by 6 and lakes by 5.

For the Red Cedar River basin, the number of complete samples increased over 1,300% during the 1959-74 period (Table 2). DNR research personnel sampled 417 (99%) of the complete

samples, and fish management personnel sampled 4 (1%).

The 80 partial samples were collected by fish management personnel, research personnel, and commercial fishermen.

Total occurrences increased from 660 for the 1959-74 period to 4,530 for the Red Cedar River basin; 92% of these were recorded by research personnel (Table 3). We also collected 93 out of the 97 total species found in the Red Cedar River basin (for list of species taken by all other collectors see Append. A Table 16).

## COLLECTION METHODS AND GEAR\*

We used 5 types of electrofishing gear depending on the size of the body of water. The types of gear and percentage of stations where each was used, were: boom shocker (4%), AC stream shocker (7%), DC stream shocker (25%), AC battery-powered backpack (2%), and longline shocker (8%). Small mesh seines were used at 53% of the stations, primarily in lakes and large rivers.

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 boom and stream shocking equipment, see Novotny and Priegel (1971, 1974). The AC battery-powered backpack uses a 12-volt deep cycle battery and outputs alternating current at several voltages. The seines were 1.2-m and 9.1-m bag seines with 4.8-mm delta mesh.

## SAMPLING EFFORT

We established sampling locations based on habitat diversity, the distance between stations, and accessibility. The length of a sampling station was approximately 80 m for all electrofishing gear except for the boom shocker. Boom shocker stations averaged 3.9 km. Areas seined averaged 242 m<sup>2</sup>. Distance between stations on the main stem of the Red Cedar River averaged 6.8 km. There was an average of 1 station/8 km of the total length of all sampled streams with one or more com-

plete stations. On sampled lakes there was an average of 1 station/42 ha of water.

Complete collections were made on 36% of the streams and 14% of the lakes in the Red Cedar 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 Red Cedar River basin. The sampled lakes comprised 74% of the total surface area for all lakes in the basin. This was due to the fact that most lakes were small, averaging only 41 ha for the Red Cedar River basin.

Figure 2 shows the locations of 249 of the 421 complete and 44 of the 80 partial stations. Only one dot per lake

was shown and dots were eliminated that would overlap another dot.

## 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 780 collections from the Red Cedar River basin, dating from 1900, Cobol and

TABLE 2. Summary of stream and lake sampling effort in the Red Cedar River basin, 1900-81.

	1900-31	1959-74	1975-81
<b>Streams</b>			
No. sampled	7	16*(31)**	91(6)
No. stations	9	25 (110)	210(60)
<b>Lakes/impoundments</b>			
No. sampled	5	3 (13)	42(5)
No. stations	5	4 (15)	211(20)
<b>Total no. stations</b>	<b>14</b>	<b>29 (125)</b>	<b>421(80)</b>

\* Complete samples.

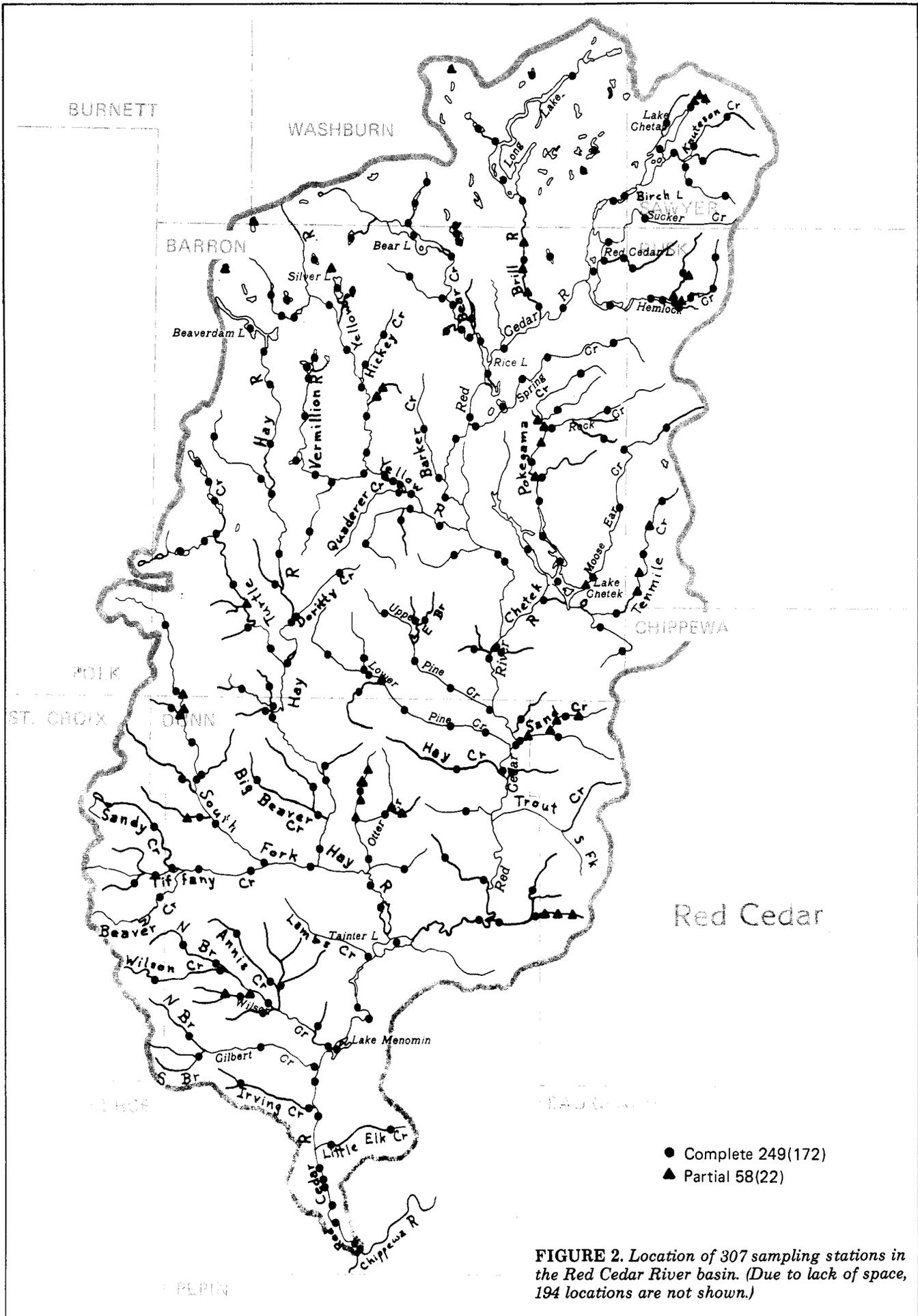
\*\* Partial samples.

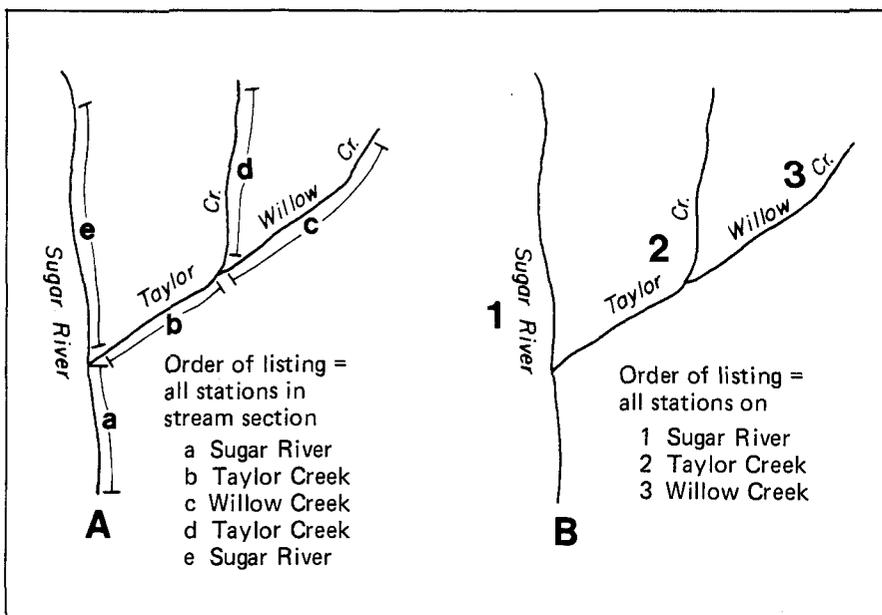
Bear Creek at Highway 53 bridge in Barron County.



Jerry Perkins

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





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

**TABLE 3.** List of collectors with number of species taken and total occurrences for samples from the Red Cedar River basin.

Source of Data*	1959-74		1975-81	
	No. Species	Total Occurrences	No. Species	Total Occurrences
Research 0	25	68(10)**	93	4,166(92)
Fish Mgt. 1	22	351(54)	44	363(8)
Becker 2	33	74(11)	—	—
Mil. Pub. Mus. 5	36	152(23)	—	—
Comm. fish 7	—	—	1	1(t)
N.U.S. Corp. 10	9	15(2)	—	—
Grand total of occurrences		660		4,530

\*Collectors identified in Appendix A Table 16.

\*\*Total occurrences are defined as the sum of the number of species collected at each station; percent of total occurrences in parentheses.

t = less than 0.5%.

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 first 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 the tributary (Fig. 3b). This procedure is followed for all tributaries in the basin of the first tributary before going to the second tributary of the original river.

The program for both of these methods can be restricted to one or more of the following criteria: particular minor basins, a sub-basin or part of a sub-basin, individual collectors, dates, township and range (by entire township or contiguous townships), counties, water types, and selected species. At each station, the stream name along with water type, number of fish taken, collector, gear, effort, date, township description, and county are listed. An example of the Cobol listing for one species is shown in Appendix A Figure 6. At the end of each species listing, the total number of stations, total number of specimens, average number of fish/station, and number of stations for each collector is computed. At the end of the printout, a summary table is given that lists each species, the number 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 Cobol program, and the listing can be organized the same two 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 A Figure 8.

A water mileage system was devised to permit computer analysis of the data and still allow easy recognition of the

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 basin as well as 16,120 additional stations throughout the state.

Other programs are used to help in the analysis of the data. One analysis uses a Cobol program to organize the data by species, and lists all stations for each species. This listing, based on a

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

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

## FISH IDENTIFICATION AND ENUMERATION

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

At least a few stonerollers at each station were keyed to species. The remainder were left as stonerollers (*Campostoma* spp.). Research personnel identified all fish for the 1975-81 period except for some specimens of 26 species (indicated by an asterisk in Appendix A Table 16) collected by fish management personnel, and lake sturgeon caught by commercial fishermen. For the 1959-74 period species records are based upon the collectors' identification. The common and scientific names of fish species cited in this report (Table 4) follow names established by the American Fisheries Society's Committee on Names of Fishes (Robins 1980). All hybrids and specimens not keyed to species, except stonerollers, were not dealt with in this report.

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

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

Computer No.	Common Name	Scientific Name
	Lampreys	Petromyzontidae
A02	Chestnut lamprey	<i>Ichthyomyzon castaneus</i>
A03	Northern brook lamprey	<i>Ichthyomyzon fossor</i>
A04	Silver lamprey	<i>Ichthyomyzon unicuspis</i>
A05	American brook lamprey	<i>Lampetra appendix</i>
	Sturgeons	Acipenseridae
B01	Lake sturgeon	<i>Acipenser fulvescens</i>
B02	Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>
	Gars	Lepisosteidae
D01	Longnose gar	<i>Lepisosteus osseus</i>
D02	Shortnose gar	<i>Lepisosteus platostomus</i>
	Bowfins	Amiidae
E01	Bowfin	<i>Amia calva</i>
	Freshwater eels	Anguillidae
F01	American eel	<i>Anguilla rostrata</i>
	Mooneyes	Hiodontidae
H02	Mooneye	<i>Hiodon tergisus</i>
	Trouts	Salmonidae
I04	Cisco or lake herring	<i>Coregonus artedii</i>
I05	Lake whitefish	<i>Coregonus clupeaformis</i>
I21	Brown trout	<i>Salmo trutta</i>
I22	Brook trout	<i>Salvelinus fontinalis</i>
	Smelts	Osmeridae
J01	Rainbow smelt	<i>Osmerus mordax</i>
	Mudminnows	Umbridae
K01	Central mudminnow	<i>Umbra limi</i>
	Pikes	Esocidae
L02	Northern pike	<i>Esox lucius</i>
L03	Muskellunge	<i>Esox masquinongy</i>
	Minnows and carps	Cyprinidae
M06	Central stoneroller	<i>Campostoma anomalum</i>
M07	Largescale stoneroller	<i>Campostoma oligolepis</i>
M12	Common carp	<i>Cyprinus carpio</i>
M14	Brassy minnow	<i>Hybognathus hankinsoni</i>
M15	Mississippi silvery minnow	<i>Hybognathus nuchalis</i>
M19	Hornyhead chub	<i>Nocomis biguttatus</i>
M20	Golden shiner	<i>Notemigonus crysoleucas</i>
M22	Pugnose shiner	<i>Notropis anogenus</i>
M23	Emerald shiner	<i>Notropis atherinoides</i>
M24	River shiner	<i>Notropis bleenni</i>
M28	Common shiner	<i>Notropis cornutus</i>
M29	Bigmouth shiner	<i>Notropis dorsalis</i>
M31	Blackchin shiner	<i>Notropis heterodon</i>
M32	Blacknose shiner	<i>Notropis heterolepis</i>
M34	Ozark minnow	<i>Notropis nubilus</i>
M35	Rosyface shiner	<i>Notropis rubellus</i>
M36	Spotfin shiner	<i>Notropis spilopterus</i>
M37	Sand shiner	<i>Notropis stramineus</i>
M38	Weed shiner	<i>Notropis texanus</i>
M39	Redfin shiner	<i>Notropis umbratilis</i>
M40	Mimic shiner	<i>Notropis volucellus</i>
M42	Northern redbelly dace	<i>Phoxinus eos</i>
M44	Finescale dace	<i>Phoxinus neogaeus</i>
M45	Bluntnose minnow	<i>Pimephales notatus</i>
M46	Fathead minnow	<i>Pimephales promelas</i>
M47	Bullhead minnow	<i>Pimephales vigilax</i>
M48	Blacknose dace	<i>Rhinichthys atratulus</i>
M49	Longnose dace	<i>Rhinichthys cataractae</i>
M50	Creek chub	<i>Semotilus atromaculatus</i>
M51	Pearl dace	<i>Semotilus margarita</i>

TABLE 4 (Cont.)

Computer No.	Common Name	Scientific Name
	Suckers	Catostomidae
N05	River carpsucker	<i>Carpiodes carpio</i>
N06	Quillback	<i>Carpiodes cyprinus</i>
N07	Highfin carpsucker	<i>Carpiodes velifer</i>
N09	White sucker	<i>Catostomus commersoni</i>
N10	Blue sucker	<i>Cycleptus elongatus</i>
N13	Northern hog sucker	<i>Hypentelium nigricans</i>
N14	Smallmouth buffalo	<i>Ictiobus bubalus</i>
N15	Bigmouth buffalo	<i>Ictiobus cyprinellus</i>
N18	Silver redhorse	<i>Moxostoma anisurum</i>
N21	Golden redhorse	<i>Moxostoma erythrurum</i>
N22	Shorthead redhorse	<i>Moxostoma macrolepidotum</i>
N23	Greater redhorse	<i>Moxostoma valenciennesi</i>
	Bullhead catfishes	Ictaluridae
O05	Black bullhead	<i>Ictalurus melas</i>
O06	Yellow bullhead	<i>Ictalurus natalis</i>
O07	Brown bullhead	<i>Ictalurus nebulosus</i>
O08	Channel catfish	<i>Ictalurus punctatus</i>
O10	Stonecat	<i>Noturus flavus</i>
O11	Tadpole madtom	<i>Noturus gyrinus</i>
O12	Flathead catfish	<i>Pylodictis olivaris</i>
	Trout-perches	Percopsidae
Q01	Trout-perch	<i>Percopsis omiscomaycus</i>
	Codfishes	Gadidae
R01	Burbot	<i>Lota lota</i>
	Killifishes	Cyprinodontidae
S01	Banded killifish	<i>Fundulus diaphanus</i>
	Silversides	Atherinidae
T01	Brook silverside	<i>Labidesthes sicculus</i>
	Sticklebacks	Gasterosteidae
U01	Brook stickleback	<i>Culaea inconstans</i>
	Temperate basses	Percichthyidae
V01	White bass	<i>Morone chrysops</i>
	Sunfishes	Centrarchidae
W04	Rock bass	<i>Ambloplites rupestris</i>
W05	Green sunfish	<i>Lepomis cyanellus</i>
W06	Pumpkinseed	<i>Lepomis gibbosus</i>
W07	Warmouth	<i>Lepomis gulosus</i>
W09	Bluegill	<i>Lepomis macrochirus</i>
W11	Smallmouth bass	<i>Micropterus dolomieu</i>
W12	Largemouth bass	<i>Micropterus salmoides</i>
W13	White crappie	<i>Pomoxis annularis</i>
W14	Black crappie	<i>Pomoxis nigromaculatus</i>
	Perches	Percidae
X03	Crystal darter	<i>Ammocrypta asprella</i>
X07	Rainbow darter	<i>Etheostoma caeruleum</i>
X09	Iowa darter	<i>Etheostoma exile</i>
X10	Fantail darter	<i>Etheostoma flabellare</i>
X11	Least darter	<i>Etheostoma microperca</i>
X12	Johnny darter	<i>Etheostoma nigrum</i>
X14	Banded darter	<i>Etheostoma zonale</i>
X15	Yellow perch	<i>Perca flavescens</i>
X16	Logperch	<i>Percina caprodes</i>
X18	Blackside darter	<i>Percina maculata</i>
X20	River darter	<i>Percina shumardi</i>
X21	Sauger	<i>Stizostedion canadense</i>
X22	Walleye	<i>Stizostedion vitreum vitreum</i>
	Drums	Sciaenidae
Y01	Freshwater drum	<i>Aplodinotus grunniens</i>
	Sculpins	Cottidae
Z01	Mottled sculpin	<i>Cottus bairdi</i>
Z02	Slimy sculpin	<i>Cottus cognatus</i>

number taken was unknown, further underestimating the total number of specimens.

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

## ENDANGERED, THREATENED, AND WATCH SPECIES

The State of Wisconsin currently has 8 species on its endangered list\*, 6 species on its threatened list\*, and 18 species on its unofficial watch list. These 3 categories are defined as follows:

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

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

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

\*Chap. NR 27, Wis. Adm. Code.

# RESULTS AND DISCUSSION

Findings are presented for the Red Cedar River basin followed by a discussion of some of the more interesting species in the basin including those on the Wisconsin DNR endangered, threatened, or watch lists. Unless otherwise indicated, findings refer only to the 1975-81 period.

## SPECIES FOUND

Over 99,000 specimens representing 97 species were identified in samples from the Red Cedar River basin (Tables 5 and 6). This includes the endangered crystal darter, 2 threatened species (Ozark minnow and blue sucker), and 7 watch species. Distribution maps for all species are presented in Appendix B; each map shows the location of stations where the species was collected. An index to the maps is contained in Table 5 and in the front of Appendix B.

## REPRODUCING POPULATIONS

Of the 97 known species found in the Red Cedar River basin, 95 species are believed to have reproducing populations. The presence of reproducing populations of the muskellunge is questionable since the only known possible area of reproduction is above Hemlock Lake (R. Cornelius pers. comm.). The other species, the American eel, does not spawn in fresh water.

## STREAM VS. LAKE HABITAT

Of all stations sampled in the Red Cedar River basin, 54% were in a stream environment and 46% in a lake environment (Table 2). Of the 95 species known to have reproducing populations in this basin, 64 occurred in streams more than 50% of the time (Table 7); 39 of these 64 occurred in streams at least 95% of the time. Of the 31 species collected more than 50% of the time in a lake environment, only 6 were taken 95% or more of the time in lakes.

## COMMON AND RARE SPECIES

The 5 most common species (caught at the highest percentage of complete

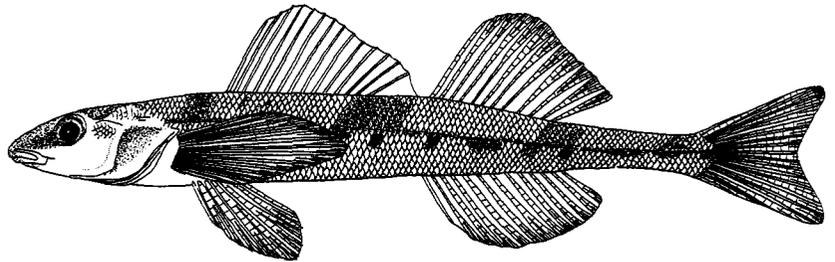
stations) were white sucker (56%), bluegill (50%), Johnny darter (50%), yellow perch (49%), and bluntnose minnow (48%) (Table 5). The 5 most numerous species (most specimens caught) were bluegill (9,100), white sucker (8,400), bluntnose minnow (8,200), yellow perch (7,700), and common shiner (4,900) (Table 6). The Johnny darter was 9th most numerous species.

Of the 29 rarest species (those caught at 5 or fewer of all the stations, Table 8), all but 3 (cisco or lake her-

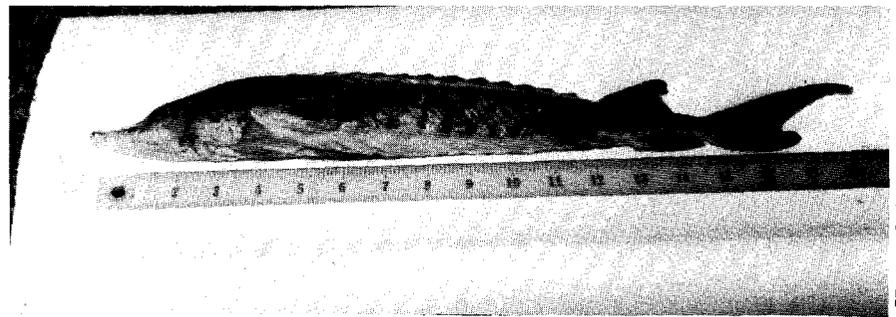
ring, Mississippi silvery minnow, and redfin shiner) were also represented by the smallest total number of specimens (Table 6).

## DIFFERENCES BETWEEN TIME PERIODS

Twenty-nine species of fish collected during the 1975-81 period have not been previously reported for this basin (Table 9).

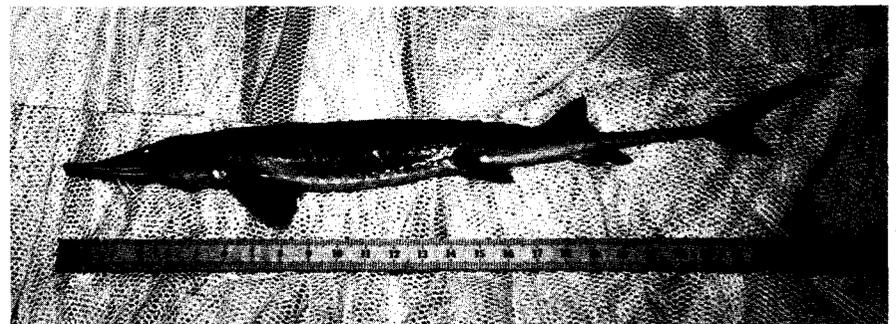


*The endangered crystal darter was taken at 5 stations in the Red Cedar River basin.*



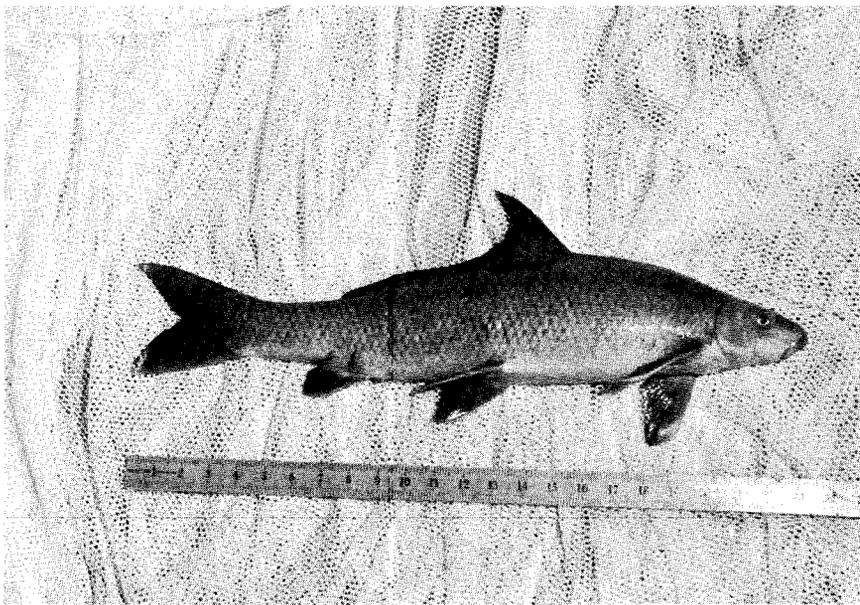
*Lake sturgeon ...*

Howard Snow

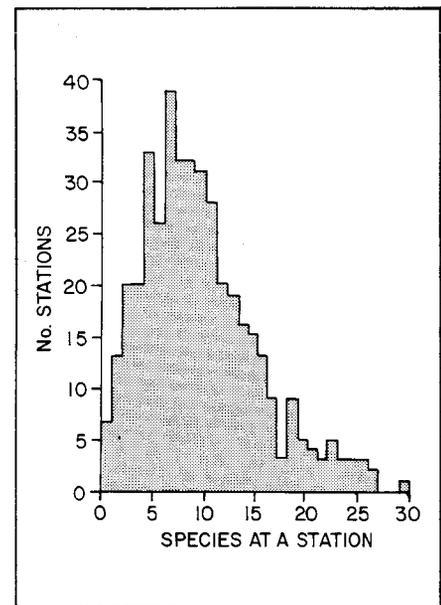


*...and shovelnose sturgeon were both taken in the Red Cedar River basin.*

Leon Johnson



*Blue sucker, a threatened species found in the Red Cedar River basin.*



**FIGURE 4.** Number of stations at which varying numbers of species were taken in the Red Cedar River basin.

Two species are apparently no longer present in the Red Cedar River basin. The lake whitefish was last observed before 1931 (and even then was only collected at 1 station) (Table 10). The flathead catfish was last reported in 1963 from 3 stations on the Red Cedar River between the dam at Menomonie and the mouth of the Red Cedar River. It too is apparently extirpated or present in very low numbers.

Nine species that we collected had not been reported between 1932 and 1975 from this basin (Table 11).

One of the most important results of this study was the documentation of changes in the known distribution of species within the Red Cedar River basin in 1975-81 as compared to previous periods (Table 5). These changes have ranged from decreases in the number of stations for 6 species to increases for 63 species, and no change for the trout-perch. The decreases ranged from 100% for 2 species to 33% for the freshwater drum. The increases ranged from 64% for the walleye to 5,800% for the pearl dace (average = 1,200%), and were due primarily but perhaps not entirely to increased sampling effort in 1975-81. There were 75 more streams and 39 more lakes with at least 1 complete station compared to 1958-74 and 84 streams and 37 lakes compared to 1900-31 (Table 2). When the total number of complete stations sampled in the 1975-81 period was compared with the 1959-74 and 1900-31 periods, there were increases of 1,400% and 2,900%, respectively.

## SPECIES DIVERSITY

Twenty-nine stations (7%) sampled by research personnel in the Red Cedar River basin had 20 or more species and 6 stations had more than 25 species (Fig. 4). The average number of species taken per station was 10.

## ENDANGERED SPECIES

Only 1 species on the state's endangered species list was found in the Red Cedar River basin (Table 12). The crystal darter was taken at 5 stations on the Red Cedar River between its mouth and 6 miles upstream (Append. B Map 71). Previously, this species had not been reported from this basin. This darter, the largest found in Wisconsin, was taken over clean gravel and sand where stream velocity was moderate. Stream habitat characteristics for this darter and 5 other rare species are shown in Table 13.

## THREATENED SPECIES

Two threatened species were found in the Red Cedar River basin (Table 14). The Ozark minnow was captured from 3 rivers and 1 lake for a total of 7 stations and 66 specimens (Append. B Map 26). This disjunct population in the Red Cedar River basin (all other known locations in extreme southern Wisconsin)

was previously reported from a single collection made in the 1920's. The other species is the blue sucker which was taken from 5 stations on the mainstem of the lower Red Cedar River (Append. 13 Map 44). A total of 19 specimens (one-4.6 kg and 750 mm) were caught from moderately deep pools where the water velocity was moderate. Previously, this species had not been reported from this basin.

## WATCH SPECIES

A total of 7 watch species were captured in the Red Cedar River basin (Table 15). Lake sturgeon were taken from Lake Menomin and Tainter Lake (Append. B Map 4). Previously, this species had been reported at one station on the Red Cedar River near its mouth. One American eel was taken in the Red Cedar River (Append. B Map 6); this species was previously reported from 3 stations on this same lower section of the Red Cedar River. The pugnose shiner was captured from a total of 9 stations on 4 lakes (Append. B Map 20); it had not been reported from this basin in the past. The weed shiner occurred at a total of 19 stations in 6 lakes and 4 streams (Append. B Map 30). This fish had been previously reported from 1 station on the Red Cedar River in 1973. The redbfin shiner was taken at a total of 4 stations in 3 lakes and 1 river (Append. B Map 31). Previously, this species had been reported

TABLE 5. Number of stations and percent of total stations at which each species was collected and percent change in occurrence, Red Cedar River basin, 1900-81.

Map No. Species	1900-31	1959-74		1975-81		Percent Change In Occurrence <sup>2</sup>
	No. Stn.	No. Stn.	Percent Total	No. Stn.	Percent Total	
1 Chestnut lamprey	0	1	3	10	2	900
2 Northern brook lamprey	0	0	-	14	3	-
2 Silver lamprey	0	0	-	1	t**	-
3 American brook lamprey	0	0	-	54(1)	13	-
4 Lake sturgeon (W)1	0	0(1)*	-	0(2)	-	100
4 Shovelnose sturgeon	0	0(8)	-	4	1	-50
5 Longnose gar	0	0	-	2	t	-
5 Shortnose gar	0	0	-	2	t	-
6 Bowfin	0	0(6)	-	3(10)	1	120
6 American eel (W)	0	0(3)	-	1	t	-67
7 Mooneye	0	0	-	8	2	-
7 Cisco or lake herring	2	0(1)	-	1(1)	t	100
- Lake whitefish	1	0	-	0	-	-100
8 Brown trout	1	2(25)	7	36(17)	9	96
9 Brook trout	0	4(47)	14	78(49)	19	150
10 Rainbow smelt	0	0	-	0(1)	-	-
10 Central mudminnow	2	8(15)	28	70(26)	17	320
11 Northern pike	1	5(22)	17	106(28)	25	400
12 Muskellunge	0	0	-	0(2)	-	-
- Stonerollers	0	6	21	0	-	-
13 Central stoneroller	0	0	-	18	4	-
14 Largescale stoneroller	6	4	14	61	14	1,400
15 Common carp	1	0(11)	-	30(4)	7	210
16 Brassy minnow	1	3	10	50	12	1,600
17 Mississippi silvery minnow	1	0	-	3	1	200
18 Hornyhead chub	4	12	41	66	16	450
19 Golden shiner	1	3	10	55	13	1,700
20 Pugnose shiner (W)	0	0	-	9	2	-
21 Emerald shiner	0	3	10	12	3	300
17 River shiner	0	0	-	3	1	-
22 Common shiner	7	18	62	124	29	600
23 Bigmouth shiner	2	1	3	34	8	3,300
24 Blackchin shiner	1	1	3	28	7	2,700
25 Blacknose shiner	1	5	17	18	4	260
26 Ozark minnow (T)	1	0	-	7	2	600
27 Rosyface shiner	1	8	28	38	9	380
28 Spotfin shiner	1	3	10	21	5	600
29 Sand shiner	1	0	-	7	2	600
30 Weed shiner (W)	0	1	3	19	5	1,800
31 Redfin shiner (W)	1	0	-	4	1	300
32 Mimic shiner	3	1	3	30	7	2,900
33 Northern redbelly dace	0	1	3	22	5	2,100
34 Finescale dace	0	2	7	6	1	200
35 Bluntnose minnow	8	12	41	204	48	1,600
36 Fathead minnow	1	5	17	114	27	2,200
31 Bullhead minnow	0	0	-	1	t	-
37 Blacknose dace	4	8	28	117	28	1,400
38 Longnose dace	1	3	10	64	15	2,000
39 Creek chub	9	13	45	147	35	1,000
40 Pearl dace	1	0	-	59	14	5,800
41 River carpsucker	0	0	-	1	t	-
42 Quillback	0	0	-	9	2	-
41 Highfin carpsucker	0	0	-	4	1	-
43 White sucker	10	19(81)	66	236(35)	56	200
44 Blue sucker (T)	0	0(2)	-	5	1	150
45 Northern hog sucker	3	3(23)	10	52(7)	12	130
46 Smallmouth buffalo	0	0	-	1	t	-
46 Bigmouth buffalo	0	0	-	2	t	-
47 Silver redhorse	1	0	-	32	8	3,100
48 Golden redhorse	2	1	3	29	7	2,800
49 Shorthead redhorse	1	1	3	39	9	3,800
50 Greater redhorse (W)	0	0	-	4	1	-
51 Black bullhead	1	2	7	21	5	950
52 Yellow bullhead	0	0	-	25	6	-
53 Brown bullhead	0	1	3	43	10	4,200

TABLE 5 (Cont.)

Map No. Species	1900-31	1959-74		1975-81		Percent Change In Occurrence <sup>2</sup>
	No. Stn.	No. Stn	Percent Total	No. Stn.	Percent Total	
54 Channel catfish	0	0(9)	-	5	1	-44
55 Stonecat	0	3	10	15	4	400
56 Tadpole madtom	0	4	14	19	5	380
- Flathead catfish	0	0(3)	-	0	-	-100
57 Trout-perch	0	2(1)	7	2(1)	t	0
58 Burbot	0	0(5)	-	9(2)	2	120
59 Banded killifish	0	0	-	9	2	-
60 Brook silverside	0	0	-	6(4)	1	-
61 Brook stickleback	4	9(14)	31	103(26)	24	460
62 White bass	0	0	-	10	2	-
63 Rock bass	4	8	28	103	24	1,200
64 Green sunfish	0	0	-	4	1	-
65 Pumpkinseed	0	4	10	115	27	2,800
64 Warmouth	0	0	-	4	1	-
66 Bluegill	5	5	14	209	50	4,100
67 Smallmouth bass	0	1(23)	3	113(11)	27	420
68 Largemouth bass	6	3(13)	10	185(16)	44	1,200
69 White crappie	0	0	-	3	1	-
70 Black crappie	2	6	21	122	29	1,900
71 Crystal darter (E)	0	0	-	5	1	-
72 Rainbow darter	0	11	38	48	11	340
73 Iowa darter	4	0	-	53	13	1,200
74 Fantail darter	4	14	48	72	17	410
75 Least darter (W)	1	0	-	5	1	400
76 Johnny darter	8	21	72	212	50	910
77 Banded darter	1	0	-	15	4	1,400
78 Yellow perch	6	6(14)	21	208(25)	49	1,100
79 Logperch	5	9	31	115	27	1,200
80 Blackside darter	2	6	21	56	13	830
81 River darter	0	0	-	3	1	-
82 Sauger	0	0	-	4	1	-
83 Walleye	0	1(27)	3	28(18)	7	64
84 Freshwater drum	0	0(9)	-	6	1	-33
85 Mottled sculpin	4	11(19)	38	93(33)	22	320
85 Slimy sculpin	0	0	-	1	t	-
No. of Species	47	60		97		
Total No. of occurrences (Sum of number of species taken at each station)	132	660		4,530		

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

\*\*t = less than 0.5%.

<sup>1</sup>E = Endangered, T = Threatened, W = Watch.

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

from only 1 station in the Yellow River. Ten specimens of the greater redhorse were caught at a total of 4 stations in the Red Cedar and Brill rivers (Append B Map 50). This species had not been previously reported from this

basin. Six specimens of the least darter were taken at a total of 5 stations in 2 lakes and 3 streams (Append. B Map 75). The species had been previously collected from 1 station on the Brill River. Our sampling of this same sec-

tion of river failed to collect it. However, we did find it in Hemlock Creek which is less than 6 miles from the mouth of the Brill River.

Habitat characteristics of 4 of the watch species are shown in Table 13.

TABLE 6. Number of specimens and number of stations for each species collected in the Red Cedar River basin, 1975-81.

Common Name	No. Specimens*	No. Stations**			Common Name	No. Specimens*	No. Stations**		
		<99	>98	"Unknown"			<99	>98	"Unknown"
Bluegill	9,100	151	57	1	Quillback	130	9		
White sucker	8,400	212	33	26	Sand shiner	120	7		
Bluntnose minnow	8,200	164	40		Brook silverside	110	6	1	3
Yellow perch	7,700	195	31	7	Bowfin	110	9		4
Common shiner	4,900	91	33		Stonecat	110	15		
Brook trout	4,600	99	27	1	Cisco or lake herring	100	1	1	
Creek chub	3,900	136	11		Yellow bullhead	97	25		
Largemouth bass	3,700	196	5		Pugnose shiner	91	9		
Johnny darter	3,400	204	8		Central stoneroller	81	18		
Blacknose dace	3,100	109	8		Redfin shiner	77	4		
Mottled sculpin	2,800	93	6	27	Mooneye	69	8		
Black crappie	2,600	111	11		Ozark minnow	66	7		
Fantail darter	2,300	60	12		Finescale dace	56	6		
Hornyhead chub	2,100	53	13		Banded killifish	54	9		
Stonerollers	2,000	22	13		Freshwater drum	52	6		
Longnose dace	2,000	56	8		Northern brook lamprey	46	14		
Logperch	1,700	112	3		Burbot	43	10		1
Pearl dace	1,600	54	5		Tadpole madtom	40	19		
Brook stickleback	1,600	110	4	15	White bass	30	10		
Pumpkinseed	1,500	109	6		Blue sucker	19	5		
Rainbow darter	1,400	40	8		White crappie	16	3		
Walleye	1,300	38	8		Chestnut lamprey	15	10		
Shorthead redhorse	1,300	35	4		Crystal darter	13	5		
Northern hog sucker	1,200	49	3	7	River darter	13	3		
Rock bass	1,200	103			River shiner	11	3		
Rosyface shiner	1,100	35	3		Muskellunge	10	2		
Fathead minnow	1,100	111	3		Greater redhorse	10	4		
Northern pike	1,100	131	1	2	Channel catfish	10	5		
Golden shiner	890	50	5		Slimy sculpin	10	1		
Smallmouth bass	720	124			Green sunfish	9	4		
Brassy minnow	710	49	1		Shovelnose sturgeon	8	4		
Brown bullhead	690	40	3		Warmouth	7	4		
Bigmouth shiner	690	33	1		Sauger	7	4		
Emerald shiner	640	6	6		Highfin carpsucker	6	4		
Blackside darter	590	56			Least darter	6	5		
Central mudminnow	570	77	2	17	Trout-perch	2	2		1
Common carp	540	30	1	3	Longnose gar	2	2		
Blackchin shiner	480	27	1		Shortnose gar	2	2		
Brown trout	470	52	1		River carpsucker	2	1		
Black bullhead	420	19	2		Bigmouth buffalo	2	2		
American brook lamprey	410	55			Lake sturgeon	1	1		1
Mimic shiner	390	29	1		Silver lamprey	1	1		
Iowa darter	380	53			American eel	1	1		
Northern redbelly dace	290	21	1		Bullhead minnow	1	1		
Silver redhorse	270	31	1		Smallmouth buffalo	1	1		
Largescale stoneroller	270	61			Rainbow smelt	-	-	-	1
Blacknose shiner	270	18			Total	99,217	4,066	395	117
Golden redhorse	210	29							
Mississippi silvery minnow	200	1	2						
Banded darter	200	15							
Weed shiner	190	18	1						
Spotfin shiner	160	21							

\* Rounded to 2 significant figures for each species.  
 \*\* <99 = 98 or fewer specimens collected/station.  
 >98 = 99 or more specimens collected/station.  
 Unknown = counts of specimens were not made.

TABLE 7. Percent occurrence of fish species in the Red Cedar River basin\* for the 1975-81 period arranged by their importance in stream vs. lake environments.

Common Name	Percent Occurrence		Common Name	Percent Occurrence	
	In Streams	In Lakes		In Streams	In Lakes
Chestnut lamprey	100	0	Common shiner	77	23
Northern brook lamprey	100	0	Shorthead redhorse	77	23
Silver lamprey	100	0	Silver redhorse	75	25
American brook lamprey	100	0	Hornyhead chub	72	28
Shovelnose sturgeon	100	0	Ozark minnow	71	29
Longnose gar	100	0	Sand shiner	71	29
Shortnose gar	100	0	Fathead minnow	71	29
Mooneye	100	0	White sucker	71	29
Brown trout	100	0	Black bullhead	71	29
Central stoneroller	100	0	Green sunfish	67	33
Mississippi silvery minnow	100	0	Least darter	60	40
River shiner	100	0	Common carp	59	41
Finescale dace	100	0	Johnny darter	55	45
Bullhead minnow	100	0	Spotfin shiner	52	48
River carpsucker	100	0	Tadpole madtom	47	53
Quillback	100	0	Logperch	45	55
Highfin carpsucker	100	0	Blacknose shiner	44	56
Blue sucker	100	0	Northern pike	39	61
Smallmouth buffalo	100	0	Walleye	35	65
Bigmouth buffalo	100	0	Trout-perch	33	67
Greater redhorse	100	0	Warmouth	33	67
Channel catfish	100	0	Weed shiner	32	68
Stonecat	100	0	Yellow bullhead	32	68
Burbot	100	0	Golden shiner	30	70
Crystal darter	100	0	Rock bass	30	70
River darter	100	0	Bluntnose minnow	27	73
Sauger	100	0	Blackchin shiner	25	75
Freshwater drum	100	0	Redfin shiner	25	75
Slimy sculpin	100	0	Iowa darter	25	75
Brown trout	99	1	Smallmouth bass	24	76
Fantail darter	99	1	Black crappie	18	82
Blacknose dace	98	2	Yellow perch	18	82
Longnose dace	98	2	Bluegill	13	87
Brook stickleback	98	2	Brown bullhead	12	88
Rainbow darter	98	2	Pumpkinseed	12	88
Mottled sculpin	98	2	Largemouth bass	10	90
Blackside darter	96	4	Mimic shiner	10	90
Northern redbelly dace	95	5	Lake sturgeon	0	100
Northern hog sucker	95	5	Bowfin	0	100
Brassy minnow	94	6	Cisco or lake herring	0	100
Bigmouth shiner	94	6	Rainbow smelt	0	100
Central mudminnow	93	7	Pugnose shiner	0	100
Golden redhorse	93	7	Banded killifish	0	100
Banded darter	93	7	Brook silverside	0	100
Emerald shiner	92	8	White crappie	0	100
Creek chub	90	10			
White bass	90	10			
Largescale stoneroller	88	12			
Rosyface shiner	82	18			
Pearl dace	82	18			

\* Known to have reproducing populations within the basin.

