IN SEARCH OF MINNESOTA'S MISSING FISHES

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The word "Minnesota" comes from the native Dakota people who inhabited the upper Midwest and means "sky-tinted water." Minnesota license plates romanticize the meaning with the motto "Land of 10,000 Lakes," which were once crystal clear and pristinely reflected blue skies. However, the reality is that the state has lost at least half of its original wetlands, and worse yet, less than one percent of native prairie remains. A 2008 Minnesota Pollution Control Agency (MPCA) study found roughly half of the stream miles have been ditched or altered, and the state's impaired waters list includes about 40% of the state's lakes and streams (MPCA 2013; 2018). The landscape in the southern two-thirds of state has been transformed from prairie potholes and hardwood forest to fields of corn and soybeans with an incalculable negative impact on native flora and fauna. Northern Minnesota remains largely forested, but even here most of the old growth Red (aka Norway) Pine and White Pine forests were long ago harvested for timber. These altered landscapes were later ravaged again by several catastrophic fires (e.g., Hinckley in 1894). It is no small wonder any fish can live today in many of the state's lakes and streams, but thankfully rare species do survive – or perhaps better said persist – despite what has transpired since Minnesota's statehood in 1858.

When discussing the topics of extinction (i.e., loss of a species) or extirpation (i.e., loss of a species in part of its former range), one fundamental rule holds true: *presence is always easier to prove than absence*. With the exception of what eDNA may offer in the not-too-distant future, there is no sampling gear available today that assures, without doubt, 100 percent of the species in a fish community will be captured in a lake or a stream. Using multiple types of survey gears, fish toxicants (e.g., cyanide and rotenone), or explosives (e.g., Primacord) may approach, but will never achieve detection of every species present. Species not reported in surveys for decades may still be present, but biologists can only assume, and can never prove with certainty they are absent. Another barrier is the lack of historical evidence of fish distribution in Minnesota, and often elsewhere, which rarely dates back to the late 1800s. As far as *known* statewide extirpations, Minnesota is extremely fortunate in losing only the aptly named Ghost Shiner (*Notropis buchanani*) from the state's ichthyofauna with the last report from the Mississippi River (Houston County) in 1957 (Figure 1).

Figure 1. Ghost Shiner from the Marais Des Cygnes River (Bates County, MO)

There are several other species which were assumed lost after very long absences, but have made infrequent appearances in recent years and decades. The Skipjack Herring (*Alosa chrysochloris*) (Figure 2) once migrated to Big Stone Lake on the Minnesota/South Dakota border, where it was last reported in 1920, and it persisted in Lake St. Croix on the Minnesota/Wisconsin border until 1928. The loss of this species was attributed to the completion of US Lock and Dam 19 (Figure 2) at Keokuk, IA, in 1913. This dam is the highest on the Mississippi River at 38 feet, and it immediately became a barrier to the Skipjack's annual spawning migrations (Eddy and Underhill 1974). However, following a prolonged period of high flows in the Mississippi River, Skipjack returned to Minnesota waters in 1986 upstream to

Photos and maps by the author unless otherwise indicated.

Figure 2. Top: Skipjack Herring from the Clinch River (Loudon County, TN). Bottom: US Lock and Dam 19 at Keokuk, IA. (USGS photo)

Lake Pepin (Goodhue County) where several anglers caught adults. In the same year, Minnesota Department of Natural Resources (MDNR) fisheries biologists found young-of-the-year Skipjack Herring revealing that reproduction had occurred. The species has continued to make occasional appearances ever since but never again in the numbers seen in 1986. The Slender Madtom (*Noturus exilis*) had been collected once from Otter Creek (Mower County) in 1954 and disappeared until 1991 when I found them again upstream of the collection's historic locality. The Bluntnose Darter (*Etheostoma chlorosoma*) had been AWOL since 1945, and I was part of a MDNR committee reviewing this species and listed it as extirpated in 1996. However, in 1997 NANFA member Ray Katula and I collected a single specimen again from the original locality in Pine Creek (Houston County) (Schmidt 2012).

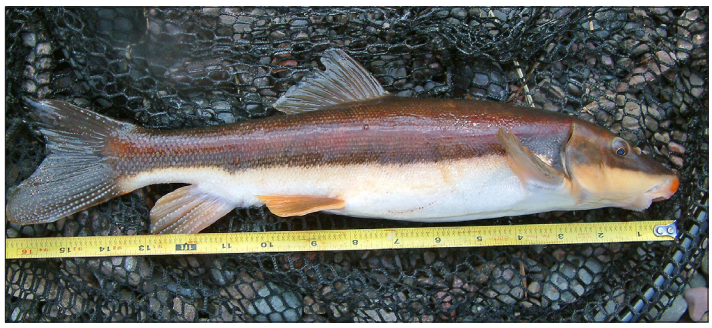

Figure 3. Nuptial male Longnose Sucker from Schmidt Creek (St. Louis County, MN). (Photo by Corey Geving, Roughfish.com)

Questions will forever remain regarding species extirpations which occurred undetected. One suspect is the lampricide, TFM, which has been widely used on Minnesota's North Shore streams of Lake Superior to control the exotic Sea Lamprey (*Petromyzon marinus*). This parasitic species is responsible for the decimation of Lake Trout (*Salvelinus namaycush*) in Lake Superior and other Great Lakes. The ongoing program is hailed as a success, but TFM kills all lamprey species. The Nemadji River system (Carlton County) south of Duluth (Figure 4) holds the sole extant Lake Superior drainage population in Minnesota of Northern Brook Lamprey (*Ichthyomyzon fossor*), which is non-parasitic. However, this species and the American Brook Lamprey (*Lethenteron appendix*) still inhabit streams along Ontario's Superior coast (Holm et al. 2009). The presence of these two species in Ontario along the Lake Superior coast suggests both species likely occurred in many of Minnesota's North Shore streams. Another management practice of concern involves small lakes of about 180 designated "stream trout lakes" where dissolved oxygen profiles support stream trout species, but none of the trout reproduce and they must be continually stocked (MDNR 2018a). Small stream trout lakes are sometimes "rehabilitated" or "reclaimed" with rotenone which is a piscicide derived from plants that interferes with cellular respiration causing fish to suffocate. This "reclaiming" is designed to eliminate competition with trout species stocked after the toxicity dissipates. This management practice likely caused the extirpation of the Longnose Sucker (*Catostomus catostomus*) (Figure 3) in Mink and Kimball lakes in Cook County, as was the Lake Chub (*Couesius plumbeus*) in Skull Lake in Lake County. Standardized lake fishery surveys generally utilize only gill and trap nets, which do not yield full community results. However, with few exceptions, this was the only sampling gear data available before initial rotenone treatments; thus the historical occurrence of all species once present in these lakes will never be known.

I would often discuss this fascinating topic with Dr. James Underhill (1923–2000), formerly Curator Emeritus of the James Ford Bell Museum of Natural History. He frequently remarked how much he marveled at a species' resiliency saying, "Once you're convinced a fish is gone for good, more often than not it proves you wrong." His statement piqued my curiosity, and I asked if he felt this was true for rare fishes formerly found in polluted streams such as the Minnesota River, which suffered immensely from sedimentation and turbidity from agricultural practices. The wise sage had the vantage point of time for his response. "I began making fish collections in the Minnesota River drainage in the 1950s. Our seine hauls typically had very few fish, but were laden with vegetables from

