

3.3 Fish Species of Greatest Conservation Need

This is an overview of Wisconsin's fish Species of Greatest Conservation Need (SGCN) and their associations with Natural Communities and Ecological Landscapes. This section also identifies fish species that are not classified as SGCN, but are classified as BasicSINS (species with information needs), RankingSINS, or species that had sufficient information to assess them with confidence and did not meet the SGCN criteria (e.g., ranked S4 or S5, ranked S3G5 or S3S4G5, or did not meet the additional criteria considered after assessing S/G-Ranks). See Section 2.6 for more explanation on ranking and SINS.

The issues, challenges and conservation actions that will be important for most or all fish SGCN over the next ten years are presented in the second half of this section along with those applicable to one or a few fish species. The discussion of the issues and challenges facing fish SGCN and their habitat, and the conservation actions that address them, follows nomenclature developed by the Open Standards for the Practice of Conservation.¹ The Open Standards classification for Conservation Actions, with some modification for circumstances particular to Wisconsin, is presented in Appendix 2.1 at the end of Section 2.

3.3.1 Fish SGCN

There are 148 native fish species in Wisconsin. Of these native fish species, 26 (20%) have been identified as Species of Greatest Conservation Need in Wisconsin. Twenty are currently listed as Threatened or Endangered in Wisconsin. Fish SGCN are listed in Table 3.3.1.

Many of our fish Species of Greatest Conservation Need are found only in large river systems such as the Mississippi and Wisconsin rivers, which have been highly altered with dams and other hydraulic control infrastructure; restoration of the natural processes that characterize these systems would help to conserve many of these species by providing the natural flow regime, connectivity and specific habitats that these large river species need throughout their life cycles. Most fish SGCN are warm water habitat species that coincide with areas of the state where development and use of aquatic resources and adjacent lands is greatest, which underscores the need and opportunity for collaborative conservation.

3.3.2 SGCN-NC and SGCN-EL Association Scores

The association between each fish SGCN and each aquatic natural community type is provided in Table 3.3.3. Figure 3.3.1 takes all fish SGCN with an association of moderate (score = 2) and high (score = 3) for a given community type and then sums all the "2's" and "3's". Each bar in the graph represents that sum for the stated natural community. If fish SGCN have only a low or no association with a community type, the community is not listed. Higher scores indicate higher overall association of fish SGCN with that

¹ <http://cmp-openstandards.org/tools/threats-and-actions-taxonomies/> (Search Terms: open standards conservation threats actions)

community type. The definitions for each level are provided below. Fish SGCN are predominantly associated with warmwater river and stream habitat. A few species are associated with Great Lakes habitat and riverine lakes and ponds. Only one species, redfin shiner, is associated with multiple aquatic communities, albeit at low levels and in many cases, based on historically recorded occurrences.

Key to SGCN-NC Association Score

Level of Association	Description
High	This natural community (currently and/or historically) contains essential biological, physical and ecological habitat elements for the species, which must be present in quality and quantity to sustain the species; conservation actions implemented in this natural community may result in significant improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Moderate	This natural community (currently and/or historically) contains some, but not all biological, physical and ecological habitat elements that support or help to support this species; species may sustain itself with reduced quantity or quality of this natural community; conservation actions implemented in this natural community may result in moderate improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Low	Species is (and/or historically was) minimally associated with the biological, physical and ecological characteristics of this natural community; conservation actions implemented in this natural community may result in minimal improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
None	Species does not (and did not historically) or is highly unlikely to use this Natural Community.

The association between each fish SGCN and the sixteen ecological landscapes is provided in Table 3.3.4. Figure 3.3.2 takes all fish SGCN with an association of moderate and high for a given ecological landscape and then sums all the 2's" and "3's". Each bar in the graph represents that sum for the stated landscape. If a fish has only a low or no association with a landscape, it is not listed. Higher scores indicate higher overall association of fish SGCN with that ecological landscape. A reminder of the definitions for each level of association is provided below. One can see a marked contrast with the SGCN-EL scores versus the SGCN-NC scores in that many fish SGCN demonstrate relatively wide association across landscapes. This is in part because the boundaries of the ecological landscapes tend more toward "terrestrial" characteristics and simply because warm and cold water habitats are well distributed throughout the state. Six species have some association with ten or more of the 16 landscapes. The most species are associated with the western coulee and ridges landscape because they are associated with the Mississippi River, which is part of that landscape. Many species are also associated with the ecological landscapes adjacent to the Wisconsin River.