**TABLE 8.** List of species collected at 5 or fewer stations from the Red Cedar River basin, 1975-81.

Silver lamprey	Highfin carpsucker
Lake sturgeon	Blue sucker
Shovelnose sturgeon	Smallmouth buffalo
Longnose gar	Bigmouth buffalo
Shortnose gar	Greater redhorse
American eel	Channel catfish
Cisco or lake herring	Trout-perch
Rainbow smelt	Green sunfish
Muskellunge	Warmouth
Mississippi silvery minnow	White crappie
River shiner	Crystal darter
Redfin shiner	Least darter
Bullhead minnow	River darter
River carpsucker	Sauger
	Slimy sculpin

**TABLE 9.** Fish species collected for the first time during the 1975-81 period from the Red Cedar River basin.

Northern brook lamprey	Smallmouth buffalo
Silver lamprey	Bigmouth buffalo
American brook lamprey	Greater redhorse
Longnose gar	Yellow bullhead
Shortnose gar	Banded killifish
Mooneye	Brook silverside
Rainbow smelt	White bass
Muskellunge	Green sunfish
Central stoneroller	Warmouth
Pugnose shiner	White crappie
River shiner	Crystal darter
Bullhead minnow	River darter
River carpsucker	Sauger
Quillback	Slimy sculpin
Highfin carpsucker	

**TABLE 10.** Fish species apparently no longer present in the Red Cedar River basin.

Last Period Recorded	Species
1900-31	Lake whitefish
1958-74	Flathead catfish

**TABLE 11.** Fish species reported prior to 1932 from the Red Cedar River basin but not collected again until 1975-81.

Mississippi silvery minnow	Pearl dace
Ozark minnow	Silver redhorse
Sand shiner	Iowa darter
Redfin shiner	Least darter
	Banded darter

**TABLE 12.** Endangered species collected in the Red Cedar River basin during 1975-81 and records from stations in other Wisconsin basins since 1974.

Species	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/Station	No. Records From Other Basins*
Crystal darter	Red Cedar R.	Dunn	5	13		13(2,280,300,310)
		TOTAL	5	13	3	

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

**TABLE 13. Characteristics of aquatic habitat for selected species\* collected in the Red Cedar River basin, 1975-81.**

Species	Stream Width (m)	Stream Depth (m)	Velocity**	Turbidity**	Cond. (umhos)	Temp. (F)
<b>ENDANGERED</b>						
Crystal darter	27-42	0.3-1	moderate	moderate	200	76
<b>THREATENED</b>						
Blue sucker	26-40	1-2.5	moderate	moderate	200	76
<b>WATCH</b>						
Pugnose shiner (lake stations)		(littoral zone with abundant aquatic vegetation)		slight	175	72-82
Weed shiner (lake stations)		(littoral zone with abundant aquatic vegetation)		slight-moderate	110	75-82
(stream stations)	4-10	0.3-1	slight	slight	180	72-77
Redfin shiner (lake stations)		(littoral zone with abundant aquatic vegetation)		slight-moderate	150-280	78
Greater redhorse	21-60	0.3-1.5	moderate	moderate	120	69-74

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

\*\* Terms are defined in Fago (1983b).

**TABLE 14. Threatened species collected in the Red Cedar River basin during 1975-81 and records from stations in other Wisconsin basins since 1974.**

Species	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/Station	No. Records From Other Basins*
Ozark minnow	Vermillion R.	Barron	2	44		43(221,223,230)
	Brill R.	Barron	2	12		
	Long L.	Washburn	2	6		
	Red Cedar R.	Barron	<u>1</u>	<u>4</u>		
	TOTAL		7	66	9	
Blue sucker	Red Cedar R.	Dunn	<u>5</u>	<u>19</u>		49(2,240,270,300,310)
		TOTAL	5	19	4	

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

**TABLE 15.** *Watch species collected in the Red Cedar River basin during 1975-81 and records from stations in other Wisconsin basins since 1974.*

Species	Body of Water	County	No. Stations	No. Fish	Avg. No. Fish/Station	No. Records From Other Basins*
Lake sturgeon	L. Menomin	Dunn	1	1		31(2,5,81,82,110,221,240,300,310)
	Tainter L.	Dunn	<u>1</u>	-		
	TOTAL		2	1	1	
American eel	Red Cedar R.	Dunn	<u>1</u>	<u>1</u>		40(2,5,81,221,222,240,270,280,300)
		TOTAL	1	1	1	
Pugnose shiner	Bear L.	Washburn	1	1		48(20,81,82,210,221,300,310)
	Kekegama L.	Washburn	1	12		
	Long L.	Washburn	6	75		
	Red Cedar L.	Barron	<u>1</u>	<u>3</u>		
	TOTAL		9	91	10	
Weed shiner	Barron Flowage (Lower)	Barron	1	1		53(2,82,120,222,240,250,260,270,290)
	Yellow R.	Barron	2	9		
	Barron Flowage (Upper)	Barron	1	99		
	Vermillion R.	Barron	1	5		
	Sweeny Pond Cr.	Barron	2	12		
	Bear Cr.	Barron	1	1		
	Bear L.	Barron	4	12		
	Kekegama L.	Washburn	1	6		
	Hemlock L.	Barron	2	3		
	L. Chetac	Sawyer	<u>4</u>	<u>38</u>		
	TOTAL		19	186	10	
	Redfin shiner	Tainter L.	Dunn	1	1	
Barron Flowage (Lower)		Barron	1	60		
Yellow R.		Barron	1	5		
Barron Flowage (Upper)		Barron	<u>1</u>	<u>11</u>		
TOTAL			4	77	19	
Greater redhorse	Red Cedar R.	Dunn	2	3		93(5,20,40,50,82,100,110,221,240,300,310)
	Red Cedar R.	Barron	1	4		
	Brill R.	Barron	<u>1</u>	<u>3</u>		
	TOTAL		4	10	3	
Least darter	Tenmile Cr.	Barron	1	1		84(20,82,120,200,210,221,222,270,300,310,400)
	Vermillion R.	Barron	1	1		
	Kekegama L.	Washburn	1	2		
	Long L.	Washburn	1	1		
	Hemlock Cr.	Rusk	<u>1</u>	<u>1</u>		
	TOTAL		5	6	1	

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

# RECOMMENDATIONS

## CONTINUING USE OF FISH DISTRIBUTION DATA

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

## FUTURE RESEARCH STUDIES

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

The potential integration of the data compiled by the study with data

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

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 HABITAT

The aquatic environment of the Red Cedar River from below the Lake Monomin dam to its mouth should be protected, for both the endangered crystal darter and the threatened blue sucker are found there. Any manipulations of this habitat should recognize the presence of these 2 beautiful and valuable species.

The populations of the threatened Ozark minnow in the Red Cedar, Brill, and Vermillion rivers and Long Lake should be protected. Any plans to manipulate this environment should recognize their presence. These disjunct populations present a unique opportunity to make ecological comparisons between them and populations in southern Wisconsin.

## UPDATING PRESENT RECORDS

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

## COMPLETION OF THIS SURVEY

Completion of 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 non-game species, high priority should be accorded to completion of the surveys in compliance with the legislative mandate.

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# APPENDIX A. Supplementary Data

TABLE 16. List of species reported from the Red Cedar River basin by collectors other than DNR research personnel.

Species	1959-74	1975-81	Species	1959-74	1975-81
Chestnut lamprey	2		Trout-perch*	1,2	1
Lake sturgeon*		1,7	Burbot*	1	1
Shovelnose sturgeon*	1,10		Brook silverside*		1
Bowfin*	1	1	Brook stickleback*	1,2,5	1
American eel*	1		Rock bass	2,5	1
Cisco or lake herring*	1	1	Pumpkinseed	5	1
Brown trout*	1,5	1	Bluegill	2,5	
Brook trout*	1,5	1	Smallmouth bass*	1,5,10	1
Rainbow smelt*		1	Largemouth bass*	1,5	1
Central mudminnow*	1,5	1	Black crappie	2,5	
Northern pike*	1,5,10	1	Rainbow darter	2,5	1
Muskellunge*		1	Iowa darter		1
Stoneroller (unsp.)	5		Fantail darter	2,5	1
Largescale stoneroller	2	1	Least darter		1
Common carp*	1,10	1	Johnny darter	2,5	1
Brassy minnow	2,5	1	Banded darter		1
Hornyhead chub	2,5		Yellow perch*	1,2,5	1
Golden shiner	2	1	Logperch	2,5	
Emerald shiner	2,5		Blackside darter	2,5	
Common shiner	2,5	1	Walleye*	1,2,10	1
Bigmouth shiner	2		Freshwater drum*	1,10	
Blackchin shiner		1	Mottled sculpin*	1,5	1
Blacknose shiner	2	1			
Rosyface shiner	2,5				
Spotfin shiner	2				
Weed shiner	5				
Mimic shiner	2	1			
Northern redbelly dace		1			
Finescale dace	5				
Bluntnose minnow	2,5				
Fathead minnow	2,5	1			
Blacknose dace	5	1			
Longnose dace	5				
Creek chub	2,5	1			
Pearl dace		1			
White sucker*	1,2,5,10	1			
Northern hog sucker*	1,2,5,10	1			
Golden redbhorse	2	1			
Shorthead redbhorse	2				
Black bullhead	5				
Brown bullhead		1			
Channel catfish*	1,10				
Stonecat	2,5	1			
Tadpole madtom	2,5				
Flathead catfish*	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 collectons
- 2 = Dr. George Becker and his students
- [3 = Professor Marlin Johnson and his students]
- [4 = Dr. George Seeburger and his students]
- 5 = Milwaukee Public Museum
- [6 = UW-Madison students]
- 7 = Commercial fishermen
- [8 = Sport fishermen]
- [9 = Upper Mississippi River Conservation Commission] (UMRCC)
- 10 = N.U.S. Corporation, Pittsburgh, PA
- [ ] = Collector not used in this basin study.

- 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) \_\_\_\_\_

STATION MILEAGE \_\_\_\_\_

REPORT LOCATION

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 \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ HOUR \_\_\_\_\_  
MO DAY YR

WIDTH \_\_\_\_\_ DEPTH \_\_\_\_\_  
L M U L M U

VELOCITY \_\_\_\_\_ TEMPERATURE \_\_\_\_\_ CONDUCTIVITY \_\_\_\_\_ TURBIDITY \_\_\_\_\_

BOTTOM TYPES \_\_\_\_\_

AQUATIC VEG. \_\_\_\_\_

STRM. BANK VEG. \_\_\_\_\_

FISH SPECIES

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

MORE DATA ON BACK:  YES

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

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



A86006

NUMBER OF STATIONS

PERCENT OF TOTAL STATIONS

DATE RUN 11/09/83

STATION	SPECIES	NUMBER OF STATIONS	PERCENT OF TOTAL STATIONS
I21	BROWN TROUT	1	2.56
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	HORNHEAD CHUB	21	53.85
M23	EMERALD SHINER	1	2.56
M28	COMMON SHINER	28	71.79
M29	BIGMOUTH SHINER	5	12.82
M35	ROSYFACE SHINER	17	43.59
M36	SPOTFIN SHINER	16	41.03
M37	SAND SHINER	14	35.90
M41	SUCKERMOUTH MINNOW	8	20.51
M43	SOUTHERN REDBELLY DACE	18	46.15
M45	BLUNTNOSE MINNOW	29	74.36
M46	FATHEAD MINNOW	6	15.38
M48	BLACKNOSE DACE	2	5.13
M50	CREEK CHUB	27	69.23
M76	COMMON SHINER X ROSYFACE SHINER	1	2.56
NO2	SUCKERS	1	2.56
NO4	REDHORSES	1	2.56
NO6	QUILLBACK	1	2.56
NO9	WHITE SUCKER	29	74.36
N13	NORTHERN HOG SUCKER	10	25.64
N15	BIGMOUTH BUFFALO	3	7.69
N18	SILVER REDHORSE	9	23.08
N21	GOLDEN REDHORSE	8	20.51
N22	SHORTHEAD REDHORSE	13	33.33
O08	CHANNEL CATFISH	1	2.56
O10	STONECAT	5	12.82
S02	BLACKSTRIFE 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=	SD-14,16=	SD-15,17,19=	SD-23-33=	SD-40=	SD-45,46=	SD-50=	SD-55,56=
	0	0	0	0	0	283	0	0
	SD-61= 158	SD-66= 0	SD-72= 0	SD-75= 0	SD-76= 0	SD-77= 0	SD-78= 0	SD-80= 0
	SD-83= 0	SD-86= 0	SD-88= 0	SD-89= 0	SD-94= 0	SD-98= 0	SD-99= 0	SD-36= 0

TOTAL NUMBER OF SPECIES OCCURRENCES 441

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

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



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

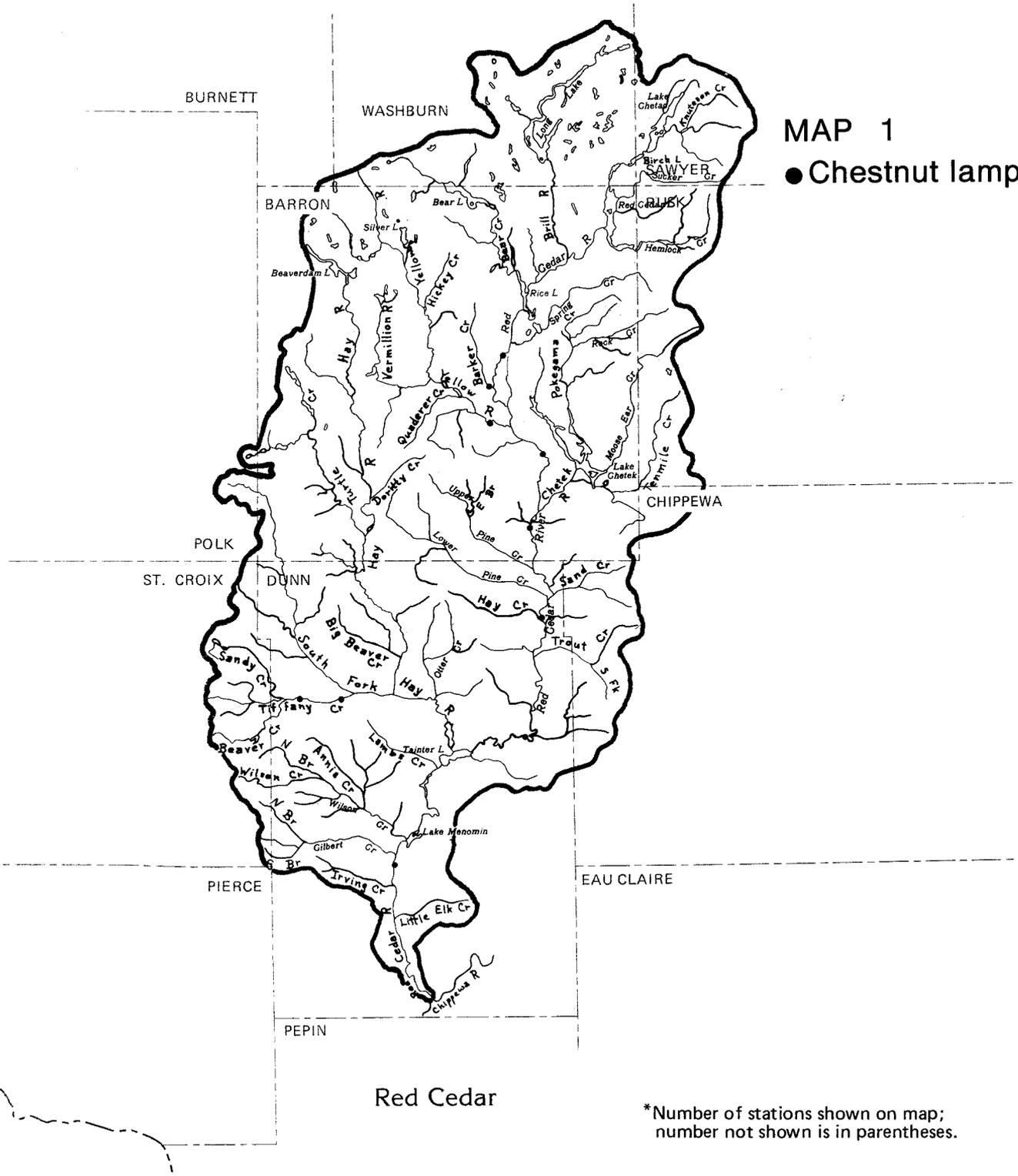
NOV 29, 1983

STREAM & LAKE FILE - MASTER

PAGE 1

BASINS MAJ MIN	MB. MI.	ORDER				M I L E A G E S				MI OR ACRES	-- STREAM OR LAKE NAME --	D WL -- LOCATION --			
		1	2	3	4/8	5/9	6/10	7/11	C			TSTWN	RNGSEC	QTQT64CD	
2 222 62640									17	GOOSE POND	0	6N	8E	13 NENE 13	
2 222 62650									33	L HARRIETT	0	5N	9E	9 NWNW 13	
2 222 62660									10	MORSE POND	0	6N	8E	3 SESW 13	
2 222 62670									12	MORTENSON POND	0	5N	9E	26 NWSE 13	
2 222 62680										SUGAR R -OXBOW	0	1N	10E	27 NWSW 54	
2 222 62690									8	VERONA GRAVEL PIT #12 (EAST	0	6N	8E	22 SENW 13	
2 222 62700	1434.8R	156.9L	.7R						11	RACCOON CR	2	46N	1E	22 80	
2 222 62710	1434.8R	156.9L	.7R	6.9R					7	E FORK RACCOON CR	2	46N	1E	8 80	
2 222 62720	1434.8R	156.9L	.7R	6.9R	1.4					E FORK RACCOON CR WI-IL BD	6	1N	12E	31 SESW 54	
2 222 62730	1434.8R	156.9L	.7R	6.9R	2.7R				4	UN CR (31-3,CHAMBERLIN SPR.	2	1N	12E	31 SWNE 54	
2 222 62740	1434.8R	156.9L	.7R	9.5						RACCOON CR WIS-ILL BD	6	1N	11E	35 SESE 54	
2 222 62750	1434.8R	156.9L	.7R	11.4						DAM-RACCOON CR-MILLPOND		1N	11E	34 NENE 54	
2 222 62760	1434.8R	156.9L	.7R	11.7R					3	UN CR	2	1N	11E	27 SWSE 54	
2 222 62770	1434.8R	156.9L	.7R	11.7R	.3R				3	UN CR	2	1N	11E	27 NWSE 54	
2 222 62780	1434.8R	156.9L	9.2R						76	SUGAR R	2	28N	11E	11 80	
2 222 62790	1434.8R	156.9L	9.2R	10.7						SUGAR R WIS-ILL BD	6	1N	10E	36 SESW 54	
2 222 62800	1434.8R	156.9L	9.2R	10.8L					9	GREEN DRAINAGE SYSTEM	2	1N	10E	36 SESW 54	
2 222 62810	1434.8R	156.9L	9.2R	10.8L	6.4R				1	UN CR	2	1N	9E	25 SENE 54	
2 222 62820	1434.8R	156.9L	9.2R	11.2R					3	UN DITCH	2	1N	10E	36 NWSW 54	
2 222 62830	1434.8R	156.9L	9.2R	11.2R	.7R				1	UN DITCH	2	1N	10E	36 NENW 54	
2 222 62840	1434.8R	156.9L	9.2R	11.7R					2	UN DITCH	2	1N	10E	35 SENE 54	
2 222 62850	1434.8R	156.9L	9.2R	16.0L					6	UN DITCH	2	1N	10E	28 NESW 54	
2 222 62860	1434.8R	156.9L	9.2R	18.8L						SUGAR R -W CHANNEL	2	1N	10E	20 SWNE 54	
2 222 62870	1434.8R	156.9L	9.2R	18.8L	.5L				1	UN DITCH	2	1N	10E	20 SWNW 54	
2 222 62880	1434.8R	156.9L	9.2R	19.8R					13	TAYLOR CR	2	1N	10E	18 SESE 54	
2 222 62890	1434.8R	156.9L	9.2R	19.8R	1.8R				10	WILLOW CR (NORTH)	2	1N	10E	7 NESW 54	
2 222 62900	1434.8R	156.9L	9.2R	19.8R	1.8R	6.7R			4	UN CR	2	1N	10E	11 SWNE 54	

# APPENDIX B. Distribution Maps For All Species Collected During 1975-81



MAP 1  
 ● Chestnut lamprey 10(0)

\*Number of stations shown on map;  
 number not shown is in parentheses.

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

EAU CLAIRE

PEPIN

Red Cedar

### MAP 2

- Northern brook lamprey 14(0)
- ▲ Silver lamprey 1(0)

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

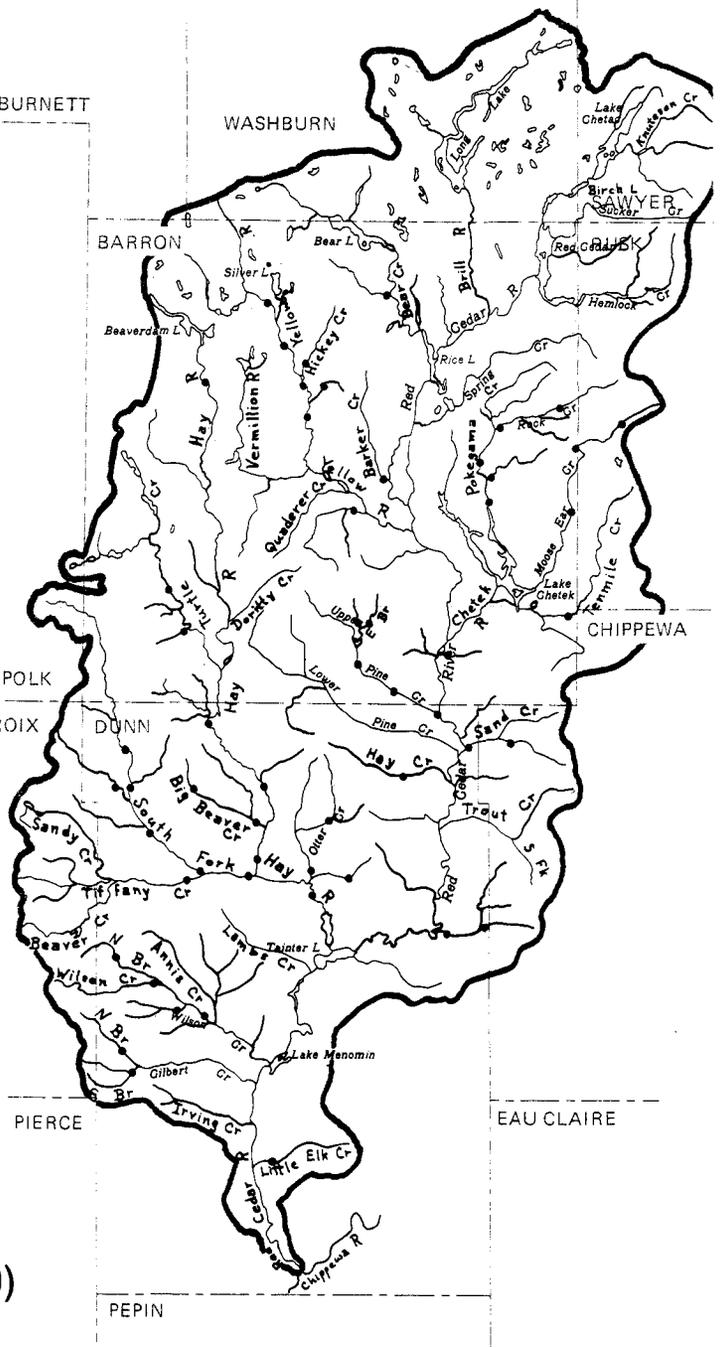
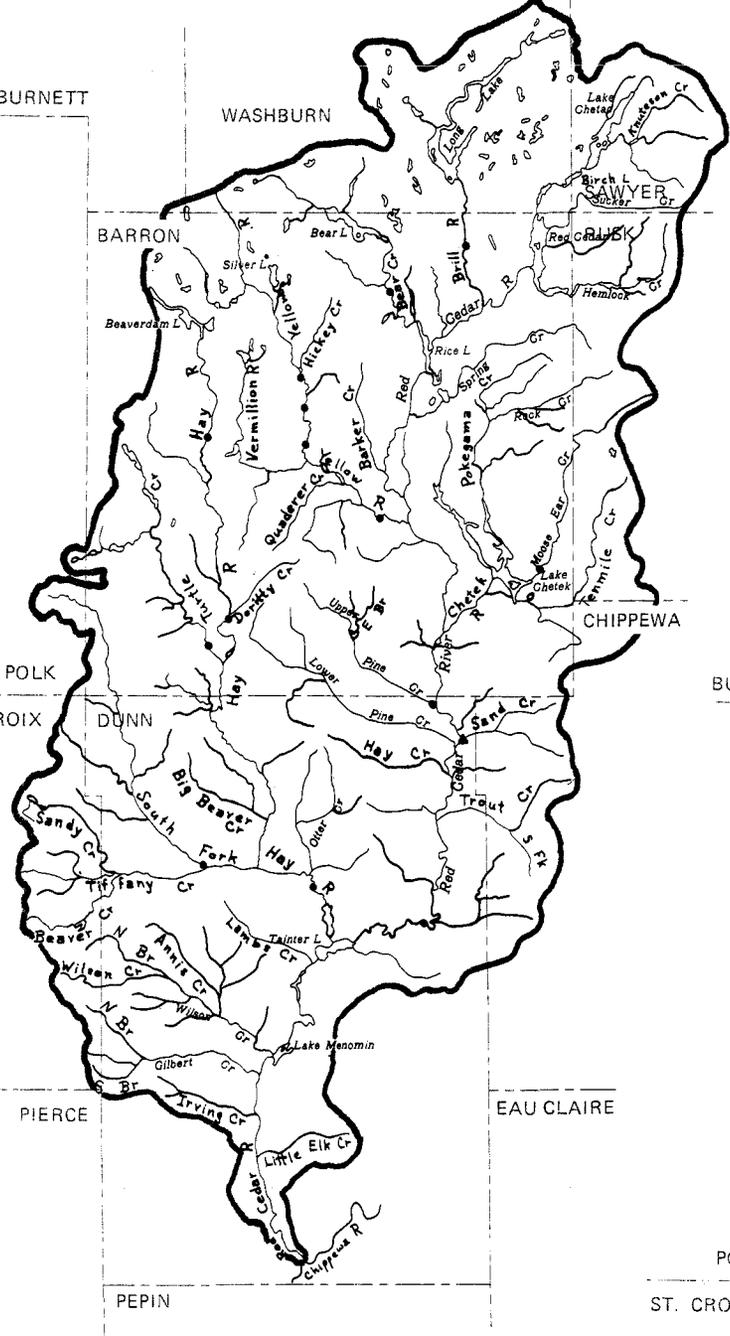
EAU CLAIRE

PEPIN

Red Cedar

### MAP 3

- American brook lamprey 55(0)



BURNETT

WASHBURN

BARRON

SAWYER

POLK

ST. CROIX

DUNN

CHIPPEWA

PIERCE

EAU CLAIRE

PEPIN

Red Cedar

### MAP 4

- Shovelnose sturgeon 4(0)
- ▲ Lake sturgeon 2(0)

BURNETT

WASHBURN

BARRON

SAWYER

POLK

ST. CROIX

DUNN

CHIPPEWA

PIERCE

EAU CLAIRE

PEPIN

Red Cedar

### MAP 5

- Longnose gar 2(0)
- ▲ Shortnose gar 2(0)

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

CHIPPEWA

PIERCE

PEPIN

EAU CLAIRE

Red Cedar

### MAP 6

● Bowfin 9(4)

▲ American eel 1(0)

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

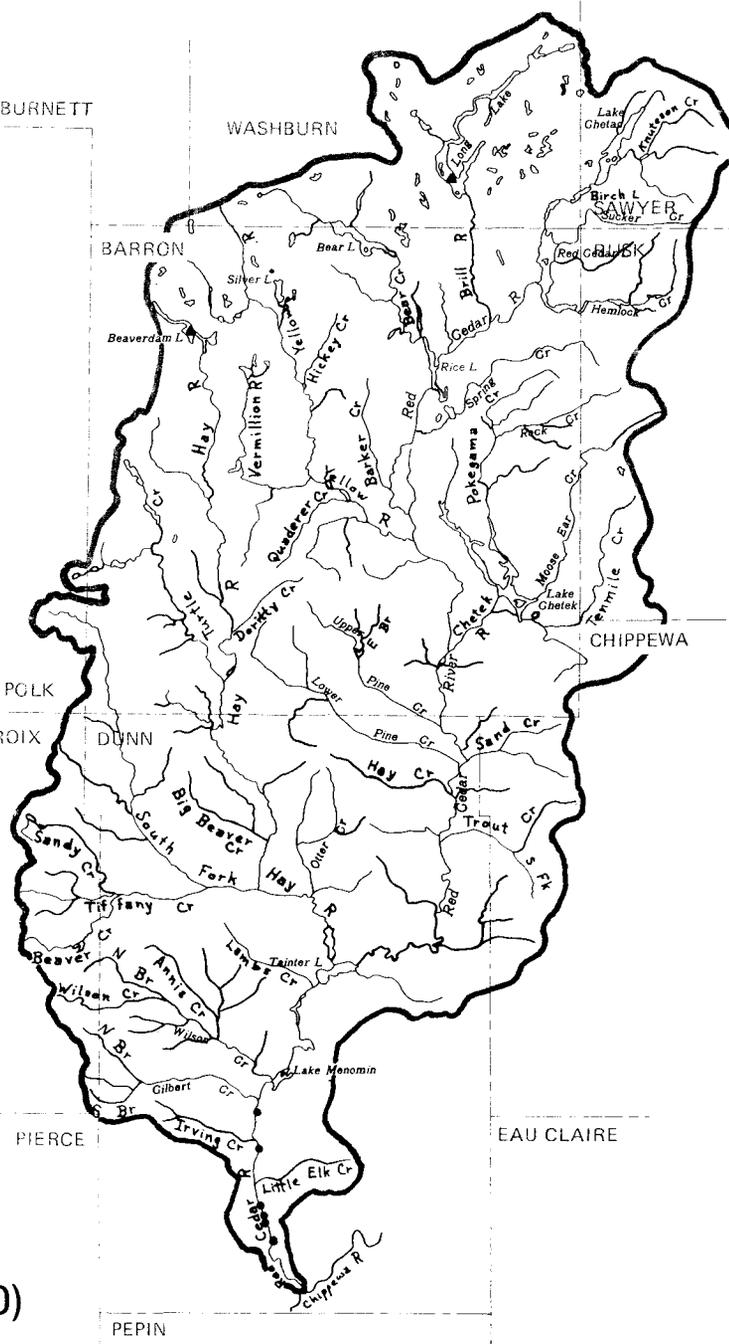
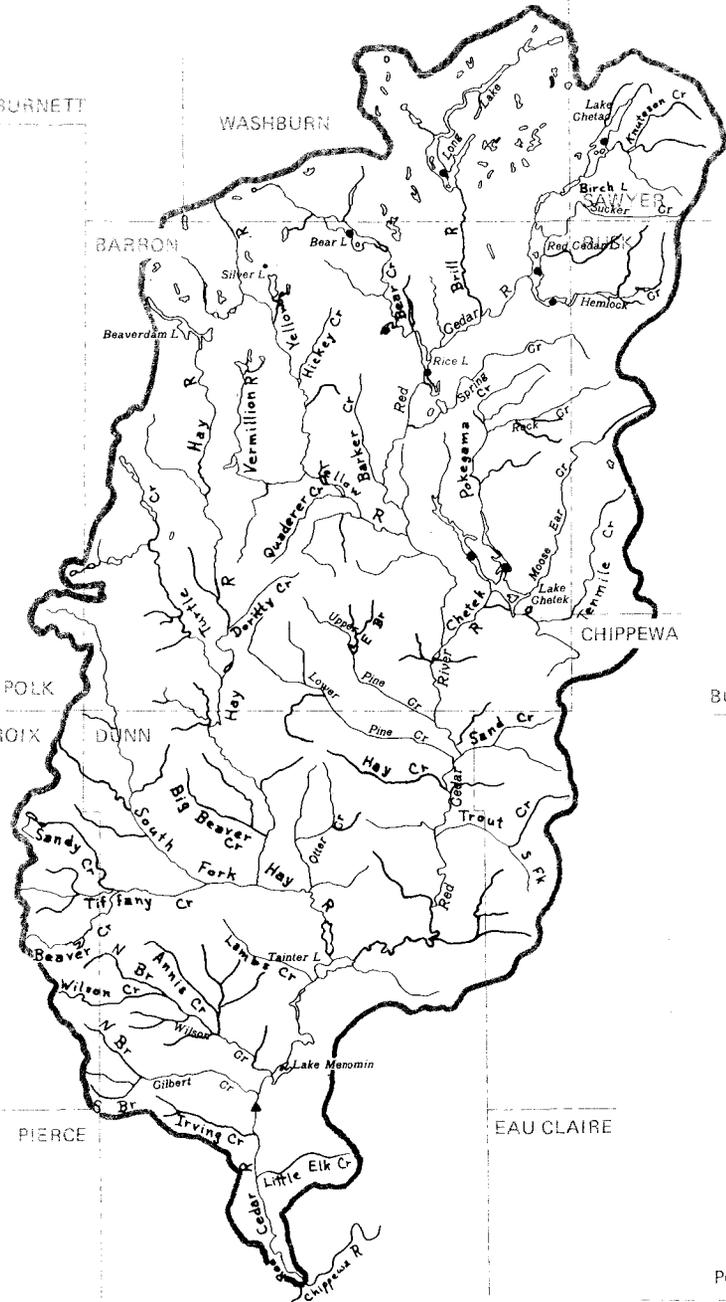
CHIPPEWA

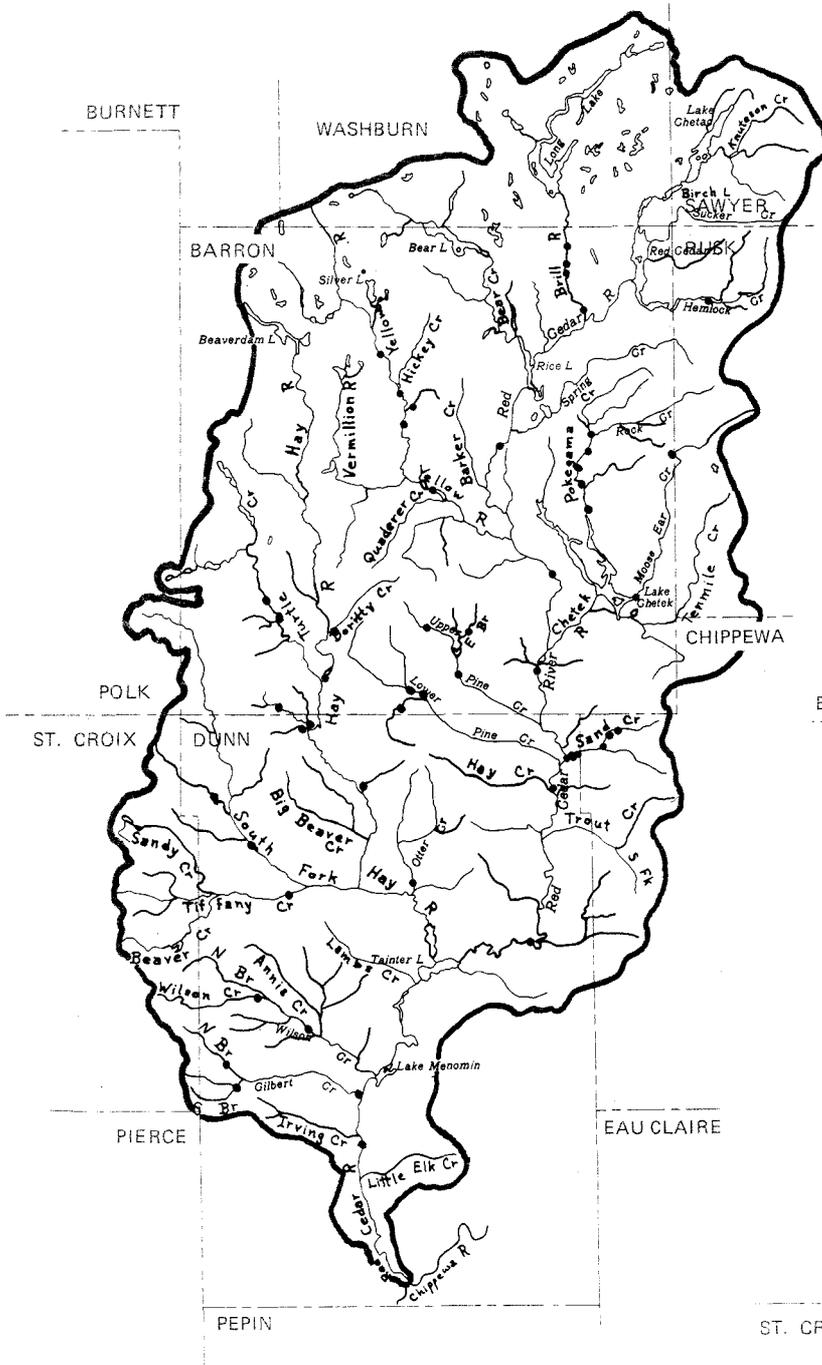
PIERCE

PEPIN

EAU CLAIRE

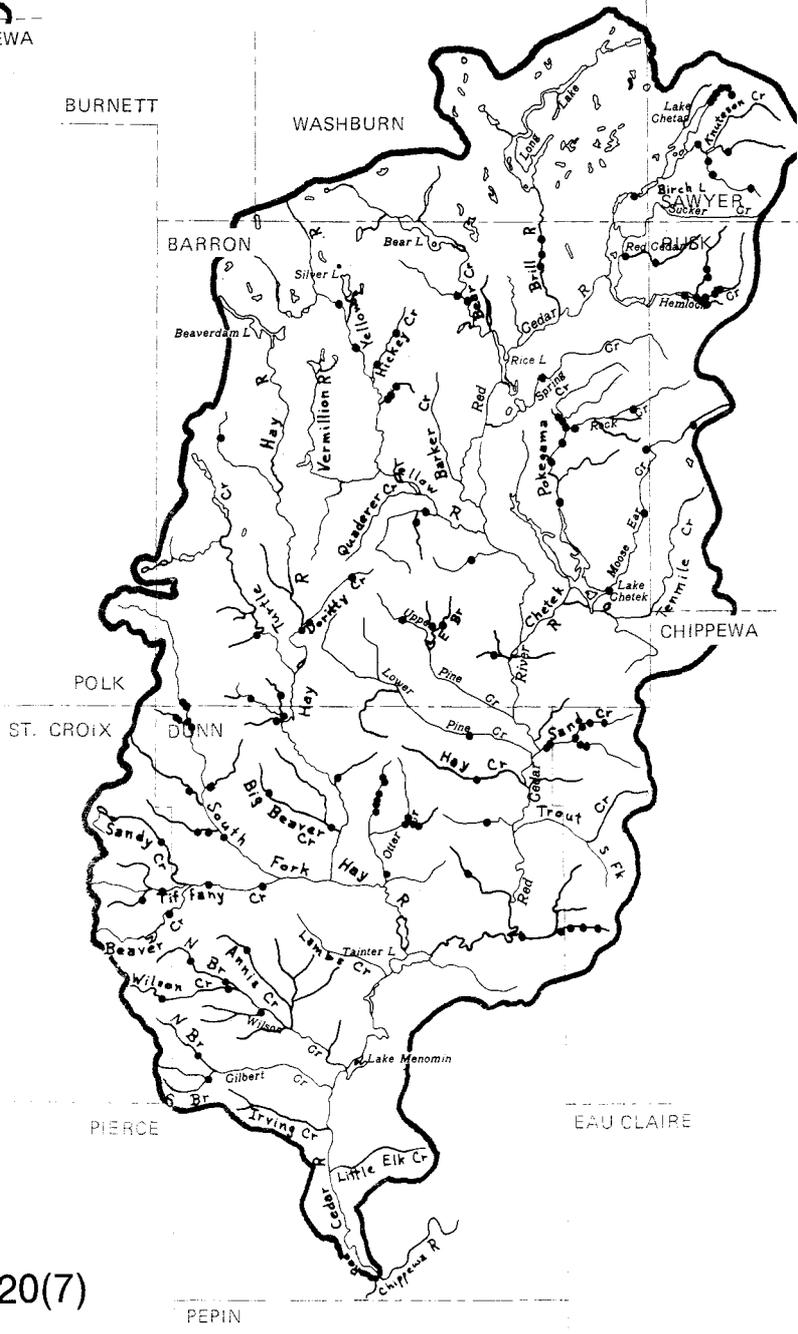
Red Cedar





**MAP 8**  
 ●Brown trout 52(1)

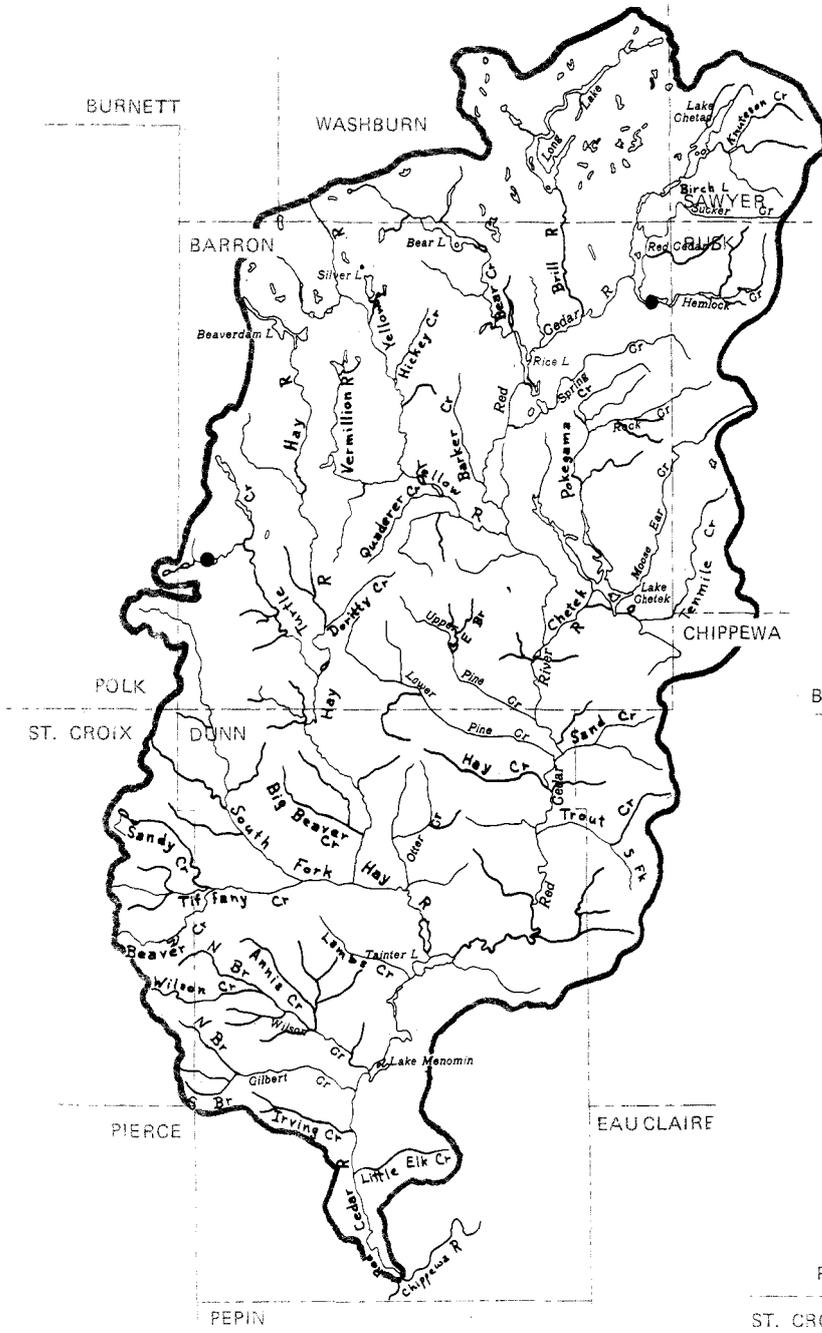
Red Cedar



**MAP 9**  
 ●Brook trout 120(7)

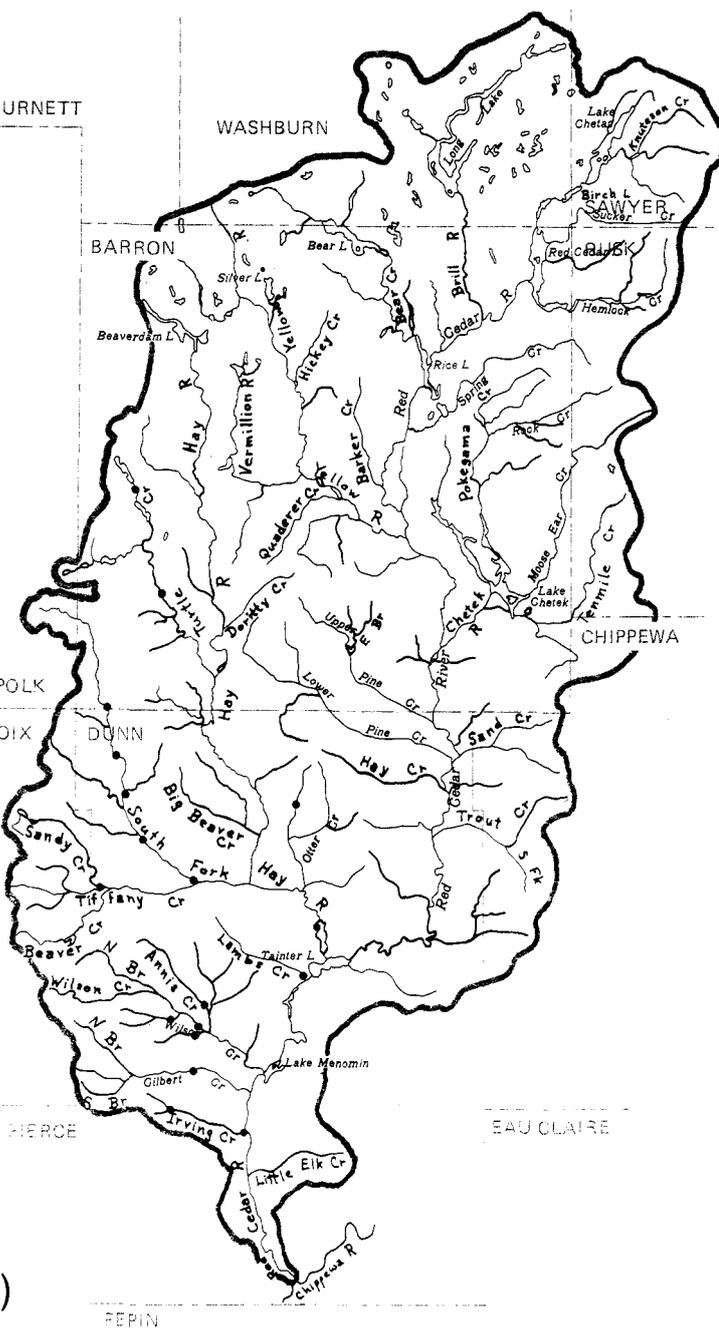
Red Cedar





MAP 12  
●Muskellunge 2(0)