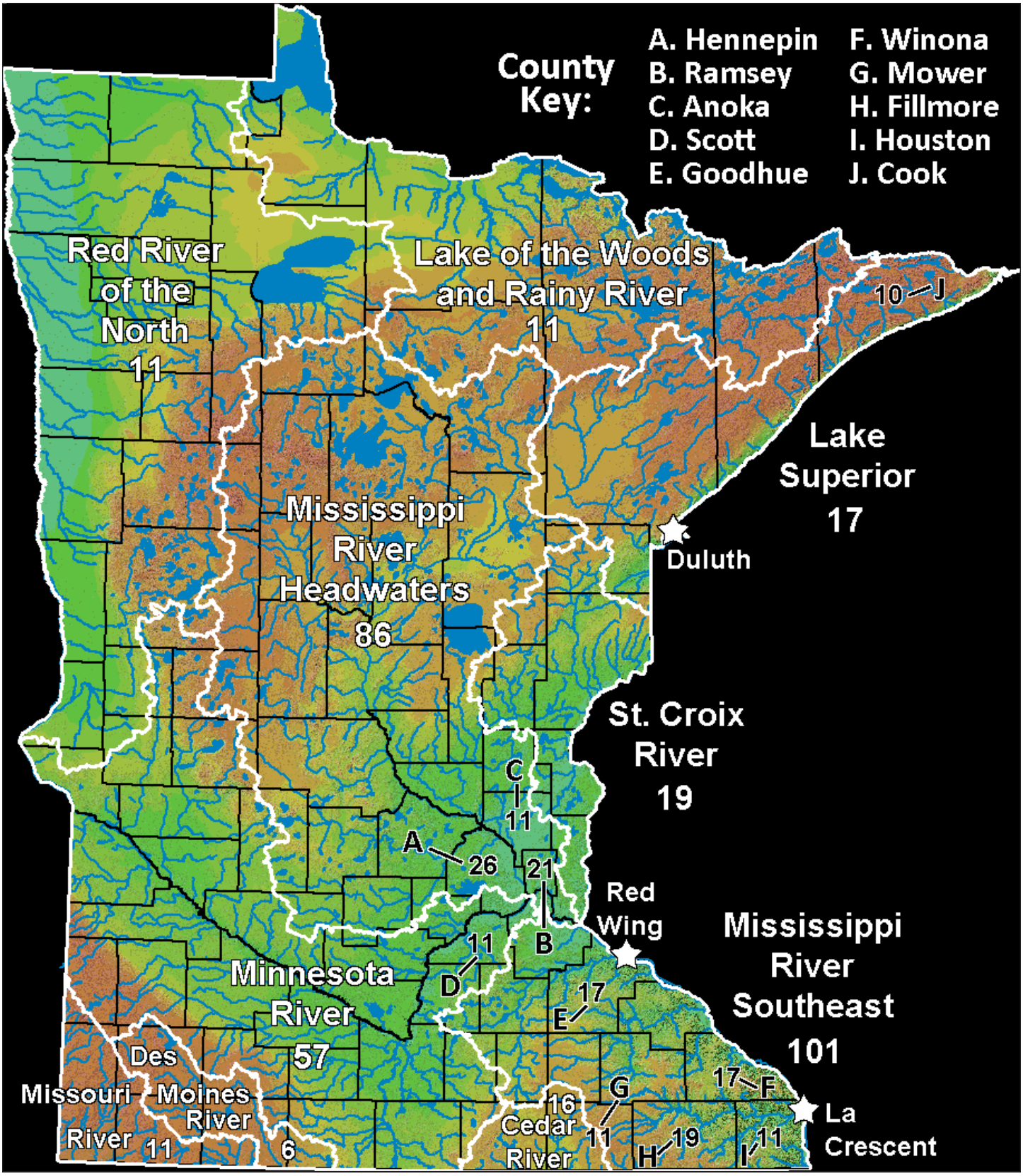

Figure 4: Number of suspected extirpation events in Minnesota drainages (white borders and numbers) and counties (black borders and numbers).

cannery discharges and human feces from untreated sewage. Today, these streams have a 'little color' to them, but are damn near pristine in comparison."

This article will focus on local extirpations suspected to have occurred in Minnesota's streams and lakes. There is no universally accepted time absence to identify a species as "ex-

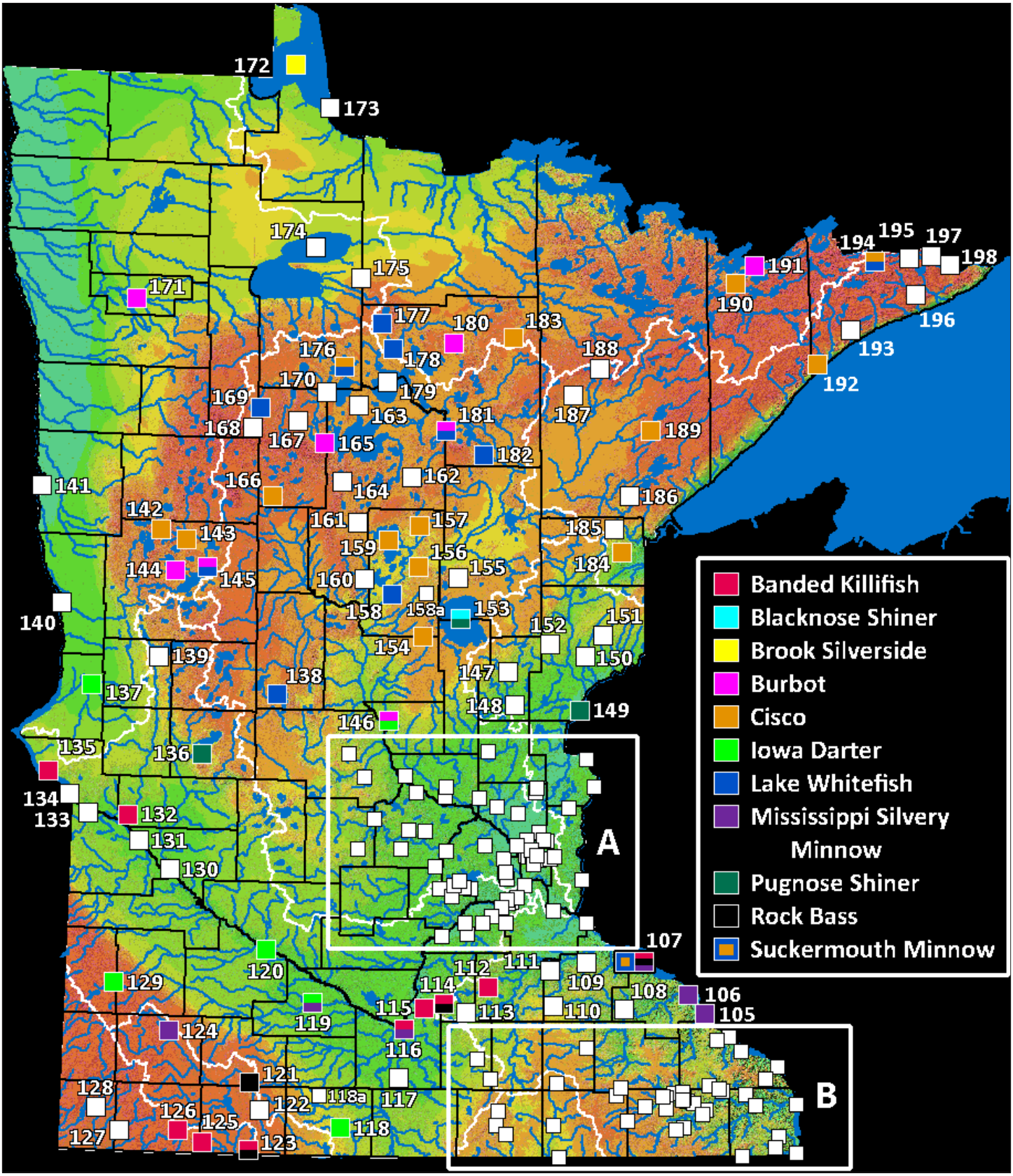

Figure 5. Localities of suspected fish extirpation events in Minnesota. Each square may represent one or more species extirpations in the same water body or multiple localities that cannot be separated at this map scale. The density of extirpations in Insets A (Figure 10) and B (Figure 12) required separate and enlarged figures to separate localities and discussed individually. The keys are restricted to species with ten or more extirpations, however, all species listed in Appendix 1 can be located by cross-referencing map numbers in Figures 5, 10, and 12.

tirpated," but some biologists use an arbitrary and subjective benchmark of half-a-century. I decided to draw my equally baseless line at 40 years which includes species whose last reported occurrence was prior to 1979.

The data source for my checklist of suspected extirpation events (Appendix 1) began in 2001 when I joined the *Fishes of Minnesota* book project and thus "inherited" about 50,000 records from the James Ford Bell Museum of Natural History fish collection. This database, which was to be used to write the book's species accounts and produce the range maps, has since swelled to over 560,000 records due to the records I have added from other museum collections and from state and federal agency fish surveys. The data weres used to generate draft ranges maps for all fishes found in Minnesota with the data stratified into three time periods: before 1950, 1950–1989, and 1990–2013 (Schmidt 2013). While reviewing the maps for errors, I realized I had a screening tool to detect local extirpations. I then refined my database queries to reveal the last year that each species was reported from a drainage or water body.

The checklist of local extirpations includes both extant cataloged specimens in museum collections and records reported in scientific literature and fish surveys. There is one very important caveat before using this checklist. The records run the gamut of certainty from valid to varying degrees of doubt. Describing the distribution of fishes is rarely if ever a black-and-white process. Errors *do* happen in fish identification, field notes, data entry, and collection contamination from accidentally mixing specimens in the field or during curation. All these variables should be thoroughly vetted whenever possible. I justify including species without extant specimens only to acknowledge the slightest possibility that these occurrences are true. More than once, I have found long-lost species that only existed as field notes on yellowed-paper stained with age from long-passed ichthyologists. This checklist does not reflect an exhaustive search, and I have omitted tolerant species (e.g., Black Bullhead, *Ameiurus melas;* Creek Chub, *Semotilus atromaculatus*; and Fathead Minnow, *Pimephales promelas*) and most game species. Inclusion of all tolerant and game species would have greatly lengthened the list into a book.

On a major drainage basis, the most extirpation events, by far, have occurred in the Mississippi River Southeast at 101, the Mississippi River Headwaters (86), and the Minnesota River (57) (Figure 4). One important point to convey is these tallies represent **extirpation events, *not* species tallies**. On a county basis, the urban counties of Hennepin ("A" in Figure 4) and Ramsey (B) have incurred more extirpations than any rural county at 26 and 21, respectively. These two counties are part of the Twin Cities metro area, and are the most densely populated counties in the state. Other counties with ten or more extirpations include: Fillmore (H) at 19, Goodhue (E) and Winona (F) at 17; Anoka (C), Scott (D), Mower (G), and Houston (I) at 11; and Cook (J) at 10.

Figure 6. Lake Whitefish from Lake Superior, Chequamegon Bay (Ashland County, WI).