Key to SGCN-EL Association Scores

Level of Association	Description
High	Estimated as "majority", "critical", or likely to be ">50%" for current and historical characteristics that measure use or presence at a large scale: area of occupancy, state population size, and/or range extent of the species or its habitat; as a result, conservation actions implemented in this Ecological Landscape may result in significant improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Moderate	Estimated as "many", "important", or likely to be "≤50%" association with the EL for current and historical characteristics that measure use or presence at a large scale: area of occupancy, state population size, and/or range extent of the species or its habitat; as a result, conservation actions implemented in this Ecological Landscape may result in moderate improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Low	Estimated as "minimal", "infrequent" or "occasional" association with the Ecological Landscape for current and historical characteristics that can be estimated at a large scale: area of occupancy and/or range extent of the species or its habitat; species is present; as a result, conservation actions implemented in this Ecological Landscape may result in some improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
None	Species does not (and did not historically) or is highly unlikely to use or be present in this Ecological Landscape.

These associations are estimates based on expert and professional knowledge, and like the SGCN list itself, new information and changes in our environment are good reasons to reassess these scores periodically. Warm water habitats, and in particular those associated with major river systems are present throughout the state. However, they demonstrate considerable variation in habitat characteristics and therefore, conservation opportunity. The habitat needs of aquatic species in terms of vegetation, water flow, depth and quality vary on a scale that is not well-captured at the scale association scores are assigned. Nevertheless, the scores help us make decisions about matching conservation actions that are linked to fish SGCN to the most appropriate species and natural community targets in an area. For aquatic species in particular, the scores are best considered together with the NC-EL opportunity scores presented in Section 4 and also in the context of surrounding land use.

3.3.3 Fish SINS and Other Fish Species that are not SGCN

Species with information needs (SINS) are classified as such because: 1) inventory, trend data, and/or life history data were insufficient to estimate the factors and other criteria used to identify SGCN (Ranking SINS); or 2) the most basic taxonomic and/or status data are lacking to identify the species or its distribution. Other species had sufficient information to assess their SGCN status, and did not meet the SGCN criteria (i.e., "NotSGCN"); however, information may still be gathered to monitor their populations and habitat in the event their status changes.

These three groups of species are identified in Table 3.3.2 to distinguish survey, monitoring, or research objectives over the next five to ten years. There are no BasicSINS fish species, indicating that basic information about the taxonomy and occurrence of species in the fish group is generally adequate and what remains is continued monitoring or surveys focused on ranking factors of rarity, trends and threats. There is only one species, western sand darter, in the RankingSINS category.

Of our states remaining native fish species, some are common or stable and presently are not in need of conservation (e.g., rainbow darter, southern redbelly dace, tadpole madtom) or they are managed as species that are fished (e.g., brook trout, walleye, smallmouth bass). These fish species were not assessed for SGCN status. Presently there are no fish species ranked as SNA or “not applicable” because they are an unsuitable target for conservation activities or their presence here is unpredictable or infrequent. Environmental changes in water temperature, quality and quantity as well as trends toward increased competition for water resources may result in changes to the status of species (i.e., SGCN or NotSGCN because they are common/stable, managed as fished species, or infrequent/unpredictable).

3.3.4 Issues and Conservation Actions Common to All or Most Fish SGCN

This section summarizes issues and challenges affecting the conservation of fish SGCN and actions that can be implemented at the source or to address the effects of the source on the species or its habitat. Distinguishing the source of the impact from the effects or the changes that occur to the species and its habitat is important because the two typically need a different approach and set of conservation actions. For example, land development along warmwater riparian corridors may be a threat that has the effect of reducing habitat quality. Conservation actions for fish SGCN may focus on the activity at the source to encourage practices that prevent or control runoff within the footprint of a development that can reach habitats where SGCN are present. Or conservation actions can focus on the effects by restoring gravel beds in suitable habitat areas for the same species. Multiple sources of impact may have the same or similar effects on species or habitat. Similar effects may be addressed collectively by a single action or suite of actions.