Red Cedar



MAP 13  
●Central stoneroller 18(0)

Red Cedar

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

EAU CLAIRE

PEPIN

Red Cedar

### MAP 14

● Largescale stoneroller 57(4)

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

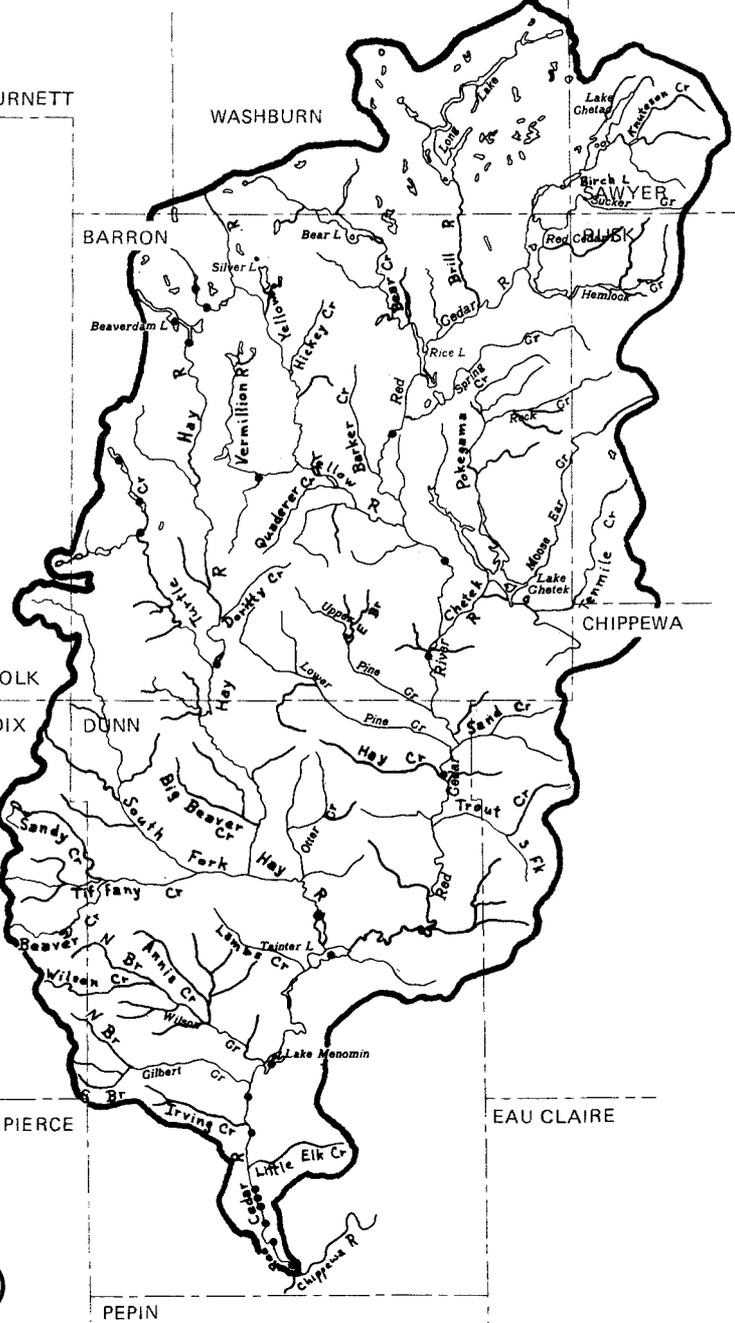
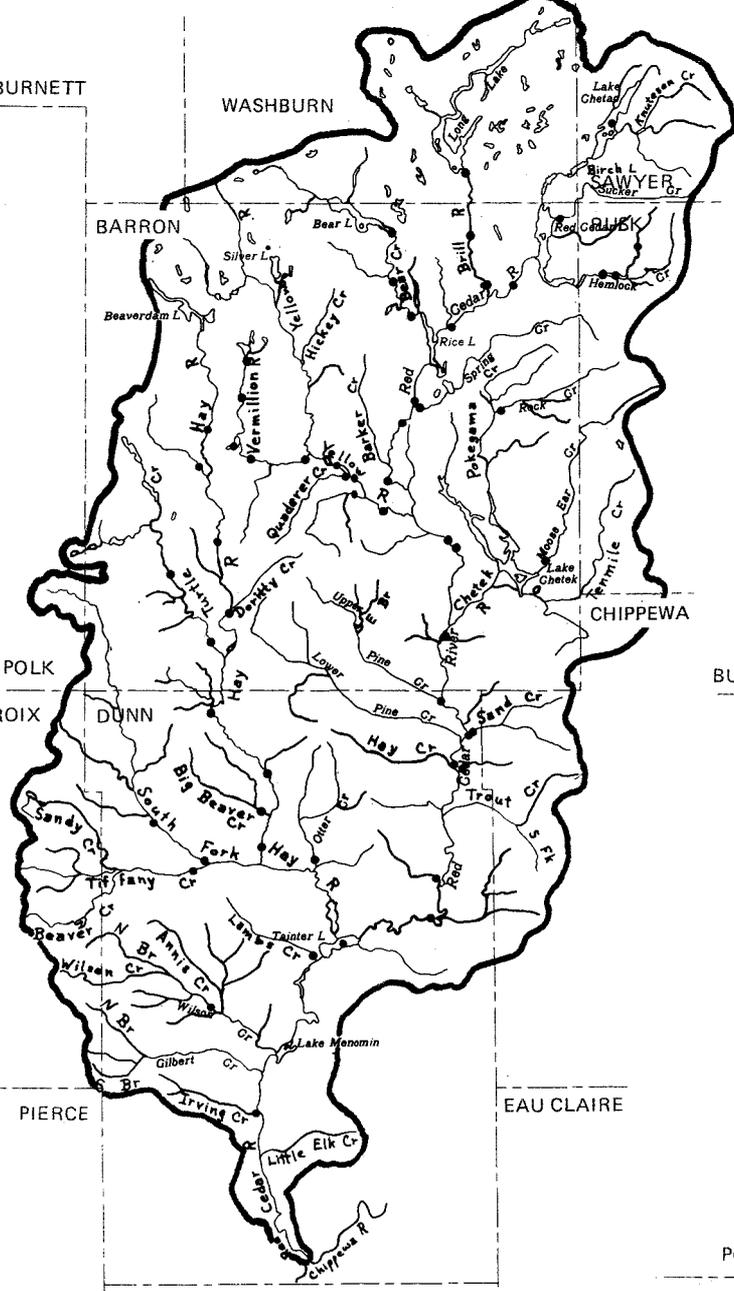
EAU CLAIRE

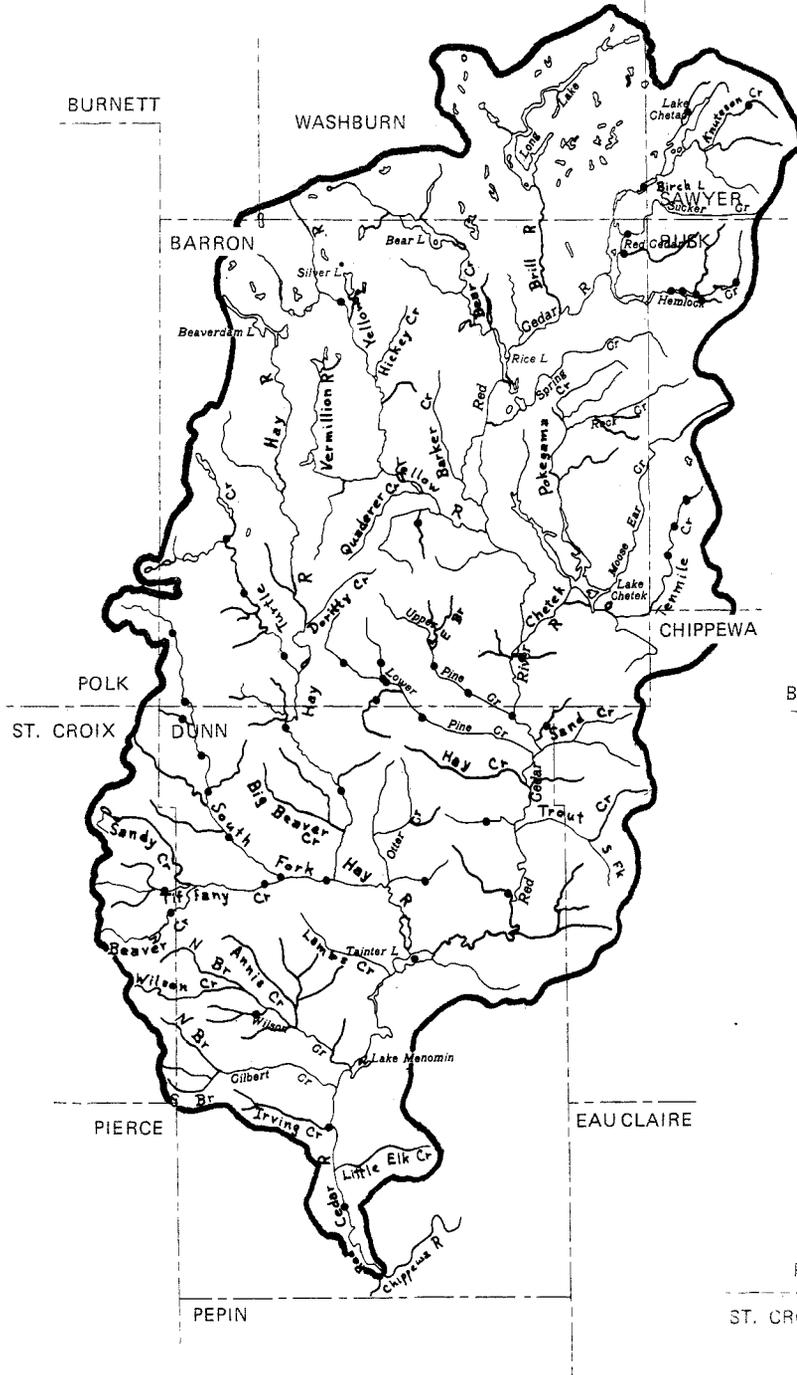
PEPIN

Red Cedar

### MAP 15

● Common carp 26(8)

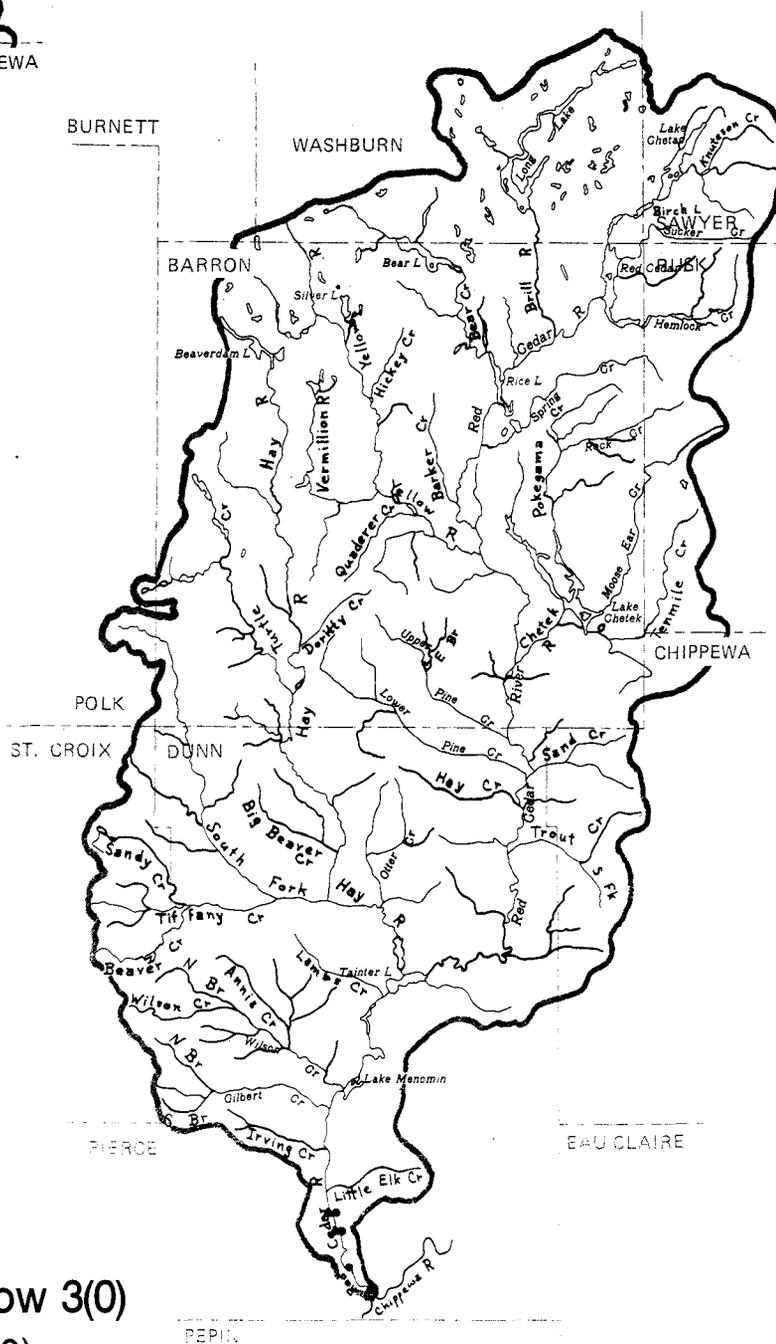




MAP 16

● Brassy minnow 49(1)

Red Cedar



MAP 17

● Mississippi silvery minnow 3(0)

▲ River shiner 3(0)

Red Cedar

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

EAU CLAIRE

PIERCE

PEPIN

Red Cedar

### MAP 18

● Hornyhead chub 54(12)

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

EAU CLAIRE

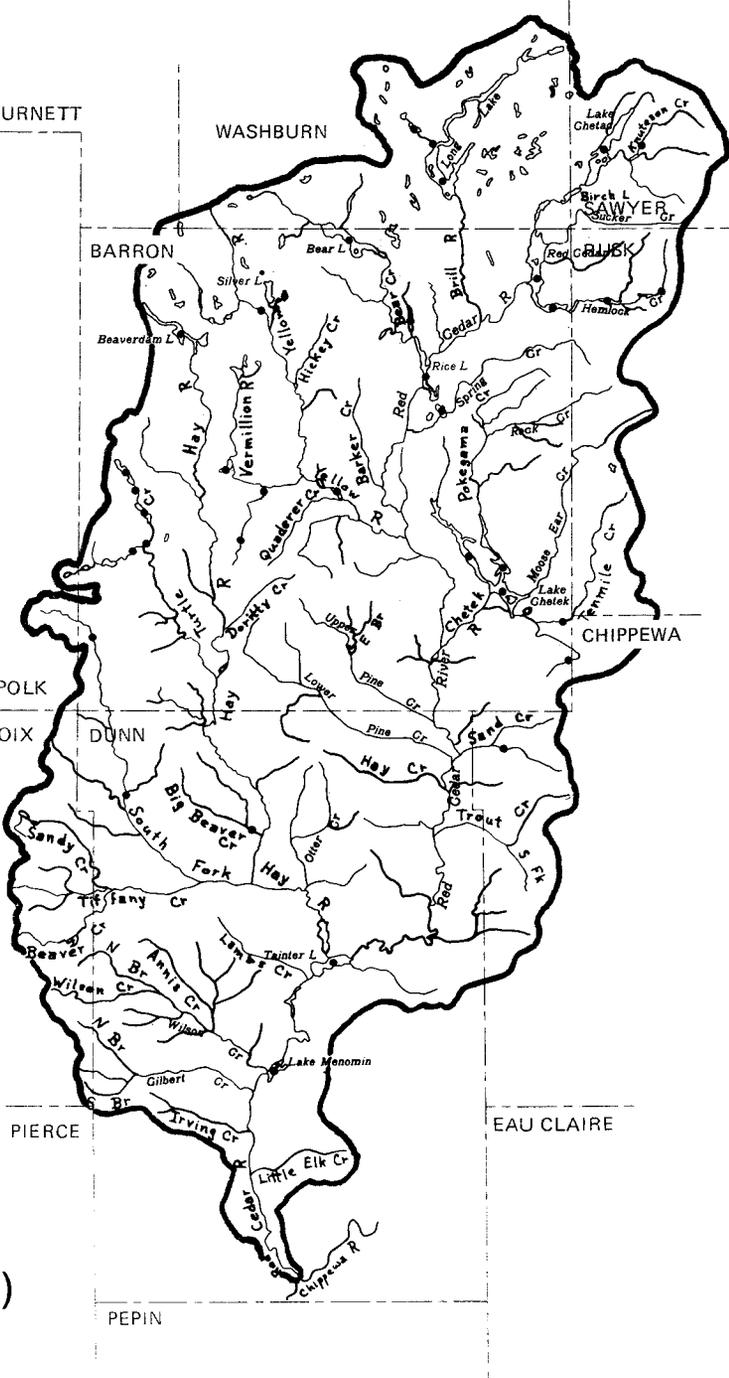
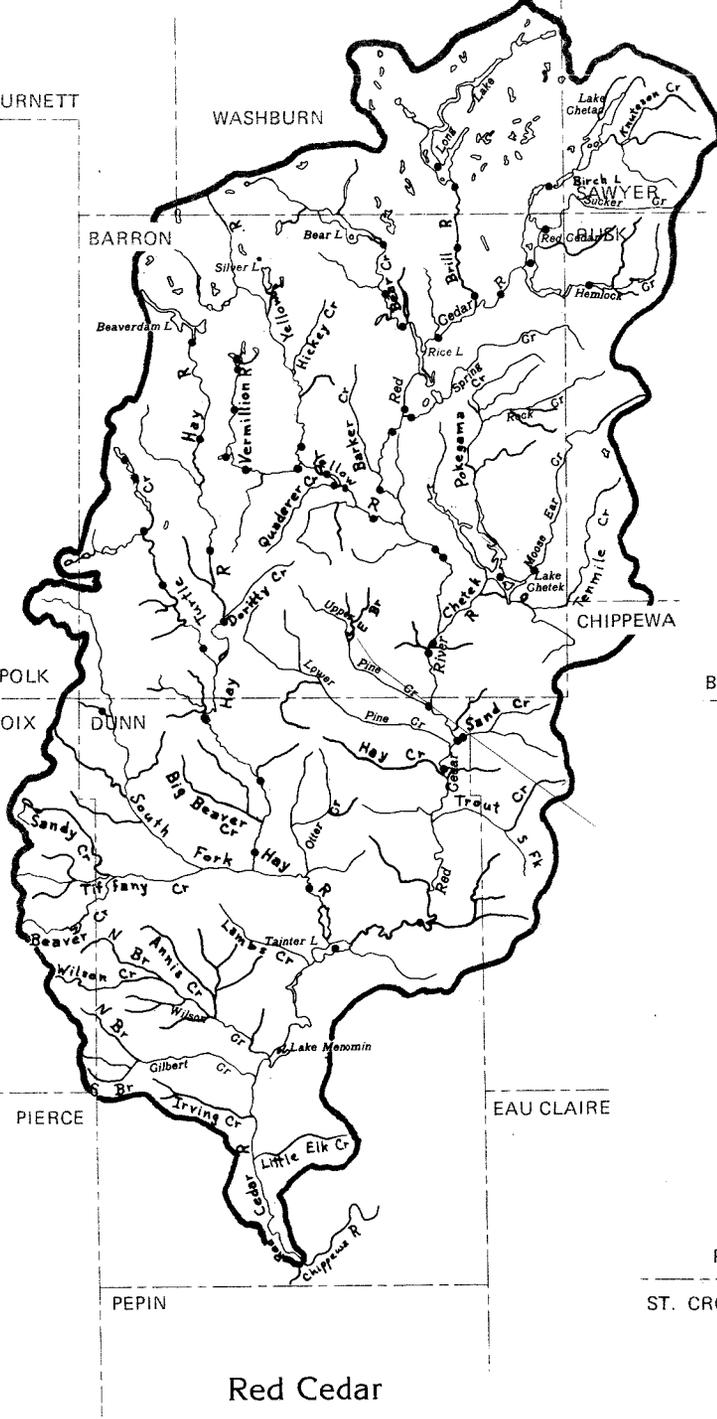
PIERCE

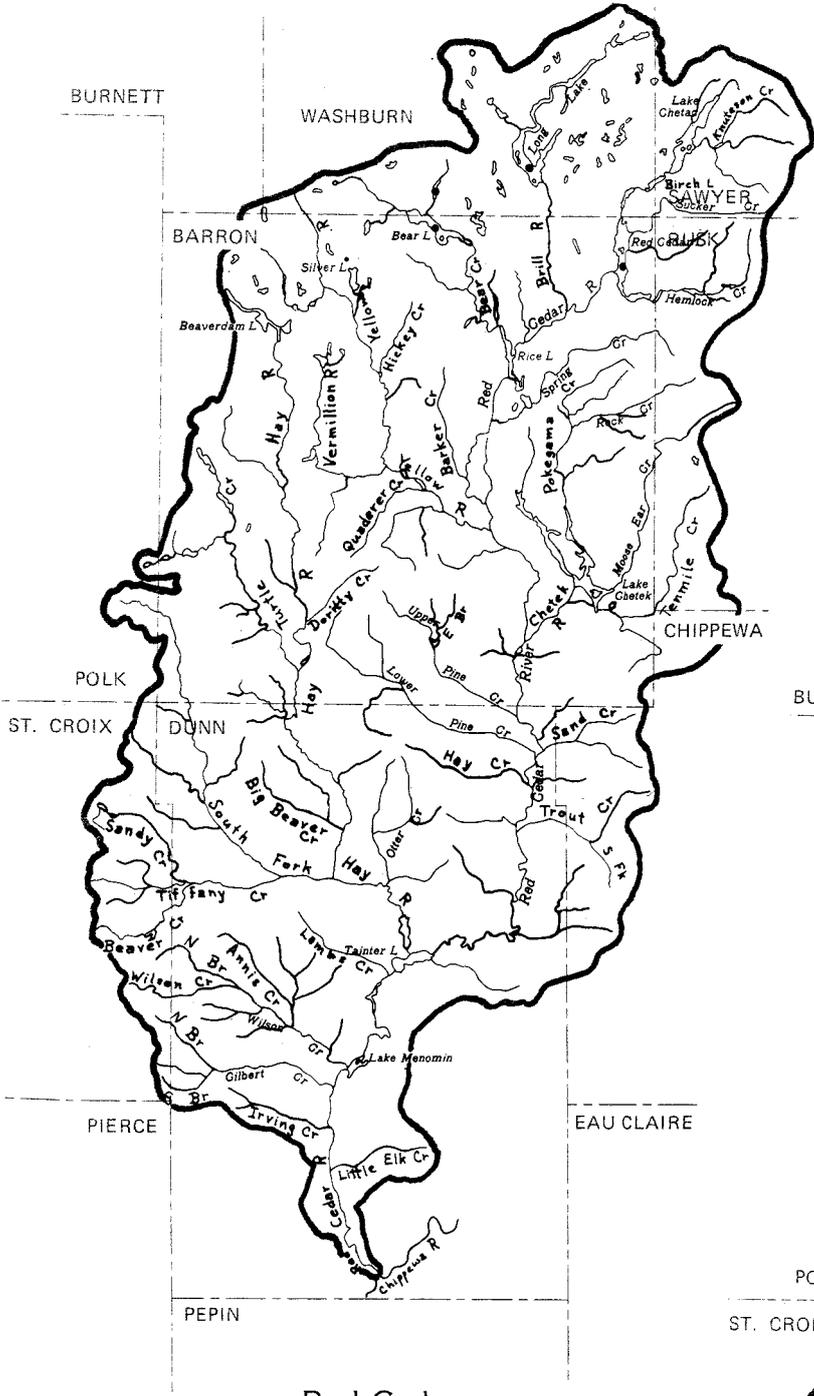
PEPIN

Red Cedar

### MAP 19

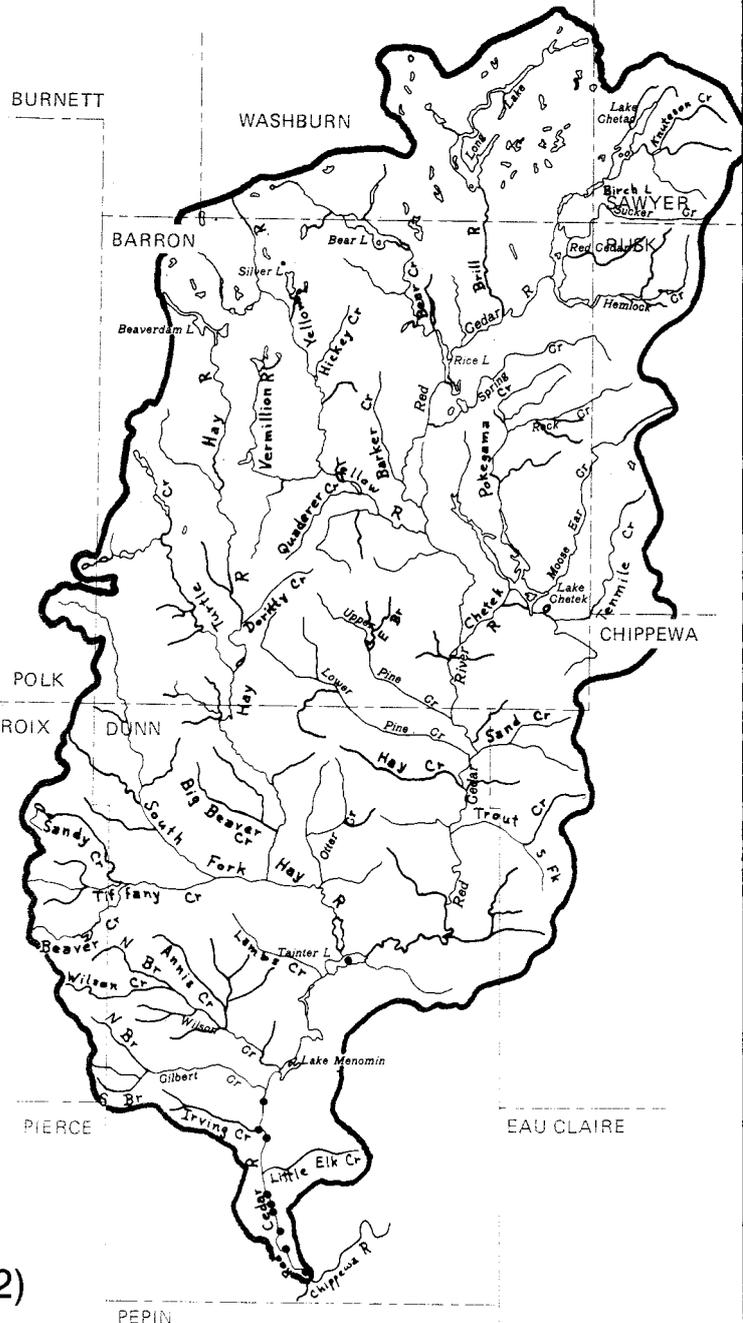
● Golden shiner 36(19)





MAP 20  
●Pugnose shiner 4(5)

Red Cedar



MAP 21  
●Emerald shiner 10(2)

Red Cedar

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

PIERCE

PEPIN

EAU CLAIRE

Red Cedar

### MAP 22

● Common shiner 106(18)

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

PIERCE

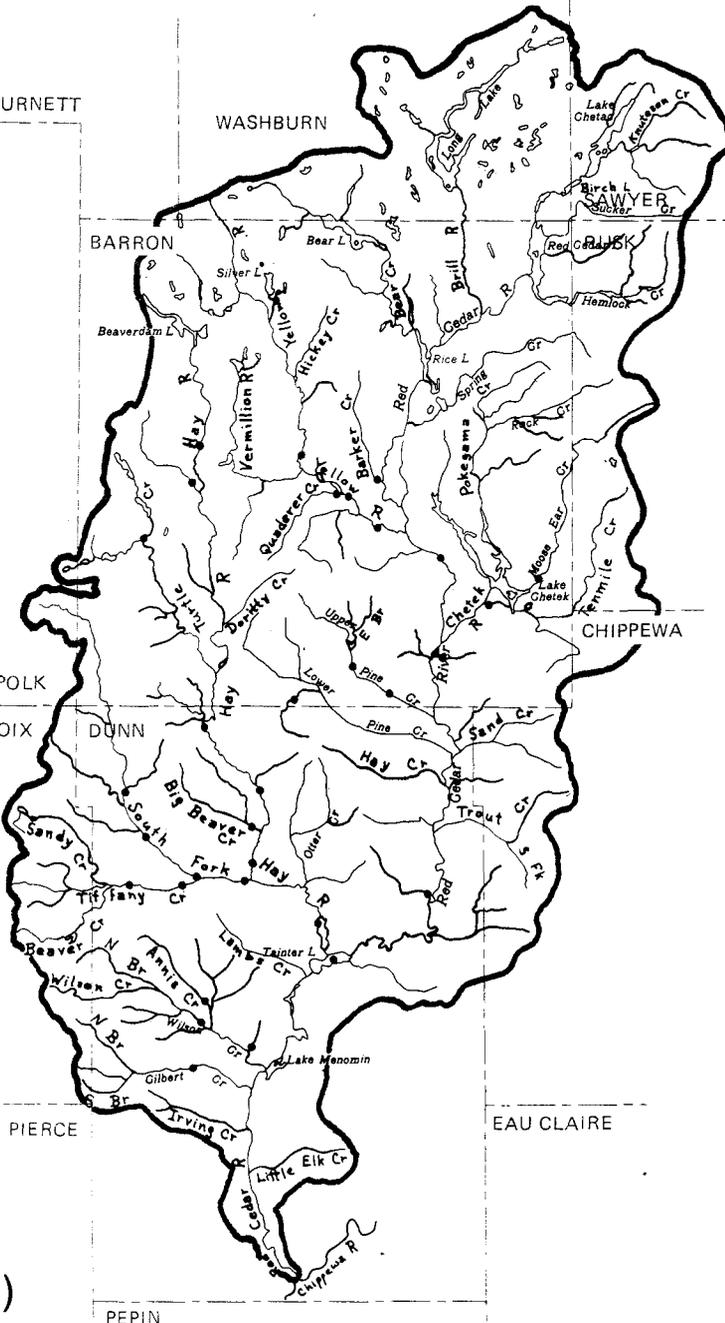
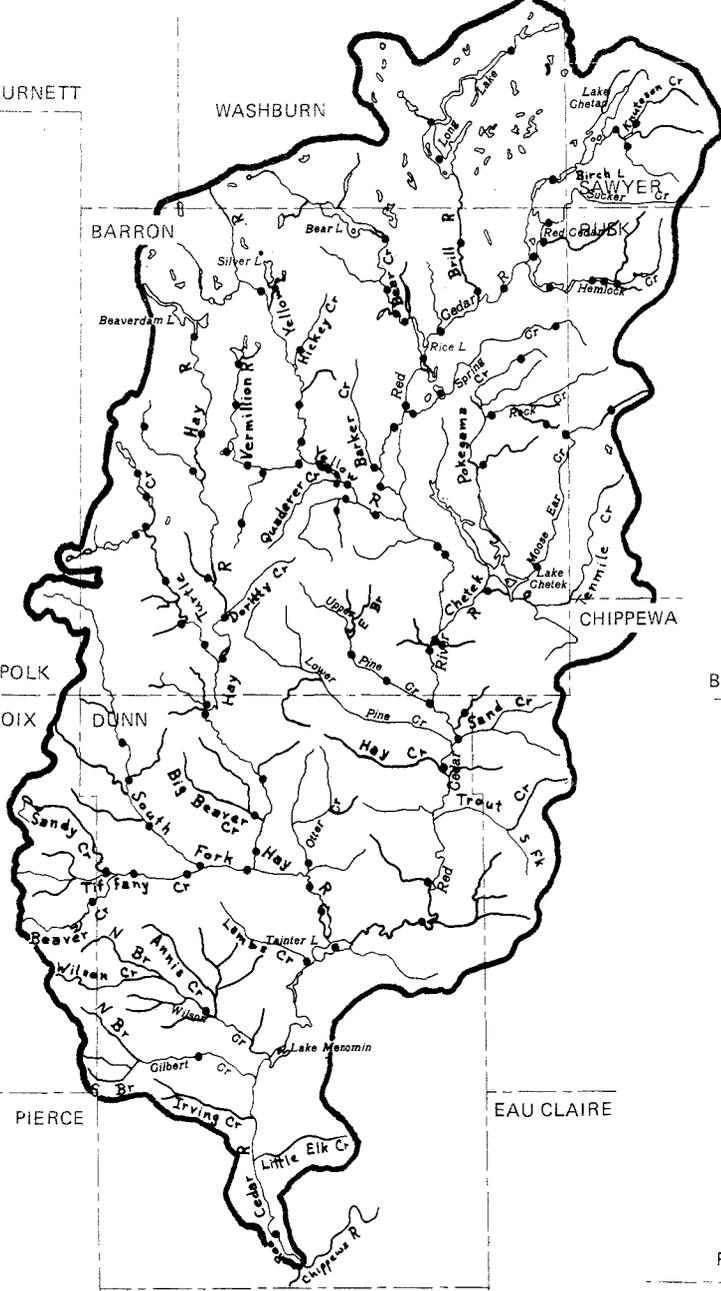
PEPIN

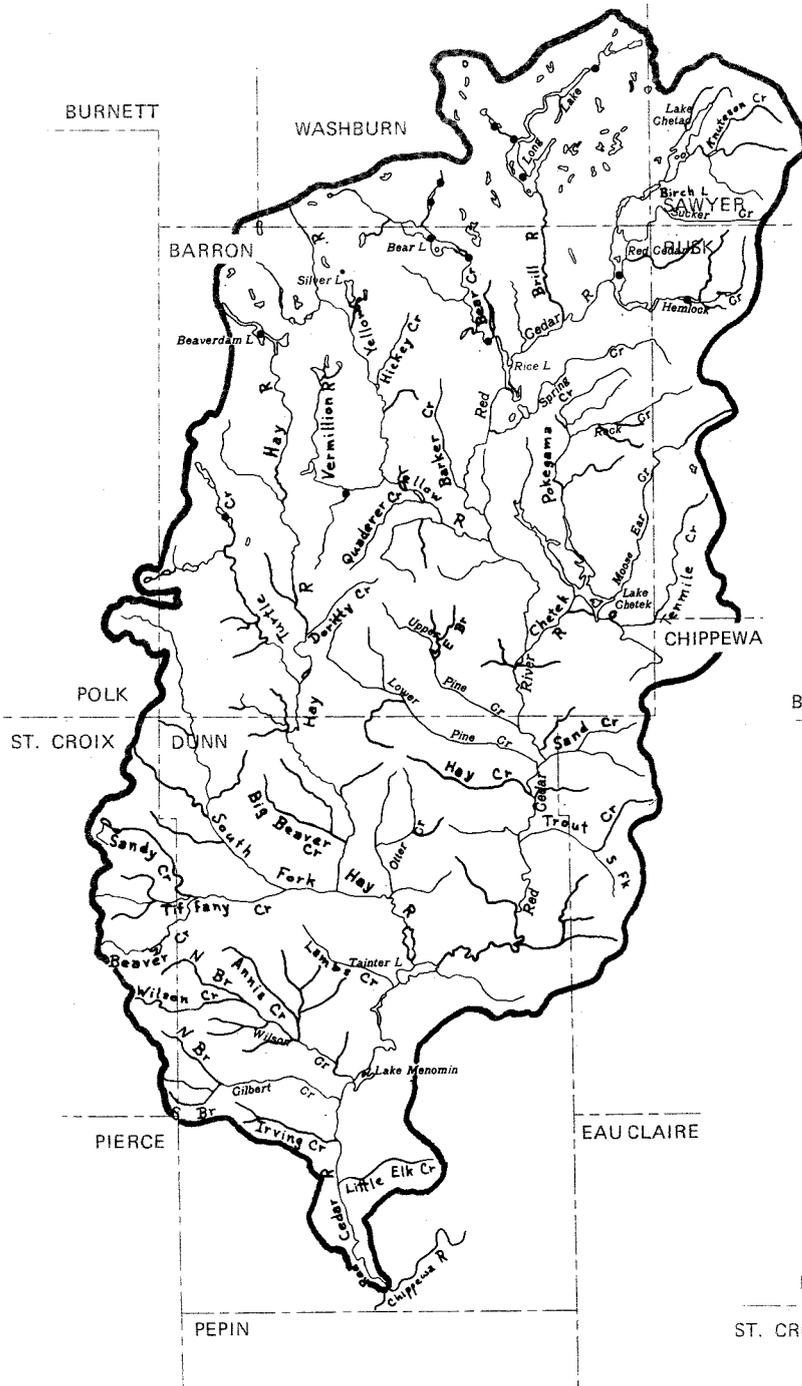
EAU CLAIRE

Red Cedar

### MAP 23

● Bigmouth shiner 33(1)