Overall the checklist contains 342 extirpations events involving 63 species in 19 families (Figures 5, 10, 12, and Appendix 1). The minnow family, which is the largest in Minnesota, had the greatest number of extirpations at 151 involving 23 species. Eleven species each have accounted for ten or more local extirpations: Banded Killifish (*Fundulus diaphanus*) at 28, Suckermouth Minnow (*Phenacobius mirabilis*) and Cisco (*Coregonus artedi*) (17), Rock Bass (*Ambloplites rupestris*) (16), Lake Whitefish (*C. clupeaformis*), Iowa Darter (*Etheostoma exile*), and Pugnose Shiner (*Notropis anogenus*) (15); Blacknose Shiner (*N. heterolepis*) (13); Brook Silverside (*Labidesthes sicculus*) (12); Mississippi Silvery Minnow (*Hybognathus nuchalis*) (11); and Burbot (*Lota lota*) (10). Historically, the number of last reports of species occurred in the following periods: 1853–1940 (84), 1941–1959 (157), and 1960–1978 (101).

The Burbot, Cisco (aka Tullibee), and Lake Whitefish (Figure 6) are coldwater fishes occurring predominately in the northern two-thirds of Minnesota with their ranges extending into northern Canada. Burbot is in the cod family and are circumpolar in distribution also occurring in northern Europe. Cisco and Lake Whitefish are in the salmon and trout family. Burbot have been apparently lost from nine lakes and one river, Cisco from 17 lakes, and Lake Whitefish from 15 lakes. The causes for the extirpations of Burbot and Lake Whitefish in the extreme southern part of these species' ranges in Minnesota is likely the impact from agricultural practices. These extirpations include Burbot from Little Rock Lake in Benton County (Figure 5; map number 146) and Lake Whitefish from Little Sauk Lake in Todd County (map number 138). Very poor water quality has persisted for many years in both lakes where the nutrient richness has ranked hypereutrophic and eutrophic, respectively (MDNR 2018b). A few of the northern losses can be attributed to rotenone applications in small lakes managed as stream trout lakes (e.g., Cook County lakes: Cisco from Dyers [map number 192] and the extirpation of Cisco and Lake Whitefish from Moss [map number 194]). However, both climate change and lake eutrophication from surround-

Figure 7. Banded Killifish from Lake Twenty-one (Otter Tail County, MN).

Figure 8. Mississippi Silvery Minnow from Menorkenut Slough (Butler County, MO).

ing land-use (e.g., land development and forest fragmentation) appear responsible for a 30-year statewide declining trend in Cisco populations. Over this period, MDNR lake survey catch rates have dropped by 60 percent (O' Brien 2016). Minnesota has about 650 Cisco lakes which is more than any of the other lower 48 states. MDNR and University of Minnesota research findings predict that only 176 lakes will be able to support Cisco populations several decades into the future.

Extirpations may now be occurring in Mille Laces Lake in Aitkin and Mille Laces counties (map number153). This "inland sea" at 207 square miles (Wikipedia 2018) was traditionally renowned as the premier Walleye Mecca for anglers but has undergone radical changes. Cisco mysteriously vanished from annual lake surveys for several years and then reappeared. Burbot were once common in the lake but now are extremely rare. Walleye have crashed, and in 2017 the MDNR closed the recreational harvest in mid-season. On the other hand, Northern Pike (*Esox lucius*) and both Largemouth Bass (*Micropterus salmoides*) and Smallmouth Bass (*M. dolomieu*) are surging which brought the first bass tournament ever to Mille Laces in 2016.

Banded Killifish (Figure 7) and Rock Bass occurring anywhere in southwestern Minnesota is hard to believe with the endless corn and soybean fields present today. However, early investigators did report these and other stunning finds. Ulysses Cox's (1896) surveys of the Des Moines River at Windom, Minnesota, reported Rock Bass, and also another surprise, Carmine Shiner (*Notropis percobromus*) (Figure 5; map number 121). This stream flows today as either a creamy chocolate brown or an eerie emerald green when large lakes in its headwaters spew out dense algal blooms. Although there are no extant specimens from Minnesota, Seth Meek made collections of Rock Bass (UMMZ 192094) and Carmine Shiner (UMMZ 86766) in the late 1800s from the Des Moines River just below the MN/IA state line at Estherville, Iowa. In the Missouri River drainage, Banded Killifish were present in Okabena Lake (map number 126) – Nobles County, and Round (map number125) and Spirit lakes (map number 123) in Jackson County. It's difficult to grasp what jewels these lakes must have once been! The exceptional water quality and habitat must have persisted until at least 1943 when Reeve Bailey collected Rock Bass (UMMZ 146778) from the Iowa side of Spirit Lake. Banded Killifish collections from the Minnesota River drainage include the now always muddy Pomme de Terre River (map number 132) in Swift County (UMMZ 248243) and Big Stone Lake (map number 135) in Big Stone County (FMNH 6881). Albert Woolman (1895) surveyed the Big Stone Lake in the summer of 1892 and described the water as "always clean and fresh." His report is the only evidence that Trout-perch were present in the lake, and he also notes that both Trout-perch and Banded Killifish were highly prized as bait.

The Mississippi Silvery Minnow (Figure 8) today occupies a fraction of its former range in Minnesota and is now restricted to Mississippi River Pools 6–9. However, it has only been found in Pool 8 with some regularity and is often represented in collections by just a single specimen. Formerly, the species was found upstream to at least Pool 3 in Dakota County (Figure 10; map number 64). Several collections during the 1940s in this historical reach contained several hundred to almost 2,000 specimens of Mississippi Silvery Minnow from Pool 4 (e.g., UWZM 15317). It was also reported in the Minnesota River drainage from the Blue Earth (Figure 5; map number 116) and Cottonwood rivers (map number 119). However, the most isolated collection (TU 5313), which represents the only Minnesota occurrence in the West Fork Des Moines River drainage, came from Lake Shetek in Murray County in 1943 (map number 124). The completion of Mississippi River US Lock and Dam system during the 1930s is a suspected cause of the disappearance of Mississippi Silvery Minnow and Ghost Shiner in the upper navigation pools. A second and very similar extirpation of Mississippi Silvery Minnow occurred 500 miles distant in the Tennessee River following the completion of the Tennessee Valley Authority dams. This extirpation, however, almost went undetected. The only collections of this species in the Tennessee River were made in the early 1940s and were deposited in the University of Michigan Museum of Zoology (UMMZ). The extirpation was not known for decades until, following the examination of hundreds of

Figure 9. Lake Sturgeon fingerling from the Assiniboine River, Manitoba.

unsorted Tennessee River samples at UMMZ in the late 1970s, the discovery was made that the species had once occurred in the Tennessee River (Etnier et al. 1979).

The historical extent of using rotenone to improve sport fisheries is difficult to determine, but the management practice was not restricted to stream trout lakes. Signalness Lake in Pope County (Figure 5; map number 136) is small gem of a lake in Glacial Lakes State Park. A MDNR lake survey in 1963 reported an incredible 420 Pugnose Shiners, which is currently designated a state-threatened species. However, the lake was later treated with rotenone. I surveyed the lake in 1992 and collected Iowa Darters, Blacknose Shiners, and Banded Killifish, which are all sensitive species, but I found no Pugnose Shiners. I returned in 2014 to assess the lake for the possible reintroduction of Pugnose Shiners and found the habitat and water quality ideal, but only game species were present. I have reluctantly put this lake on the back burner of my pending stocking efforts until I can determine what caused the loss of these sensitive species.

There may be a species resurrection of sorts in the making. Lake Sturgeon (*Acipenser fulvescens*) have been lost from Big Stone Lake (Figure 5; map number 135) and Upper Red Lake (map number 174). Although some dams have been removed, the rivers that once served as migration routes to these lakes continue to be blocked by dams without fish passage. However, Big Stone was stocked with 17,000 fingerling Lake Sturgeon (Figure 9) from 2014–2016 and Upper Red with 80,000 Lake Sturgeon from 2011–2016 (MDNR 2018b). Since it takes a quarter-century for female Lake Sturgeon to mature and reproduce, these localities will not be coming off my list anytime soon.

The highest density and one-third (i.e., 114) of the total extirpation events have occurred in the Twin Cities Metropolitan Area (Inset A) where 33 species have been lost from