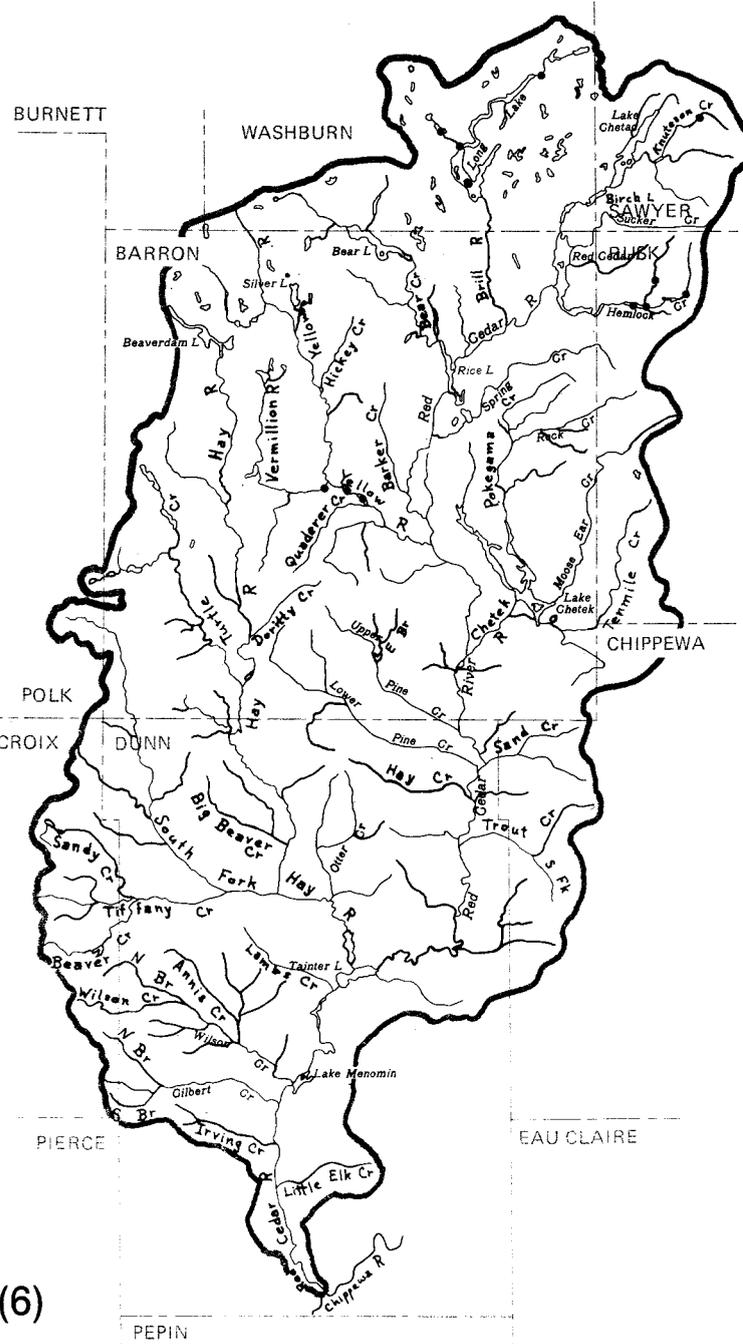




MAP 24

● Blackchin shiner 14(14)

Red Cedar



MAP 25

● Blacknose shiner 12(6)

Red Cedar

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

EAU CLAIRE

PEPIN

Red Cedar

### MAP 26

● Ozark minnow 6(1)

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

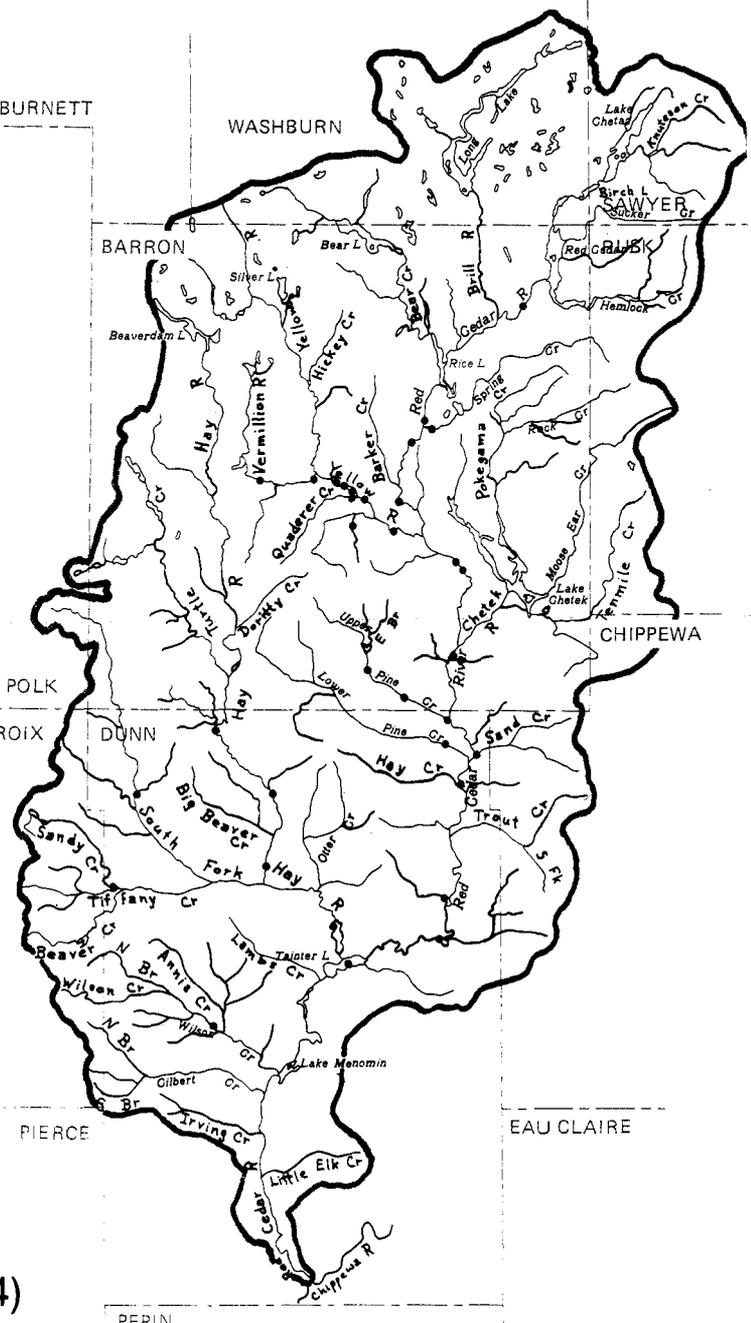
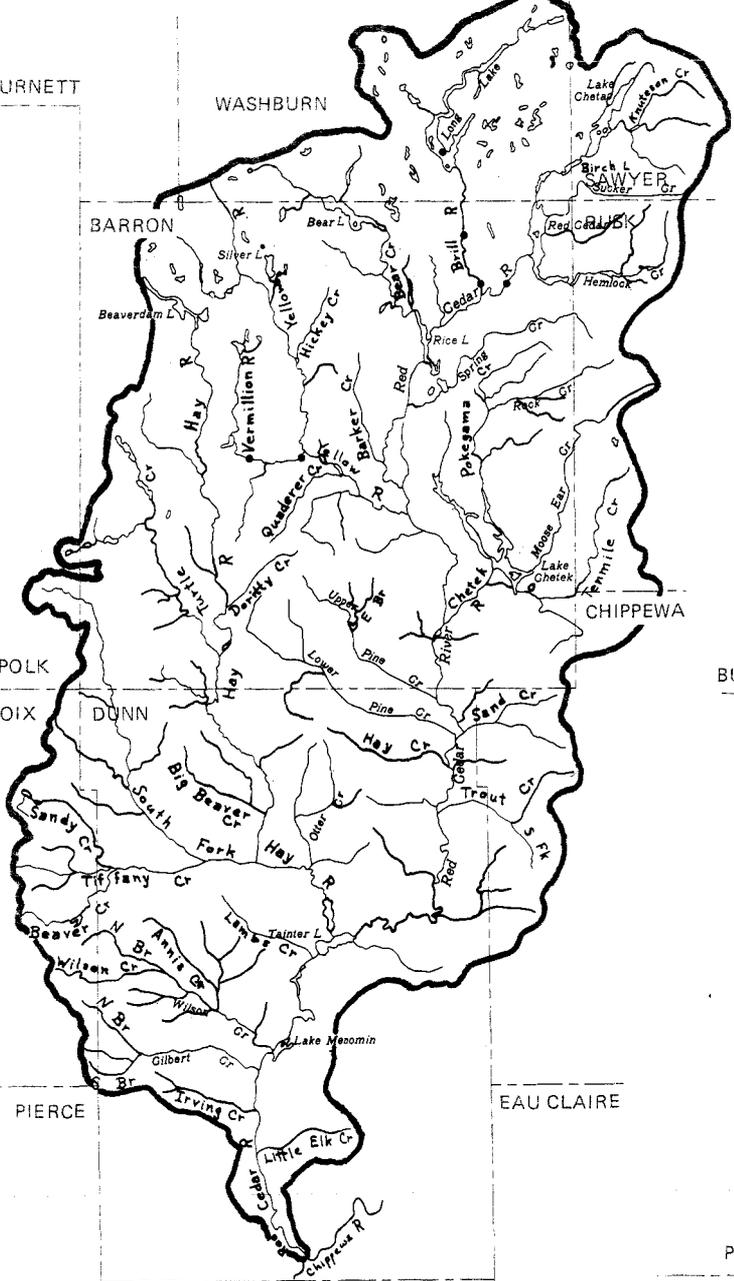
EAU CLAIRE

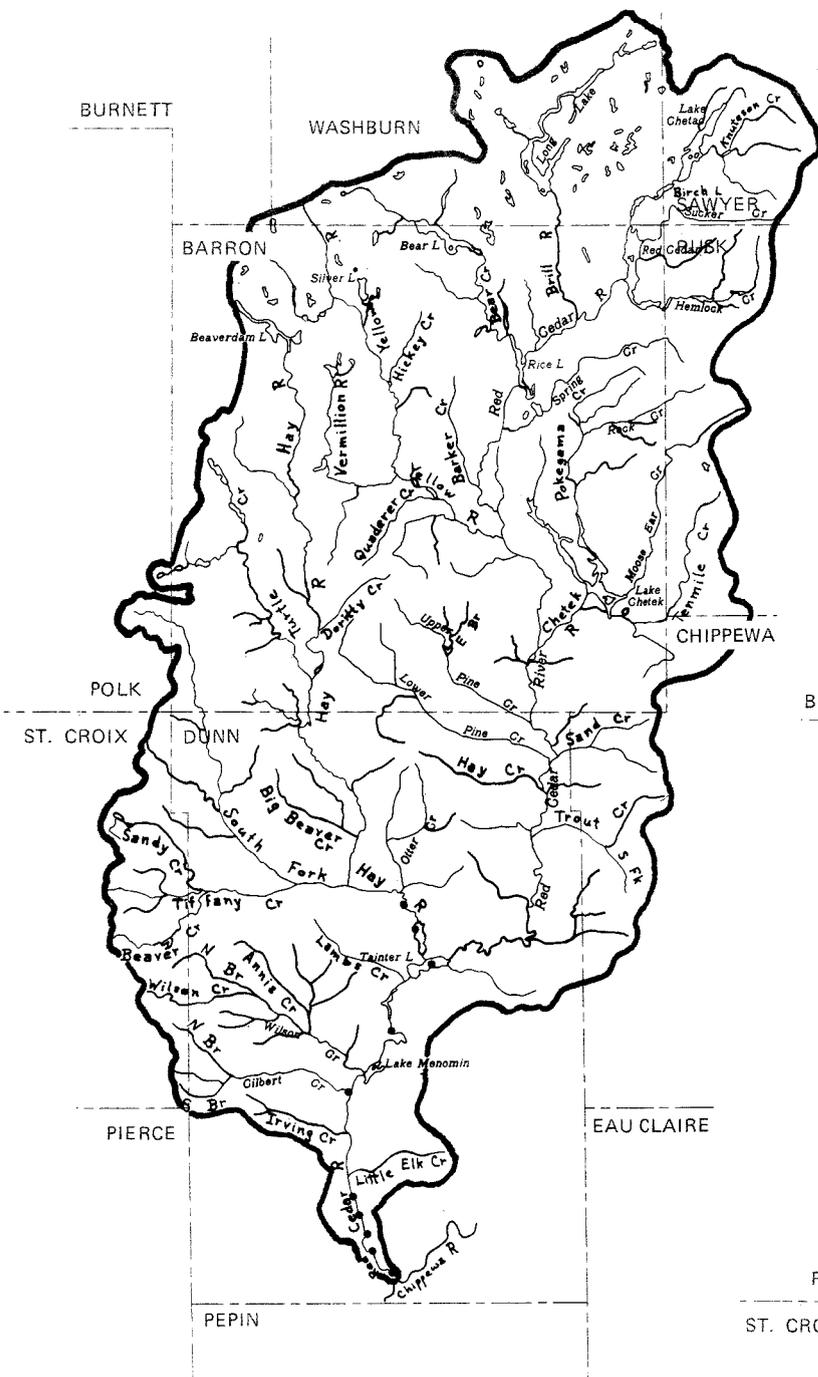
PEPIN

Red Cedar

### MAP 27

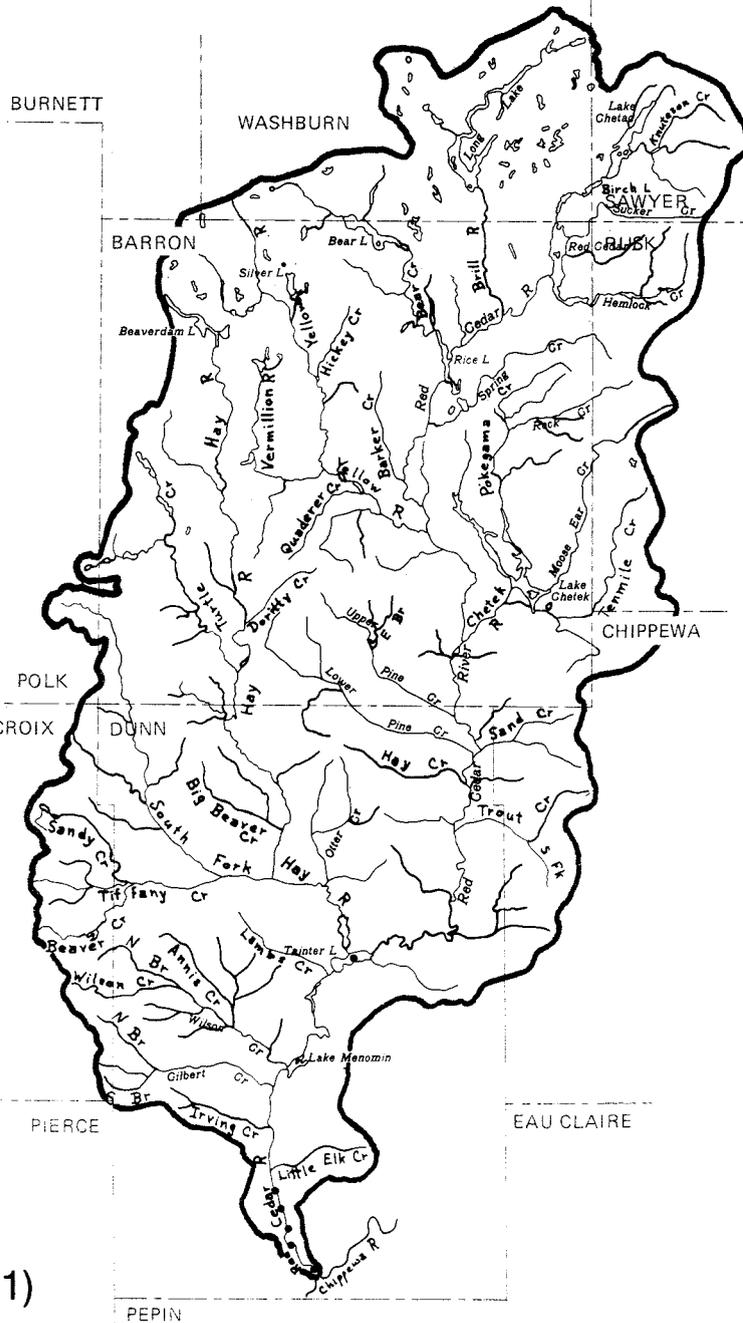
● Rosyface shiner 34(4)





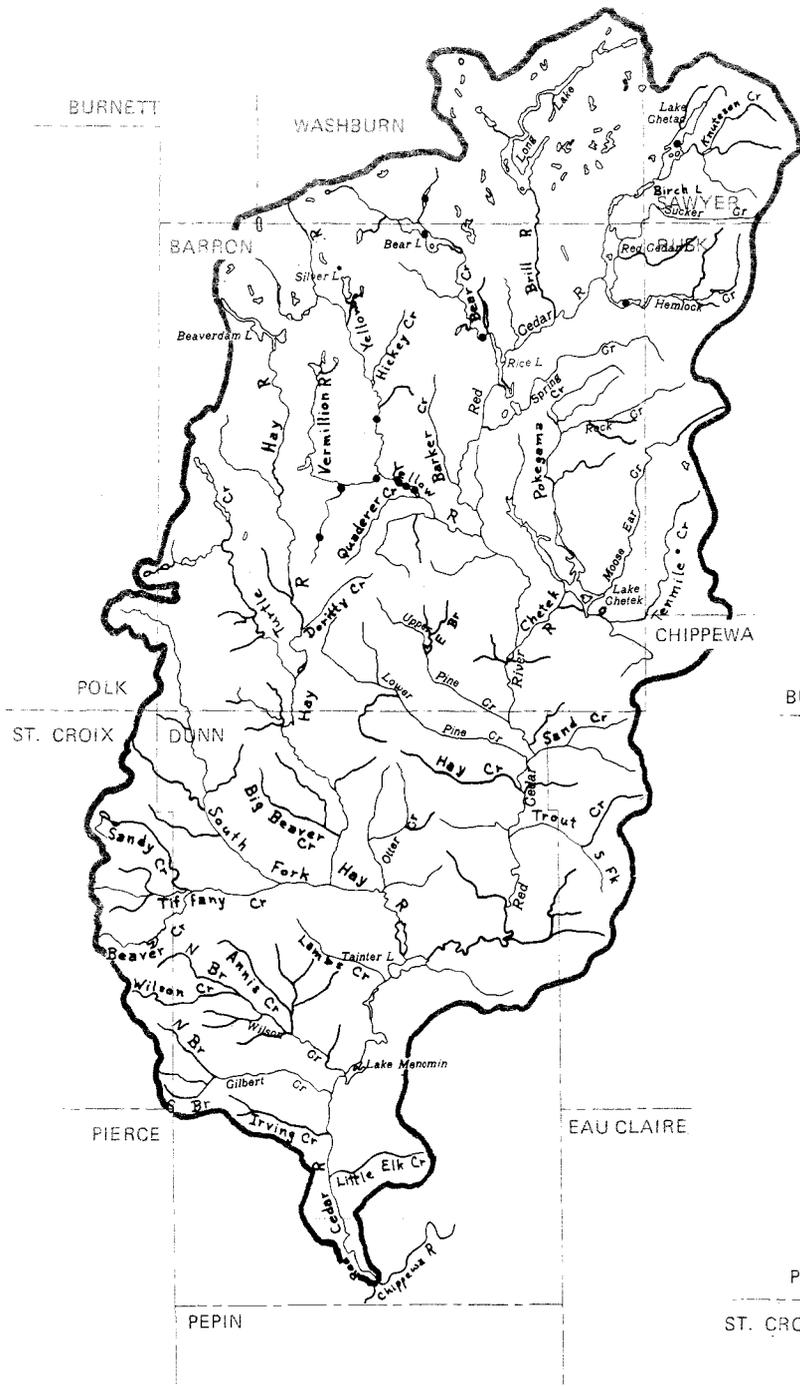
**MAP 28**  
 ● Spotfin shiner 10(11)

Red Cedar

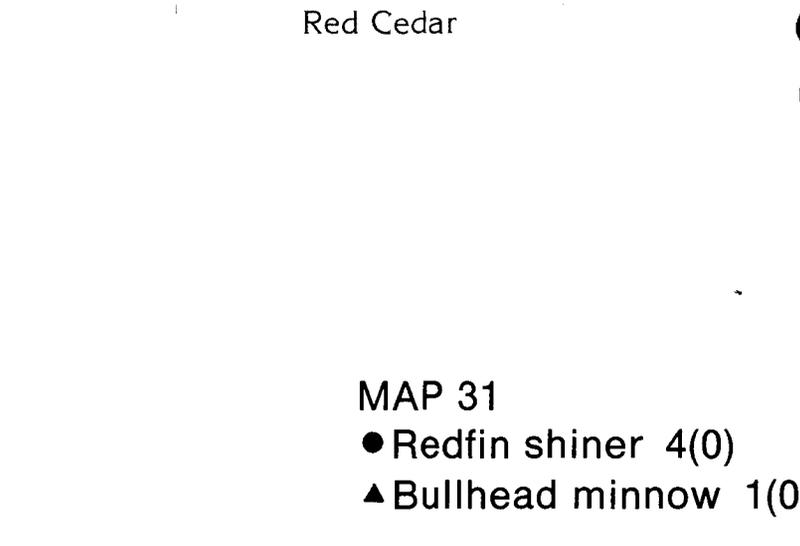


**MAP 29**  
 ● Sand shiner 6(1)

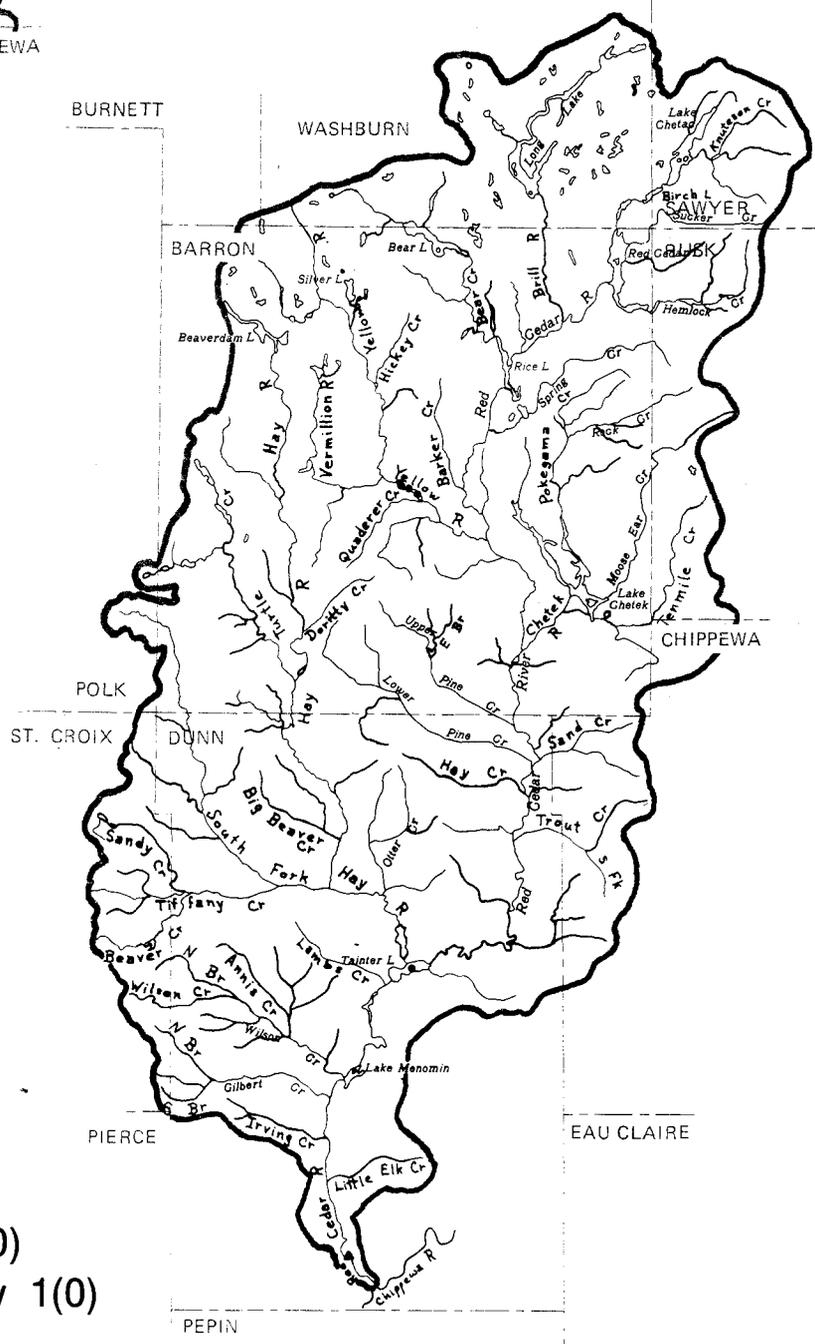
Red Cedar



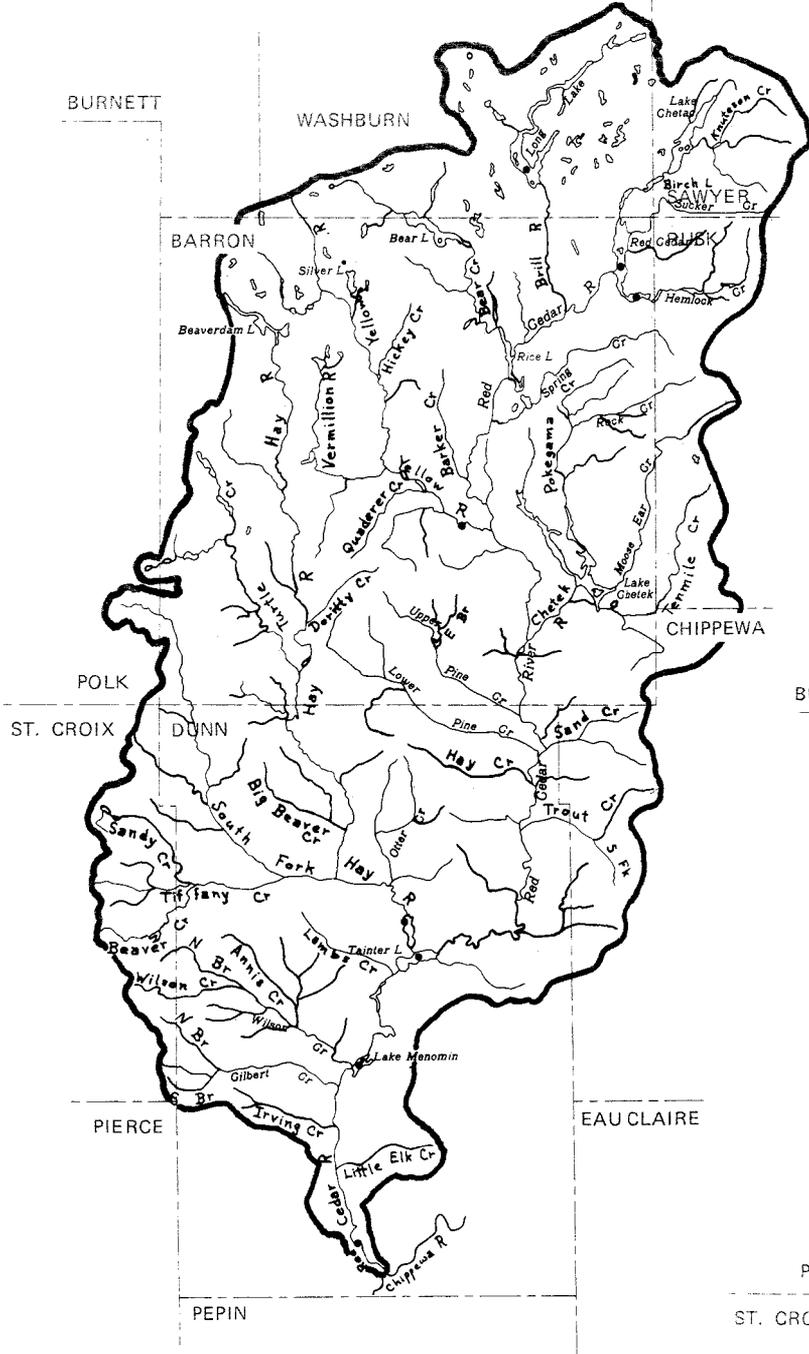
MAP 30  
● Weed shiner 12(7)



MAP 31  
● Redfin shiner 4(0)  
▲ Bullhead minnow 1(0)

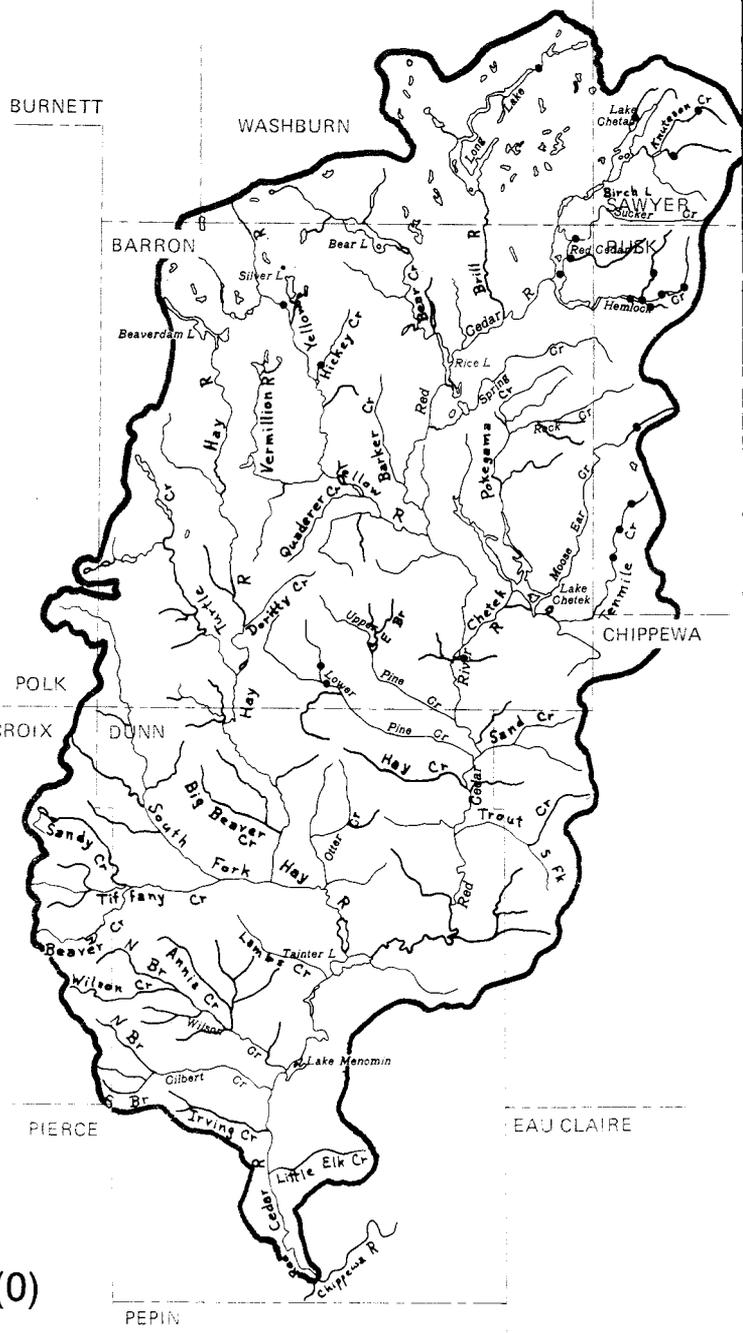


Red Cedar



**MAP 32**  
 ● Mimic shiner 8(22)

Red Cedar

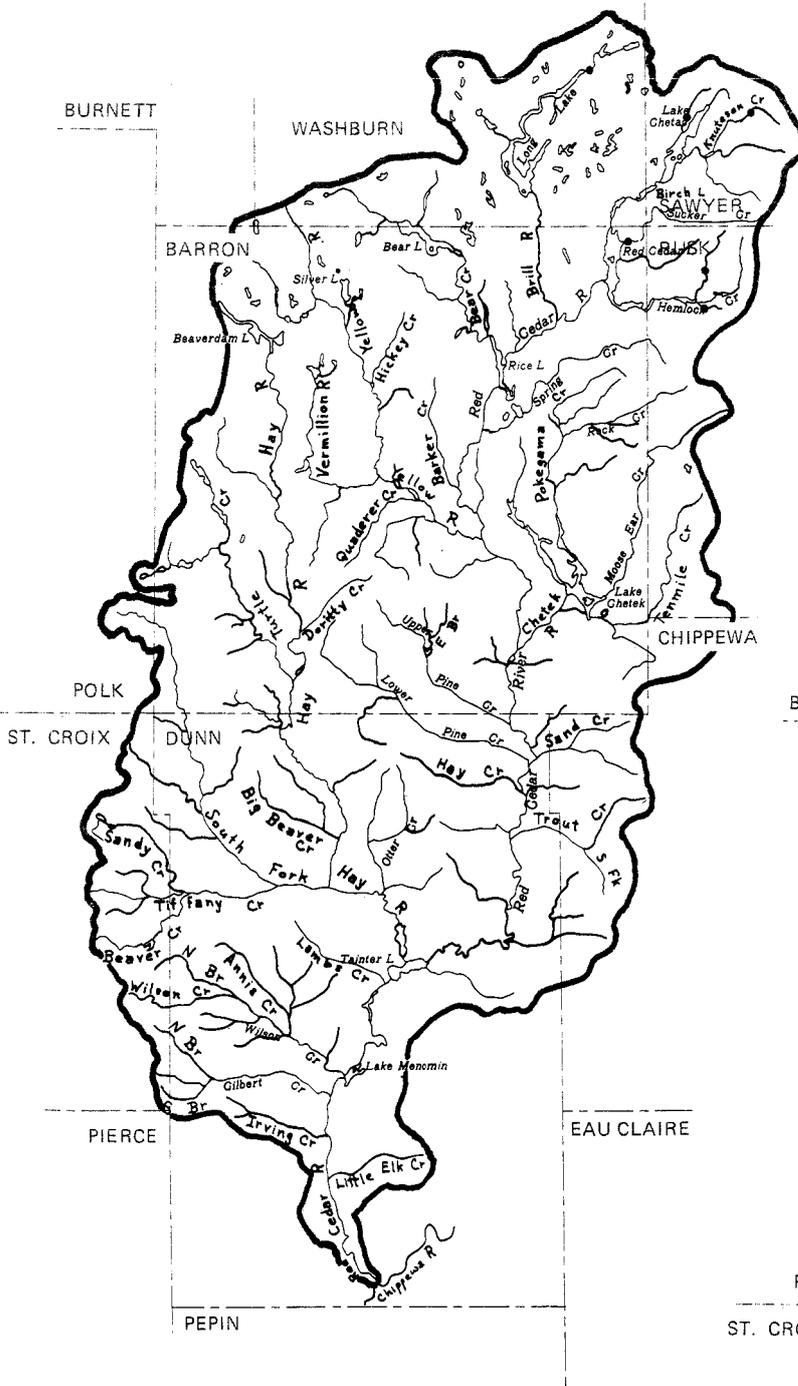


**MAP 33**  
 ● Northern redbelly dace 22(0)

Red Cedar

MAP 34

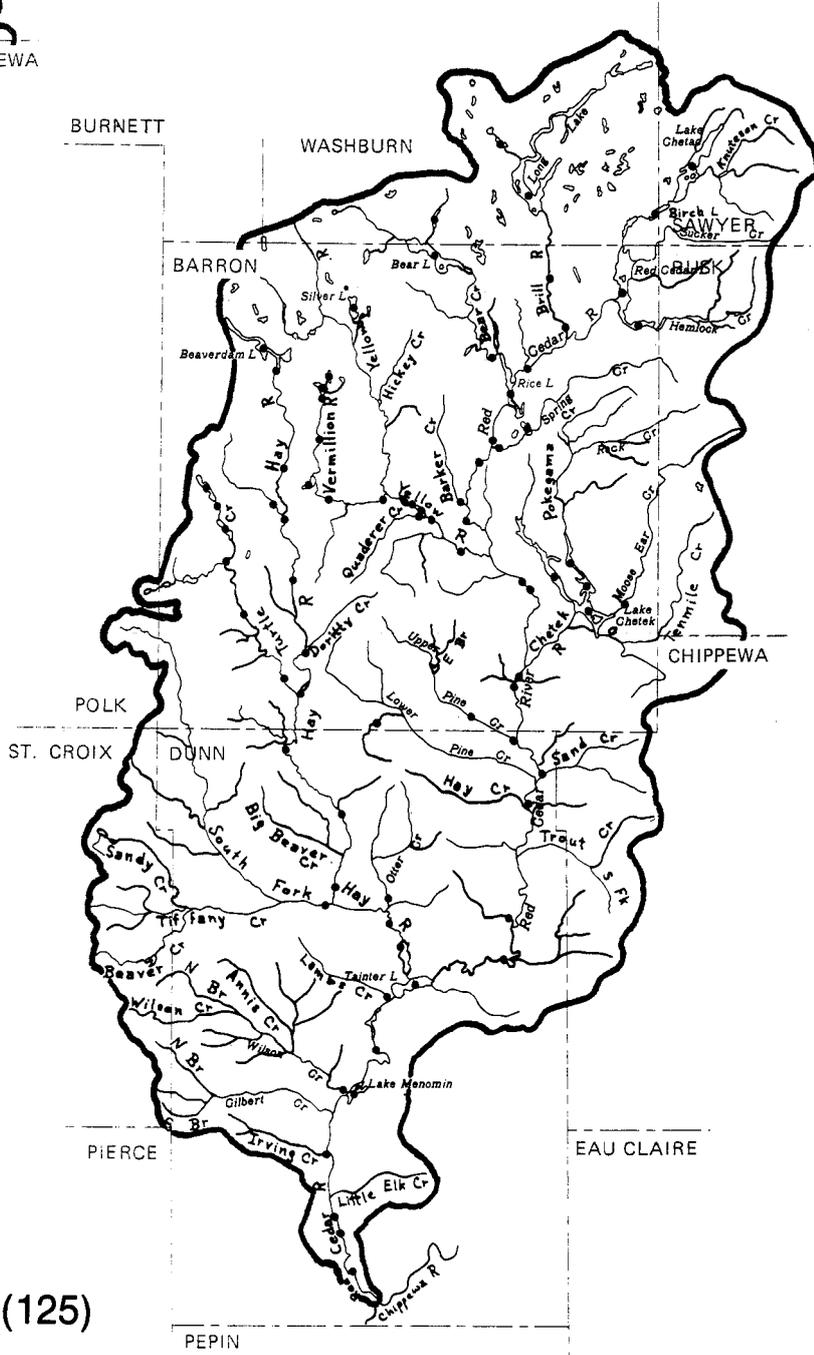
● Finescale dace 6(0)



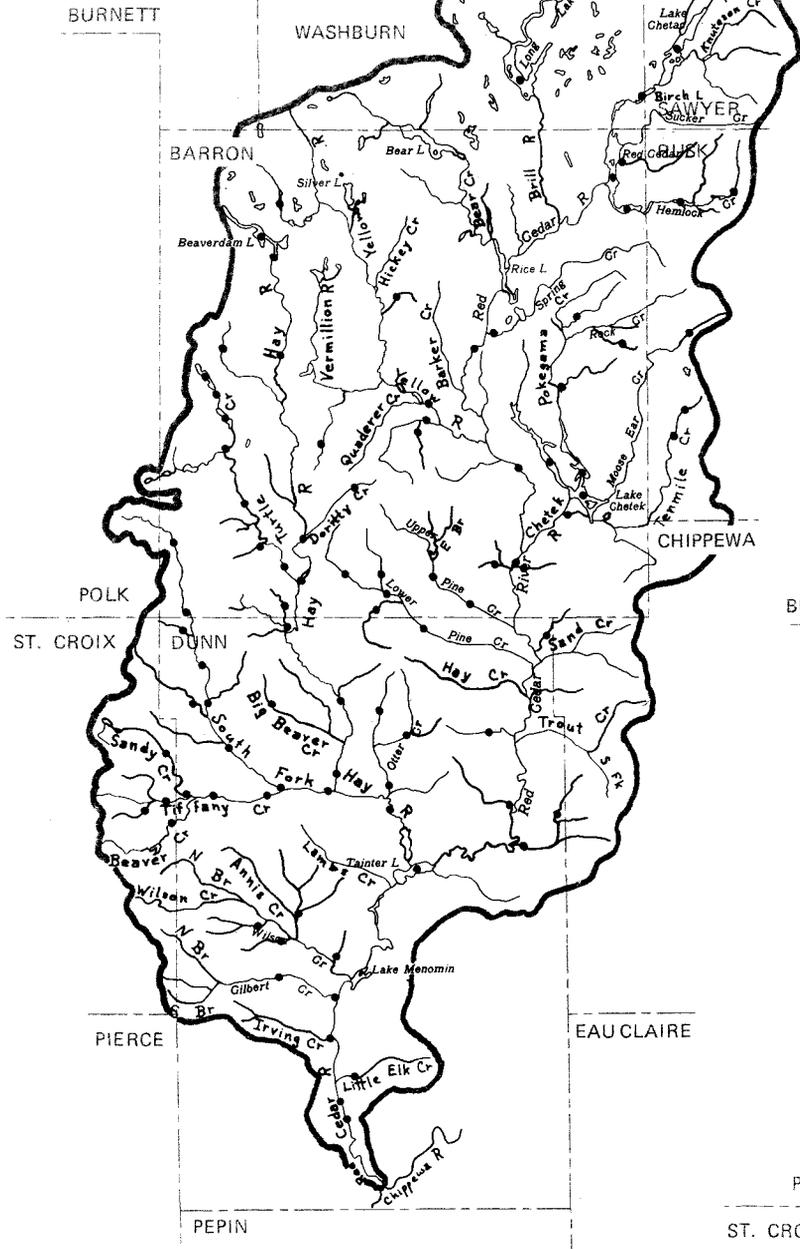
Red Cedar

MAP 35

● Bluntnose minnow 79(125)

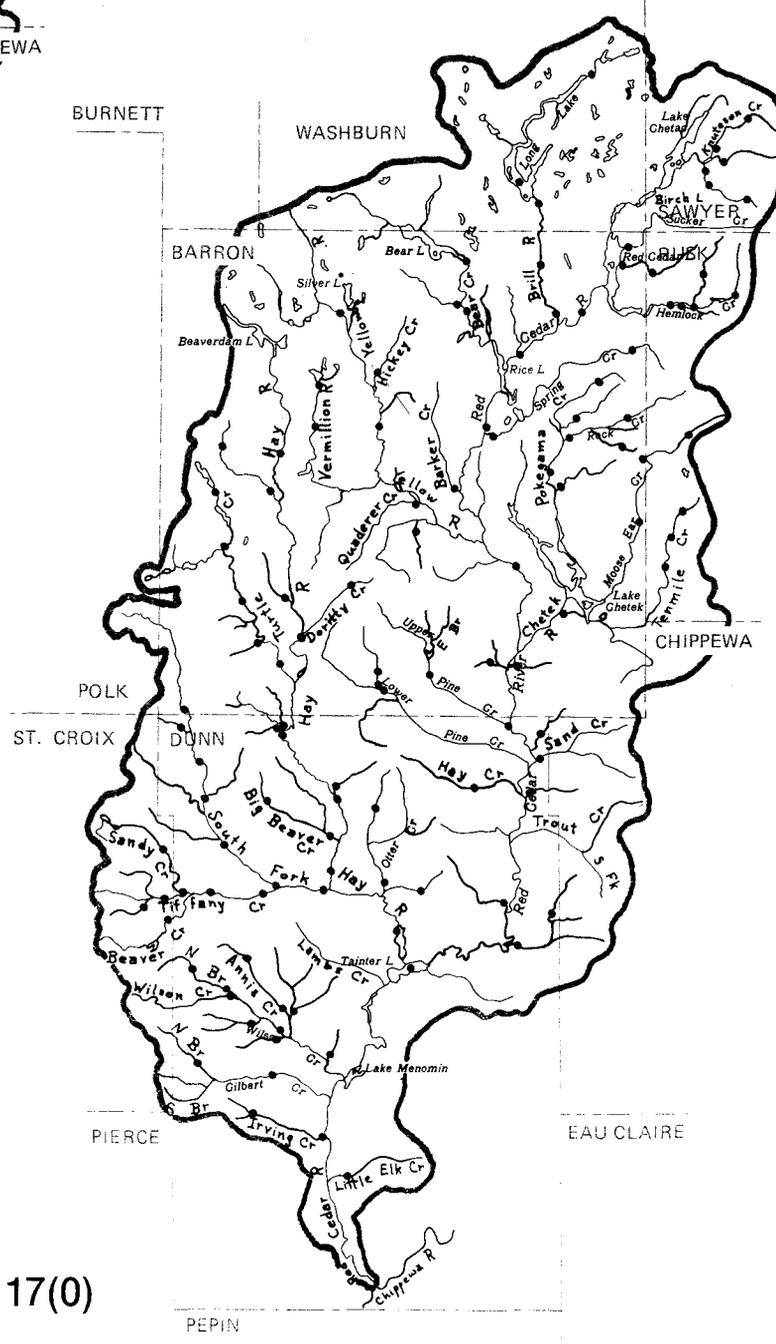


Red Cedar



**MAP 36**  
**● Fathead minnow 93(21)**

Red Cedar

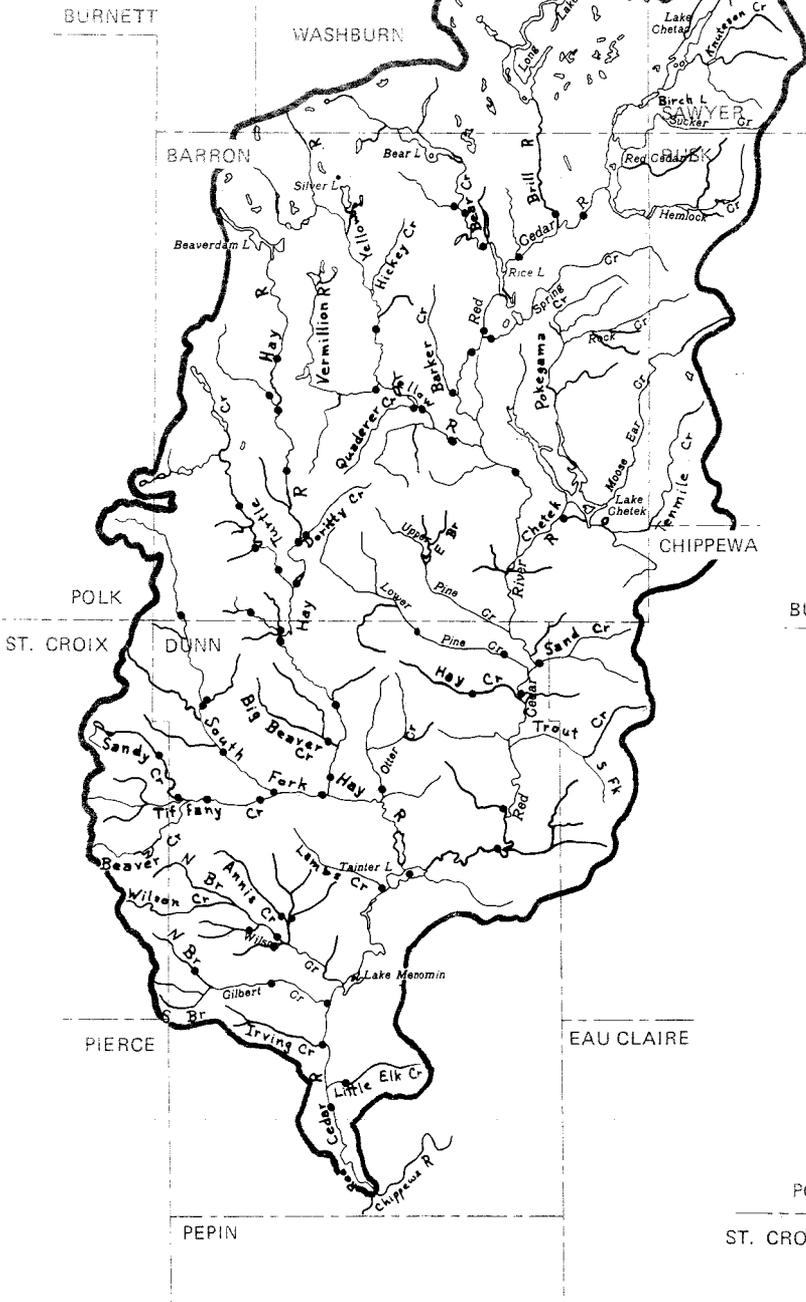


**MAP 37**  
**● Blacknose dace 117(0)**

Red Cedar

MAP 38

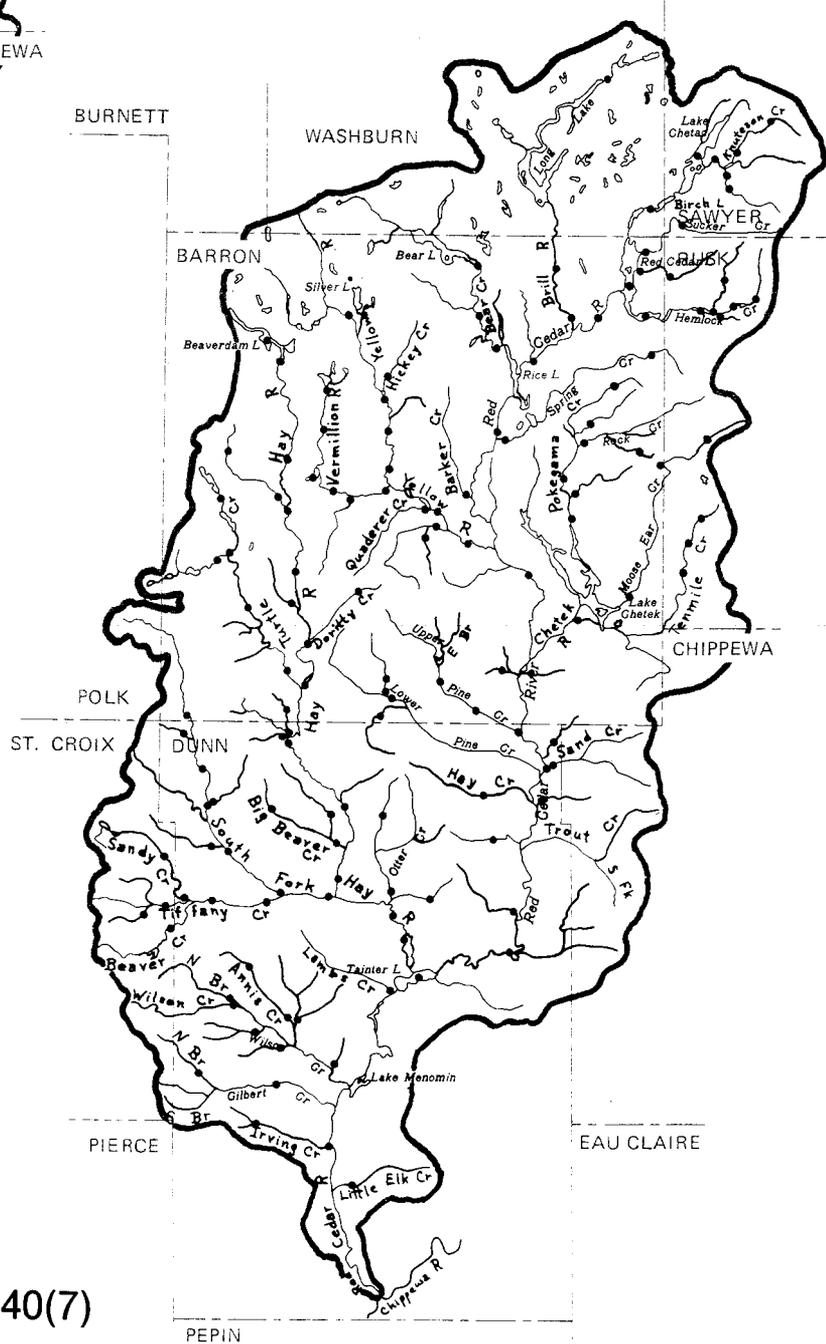
● Longnose dace 64(0)



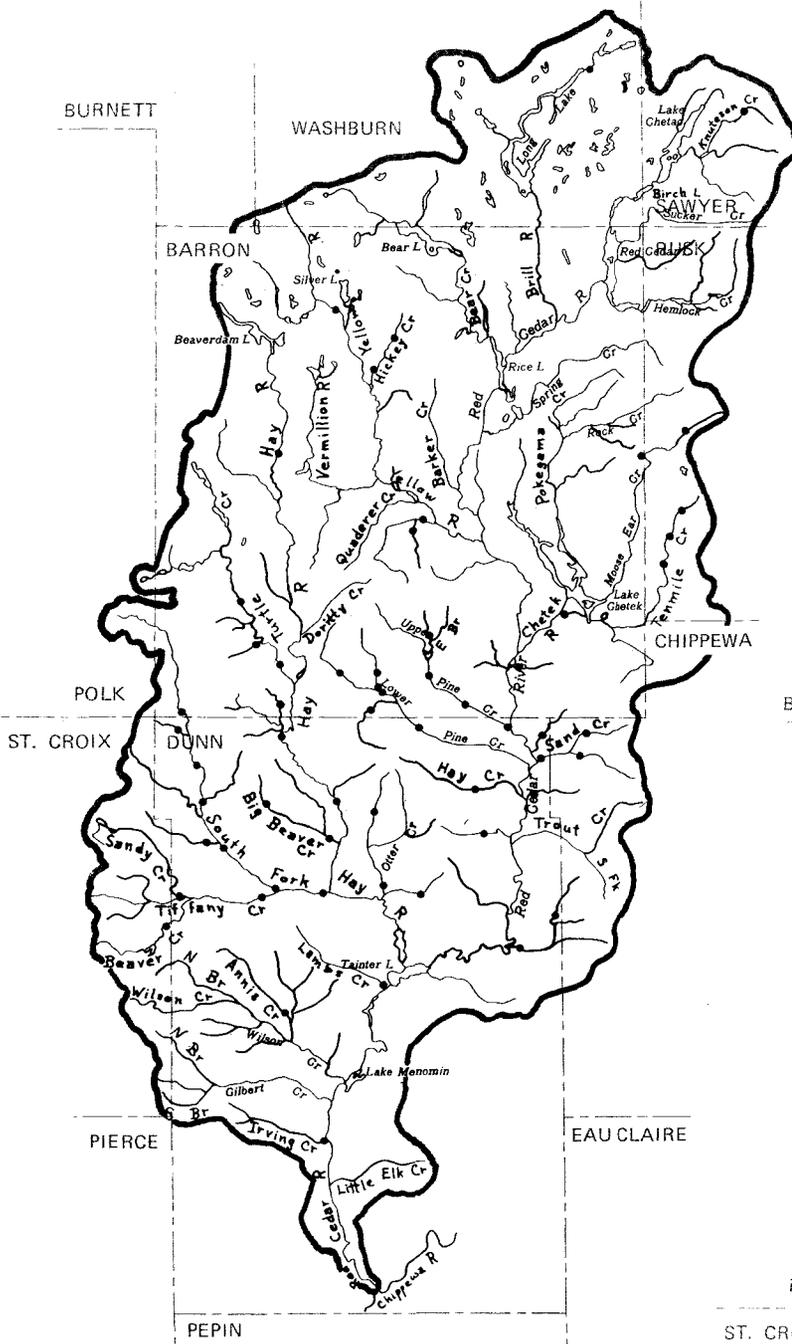
Red Cedar

MAP 39

● Creek chub 140(7)

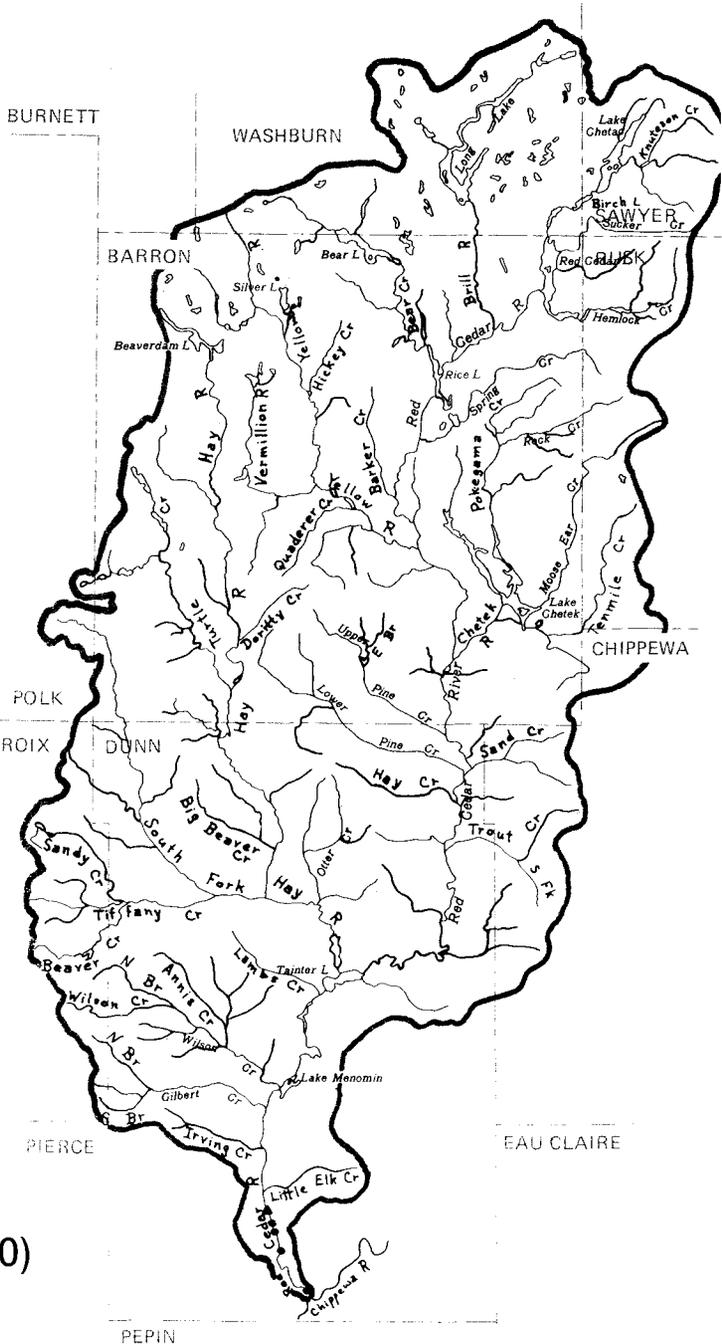


Red Cedar



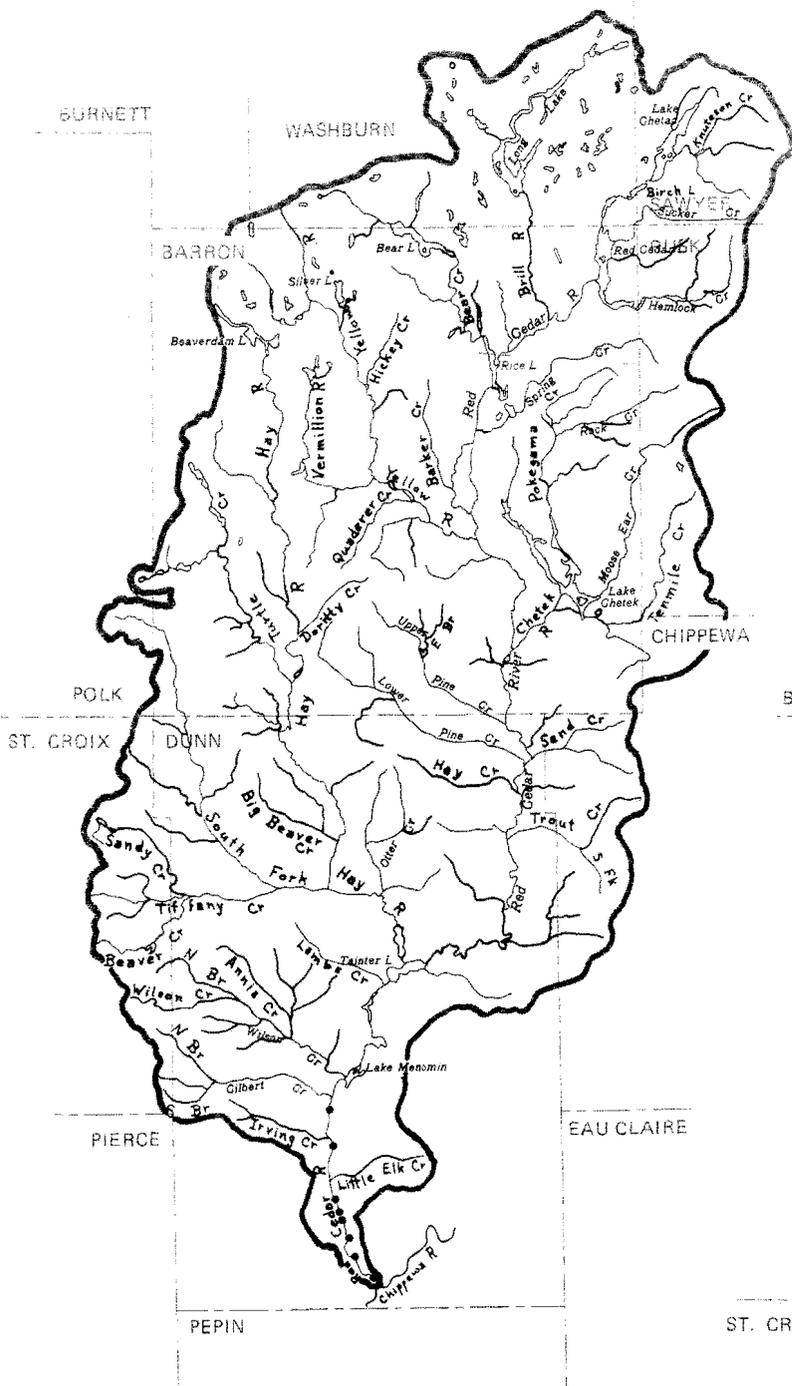
**MAP 40**  
● Pearl dace 59(0)

Red Cedar

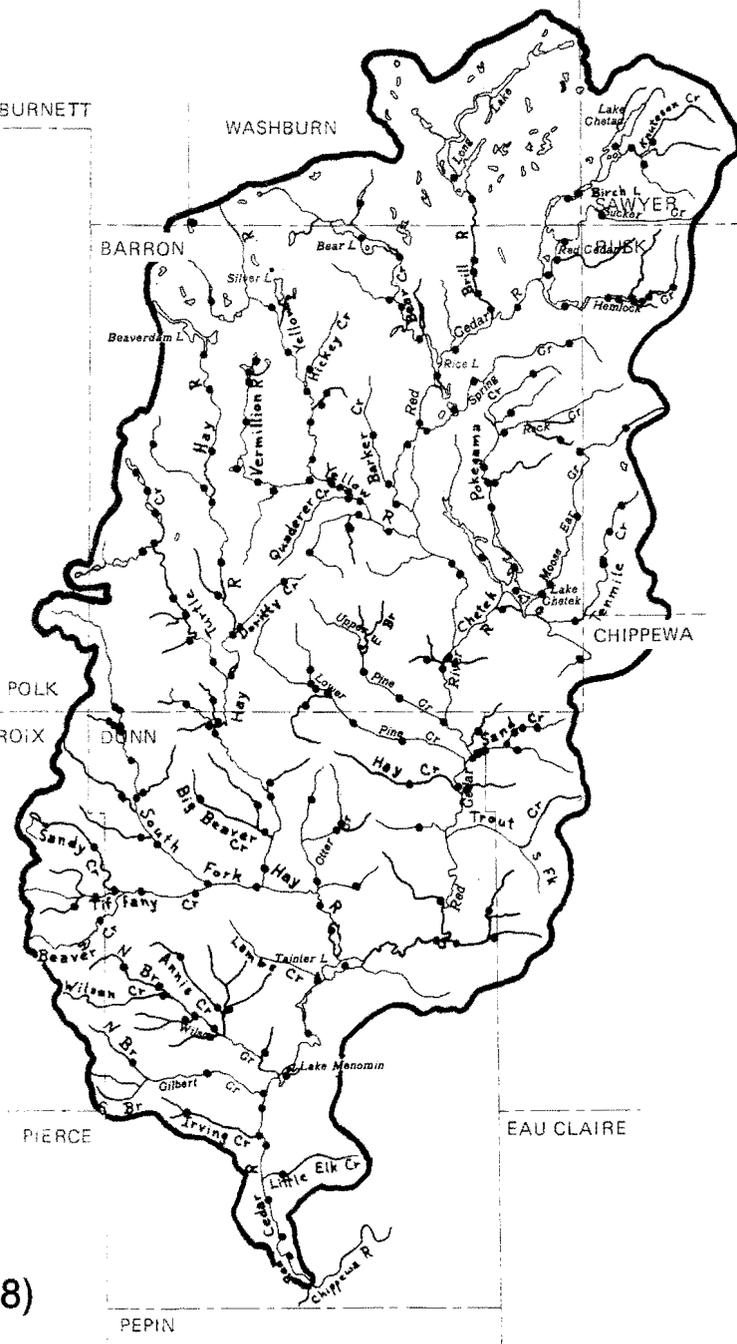


**MAP 41**  
● Highfin carpsucker 4(0)  
▲ River carpsucker 1(0)

Red Cedar



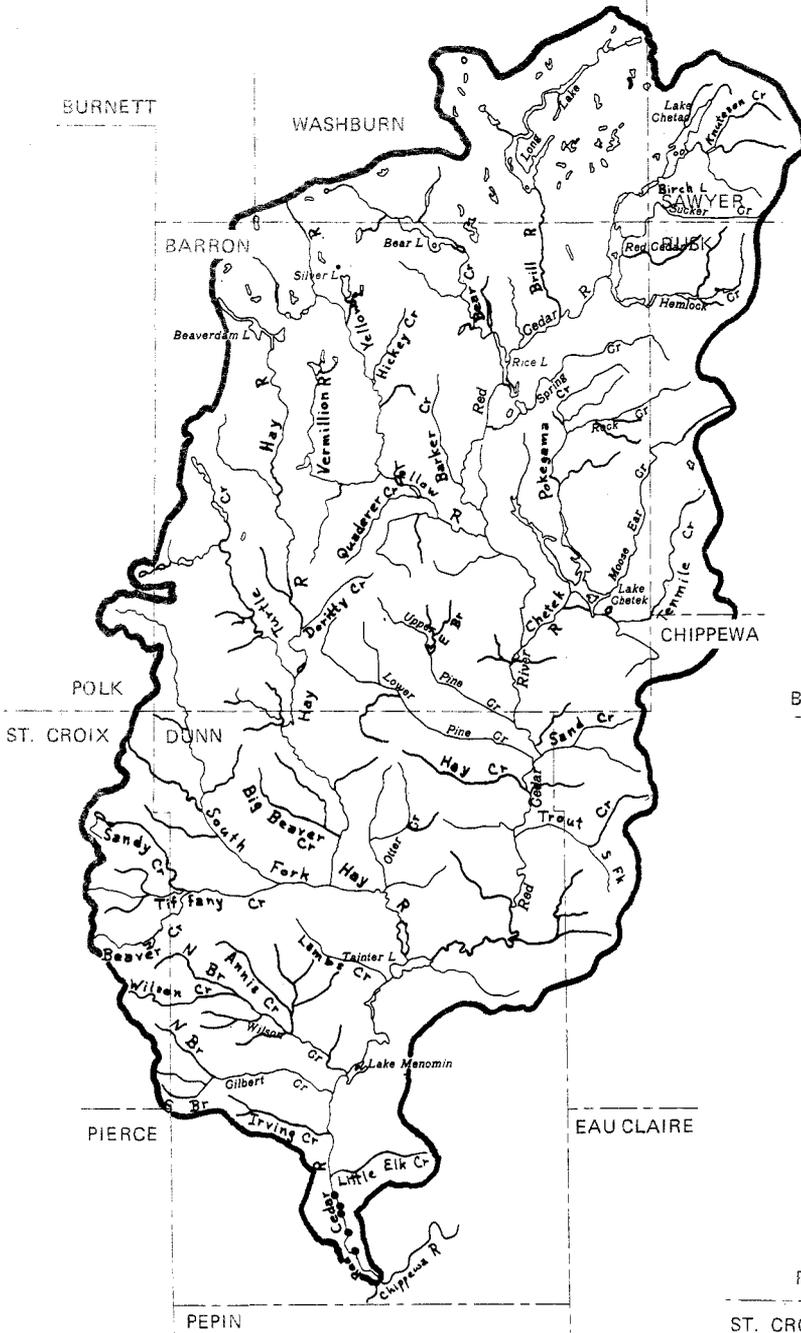
**MAP 42**  
 ● Quillback 9(0)



**MAP 43**  
 ● White sucker 213(58)

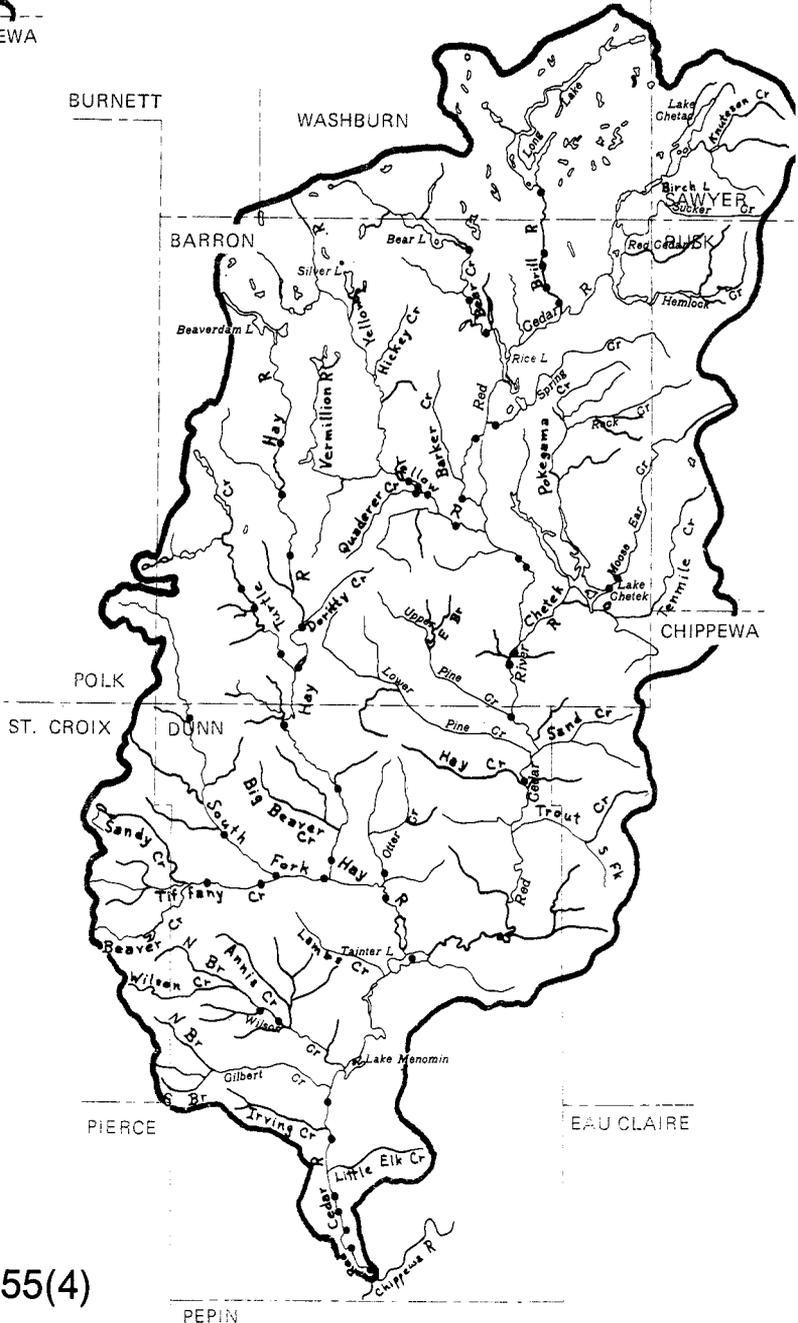
Red Cedar

Red Cedar



**MAP 44**  
 ● Blue sucker 5(0)

Red Cedar



**MAP 45**  
 ● Northern hog sucker 55(4)

Red Cedar

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

CHIPPEWA

PIERCE

PEPIN

Red Cedar

### MAP 46

● Bigmouth buffalo 2(0)

▲ Smallmouth buffalo 1(0)

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

CHIPPEWA

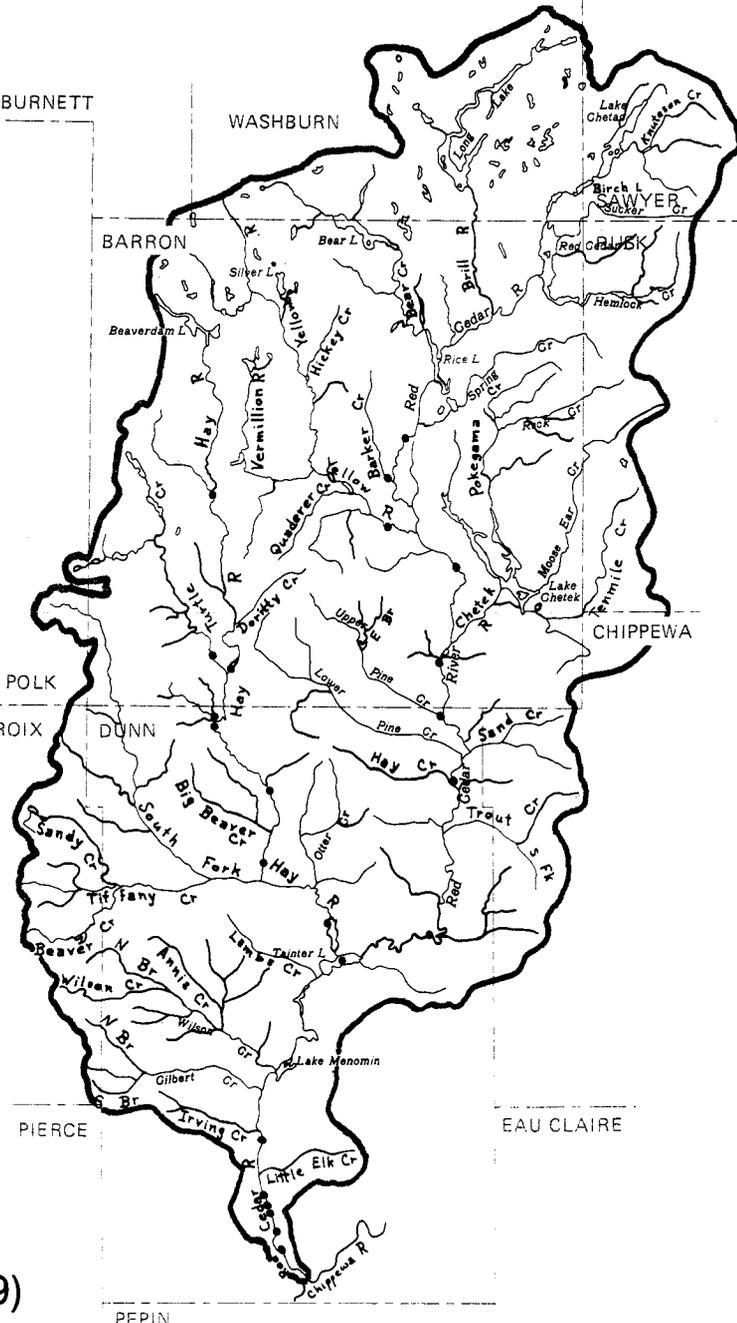
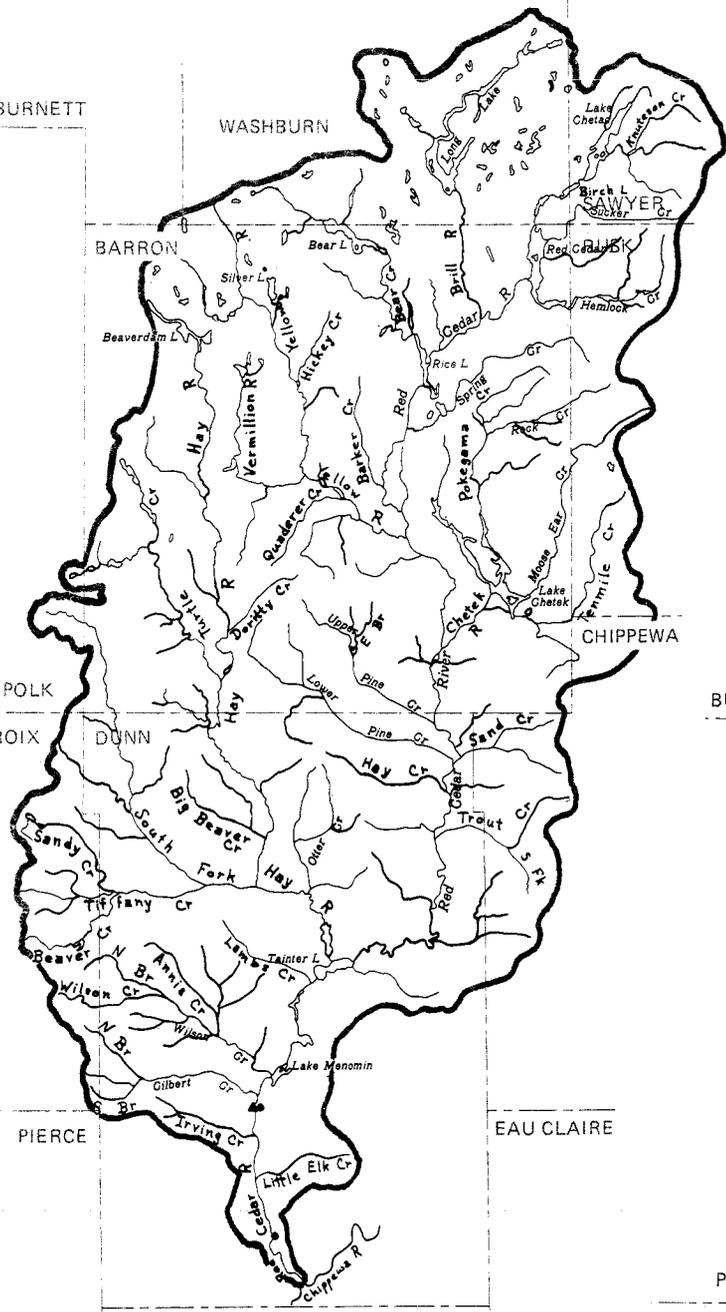
PIERCE

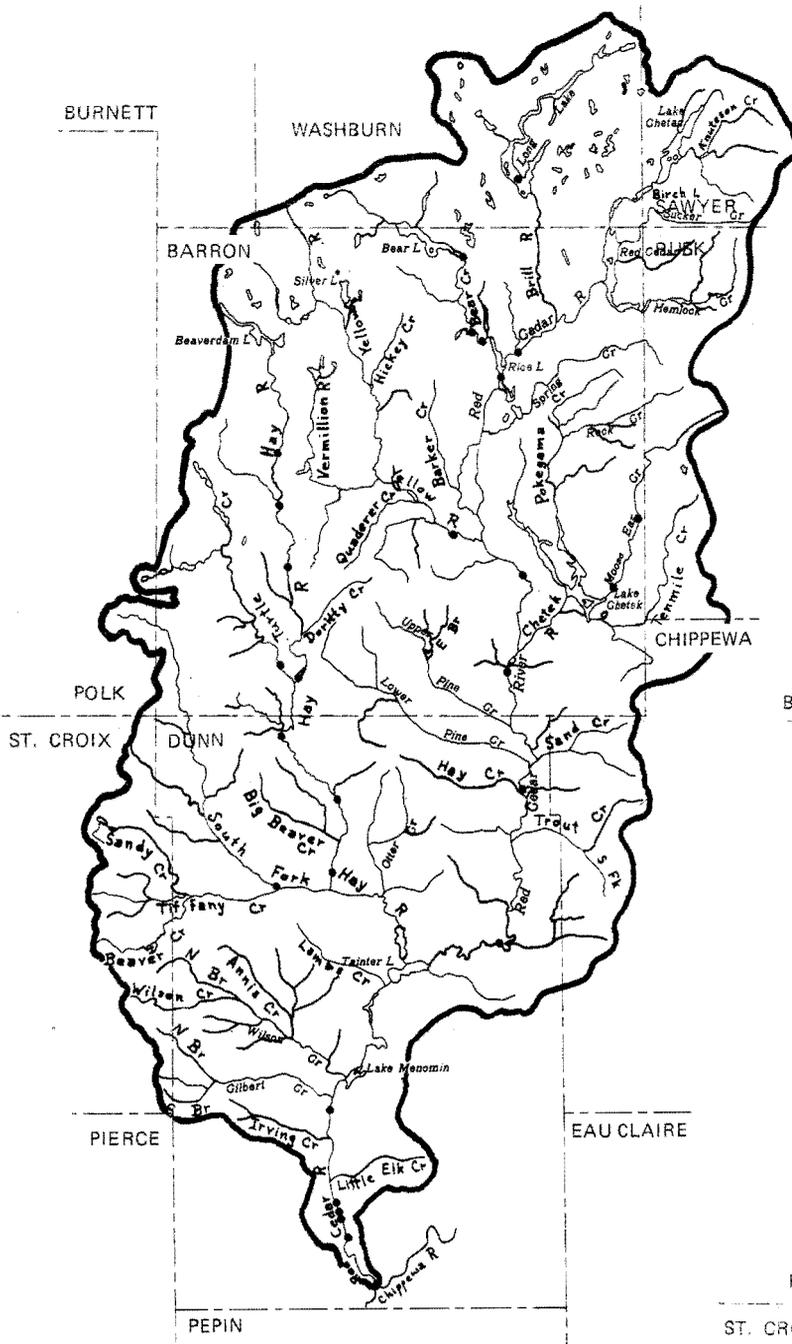
PEPIN

Red Cedar

### MAP 47

● Silver redhorse 23(9)

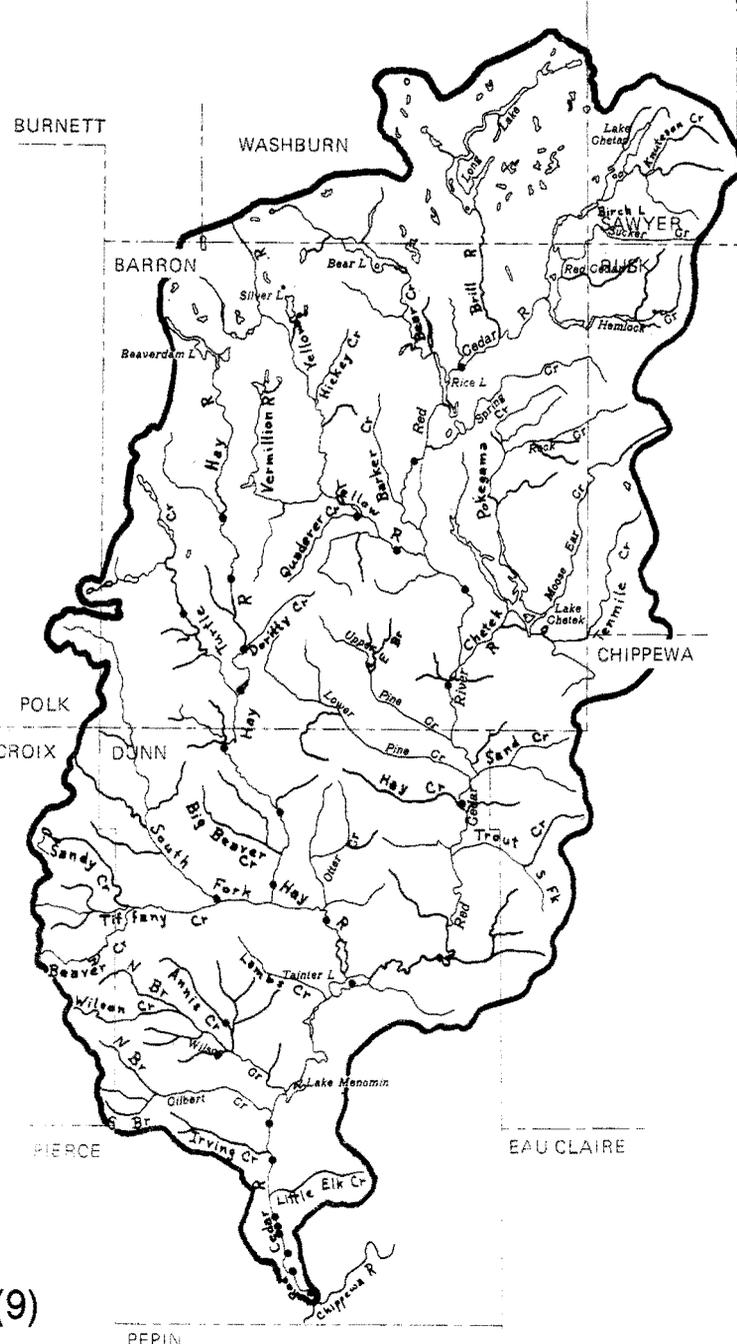




MAP 48

● Golden redhorse 28(1)