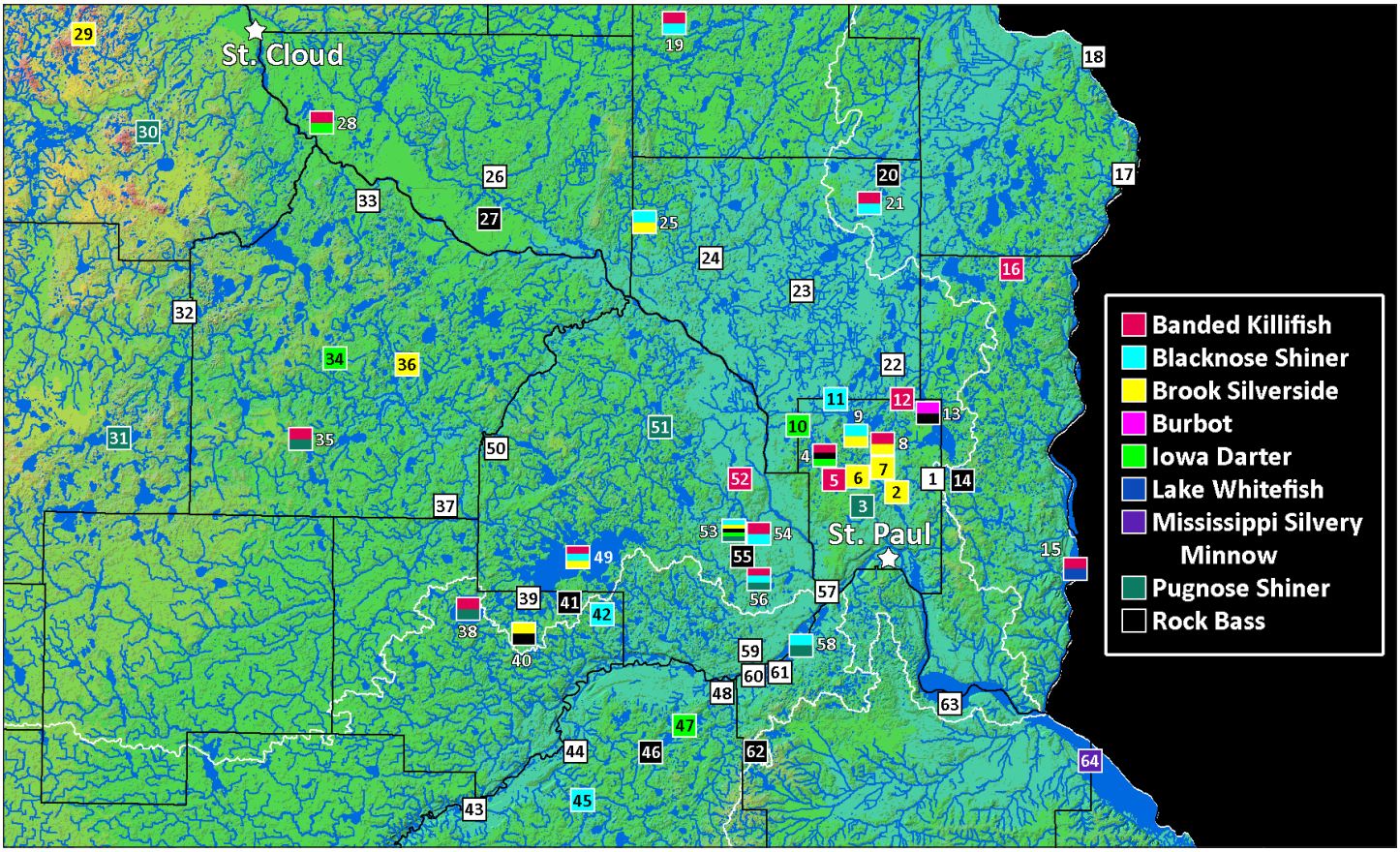

Figure 10. Inset A: Localities of suspected extirpations events in the Twin Cities metro area. The key is restricted to species with ten or more extirpations, however, all species listed in Appendix 1 can be located by cross-referencing map numbers.

Figure 11. Left: Blacknose Shiner from the Dead River (Otter Tail County, MN). Right: Brook Silverside from the Mississippi River (Sherburne County, MN).

historical localities (Figure 10). This area encompasses the seven-country Twin Cities metro and includes the largest cities in Minnesota (i.e., Minneapolis, St. Paul, and surrounding suburbs). The loss of American Brook Lamprey in the Credit River - Scott County (Figure 4; map number 48) highlights the impact of urbanization on aquatic habitats. The species once congregated by the hundreds each year to spawn between May 5 and May 20. However, this population was likely eliminated due to post-World War II development in the watershed (Eddy and Underhill 1974). Most of the extirpations in the Twin Cities metro area have occurred in lakes which have lost stream connectivity thus making natural re-colonization impossible. Many of these lakes remain in poor shape and suffer from severe algal blooms and turbidity prohibiting the growth of submerged vegetation, which is critical habitat for many extirpated species. However, a few lakes have undergone remarkable recoveries in clarity and growth of submerged vegetation through lake shed management, storm water remediation, and wetland restoration. Limited efforts to re-establish some of the extirpated species in these exceptional lakes have been successful. More introductions are planned for Twin Cities metro area lakes that meet the "crystal-clear" criteria (Schmidt 2014).

The Banded Killifish led the infamous pack in extirpation events statewide (Figure 5) and again in the metro area at 15. It is often part of a suite of sensitive species associates restricted to lakes and streams exhibiting exceptional water quality and habitat. Water is typically crystal-clear and sometimes exhibits an alluring aquamarine hue. The "fragrant" Musk grass (*Chara* sp.), which would seem to most to be a rooted plant is actually an algae, very often dominates the submerged vegetation in dense and extensive mats. The other associates in the suite include: Blacknose Shiner (Figure 11), Blackchin Shiner (*Notropis heterodon*), Pugnose Shiner, Iowa Darter, and Least Darter (*Etheostoma microperca*). The Brook Silverside (*Labidesthes sicculus*) (Figure 11) and Rock Bass also require clean, clear water for hunting their prey. Similar to the other species, both may have been eliminated due to declining water clarity and loss of stream connections.

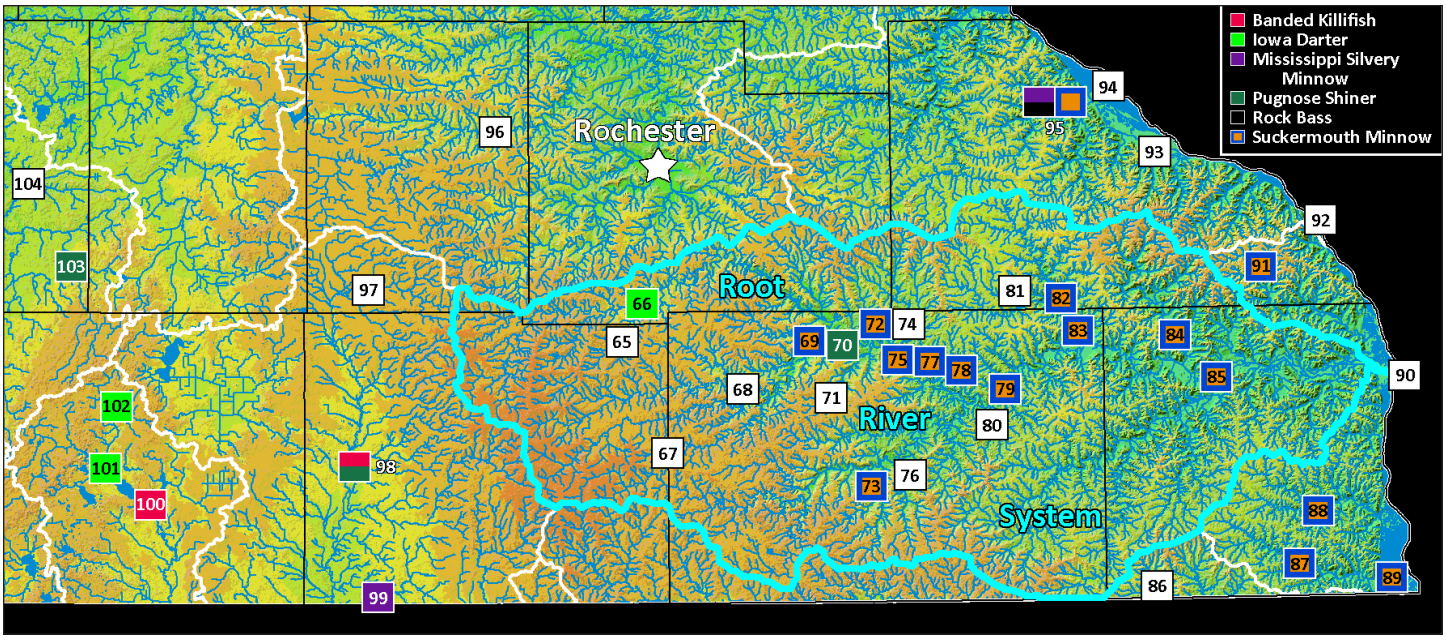

Figure 12. Localities of suspected extirpation events in southeastern Minnesota (Inset B). The key is restricted to species with ten or more extirpations, however, all species listed in Appendix 1 can be located by cross-referencing map numbers.

Figure 13. Suckermouth Minnow from Belle Creek (Goodhue County, MN)

Southeastern Minnesota holds both the greatest diversity and the largest number of state endangered, threatened, and special concern fishes. This area of Minnesota has incurred 70 extirpation events (Figures 12). Furthermore, the Root River system, which joins the Mississippi near La Crescent, MN (Figures 4 and 12), also holds the dubious distinction of having the most losses (i.e., 30 events) of any system in the state.

Southeastern Minnesota is part of the Driftless Area (aka coulee country), which was not covered by glaciers during the last ice age. However, this area did drain meltwater from receding glaciers, leaving a landscape of towering bluffs dissected with steep valleys holding present-day streams. In my humble opinion, this area is our little bit of the Ozarks. Here, the Suckermouth Minnow (Figure 13) emerges as the "biggest loser" at 15 extirpation events by far exceeding the number of the events for other species in the region. The extirpations of the Suckermouth Minnow are puzzling. Typically a pioneering species and negative environmental indicator, the Suckermouth Minnow prefers and actually thrives in streams prone to habitat disturbances that cause channel instability and turbidity. Early agricultural in this area involved cropping on incredibly steep slopes. Rainfall runoff from these steep slopes caused severe soil erosion and frequent and catastrophic flooding. Today, the region's streams are typically ice cold, crystal clear, and are very often exclusively inhabited by exotic Brown Trout (*Salmo trutta*). The Suckermouth's widespread decline suggests streams in the region have improved remarkably regarding turbidity and channel stability with an unintended consequence being a loss in diversity. Similar, but less striking, declines are mirrored in other special concern species associates (i.e., Redside Dace - *Clinostomus elongatus*, Redfin Shiner - *Lythrurus umbratilis*, and Ozark Minnow - *Notropis nubilus*). The very cold water temperatures in the streams today may exceed the thermal preferences of these species and thus may explain their extirpations.

I hope biologists and aquarists will use this checklist to inform me when the missing species are found and that specimens are saved or photo vouchers are taken to back up the new record. Nothing would give me greater joy than seeing my list shot full of holes with repatriated long-lost fishes. I will say again that species once identified as extirpated have a nagging habit of resurrecting shortly afterwards. Since the initial draft of Appendix 1 in 2013, my database has grown by several thousand records. During my first revision of the list, I deleted Banded Killifish from Bald Eagle Lake (Figure 10; map number 13) in Ramsey County where Henry Nachtrieb collected specimens in 1892 (JFBM 15). The species was not seen again until 2012 when a MDNR lake survey reported the species but did not save specimens. NANFA member Jenny Kruckenberg and I returned to this lake in 2014 and easily found and preserved specimens (UWZM 16203). Nachtrieb also collected specimens in 1892 (JFBM 45) from Otter Lake (locality 12) which is connected to Bald Eagle Lake via a cattail-choked ditch. NANFA member Bryan Stefansky and I tried our luck here later in 2014 hoping for a double deletion to my list but no Banded Killifish were found.

The final grand plan I envision for the checklist is to provide historical evidence of fish assemblages to justify appropriate future reintroductions. My first "bring back the natives"

Figure 14. Releasing fish (left) and mudpuppies (right) in the Knife River (Kanabec County, MN).

project was in 1989 when Knife Lake and its watershed in Kanabec and Mille Lac counties were treated with rotenone to eliminate Common Carp (*Cyprinus carpio*) that invaded the watershed following the washout of the original dam in 1972 (Schmidt 1996). Fish distribution databases at that time were few and extremely limited in scope. However, I eventually compiled list of 45 species, and in a collaborative effort, Tim Brastrup and Roger Hugill (formerly MDNR Hinckley Area Fisheries) re-established at least 35 fishes species plus Mudpuppies (*Necturus maculosus*) that also once occurred above the current dam (Figure 14).

I encourage other NANFA members to begin similar lists of localized/watershed extirpations and publish them in *American Currents*. These reference resources will be invaluable for assessing the status of both listed and non-listed species and could help guide the already scarce funding to the highest priority surveys and reintroduction efforts. NANFA has the potential to provide a unique and valued perspective on both extirpations and reintroduction with our diverse membership of professional biologists and native fish enthusiasts who have the passion and drive to think and act outside the box.

It is a rare exception in state natural resource agencies to have any non-game fish biologists on staff; the "little dicky" fish do not resonate with the general public as do warm and fuzzy animals to save or game fish to stock. I was the only non-game fish biologist for 20 years with MDNR and participated in many projects in which I take great pride. However, funds were never available to assess the status of non-listed species that I suspected may be in decline. Even designated rare species receive a pittance in comparison to the consistent funding levels game species receive from state fishing license revenues and from federal excise taxes on sporting goods. The future of our little fish is entirely up to us.

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Appendix I: Suspected extirpation events of Minnesota fishes. The table lists 342 events involving 63 species in 19 families.

COMMON NAME	SCIENTIFIC NAME	WATERBODY	COUNTY	LAST REPORT	MAP #	LATITUDE/ LONGITUDE	MUSEUM CATALOG #
LAMPREY - PETROMYZONTIDAE							
Chestnut Lamprey	*Ichthyomyzon castaneus*	Minnesota River	Blue Earth	1892	116	44.16417/-94.03667	
		Cedar or Martin Creek	Martin	1853	118a	43.80528/-94.67278	USNM 979
Silver Lamprey	*Ichthyomyzon unicuspis*	Groundhouse River	Kanabec	1964	148	45.81083/-93.26194	
American Brook Lamprey	*Lethenteron appendix*	Credit River	Scott	1935	48	44.77875/-93.34317	JFBM 17350
STURGEON - ACIPENSERIDAE							
Lake Sturgeon	*Acipenser fulvescens*	Upper Red Lake	Beltrami	1941	174	48.13128/-94.76653	
		Big Stone Lake	Big Stone	1940	135	45.40932/-96.61082	
		Crooked Lake	Crow Wing	1963	158a	46.36992/-93.90250	
		Pomme de Terre Lake	Grant	1941	139	46.02331/-95.88343	
		Grindstone Lake	Pine	1969	152	46.12192/-93.00743	
GAR - LEPISOSTEIDAE							
Longnose Gar	*Lepisosteus osseus*	Okabena Lake	Nobles	1896	126	43.61543/-95.61760	
		Otter Tail River	Wilkin	1895	140	46.27292/-96.58756	
Shortnose Gar	*Lepisosteus platostomus*	Lake Tetonka	Le Sueur	1954	113	44.23052/-93.60736	JFBM 22565
		Locke Lake	Wright	1931	33	45.35987/-93.95907	
BOWFIN - AMIIDAEV							
Bowfin	*Amia calva*	Hoover Brook	Beltrami	1947	175	47.97110/-94.41768	
		Stone Lake	Carver	1962	39	44.88873/-93.67897	
		Lake Rebecca	Hennepin	1954	50	45.06454/-93.74225	
		Knife Lake	Kanabec	1949	147	45.97870/-93.29915	
		Sand Creek	Pine	1947	150	46.07198/-92.72397	
		West Fork Crooked Creek	Pine	1947	151	46.15629/-92.61565	
		Gervais Lake	Ramsey	1949	2	45.02008/-93.07070	
		Lake Josephine	Ramsey	1967	5	45.03574/-93.15323	
		Silver Lake	Ramsey	1963	1	45.02692/-92.98811	
MOONEYE - HIODONTIDAE							
Goldeye	*Hiodon alosoides*	Lake of the Woods	Lake of the Woods	1908	172	49.05462/-94.95764	USNM 131335
Mooneye	*Hiodon tegisus*	Lake Minnetonka	Hennepin	1800s	49	44.90972/-93.64446	ANSP 19987
FRESHWATER EEL - ANGUILLA ROSTRATA							
American Eel	*Anguilla rostrata*	Little Rock Lake	Benton	1960	146	45.73166/-94.16876	
		Red River of the North	Clay	1950s	141	46.87376/-96.77622	
		Lac qui Parle Lake	Lac qui Parle	1956	131	45.08548/-95.95886	
HERRING - CLUPEIDAE							
Skipjack Herring	*Alosa chrysochloris*	Big Stone Lake	Big Stone	1920	135	45.40932/-96.61082	
		Minnesota River	Dakota	1899	60	44.79967/-93.29044	JFBM 7335
		Lake St. Croix	Washington	1928	15	44.92094/-92.77270	UMMZ 78081
MINNOW - CYPRINIDAE							
Largescale Stoneroller	*Campostoma oligolepis*	Belle Creek	Goodhue	1974	109	44.50485/-92.75025	JFBM 45897
Northern Redbelly Dace	*Chrosomus eos*	Minneopa Creek	Blue Earth	1954	116	44.15309/-94.08252	JFBM 18246
		Lake Minnetonka	Hennepin	1969	49	44.90972/-93.64446	
		Ninemile Creek	Hennepin	1973	59	44.81488/-93.30097	JFBM 22563
		Lake Francis	Meeker	1940	32	45.22104/-94.26081	JFBM 14225
		Credit River	Scott	1955	48	44.77875/-93.34317	JFBM 18238
		Buffalo Lake	Wright	1945	36	45.16294/-93.89358	ANSP 71725
		South Fork Crow River	Wright	1939	37	44.98436/-93.82099	JFBM 10635
Southern Redbelly Dace	*Chrosomus erythrogaster*	Sugar Creek	Fillmore	1974	71	43.74669/-92.17593	
		Belle Creek	Goodhue	1974	109	44.50485/-92.75025	JFBM 21909
		Mississippi River - Pool 4	Goodhue	1940	107	44.49248/-92.27942	JFBM 14122
		Bear Creek	Houston	1974	86	43.50070/-91.64021	JFBM 21300
		Rush Creek	Winona	1945	82	43.84778/-91.79750	
Redside Dace	*Clinostomus elongatus*	Gribben Creek	Fillmore	1970	80	43.71713/-91.91621	
		Trout Run	Fillmore	1974	75	43.80033/-92.05110	
		Little Le Sueur River	Waseca	1972	104	44.00154/-93.50903	