Red Cedar



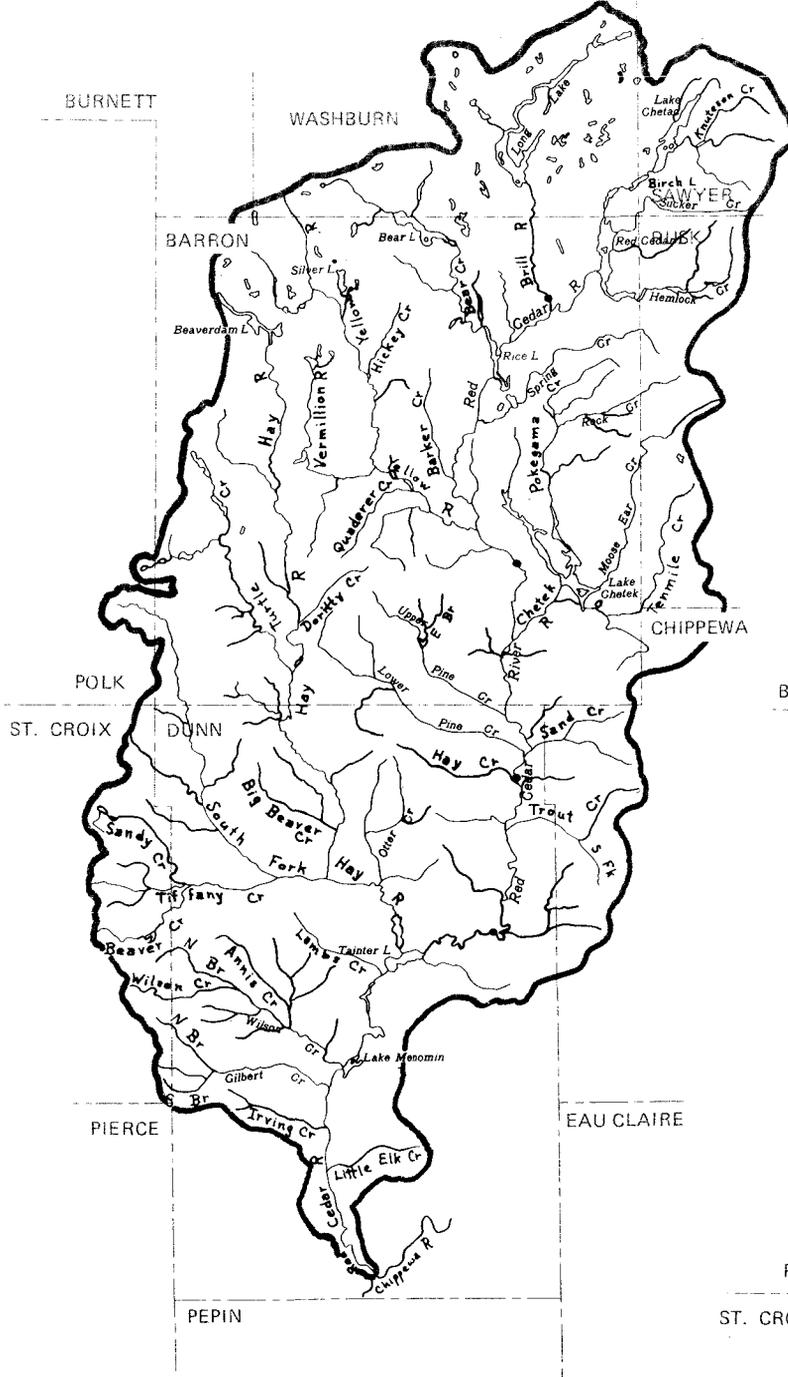
MAP 49

● Shorthead redhorse 30(9)

Red Cedar

MAP 50

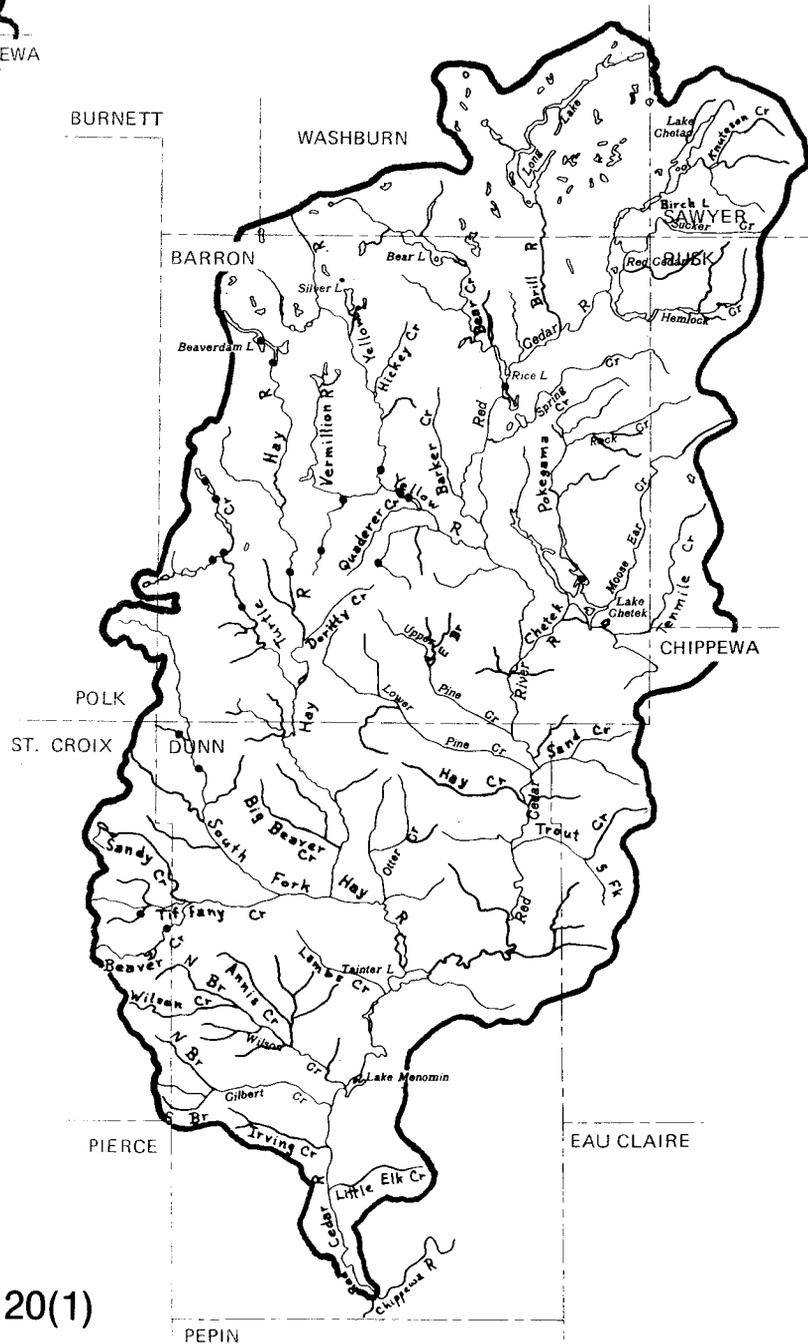
● Greater redhorse 4(0)



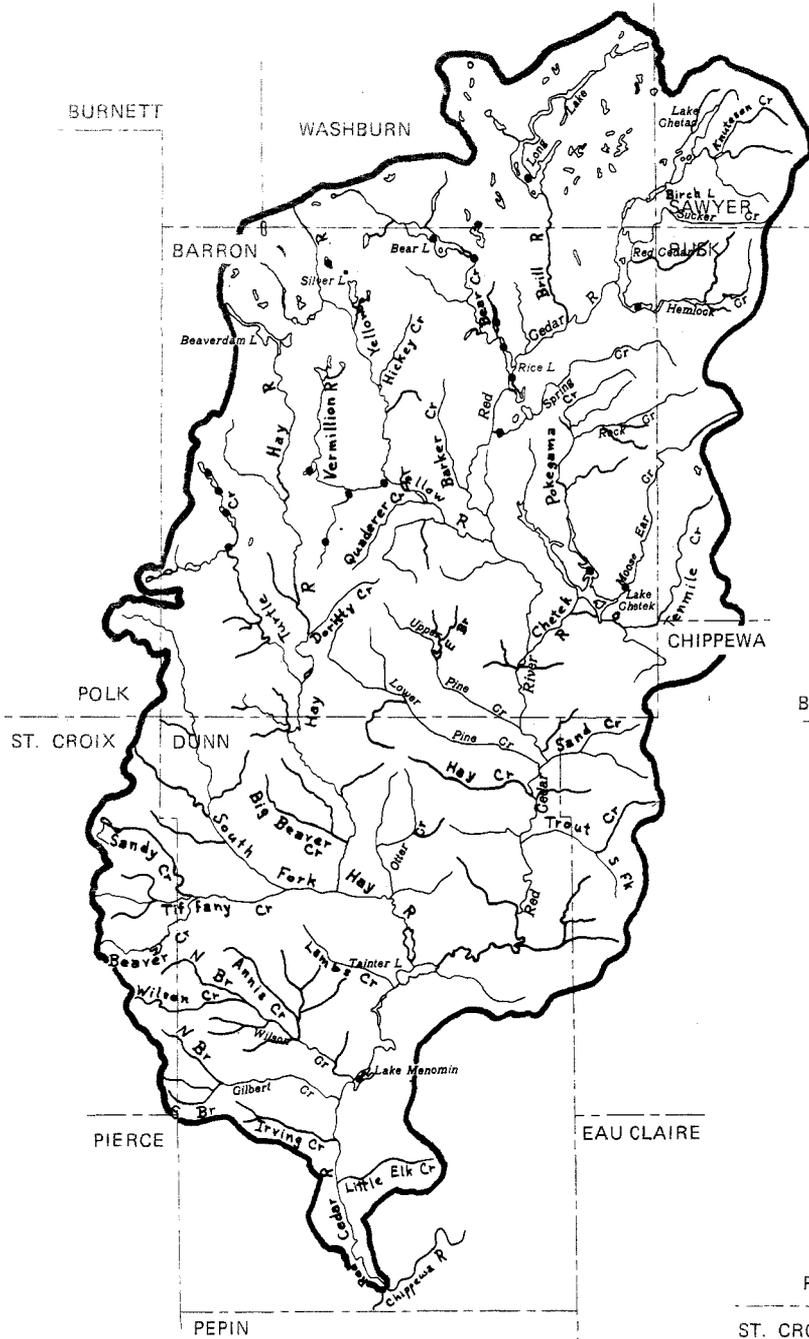
Red Cedar

MAP 51

● Black bullhead 20(1)

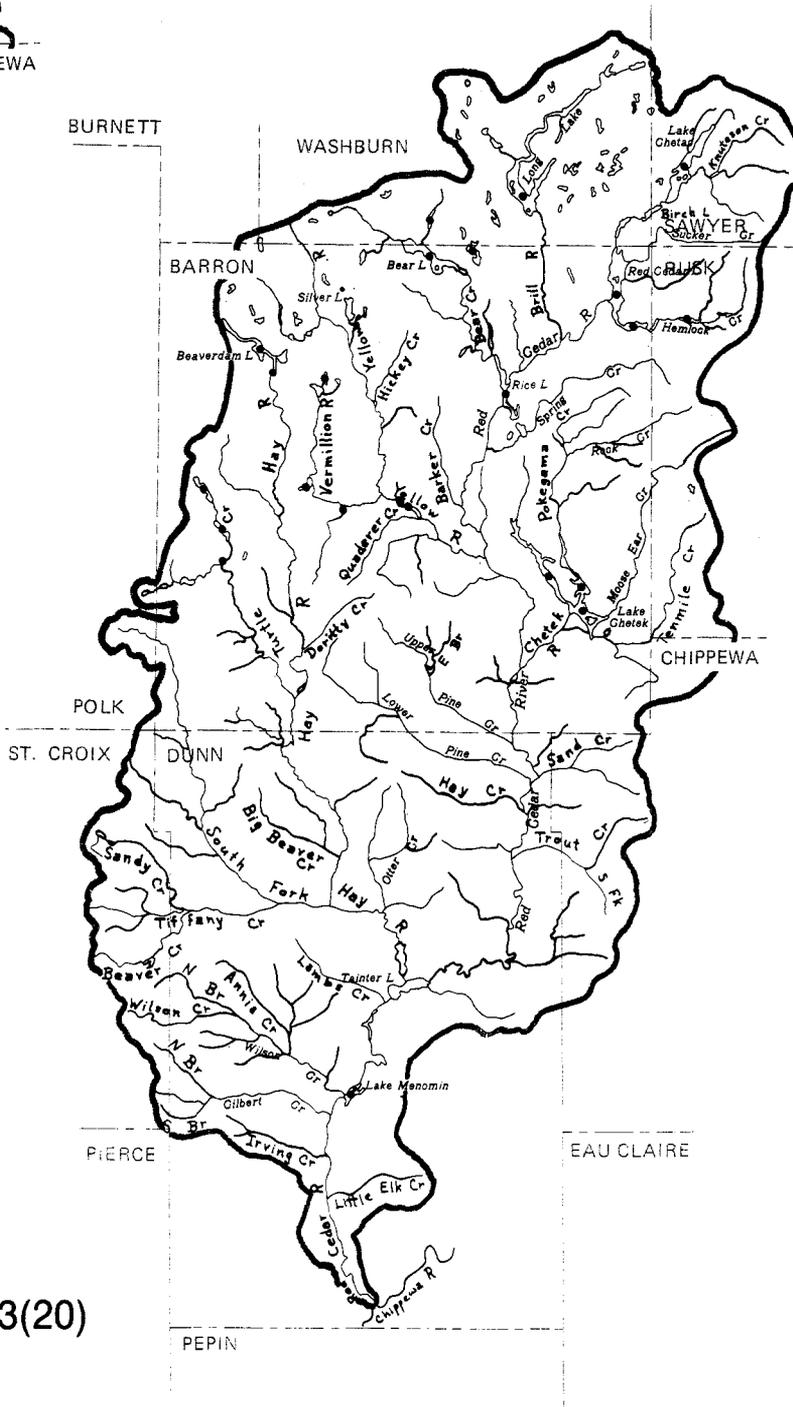


Red Cedar



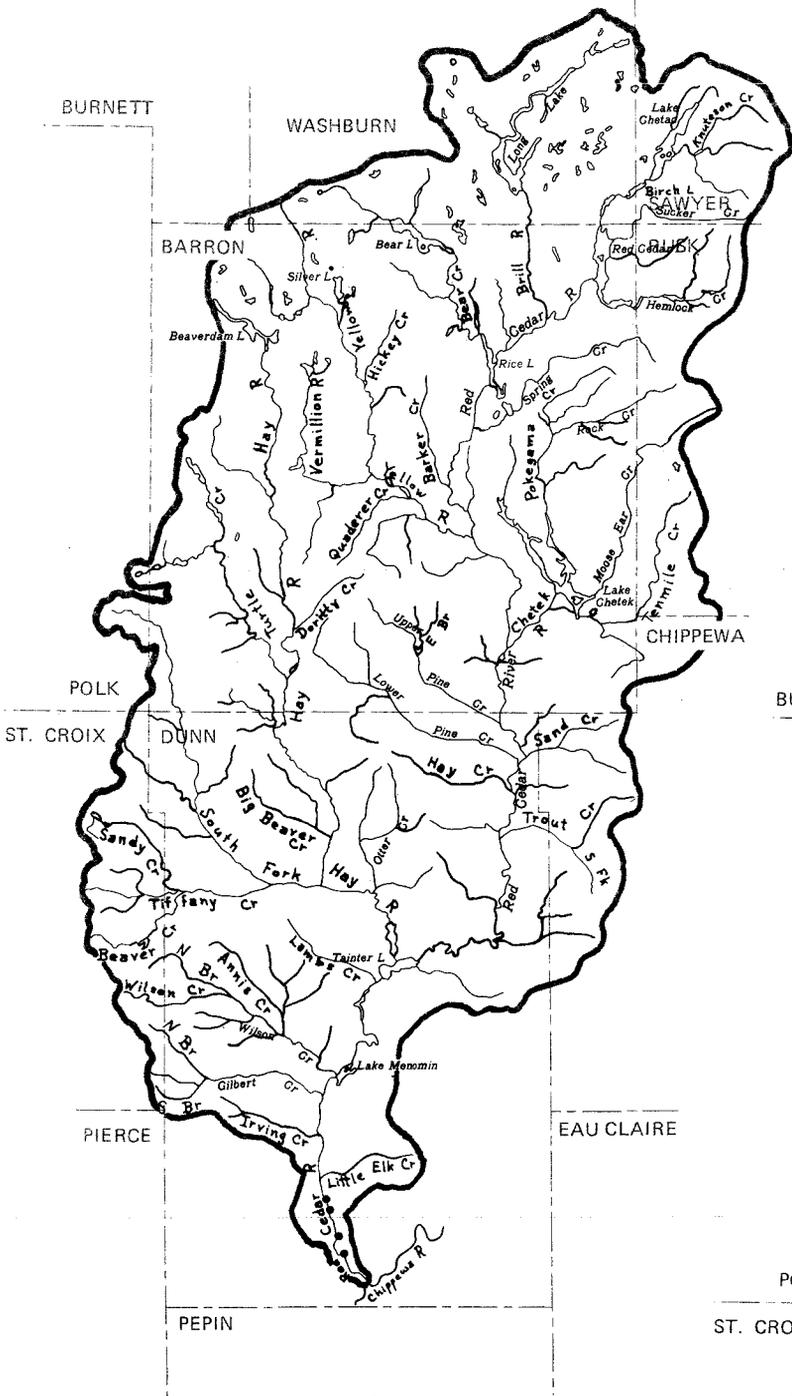
**MAP 52**  
 ● Yellow bullhead 21(4)

Red Cedar



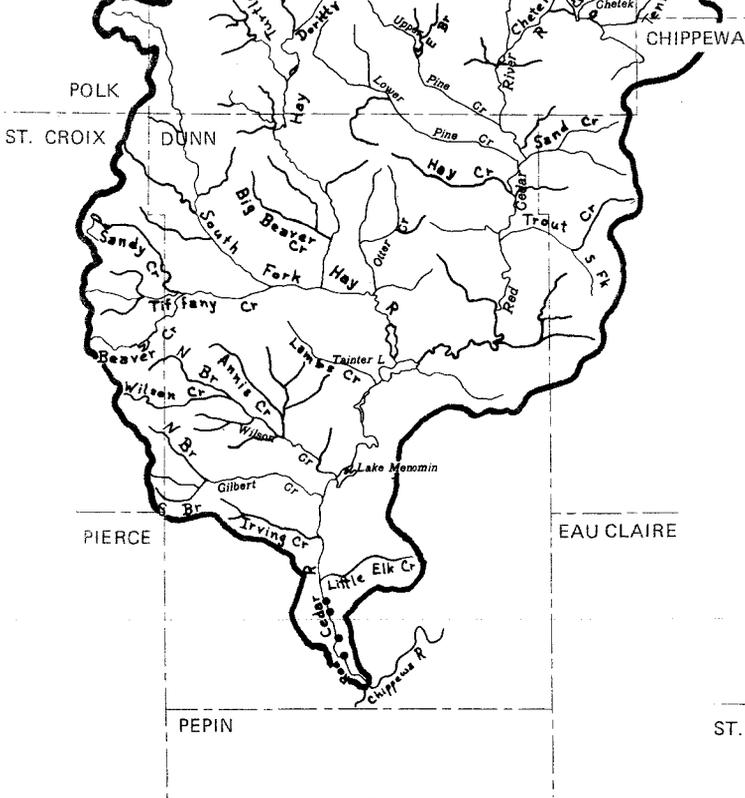
**MAP 53**  
 ● Brown bullhead 23(20)

Red Cedar

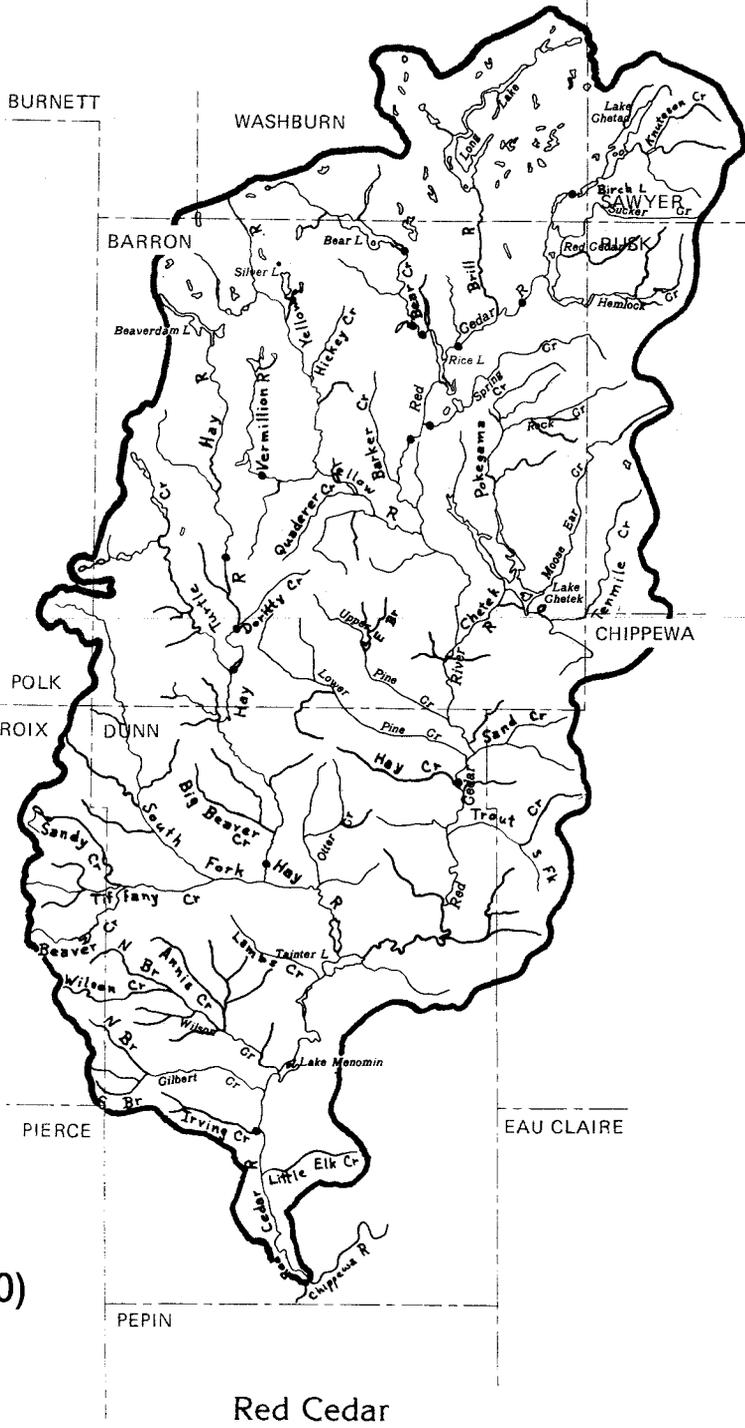


Red Cedar

MAP 54  
● Channel catfish 4(1)



MAP 55  
● Stonecat 15(0)



Red Cedar

MAP 56  
● Channel catfish 1(1)

BURNETT

WASHBURN

### MAP 56

● Tadpole madtom 18(1)

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

BURNETT

WASHBURN

BARRON

CHIPPEWA

PIERCE

EAU CLAIRE

POLK

ST. CROIX

DUNN

PEPIN

Red Cedar

### MAP 57

● Trout-perch 3(0)

BURNETT

WASHBURN

BARRON

CHIPPEWA

PIERCE

EAU CLAIRE

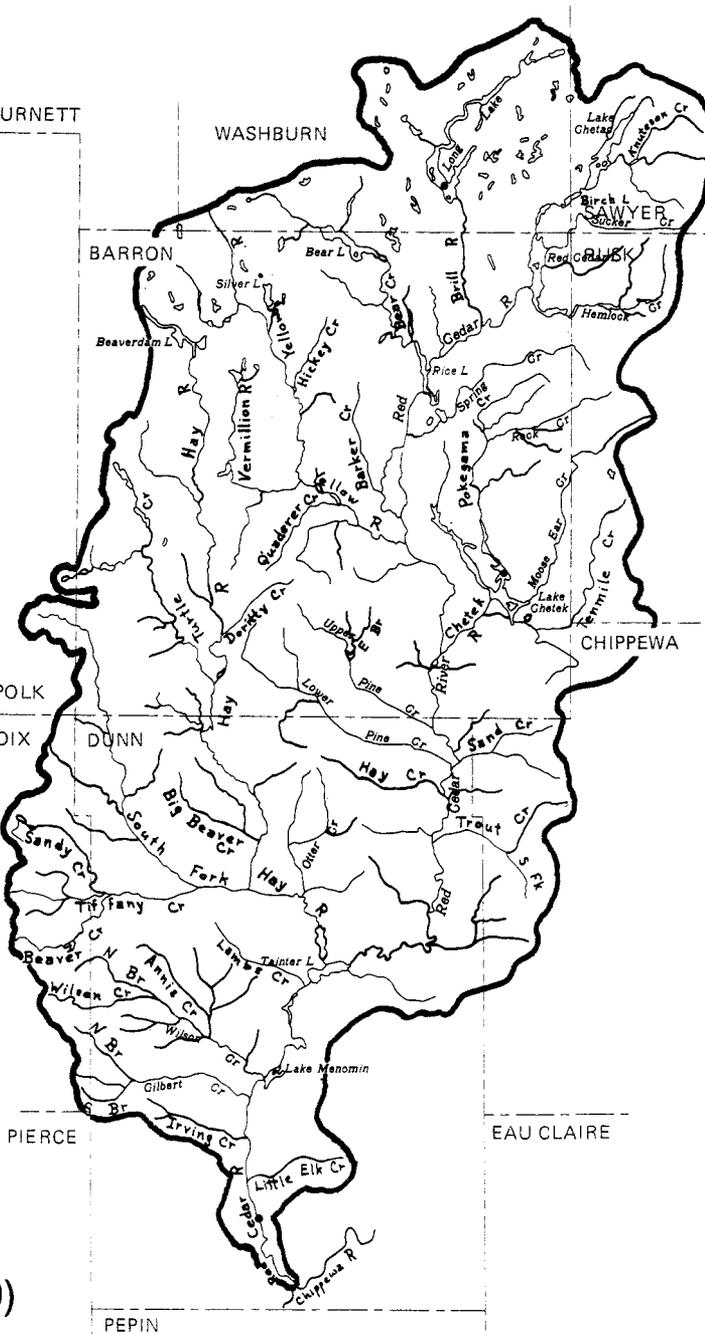
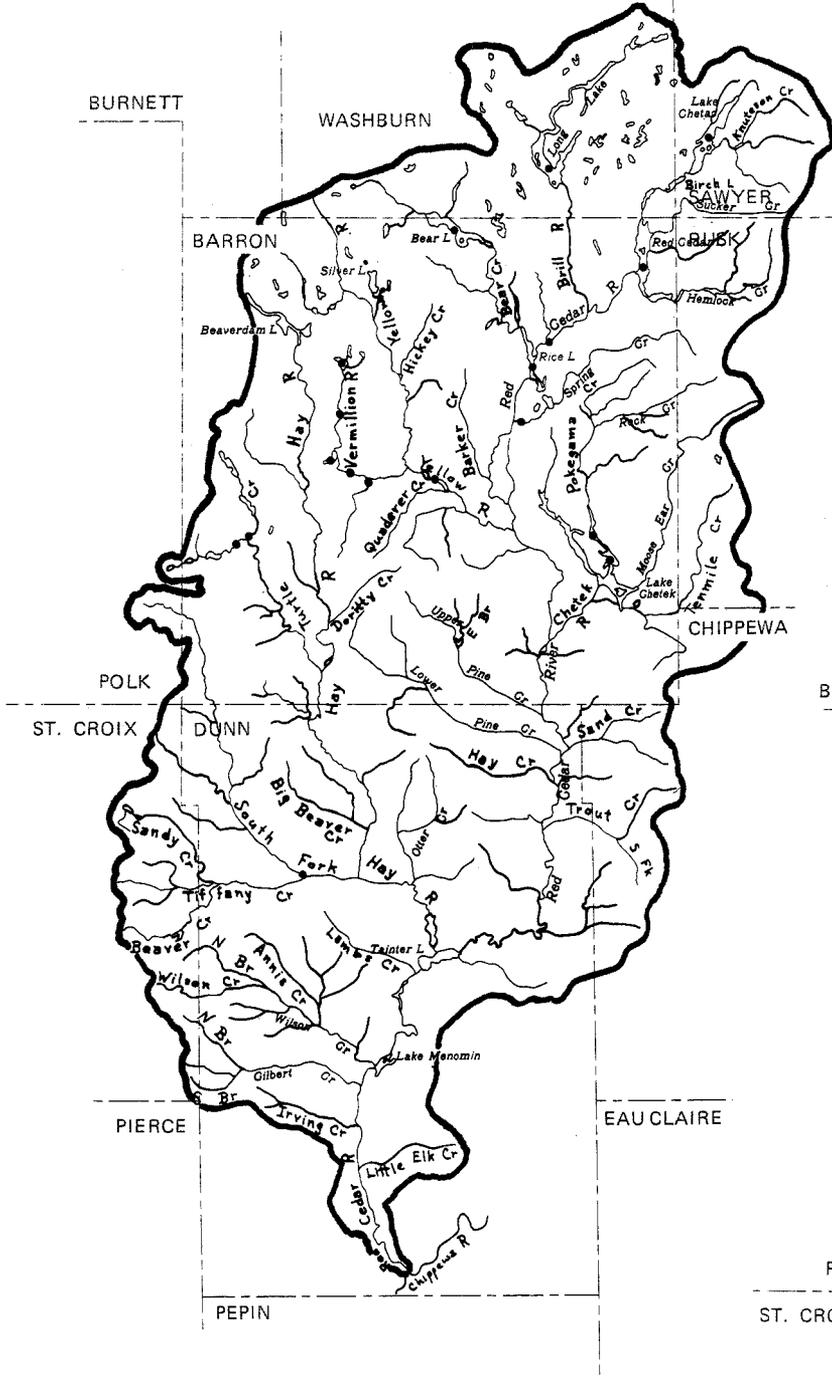
POLK

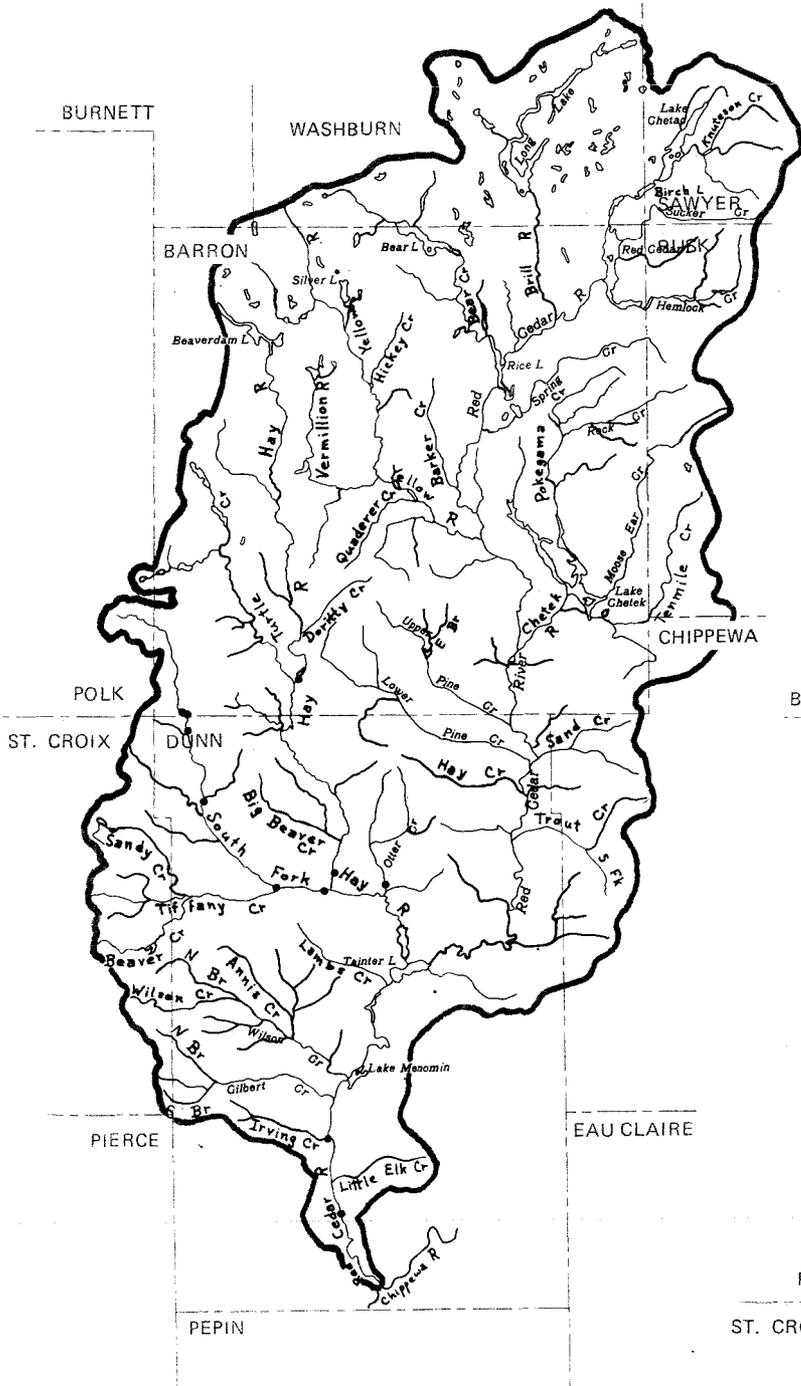
ST. CROIX

DUNN

PEPIN

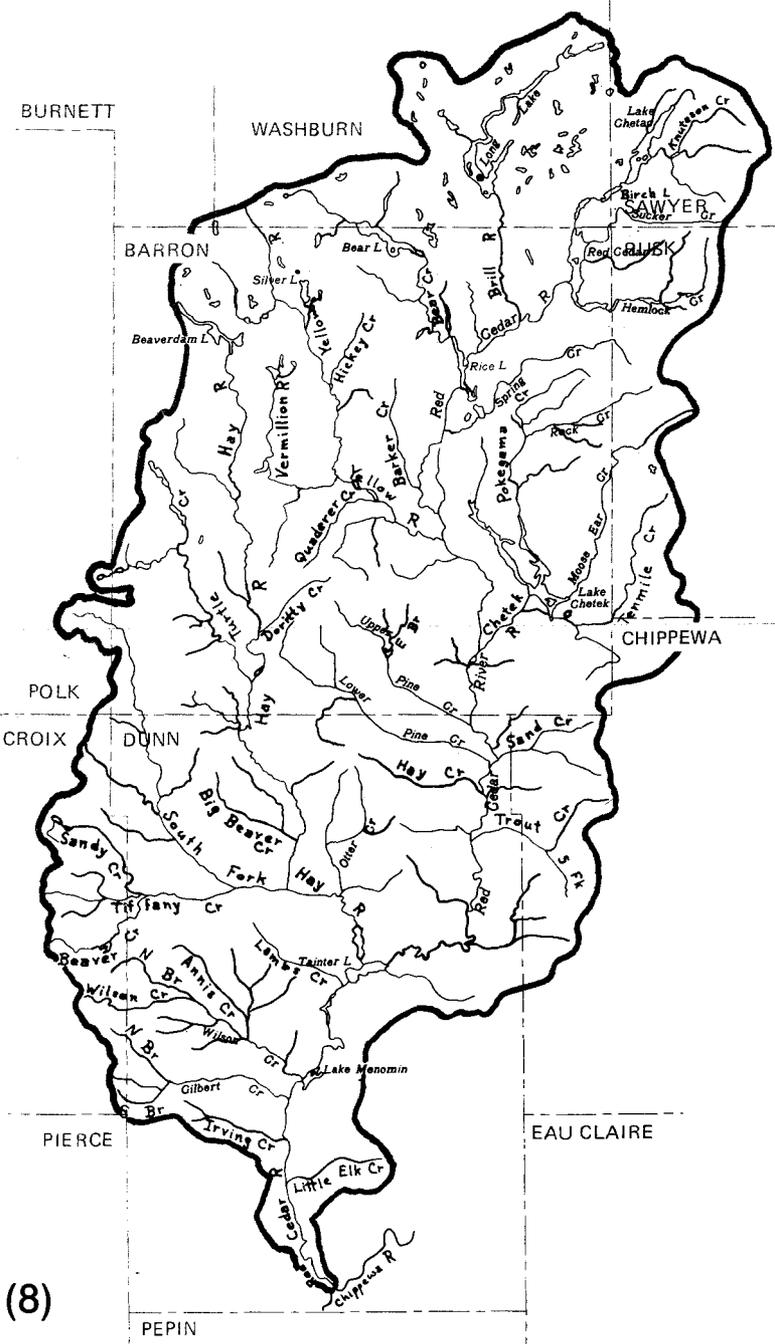
Red Cedar





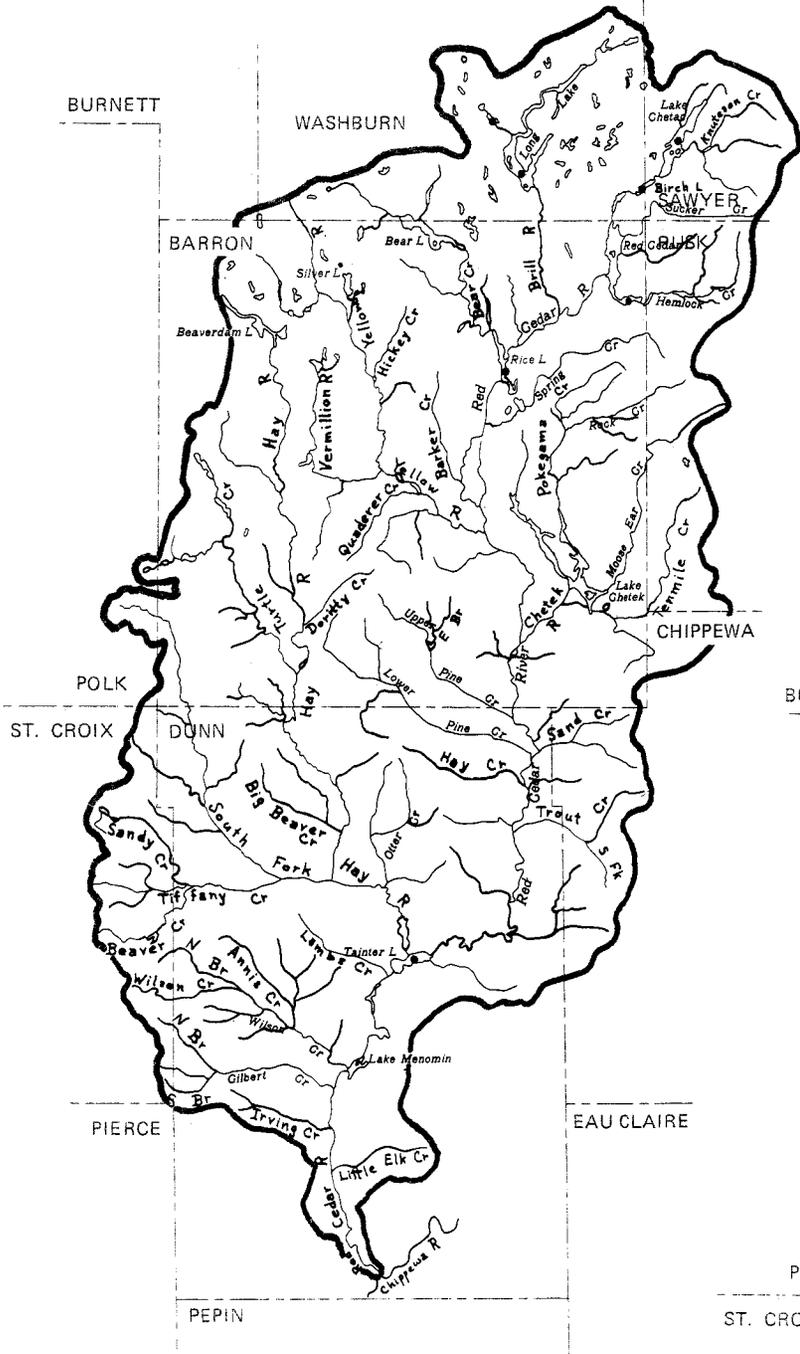
**MAP 58**  
● Burbot 11(0)

Red Cedar



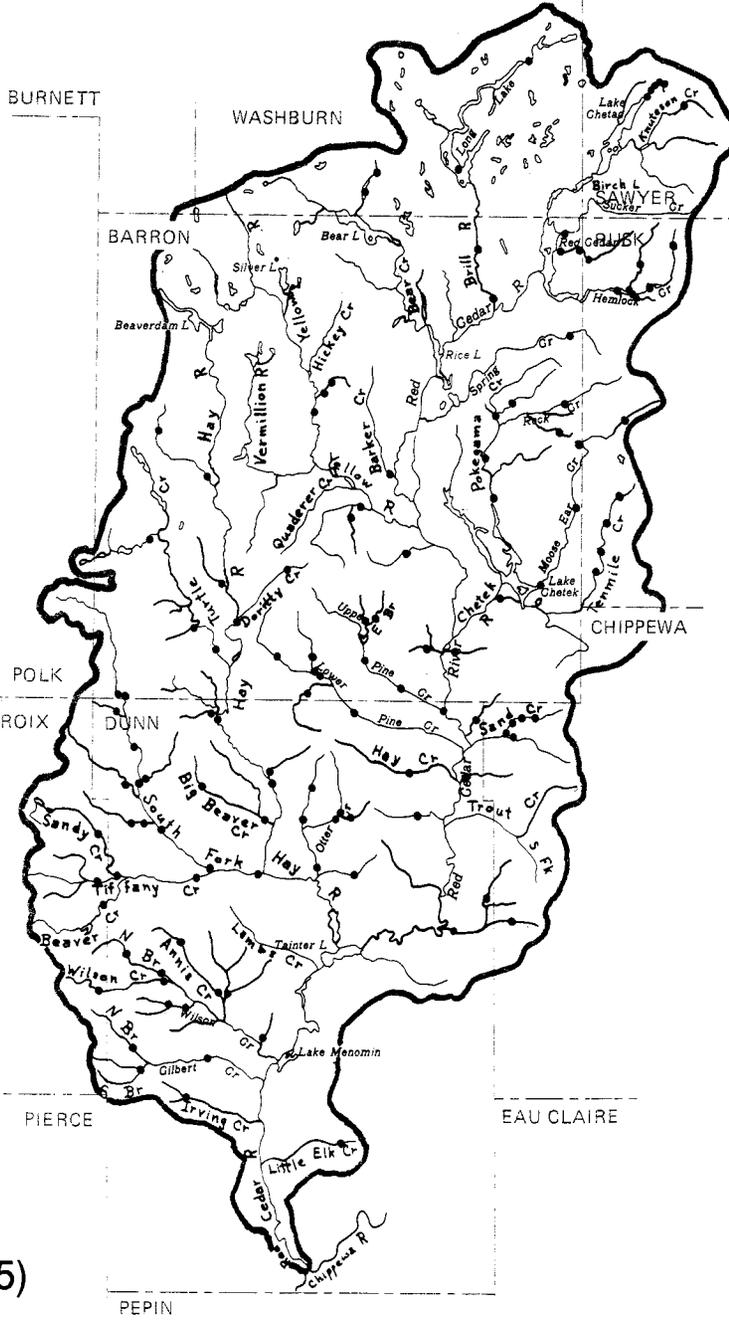
**MAP 59**  
● Banded killifish 1(8)

Red Cedar



**MAP 60**  
 ● Brook silverside 7(3)

Red Cedar

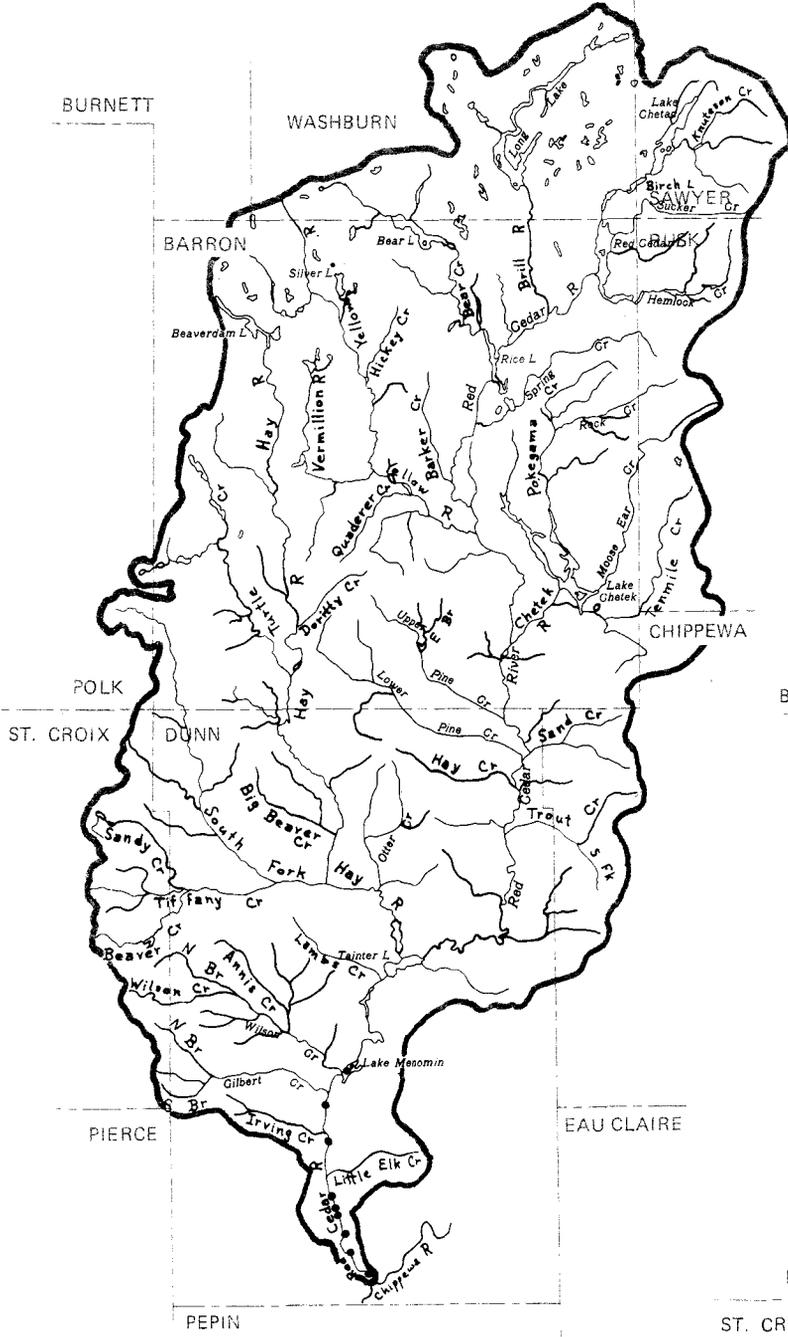


**MAP 61**  
 ● Brook stickleback 124(5)

Red Cedar

MAP 62

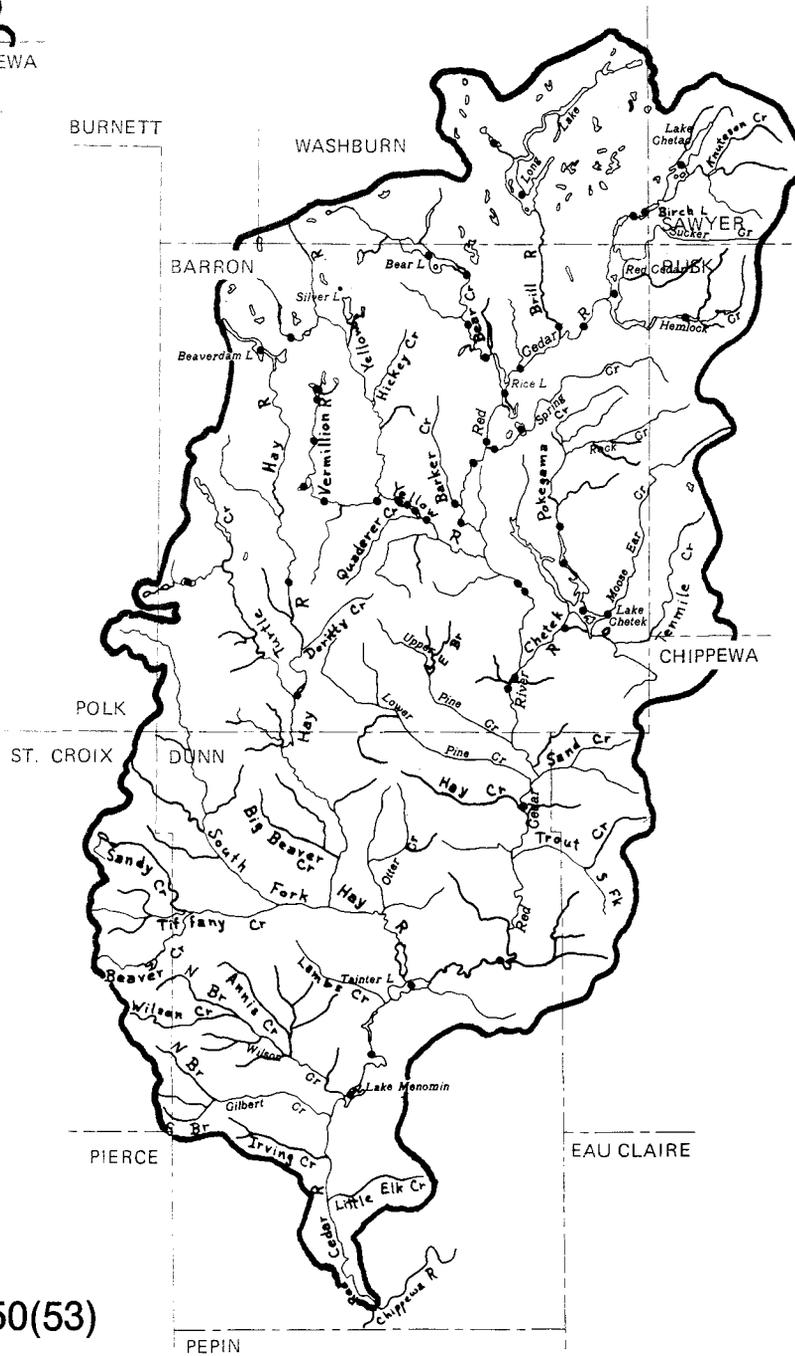
● White bass 10(0)



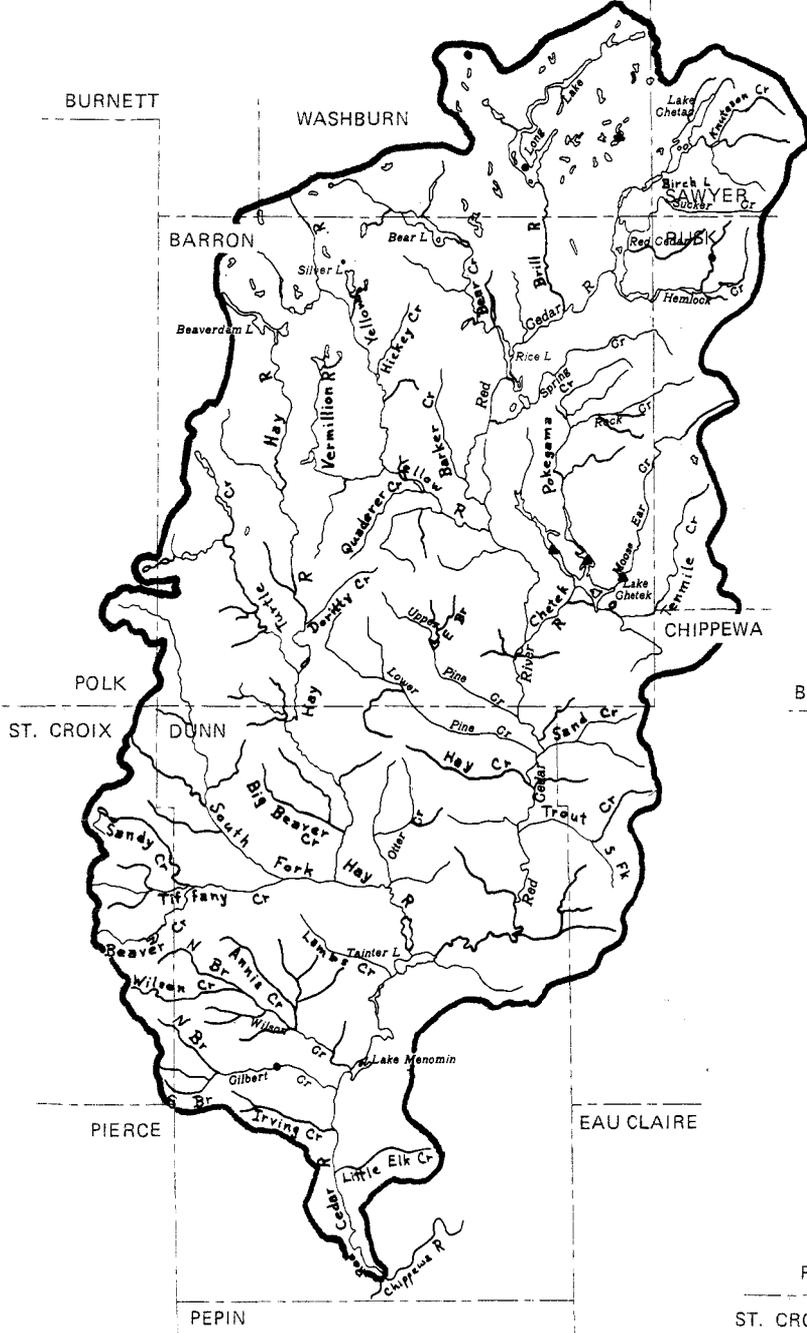
Red Cedar

MAP 63

● Rock bass 50(53)



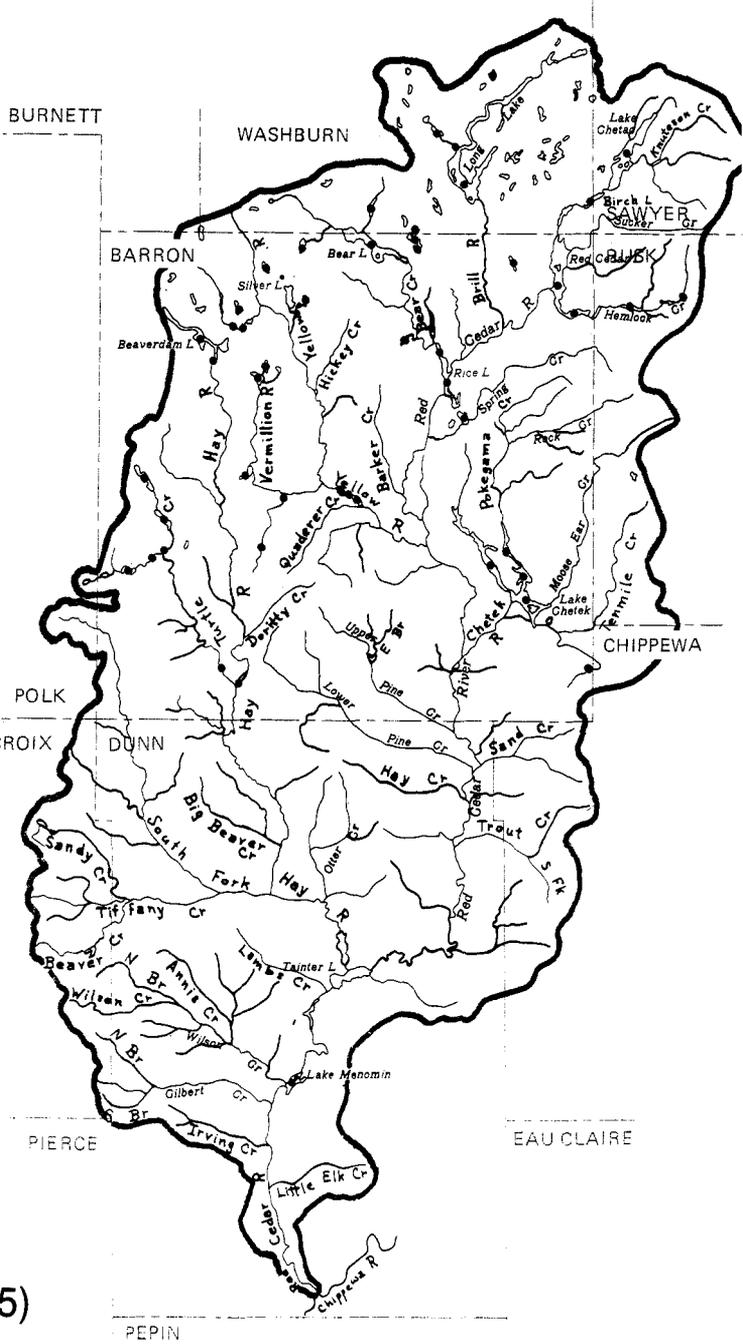
Red Cedar



MAP 64

- Green sunfish 4(0)
- ▲ Warmouth 4(0)

Red Cedar



MAP 65

- Pumpkinseed 50(65)

Red Cedar

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

EAU CLAIRE

PEPIN

Red Cedar

MAP 66

● Bluegill 69(140)

BURNETT

WASHBURN

BARRON

CHIPPEWA

POLK

ST. CROIX

DUNN

PIERCE

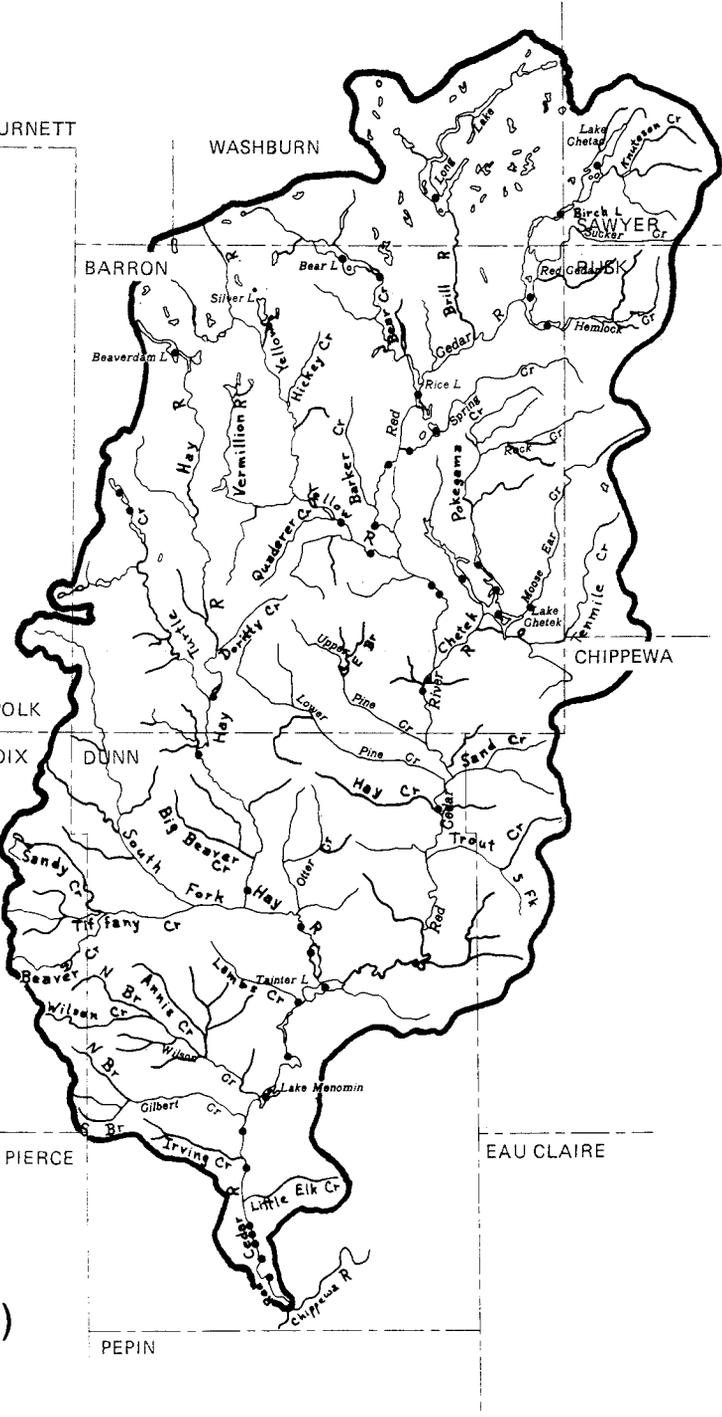
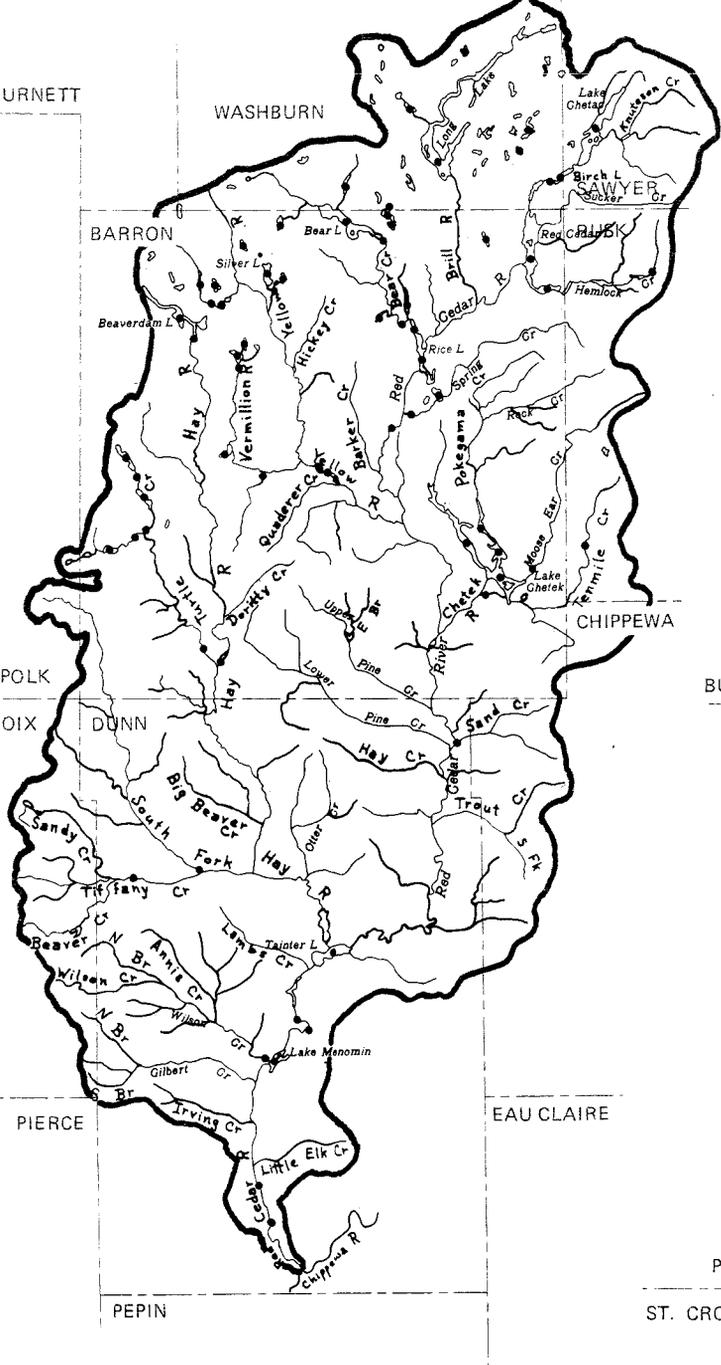
EAU CLAIRE

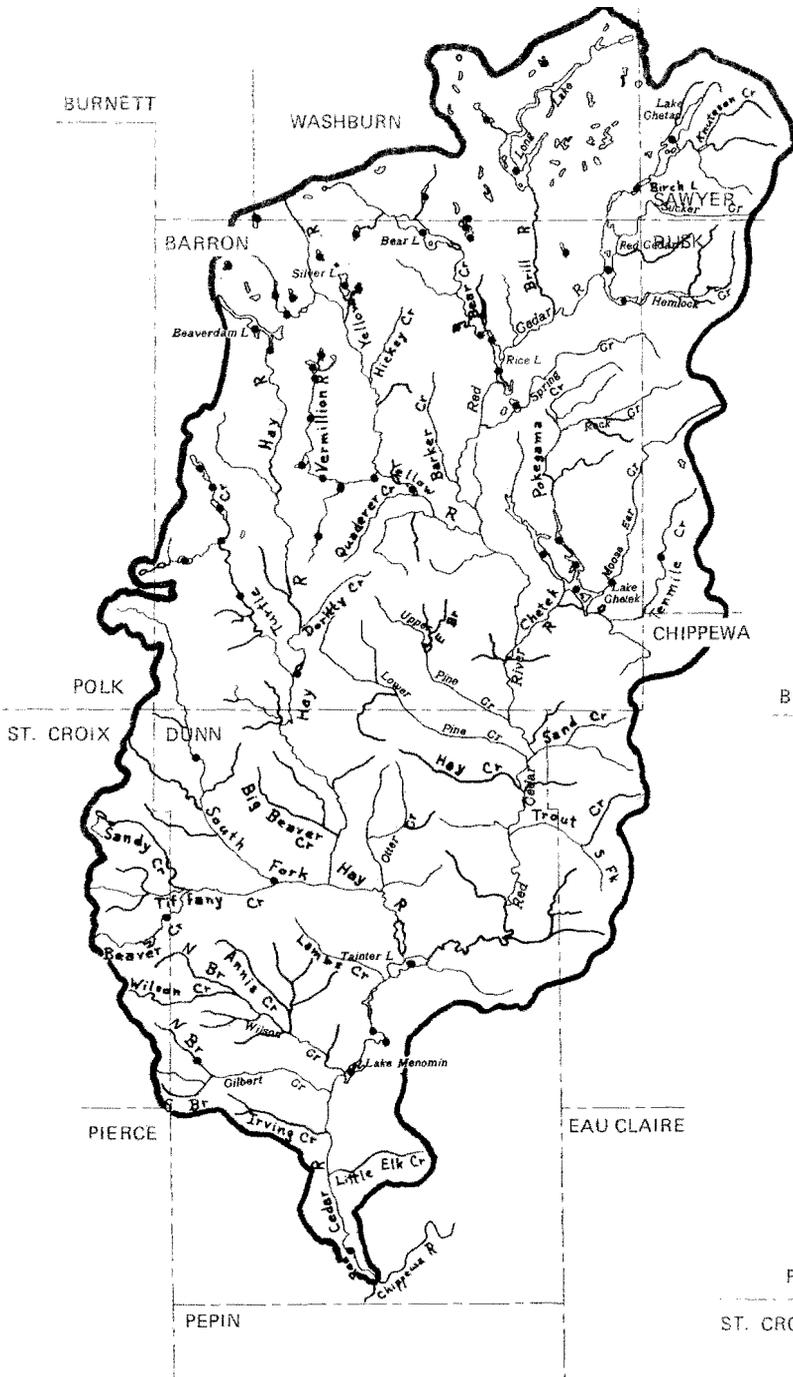
PEPIN

MAP 67

● Smallmouth bass 45(79)

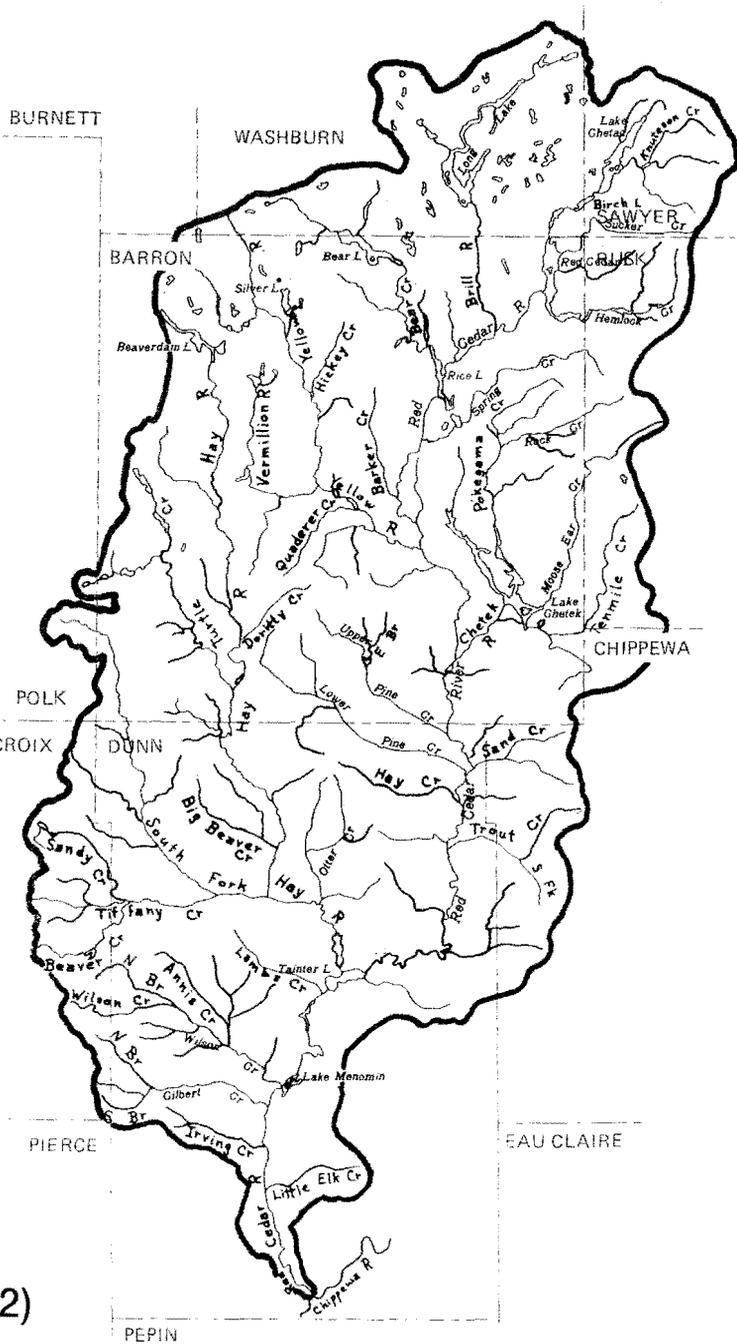
Red Cedar





**MAP 68**  
● Largemouth bass 62(139)

Red Cedar

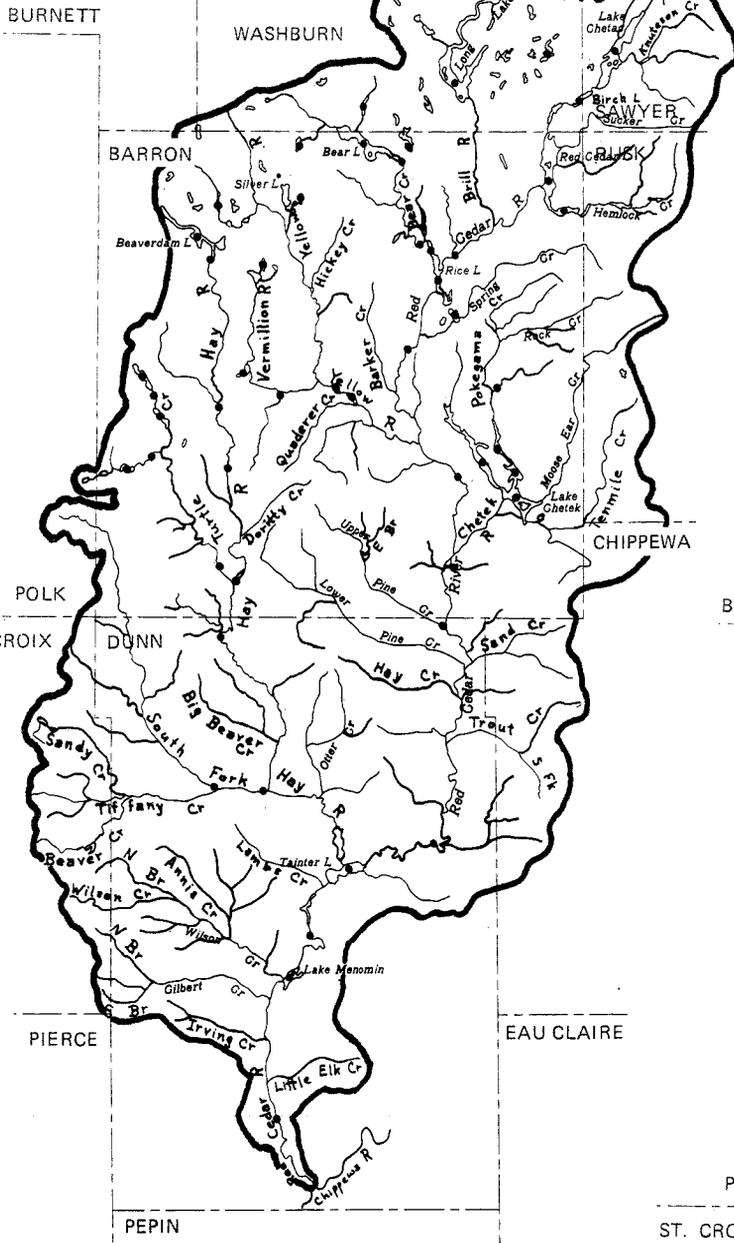


**MAP 69**  
● White crappie 1(2)

Red Cedar

MAP 70

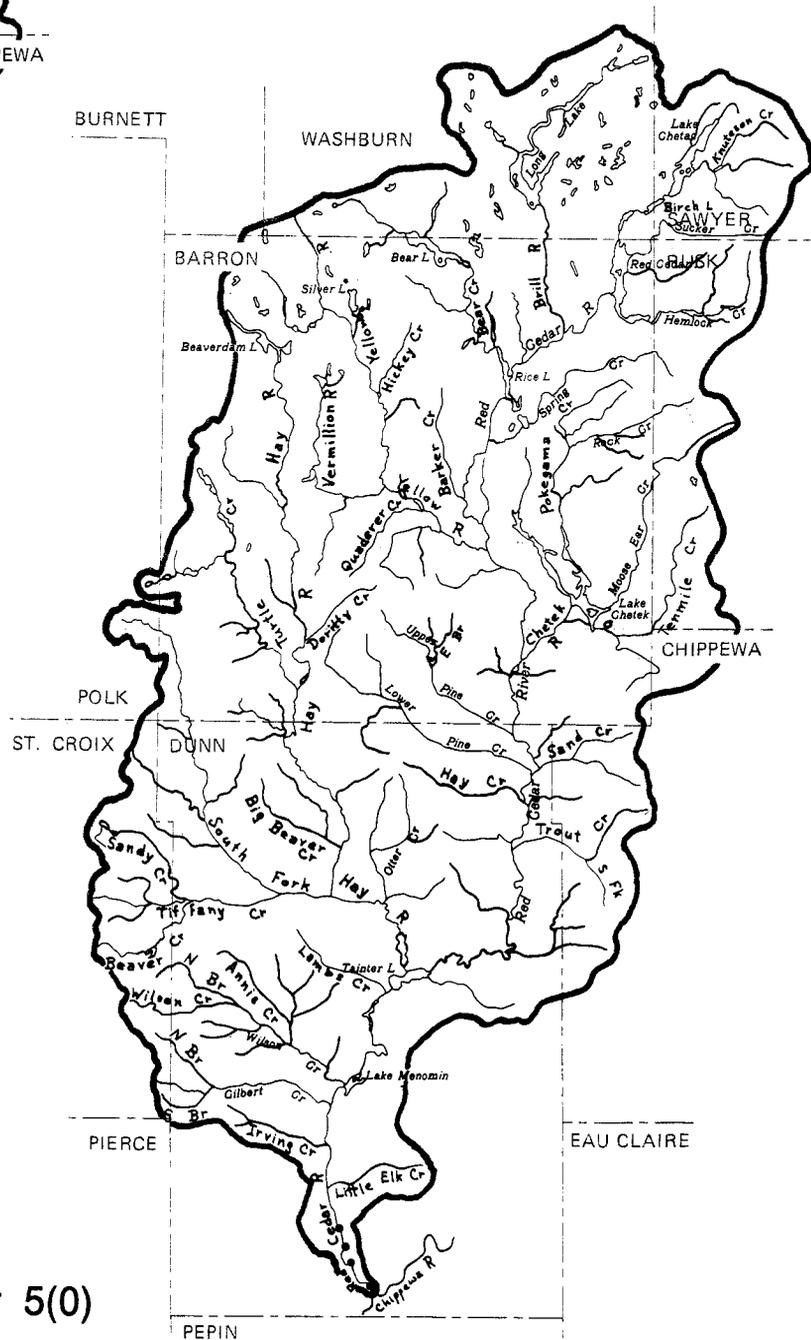
● Black crappie 52(70)



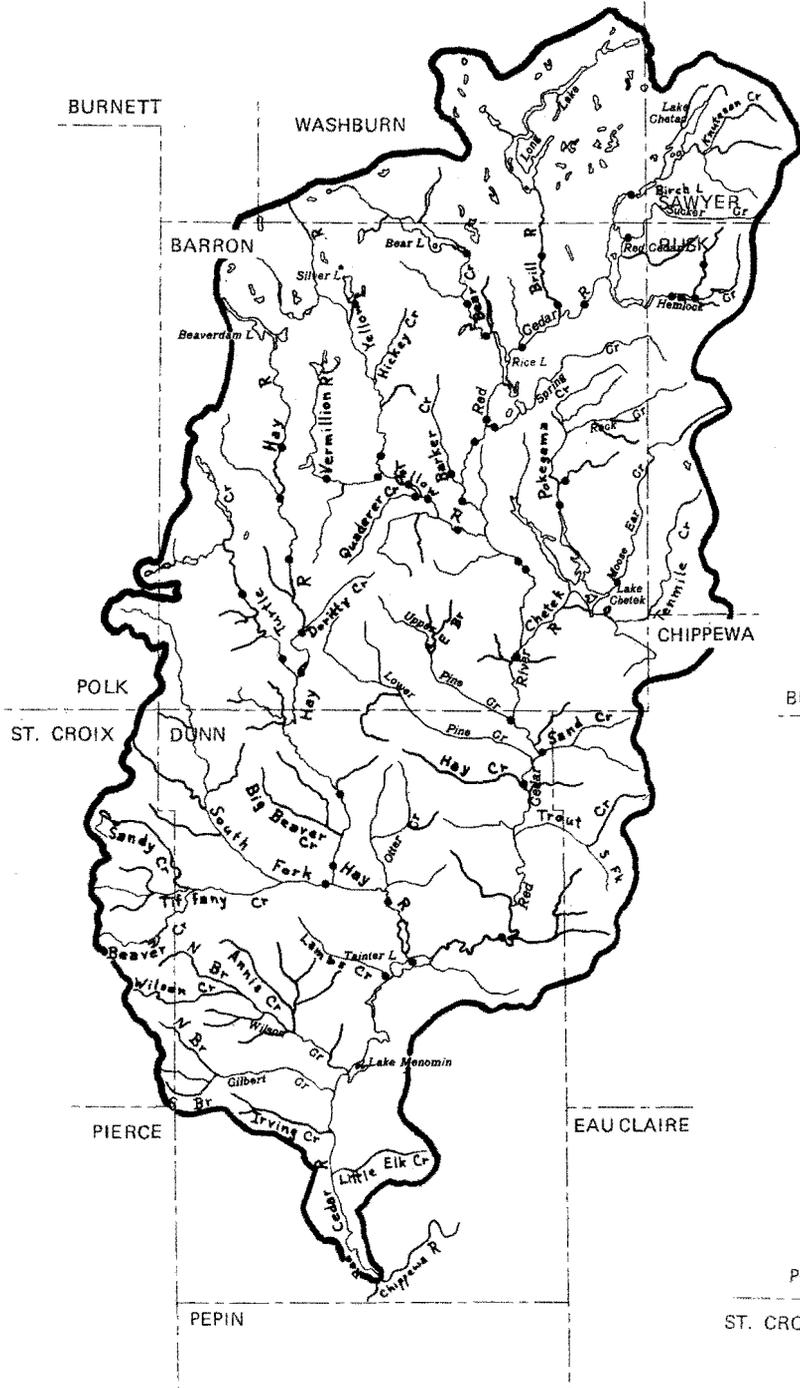
Red Cedar

MAP 71

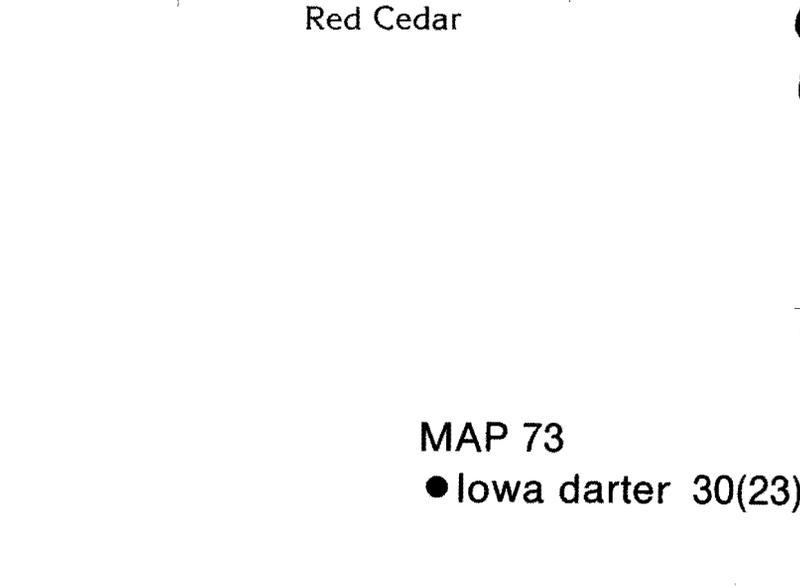
● Crystal darter 5(0)



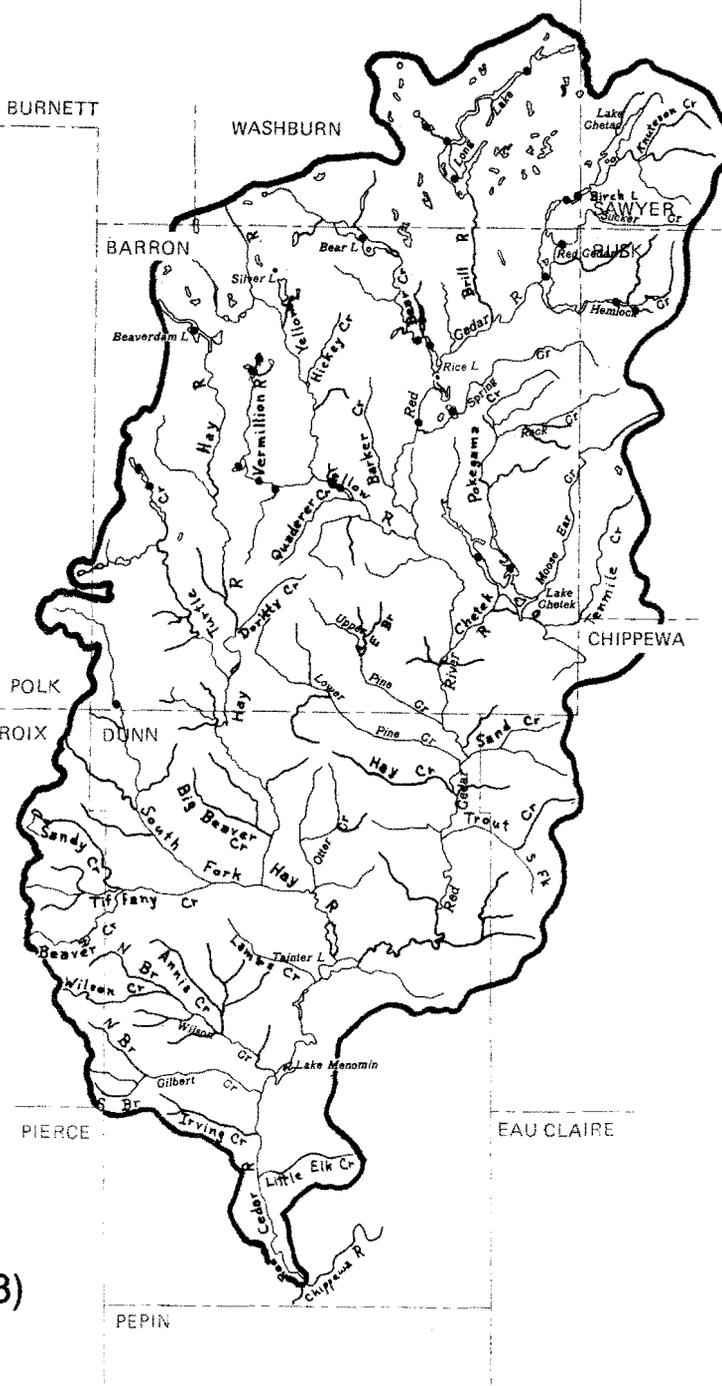
Red Cedar



**MAP 72**  
 ● Rainbow darter 48(0)



**MAP 73**  
 ● Iowa darter 30(23)



Red Cedar

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

PIERCE

PEPIN

EAU CLAIRE

Red Cedar

### MAP 74

●Fantail darter 72(0)