COMMON NAME	SCIENTIFIC NAME	WATERBODY	COUNTY	LAST REPORT	MAP #	LATITUDE/ LONGITUDE	MUSEUM CATALOG #
Redside Dace (continued)	*Clinostomus elongatus*	Pine Creek	Winona	1956	81	43.86414/-91.86896	
		Rush Creek	Winona	1945	82	43.84778/-91.79750	JFBM 19050
Lake Chub	*Couesius plumbeus*	Poplar River	Cook	1941	193	47.70945/-90.72098	JFBM 12084
		Skull Lake	Lake	1974	191	48.02333/-91.44803	
		Grand Lake	St. Louis	1945	186	46.87557/-92.40352	JFBM 16674
Red Shiner	*Cyprinella lutrensis*	Spirit Lake	Jackson	1945	123	43.50417/-95.10535	UMMZ 146009
		Okabena Lake	Nobles	1947	126	43.61543/-95.61760	
Mississippi Silvery Minnow	*Hybognathus nuchalis*	Blue Earth River	Blue Earth	1948	116	44.16417/-94.03667	
		Cottonwood River	Brown	1949	119	44.28202/-94.67989	
		Mississippi River - Pool 3	Dakota	1946	64	44.69609/-92.73038	UWZM 14221
		Mississippi River - Pool 4	Goodhue	1949	107	44.49248/-92.27942	UWZM 3419
		Wells Creek	Goodhue	1964	107	44.51213/-92.32408	
		Otter Creek	Mower	1954	99	43.50045/-92.93077	
		Lake Shetek	Murray	1943	124	44.11878/-95.70018	TU 5313
		Mississippi River - Pool 5	Wabasha	1946	105	44.22504/-91.90633	UWZM 14381
		Zumbro River	Wabasha	1967	106	44.31380/-91.99633	
		Mississippi River - Pool 5A	Winona	1977	94	44.11044/-91.72454	
		Rollingstone Creek	Winona	1968	95	44.09284/-91.74802	JFBM 36645
Pallid Shiner	*Hybopsis amnis*	St. Croix River	Chisago	1928	18	45.53611/-92.72332	UMMZ 77959
		Minnesota River	Hennepin	1926	57	44.89219/-93.17764	UMMZ 72004
Redfin Shiner	*Lythrurus umbratilis*	East Fork Cedar River	Dodge	1953	97	43.87811/-92.94570	JFBM 17451
		Trout Run	Fillmore	1945	74	43.83091/-92.05481	
		Crooked Creek	Houston	1943	88	43.60024/-91.38341	
		North Fork Zumbro River	Goodhue	1896	110	44.27731/-92.98409	JFBM 24508
		Spring Valley Creek	Mower	1938	67	43.68466/-92.44986	UMMZ 138212
		Zumbro River	Wabasha	1967	108	44.23360/-92.48155	JFBM 20825
Shoal Chub	*Macrhybopsis hyostoma*	Minnesota River	Big Stone	1892	134	45.30260/-96.45194	UMMZ 247223
		Rollingstone Creek	Winona	1965	95	44.09496/-91.81228	
Silver Chub	*Macrhybopsis storeriana*	Big Stone Lake	Big Stone	1892	135	45.40932/-96.61082	
		Wells Creek	Goodhue	1963	107	44.51213/-92.32408	
		Lake Mille Lacs	Mille Lacs	1886	153	46.24245/-93.64622	USNM 37916
Northern Pearl Dace	*Margariscus nachtriebi*	Little Rock Lake	Benton	1933	146	45.73166/-94.16876	UMMZ 64482
		Spring Lake	Dakota	1936	63	44.76147/-92.97029	JFBM 2994
		Albert Lea Lake	Freeborn	1945	100	43.63017/-93.31298	
		Bancroft Creek	Freeborn	1945	102	43.73860/-93.35770	
		Shell Rock River	Freeborn	1945	100	43.61166/-93.29264	JFBM 19066
		Credit River	Scott	1954	48	44.77875/-93.34317	JFBM 18168
Hornyhead Chub	*Nocomis biguttatus*	Rice Creek	Blue Earth	1973	117	43.89622/-94.06228	
		Masten Creek	Dodge	1974	96	44.06265/-92.73388	
		Camp Creek	Fillmore	1966	76	43.65228/-92.05510	
		Gribben Creek	Fillmore	1970	80	43.71713/-91.91621	
		Belle Creek	Goodhue	1968	109	44.50485/-92.75025	
		West Fork Des Moines River	Jackson	1954	122	43.72129/-95.05006	
		Carey Creek	Mower	1974	65	43.81915/-92.52370	
		Kanaranzi Creek	Nobles	1974	127	43.60800/-96.02238	
Pugnose Shiner	*Notropis anogenus*	Lake Waconia	Carver	1948	38	44.86862/-93.78430	
		North Branch Root River	Fillmore	1946	70	43.80667/-92.17028	JFBM 16663
		Cedar Lake	Hennepin	1941	53	44.95991/-93.32162	
		Fish Lake	Hennepin	1948	51	45.09178/-93.46333	
		Lake Harriet	Hennepin	1948	56	44.92183/-93.30506	
		Minnesota River	Hennepin	1926	58	44.82672/-93.23209	UMMZ 72045
		Lake Washington	Meeker	1947	31	45.06948/-94.37588	
		Lake Mille Lacs	Mille Lacs	1941	153	46.24245/-93.64622	JFBM 20049
		Cedar River	Mower	1892	98	43.66643/-92.96750	
		St. Croix River	Pine	1928	149	45.77300/-92.78048	UMMZ 77909
		Signalness Lake	Pope	1963	136	45.54088/-95.52179	
		McCarrons Lake	Ramsey	1931	3	44.99819/-93.11306	JFBM 14139
		Grand Lake	Stearns	1949	30	45.43683/-94.33691	
		St. Olaf Lake	Waseca	1954	103	43.90308/-93.41681	JFBM 17847

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Pugnose Shiner (continued)	*Notropis anogenus*	Howard Lake	Wright	1946	35	45.07218/-94.06914	
River Shiner	*Notropis blennius*	Cottonwood River	Brown	1948	119	44.28202/-94.67989	
		Chippewa River	Chippewa	1890s	130	44.94393/-95.72914	
		St. Croix River	Chisago	1968	17	45.39107/-92.66819	JFBM 20400
		West Fork Des Moines River	Cottonwood	1890s	121	43.86106/-95.11345	
		Wells Creek	Goodhue	1963	107	44.51213/-92.32408	JFBM 19616
		Cedar River	Mower	1892	98	43.66643/-92.96750	FMNH 967
		Sand Creek	Scott	1954	44	44.69985/-93.60306	JFBM 17547
		Pomme de Terre River	Swift	1892	132	45.20456/-96.02356	UMMZ 248088
		Rollingstone Creek	Winona	1969	95	44.09496/-91.81228	JFBM 20788
Ghost Shiner	*Notropis buchanani*	Mississippi River - Pool 3	Dakota	1946	64	44.69609/-92.73038	
		Mississippi River - Pool 4	Goodhue	1946	107	44.51212/-92.32407	
		Mississippi River - Pool 8	Houston	1957	90	43.76169/-91.25205	
		Mississippi River - Pool 9	Houston	1953	89	43.50882/-91.26091	
		Mississippi River - Pool 5A	Winona	1948	94	44.11044/-91.72454	
		Mississippi River - Pool 7	Winona	1949	92	43.95113/-91.38264	UWZM 5235
Blackchin Shiner	*Notropis heterodon*	Centerville Lake	Anoka	1962	22	45.16339/-93.07052	
		Rum River	Anoka	1935	24	45.29145/-93.37591	JFBM 10445
		Crystal Lake	Hennepin	1933	52	45.02697/-93.32707	JFBM 13860
		Lake Harriet	Hennepin	1948	56	44.92183/-93.30506	
		Green Lake	Isanti	1962	19	45.57342/-93.43993	
		Spirit Lake	Jackson	1932	123	43.50417/-95.10535	UMMZ 101537
		Lake Shetek	Murray	1943	124	44.11878/-95.70018	
		Clear Lake	Sherburne	1954	28	45.44647/-94.04498	
		Pomme de Terre River	Swift	1892	132	45.20456/-96.02356	
Blacknose Shiner	*Notropis heterolepis*	East Twin Lake	Anoka	1955	25	45.33418/-93.50253	
		Island Lake	Anoka	1960	21	45.36721/-93.09580	
		Rice Creek	Anoka	1964	11	45.12451/-93.16309	
		Ann Lake	Carver	1959	42	44.87111/-93.55991	
		Cedar Lake	Hennepin	1948	53	44.95991/-93.32162	
		Lake Harriet	Hennepin	1948	56	44.92183/-93.30506	
		Lake Minnetonka	Hennepin	1969	49	44.90972/-93.64446	
		Lake of the Isles	Hennepin	1948	54	44.95538/-93.30695	
		Minnesota River	Hennepin	1926	58	44.82672/-93.23209	UMMZ 72044
		Green Lake	Isanti	1962	19	45.57342/-93.43993	
		Lake Mille Lacs	Mille Lacs	1941	153	46.24245/-93.64622	JFBM 13414
		Snail Lake	Ramsey	1951	9	45.07325/-93.12606	KU 3436
		Porter Creek	Scott	1932	45	44.64156/-93.58376	UMMZ 114056
Spottail Shiner	*Notropis hudsonius*	Wells Creek	Goodhue	1963	107	44.51213/-92.32408	
		Lake Josephine	Ramsey	1892	5	45.03574/-93.15323	JFBM 28
		Bonny (Bone) Lake	Washington	1960	16	45.28686/-92.85981	
		Rock Lake	Wright	1961	34	45.17059/-94.01285	
Carmine Shiner	*Notropis percobromis*	Blue Earth River	Blue Earth	1948	116	44.16417/-94.03667	
		West Fork Des Moines River	Cottonwood	1890s	121	43.86106/-95.11345	
		Upper Bear Creek	Fillmore	1945	69	43.81092/-92.19596	
		Belle Creek	Goodhue	1975	109	44.50485/-92.75025	UT 44.10135
		Prairie Creek	Goodhue	1954	111	44.45809/-93.01007	JFBM 17463
		Winnebago Creek	Houston	1942	87	43.54035/-91.41302	JFBM 14001
		Pine Creek	Winona	1945	82	43.84778/-91.79750	
Weed Shiner	*Notropis texanus*	St. Croix River	Chisago	1961	17	45.39107/-92.66819	JFBM 19265
		Masten Creek	Dodge	1974	96	44.06265/-92.73388	JFBM 21215
		Credit River	Scott	1953	48	44.77875/-93.34317	JFBM 18868
Topeka Shiner	*Notropis topeka*	Minnesota River	Big Stone	1892	134	45.30260/-96.45194	UMMZ 247927
		Okabena Lake	Nobles	1947	126	43.61543/-95.61760	
		North Mound Springs Lake	Rock	1947	128	43.72060/-96.18952	JFBM 19076
Mimic Shiner	*Notropis volucellus*	Centerville Lake	Anoka	1962	22	45.16339/-93.07052	
		Ham Lake	Anoka	1948	23	45.25702/-93.22220	
		Bear Creek	Fillmore	1945	68	43.75718/-92.32065	
		Cedar River	Mower	1892	98	43.66643/-92.96750	FMNH 105396