BURNETT

WASHBURN

BARRON

POLK

ST. CROIX

DUNN

PIERCE

PEPIN

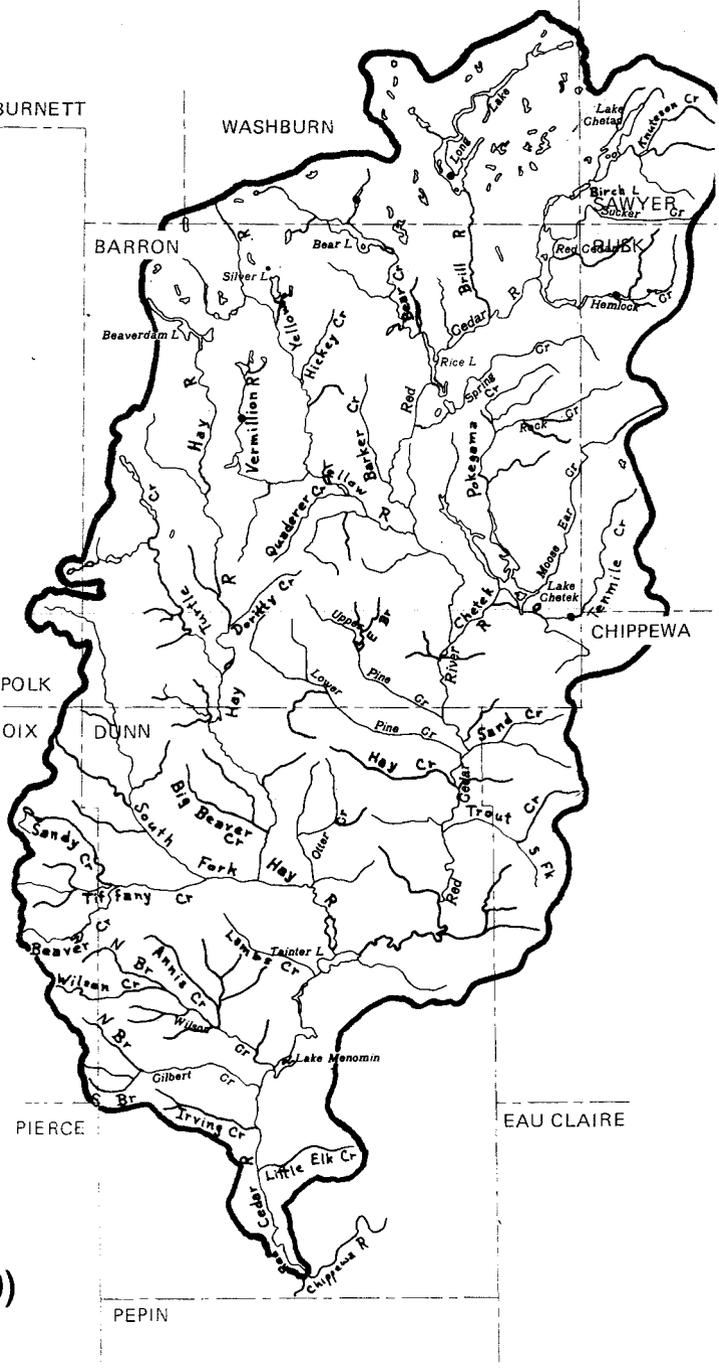
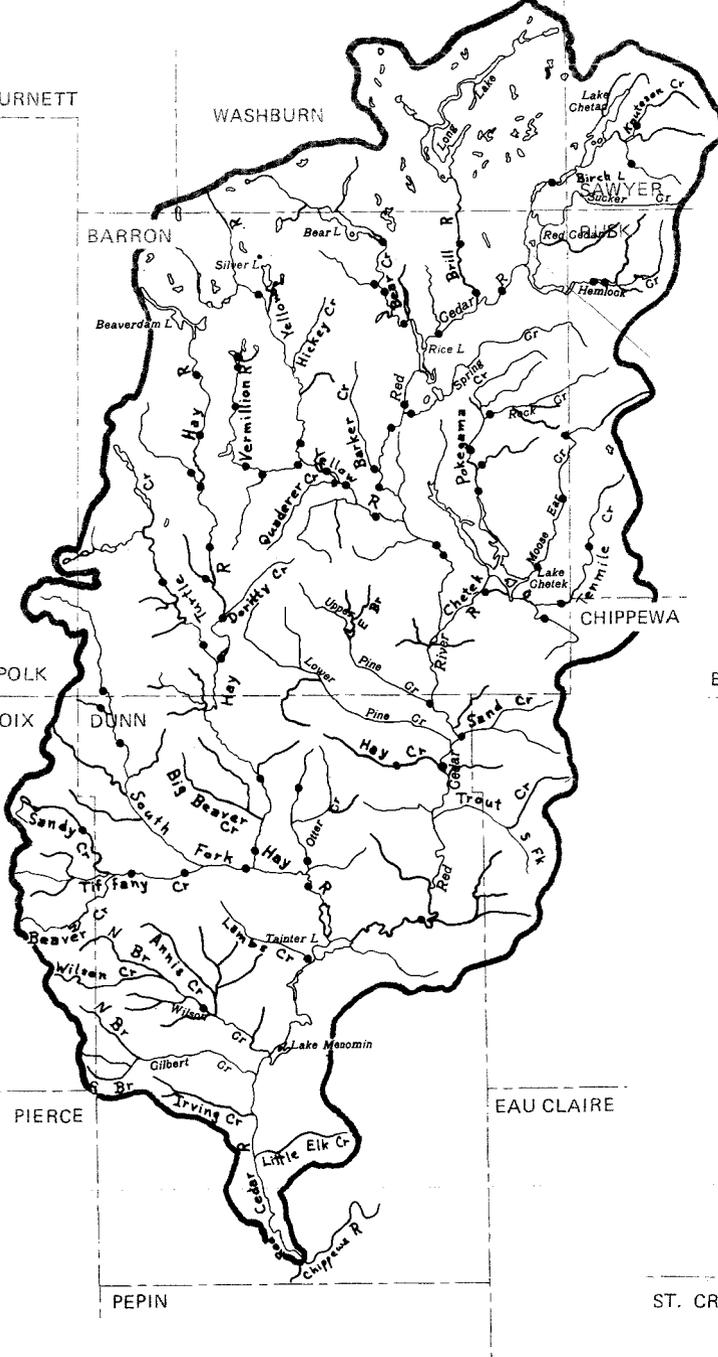
CHIPPEWA

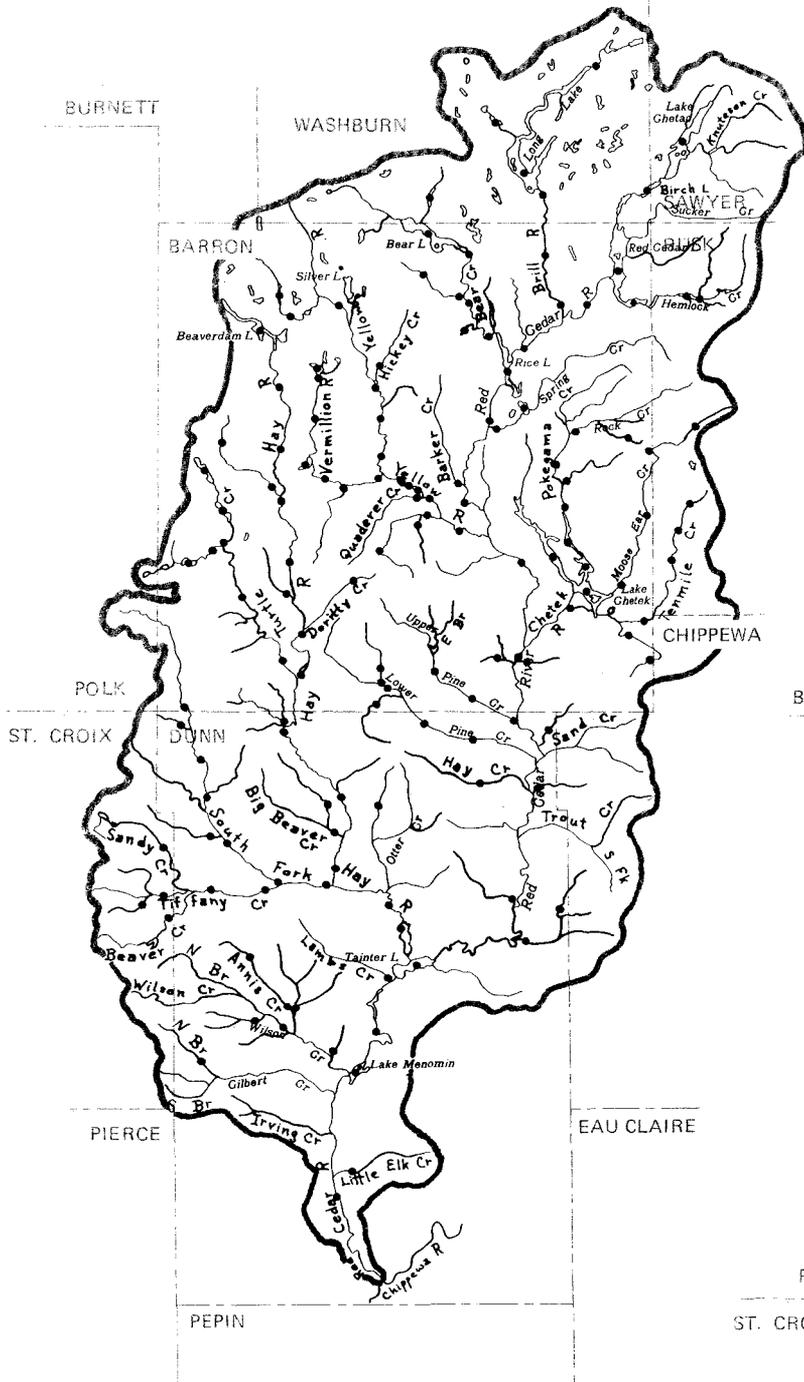
EAU CLAIRE

Red Cedar

### MAP 75

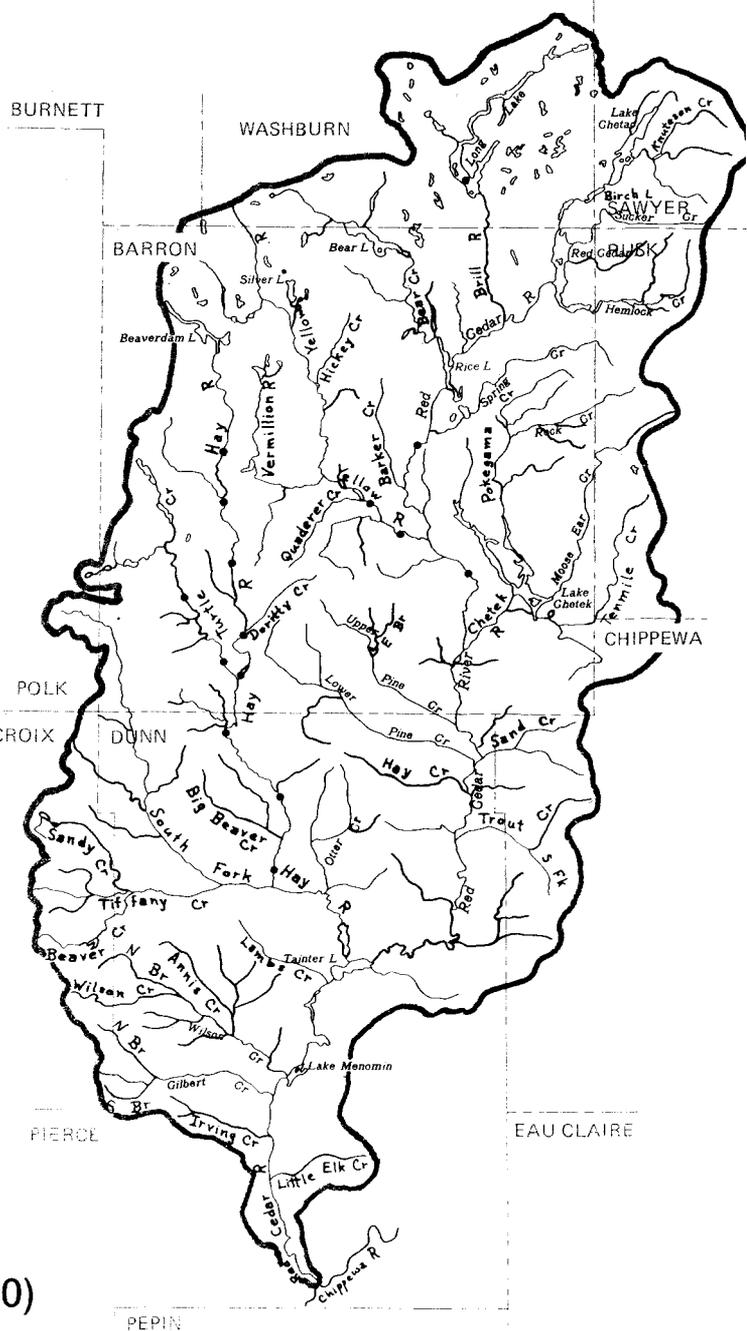
●Least darter 5(0)





**MAP 76**  
 ● Johnny darter 144(68)

Red Cedar

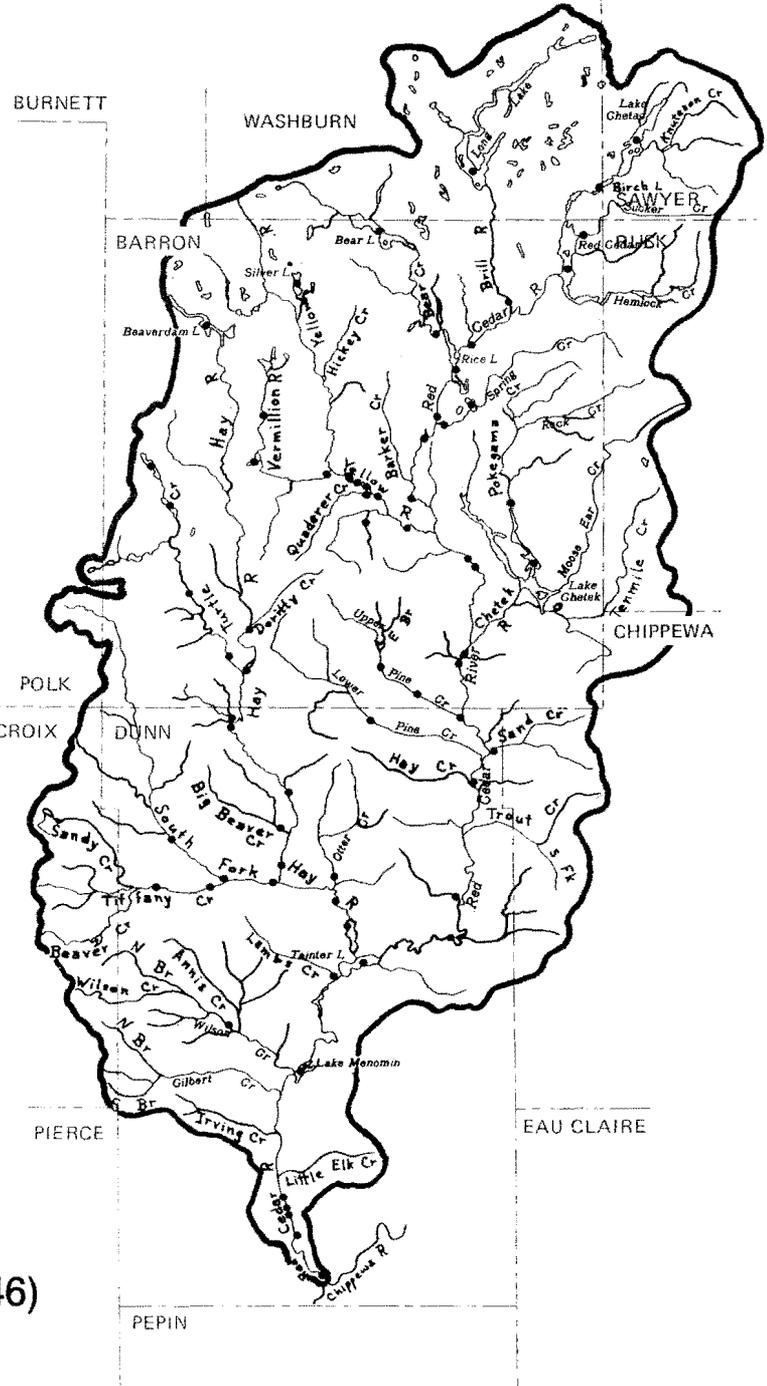
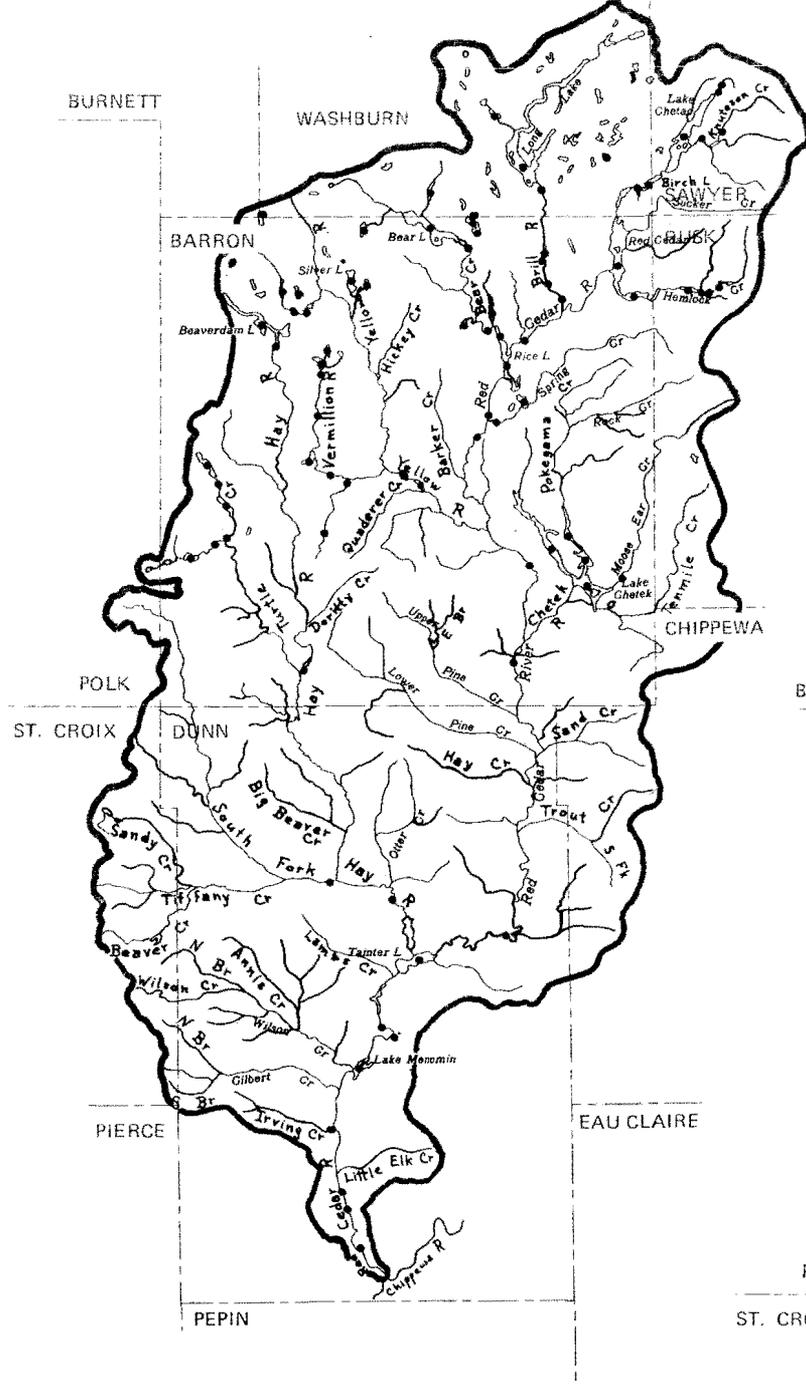


**MAP 77**  
 ● Banded darter 15(0)

Red Cedar

MAP 78

● Yellow perch 83(150)

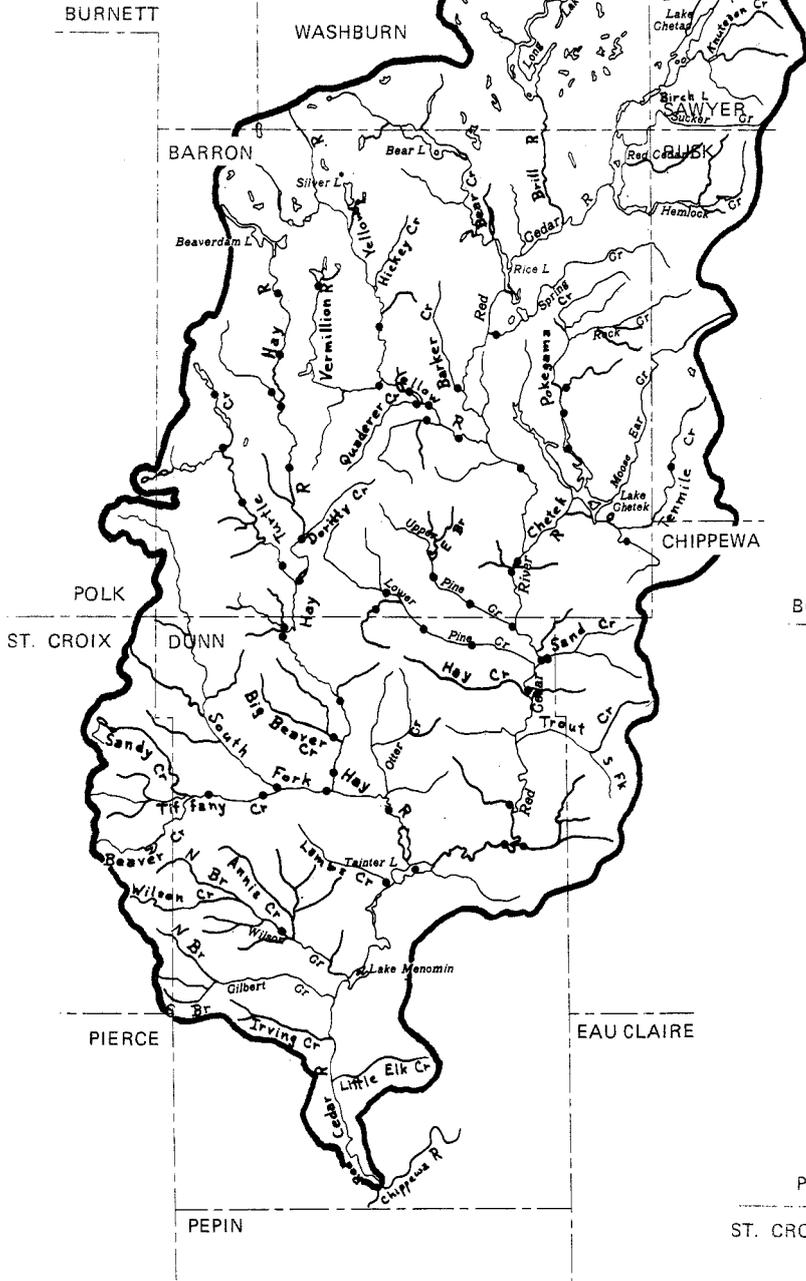


Red Cedar

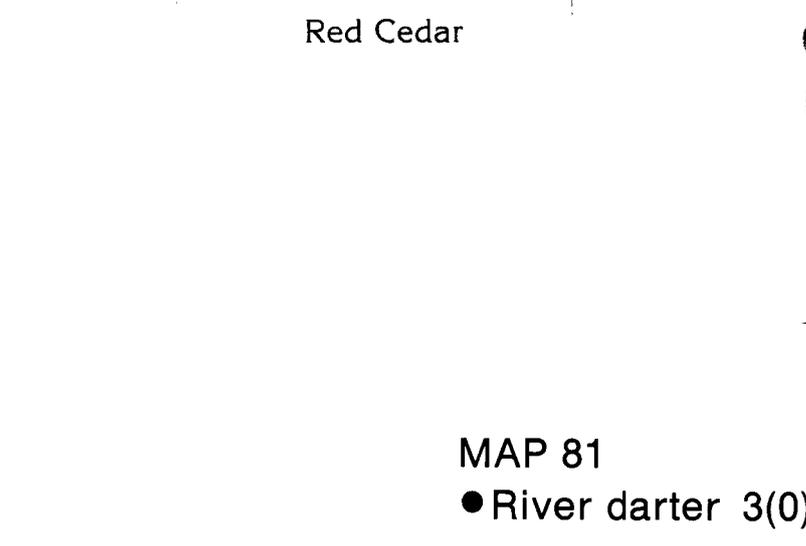
MAP 79

● Logperch 69(46)

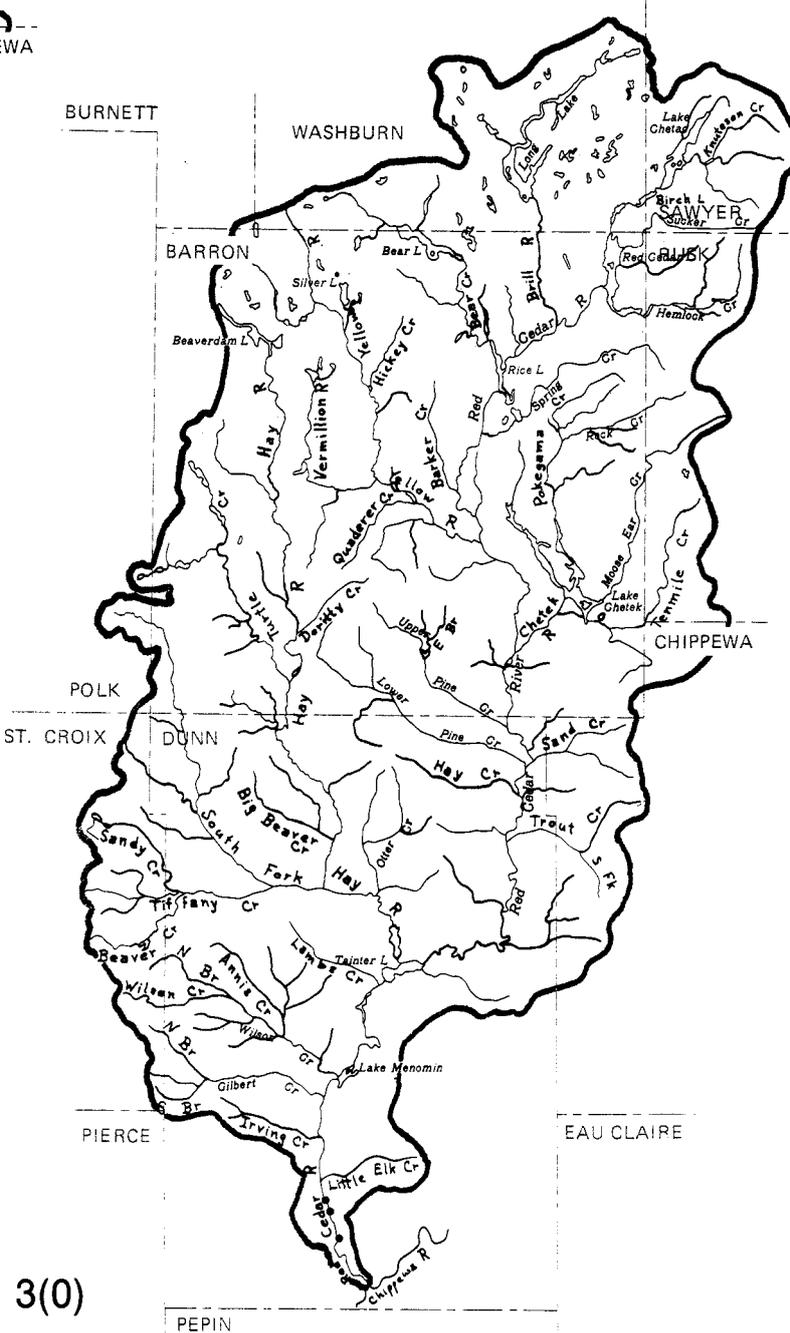
Red Cedar



MAP 80  
 ● Blackside darter 56(0)



MAP 81  
 ● River darter 3(0)

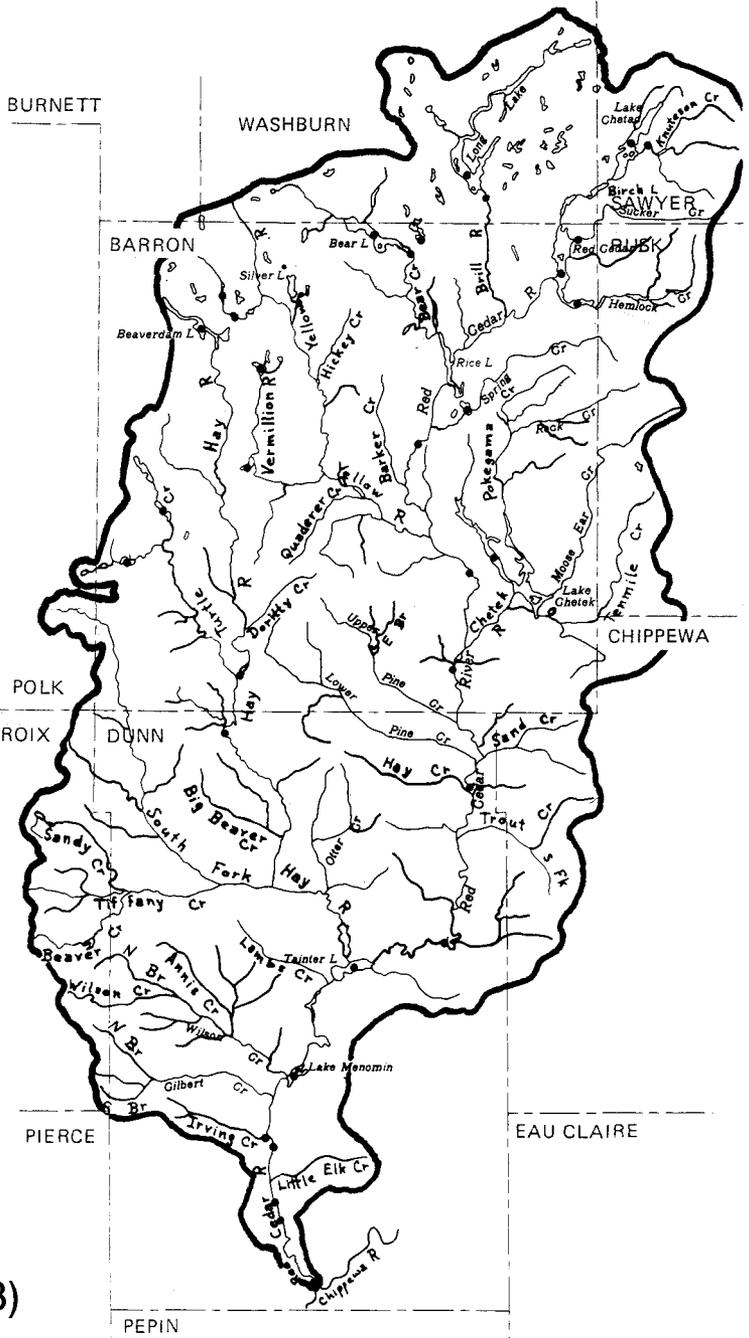
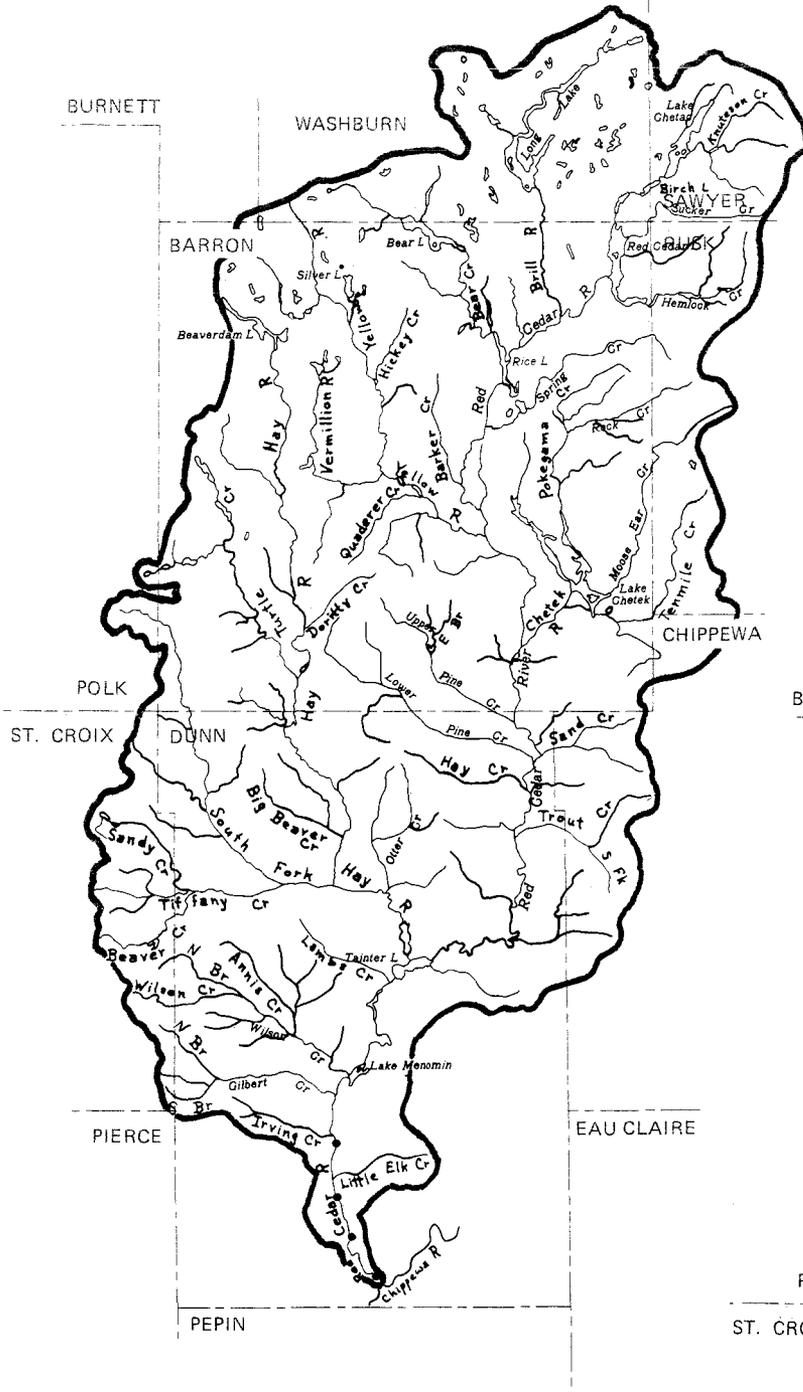


MAP 81  
 ● River darter 3(0)

Red Cedar

MAP 82

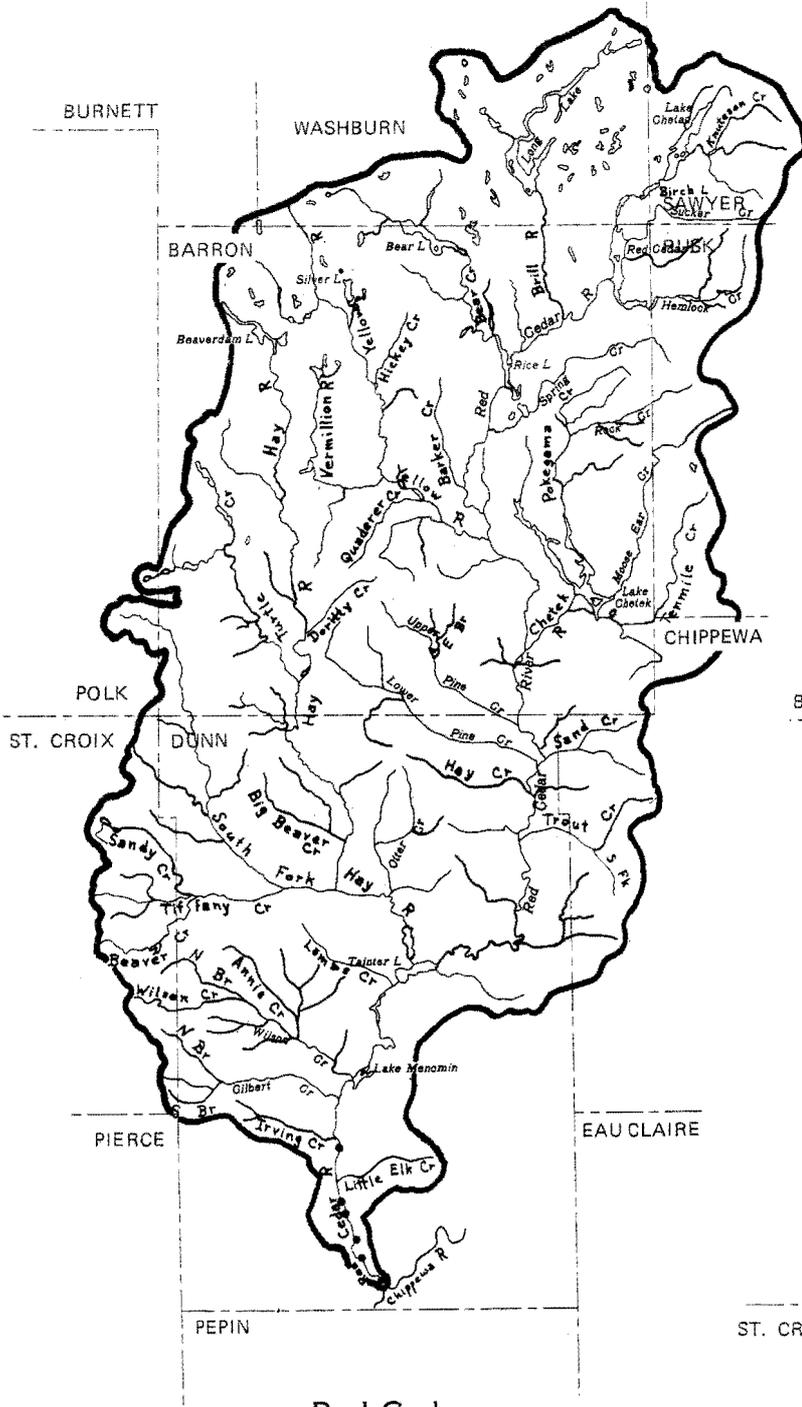
● Sauger 4(0)



MAP 83

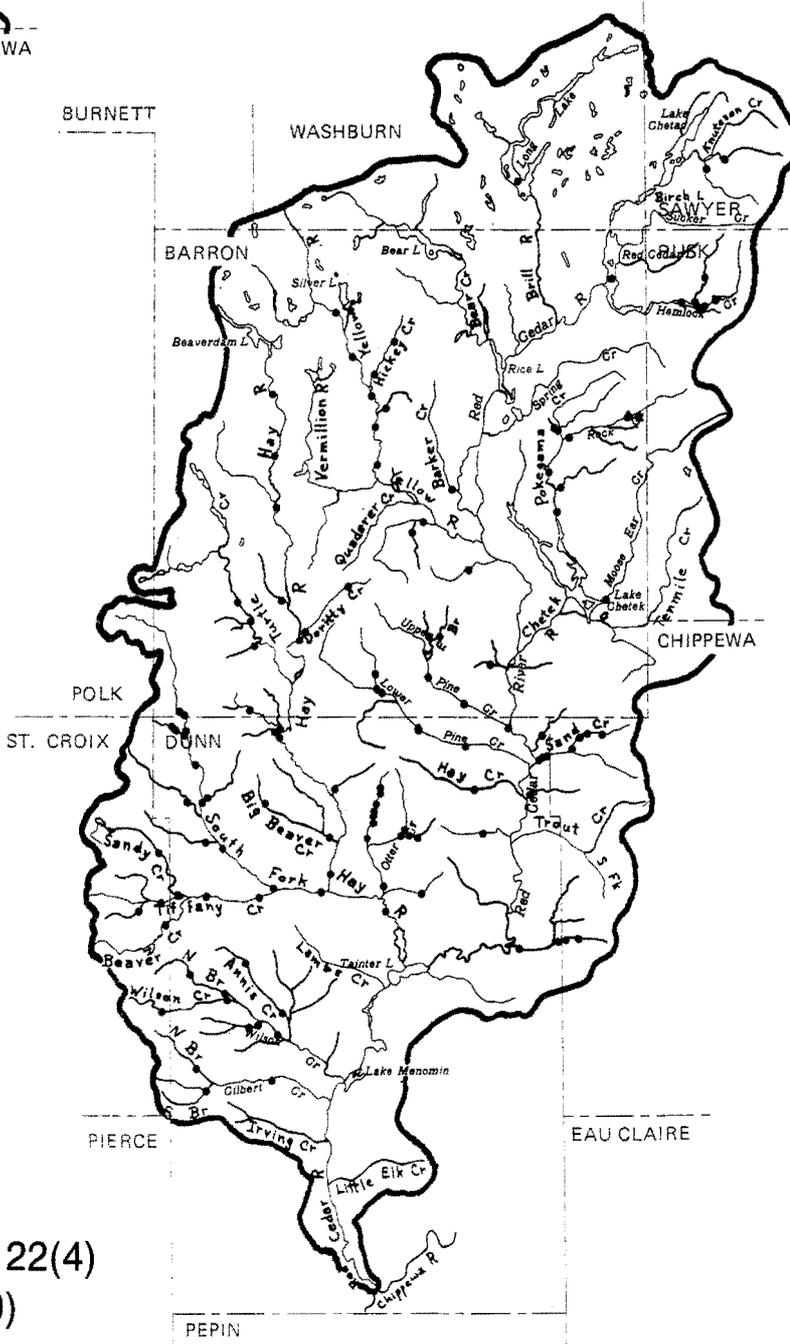
● Walleye 33(13)

Red Cedar



**MAP 84**  
 ● Freshwater drum 6(0)

Red Cedar



**MAP 85**  
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 ▲ Slimy sculpin 1(0)

Red Cedar

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## METRIC-ENGLISH AND ENGLISH-METRIC CONVERSIONS

1 km = 0.6214 mile  
1 km<sup>2</sup> = 0.3861 miles<sup>2</sup>  
1 ha = 2.47 acres  
1 cm = 0.3937 inches (0.328 ft)  
1 m<sup>3</sup> = 35.21 ft<sup>3</sup>  
  
1 ft = 30.48 cm  
1 mile = 1.609 km  
1 acre = 0.4047 ha

## ACKNOWLEDGMENTS

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