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Suckermouth Minnow	*Phenacobius mirabilis*	Diamond Creek	Fillmore	1943	79	43.74218/-91.89523	
		Lynch Creek	Fillmore	1945	72	43.82590/-92.11968	
		Money Creek	Fillmore	1945	77	43.78861/-92.02504	
		Rush Creek	Fillmore	1945	83	43.83202/-91.77651	
		Torkelson Creek	Fillmore	1945	78	43.77417/-91.98252	
		Trout Run	Fillmore	1977	75	43.80033/-92.05110	
		Upper Bear Creek	Fillmore	1945	69	43.81092/-92.19596	JFBM 14923
		Willow Creek	Fillmore	1943	73	43.63962/-92.10316	
		Wells Creek	Goodhue	1975	107	44.51213/-92.32408	
		Crooked Creek	Houston	1943	88	43.60024/-91.38341	
		Money Creek	Houston	1977	84	43.81472/-91.61112	
		South Fork Root River	Houston	1943	85	43.76023/-91.54374	
		Winnebago Creek	Houston	1958	87	43.54035/-91.41302	
		Mississippi River - Pool 9	Houston	1953	89	43.50882/-91.26092	JFBM 17468
		Pine Creek	Winona	1945	82	43.84778/-91.79750	
		Pine Creek (2)	Winona	1958	91	43.89040/-91.47206	
		Rollingstone Creek	Winona	1967	95	44.09496/-91.81228	
SUCKER - CATOSTOMIDAE							
Longnose Sucker	*Catostomus catostomus*	Kimball Lake	Cook	1958	196	47.86197/-90.23024	
		Mink Lake	Cook	1957	196	47.86747/-90.22407	
		Portage Brook	Cook	1941	198	48.01444/-89.96806	JFBM 12395
Northern Hog Sucker	*Hypentelium nigricans*	Yellow Bank River	Lac qui Parle	1957	133	45.22639/-96.34861	JFBM 18928
Spotted Sucker	*Minytrema melanops*	Minnesota River	Scott	1899	43	44.63122/-93.76825	JFBM 20064
		Rollingstone Creek	Winona	1968	95	44.09496/-91.81228	
River Redhorse	*Moxostoma carinatum*	Minnesota River	Scott	1899	43	44.63122/-93.76825	JFBM 7476
Black Redhorse	*Moxostoma duquesnei*	Cedar River	Mower	1892	98	43.66643/-92.96750	SU 4436
Harelip Sucker	*Moxostoma lacerum*	Cedar River	Mower	1892	98	43.66643/-92.96750	SU 4436
Greater Redhorse	*Moxostoma valenciennesi*	Little Rock Lake	Benton	1974	146	45.73166/-94.16876	
		Gull Lake	Cass	1972	160	46.44626/-94.35107	
		Rainy River	Lake of the Woods	1892	173	48.84861/-94.69139	USNM 61510
SALMON AND TROUT- SALMONIDAE							
Cisco	*Coregonus artedi*	Big Rice Lake	Beltrami	1960	176	47.52460/-94.54843	
		Hay Lake	Carlton	1955	184	46.59970/-92.46352	
		Birch Lake	Cass	1958	164	46.93846/-94.54518	
		Norway Lake	Cass	1955	161	46.73844/-94.39731	
		Dyers Lake	Cook	1956	192	47.52860/-90.98075	
		Moss Lake	Cook	1969	194	48.06674/-90.47777	
		Poplar Lake	Cook	1959	194	48.04669/-90.50868	
		Bass Lake	Crow Wing	1974	159	46.65682/-94.18644	
		Clinker Lake	Crow Wing	1967	156	46.51902/-93.95214	
		Platte Lake	Crow Wing	1969	154	46.16399/-93.92321	
		Trout Lake	Crow Wing	1950	157	46.72240/-93.97707	
		Hinds Lake	Hubbard	1963	166	46.83485/-95.05125	
		Bear Lake	Itasca	1939	183	47.66946/-93.26808	JFBM 10516
		Tofte Lake	Lake	1950	190	47.96495/-91.57359	
		Leek Lake	Otter Tail	1950	142	46.68295/-95.86287	
		Little McDonald Lake	Otter Tail	1959	143	46.61089/-95.70381	
		Lower Comstock Lake	St. Louis	1936	189	47.20783/-92.24212	JFBM 8346
Lake Whitefish	*Coregonus clupeaformis*	Ripple Lake	Aitkin	1970	155	46.46229/-93.67035	
		Big Lake	Beltrami	1967	176	47.50649/-94.62087	
		Pimushe Lake	Beltrami	1974	176	47.56108/-94.52669	
		Little Wolf Lake	Cass	1969	170	47.39300/-94.66521	
		Lower Sucker Lake	Cass	1963	163	47.32917/-94.42564	
		Big LaSalle Lake	Clearwater	1938	169	47.29333/-95.17215	JFBM 9746
		Moss Lake	Cook	1969	194	48.06674/-90.47777	
		Rice Lake	Crow Wing	1967	158	46.38033/-94.16585	
		Leighton Lake	Itasca	1978	181	47.19871/-93.75447	
		Round Lake	Itasca	1954	178	47.61851/-94.16548	

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Lake Whitefish (continued)	*Coregonus clupeaformis*	Shallow Pond	Itasca	1974	177	47.75040/-94.25923	
		Split Hand Lake	Itasca	1953	182	47.06038/-93.48538	
		Rush Lake	Otter Tail	1956	145	46.48689/-95.52927	
		Little Sauk Lake	Todd	1954	138	45.85796/-94.98448	
		Lake St. Croix	Washington	1967	15	44.92094/-92.77270	
Lake Trout	*Salvelinus namaycush*	McFarland Lake	Cook	1955	197	48.05339/-90.07234	
		Pierz Lake	Cook	1956	195	48.04533/-90.25100	
		Lake of the Woods	Lake of the Woods	1949	172	49.05462/-94.95764	
TROUT-PERCH - PERCOPSIDAE							
Trout-perch	*Percopsis omiscomaycus*	Big Stone Lake	Big Stone	1892	135	45.40932/-96.61082	
		Minnesota River	Chippewa	1892	130	44.93275/-95.73300	UMMZ 245844
		Eagle Lake	Sherburne	1941	26	45.39169/-93.74416	JFBM 13275
		Buffalo Lake	Wright	1938	36	45.16294/-93.89358	JFBM 10696
COD - GADIDAE							
Burbot	*Lota lota*	Little Rock Lake	Benton	1974	146	45.73166/-94.16876	
		Upper Trelipe Lake	Cass	1971	162	46.97455/-94.03577	
		Benedict Lake	Hubbard	1972	165	47.13896/-94.69255	
		Leighton Lake	Itasca	1978	181	47.19871/-93.75447	
		Maple Lake	Itasca	1973	180	47.64757/-93.72219	
		Newfound Lake	Lake	1972	191	48.02594/-91.45272	
		Boedigheimer Lake	Otter Tail	1972	145	46.51512/-95.59179	
		Dead Lake	Otter Tail	1973	144	46.47541/-95.76113	
		Bald Eagle Lake	Ramsey	1892	13	45.11433/-93.01582	JFBM 8803
		Clearwater River	Red Lake	1955	171	47.84294/-96.12821	JFBM 18044
SILVERSIDE - ATHERINOPSIDAE							
Brook Silverside	*Labidesthes sicculus*	East Twin Lake	Anoka	1955	25	45.33418/-93.50253	
		Piersons Lake	Carver	1954	40	44.83257/-93.69823	
		Cedar Lake	Hennepin	1911	53	44.95991/-93.32162	ANSP 38894
		Lake Minnetonka	Hennepin	1969	49	44.90972/-93.64446	JFBM 20763
		Lake of the Woods	Lake of the Woods	1907	172	49.05462/-94.95764	JFBM 2785
		Gervais Lake	Ramsey	1948	2	45.02008/-93.07070	
		Lake Owasso	Ramsey	1938	6	45.03514/-93.12235	JFBM 10668
		Lake Vadnais	Ramsey	1954	8	45.05100/-93.09028	
		Snail Lake	Ramsey	1951	9	45.07325/-93.12606	KU 3423
		Twin Lake	Ramsey	1961	7	45.04033/-93.08984	
		Big Watab Lake	Stearns	1960	29	45.55259/-94.45128	
		Buffalo Lake	Wright	1945	36	45.16294/-93.89358	ANSP 71724
KILLIFISH - FUNDULIDAE							
Banded Killifish	*Fundulus diaphanus*	Island Lake	Anoka	1960	21	45.36721/-93.09580	
		Big Stone Lake	Big Stone	1892	135	45.40932/-96.61082	FMNH 6881
		Blue Earth River	Blue Earth	1892	116	44.16417/-94.03667	
		Lake Waconia	Carver	1941	38	44.86862/-93.78430	JFBM 12299
		Albert Lea Lake	Freeborn	1938	100	43.63017/-93.31298	JFBM 9229
		Mississippi River - Pool 4	Goodhue	1940	107	44.49248/-92.27942	JFBM 14120
		Pleasant Valley Creek	Goodhue	1940	107	44.51431/-92.35469	JFBM 14206
		Crystal Lake	Hennepin	1932	52	45.02697/-93.32707	JFBM 2780
		Lake Harriet	Hennepin	1948	56	44.92183/-93.30506	
		Lake Minnetonka	Hennepin	1969	49	44.90972/-93.64446	
		Lake of the Isles	Hennepin	1948	54	44.95538/-93.30695	
		Green Lake	Isanti	1965	19	45.57342/-93.43993	
		Round Lake	Jackson	1892	125	43.55939/-95.43431	
		Spirit Lake	Jackson	1943	123	43.50417/-95.10535	UMMZ 146738
		Lake Jefferson	Le Sueur	1956	114	44.27537/-93.75914	LACM 6564-1
		Lake Washington	Le Sueur	1892	115	44.25328/-93.87161	
		Cedar River	Mower	1892	98	43.66643/-92.96750	SU 4440
		Okabena Lake	Nobles	1892	126	43.61543/-95.61760	
		Lake Johanna	Ramsey	1947	4	45.04309/-93.17008	TU 5296
		Lake Josephine	Ramsey	1892	5	45.03574/-93.15323	JFBM 27

COMMON NAME	SCIENTIFIC NAME	WATERBODY	COUNTY	LAST REPORT	MAP #	LATITUDE/ LONGITUDE	MUSEUM CATALOG #
Banded killifish (continued)	*Fundulus diaphanus*	Lake Vadnais	Ramsey	1954	8	45.05100/-93.09028	
		Otter Lake	Ramsey	1892	12	45.12403/-93.04013	JFBM 45
		Lake Shields	Rice	1955	112	44.37005/-93.44134	
		Clear Lake	Sherburne	1954	28	45.44647/-94.04498	
		Pomme de Terre River	Swift	1892	132	45.20456/-96.02356	UMMZ 248243
		Bonny (Bone) Lake	Washington	1941	16	45.28686/-92.85981	JFBM 12277
		Lake St. Croix	Washington	1969	15	44.92094/-92.77270	JFBM 38095
		Howard Lake	Wright	1941	35	45.07218/-94.06914	JFBM 12180
STICKLEBACK - GASTEROSTEIDAE							
Ninespine Stickleback	*Pungitius pungitius*	Lake Winnibigosish	Cass	1958	179	47.44159/-94.19801	JFBM 19152
		Lake Itasca	Clearwater	1927	168	47.21581/-95.20072	JFBM 8779
SCULPIN - COTTIDAE							
Mottled Sculpin	*Cottus bairdii*	Camp Creek	Fillmore	1966	76	43.65228/-92.05510	
		Eagle Lake	Sherburne	1939	26	45.39169/-93.74416	JFBM 17169
		North Fork Zumbro River	Wabasha	1964	108	44.25435/-92.50011	JFBM 20296
Slimy Sculpin	*Cottus cognatus*	Little Otter Creek	Carlton	1941	185	46.65764/-92.54393	JFBM 2105
		Otter Creek	Carlton	1955	185	46.70486/-92.52089	
		Upper Bear Creek	Fillmore	1974	69	43.81092/-92.19596	JFBM 21298
		Kabekona River	Hubbard	1947	167	47.24096/-94.87667	JFBM 17283
		Dempsey Creek	St. Louis	1942	187	47.38794/-92.81872	JFBM 1080
		West Two Rivers	St. Louis	1942	188	47.51711/-92.61484	JFBM 1077
Deepwater Sculpin	*Myoxocephalus thompsonii*	Lake St. Croix	Washington	1969	15	44.92091/-92.75926	JFBM 38097
TEMPERATE BASS - MORONIDAE							
Yellow Bass	*Morone mississippiensis*	Zumbro River	Wabasha	1964	106	44.31380/-91.99633	
		Lake Winona	Winona	1953	93	44.03717/-91.63712	
SUNFISH - CENTRARCHIDAE							
Rock Bass	*Ambloplites rupestris*	Martin Lake	Anoka	1954	20	45.38505/-93.08468	
		Lake Minnewashta	Carver	1954	41	44.87900/-93.60891	
		Piersons Lake	Carver	1954	40	44.83257/-93.69823	
		West Fork Des Moines River	Cottonwood	1890s	121	43.86106/-95.11345	
		Orchard Lake	Dakota	1955	62	44.70099/-93.30948	
		Wells Creek	Goodhue	1963	107	44.51213/-92.32408	
		Cedar Lake	Hennepin	1948	53	44.95991/-93.32162	
		Lake Calhoun (Bde Maka Ska)	Hennepin	1958	55	44.94184/-93.31186	
		Spirit Lake	Jackson	1943	123	43.50417/-95.10535	UMMZ 146778
		Lake Jefferson	Le Sueur	1956	114	44.27537/-93.75914	LACM 6564-8
		Bald Eagle Lake	Ramsey	1892	13	45.11433/-93.01582	JFBM 50
		Lake Johanna	Ramsey	1892	4	45.04309/-93.17008	JFBM 64
		Spring Lake	Scott	1954	46	44.70063/-93.47394	
		Big Lake	Sherburne	1935	27	45.33878/-93.75392	JFBM 6930
		Long Lake	Washington	1959	14	45.03461/-92.95980	
		Rollingstone Creek	Winona	1968	95	44.09496/-91.81228	
Warmouth	*Lepomis gulosus*	Lake Jefferson	Le Sueur	1956	114	44.27537/-93.75914	LACM 6564-9
Smallmouth Bass	*Micropterus dolomieu*	McCarrons Lake	Ramsey	1958	3	44.99819/-93.11306	
PERCH - PERCIDAE							
Western Sand Darter	*Ammocrypta clara*	Blue Earth River	Blue Earth	1892	116	44.16417/-94.03667	
		Minnesota River	Dakota	1970	60	44.79967/-93.29044	JFBM 22692
Rainbow Darter	*Etheostoma caeruleum*	Blue Earth River	Blue Earth	1892	116	44.16417/-94.03667	
		Bear Creek	Houston	1945	86	43.50070/-91.64021	JFBM 14460
		Credit River	Scott	1956	48	44.77875/-93.34317	UF 8704
		Pomme de Terre River	Swift	1954	132	45.20456/-96.02356	JFBM 17431
Iowa Darter	*Etheostoma exile*	Little Rock Lake	Benton	1960	146	45.73166/-94.16876	
		Cottonwood River	Brown	1948	119	44.28202/-94.67989	JFBM 156702
		Bancroft Creek	Freeborn	1945	102	43.73860/-93.35770	
		Fountain Lake	Freeborn	1954	101	43.66357/-93.37570	
		Cedar Lake	Hennepin	1948	53	44.95991/-93.32162	
		Dead Coon Lake	Lincoln	1938	129	44.36218/-96.09621	JFBM 11389

COMMON NAME	SCIENTIFIC NAME	WATERBODY	COUNTY	LAST REPORT	MAP #	LATITUDE/ LONGITUDE	MUSEUM CATALOG #
Iowa Darter (continued)	*Etheostoma exile*	Budd Lake	Martin	1938	118	43.63973/-94.46651	JFBM 9942
		North Branch Root River	Olmsted	1969	66	43.85895/-92.49021	JFBM 20906
		Lake Johanna	Ramsey	1938	4	45.04309/-93.17008	JFBM 13857
		Rice Creek	Ramsey	1957	10	45.09088/-93.22754	JFBM 18431
		Crow Creek	Redwood	1973	120	44.54300/-95.02374	JFBM 21132
		Prior Lake	Scott	1948	47	44.73287/-93.41276	
		Clear Lake	Sherburne	1948	28	45.44647/-94.04498	
		Five Mile Creek	Traverse	1975	137	45.87564/-96.33881	
		Rock Lake	Wright	1961	34	45.17059/-94.01285	
Least Darter	*Etheostoma microperca*	Rum River	Anoka	1935	24	45.29145/-93.37591	JFBM 11408
		Crystal Lake	Hennepin	1931	52	45.02697/-93.32707	JFBM 2836
Banded Darter	*Etheostoma zonale*	Otter Creek	Mower	1954	99	43.50045/-92.93077	
Logperch	*Percina caprodes*	Black Dog Lake	Dakota	1899	61	44.80351/-93.26803	JFBM 7438
		Otter Creek	Mower	1954	99	43.50045/-92.93077	
Blackside Darter	*Percina maculata*	Crow Creek	Redwood	1973	120	44.54300/-95.02374	JFBM 21102
		Rollingstone Creek	Winona	1965	95	44.09496/-91.81228	