The first part of this subsection identifies issues and conservation actions identified most frequently for fish SGCN and their habitats. The nomenclature is based on the higher level categories in the Open Standards threats and actions classification². The second half is devoted to very important conservation actions for specific fish SGCN and their habitat.³ Key words or titles that correspond to the categories in the threats and conservation actions classifications are used in the text to orient the reader. Unlike in

² See the following website for the classifications. <http://cmp-openstandards.org/tools/threats-and-actions-taxonomies/> (Search Terms: open standards conservation threats actions). The conservation actions classification is provided in Appendix 2.1.

³ An Actions Database is being developed by WWAP partners to add more detail and characteristics about the conservation actions described here, including locations, cross-benefits to other species or natural communities, issues categories addressed by the action and the rationale behind the action). More about the approach to the Actions Database is described in Section 2.5.

WWAP1, an effort has been made to pair issues affecting conservation of fish SGCN with their relevant conservation actions.

Comprehensive management of aquatic habitats on both public and private lands is an overarching theme for conserving fish SGCN simply because many of the issues identified below occur in the same aquatic communities in our state and one or more conservation actions may address multiple threats to the conservation of SGCN and their habitat. For example, changing climate and extreme weather events adds to existing effects of hydrologic modification and floodplain or riparian development. Protecting our waters, focusing on specific refuge areas, such as important spawning grounds or known locations of very rare species within watersheds, will also be important to the conservation of multiple fish species. Many of our fish Species of Greatest Conservation Need are found only in large river systems such as the Mississippi and Wisconsin rivers, which have been highly altered for commercial navigation and other purposes; restoration of the natural processes that characterize these systems would help to conserve many of these species by providing the natural flow regime, connectivity and specific habitats that these large river species need throughout their life cycles.

Issue. The most frequently cited issue category for fish SGCN is water quality alteration, which can be divided into three subcategories of nutrient loads, sediments and to a lesser extent chemical pesticides/herbicides. All three categories enter aquatic systems via point and non-point sources from certain agricultural practices and development within the watershed. The agricultural practice sources tend to predominate in the southern half of the state. Development areas affecting SGCN fish tend to be more dominant in the northern part of the state and along the Great Lakes.

Conservation Actions. The most commonly cited action categories to address sources of pollution are comprehensive management to protect, preserve and restore aquatic habitat on private and public lands; compliance with water quality regulations and standards; rigorous application of industry or sector standards or practices (e.g., agricultural best management practices); and integrated pest management that relies on biological or natural method of pest control rather than chemical methods.

Issue. Residential and commercial development in the form of shoreline alteration and development. Loss or destruction of riparian and floodplain vegetation is another commonly cited category of threat facing fish SGCN. This is particularly noted in inland and Great Lakes natural communities.

Conservation Actions. Conservation actions to address this issue are focused on two primary areas. The first of these is raising awareness and education of landowners to preserve and restore riparian and floodplain habitat. Landowner and community associations are core groups that can successfully implement actions in this category. The second category is policies and regulations that maintain, encourage and support protection of these natural communities. Local policy and regulations are relatively more effective in this respect because they can more readily target aquatic systems that provide SGCN habitat.

Issue. Natural system modification in aquatic habitats occurs through hydrologic control and infrastructure, including the many lock and dam structures for commercial navigation along the Mississippi River and water management along the Wisconsin River. These modifications alter water flow and depth that affect habitat for SGCN fish. Tributaries to these rivers and other river aquatic systems are also affected by water level management throughout the state.

Conservation Actions. Some of the important actions that address hydrologic modifications to SGCN fish habitat include continued evaluation and implementation of the Mississippi River Habitat Enhancement and Rehabilitation Program projects and to carefully anticipate beneficial and detrimental impacts to SGCNs when planning and carrying out drawdown projects. Restoration projects on the Mississippi River are largely aimed at mitigating the impacts of impoundment and navigation, including the rebuilding of lost islands (themselves former high points within the floodplain), removal of sediment from backwater lakes to increase habitat complexity and preserve fish habitats, protection of islands, marshes and shorelines from wind- and wave-driven erosion, and similar actions to promote the water quality, habitat and wildlife of the river ecosystem. Connectivity of habitats is also a consideration in restoration projects.

Issue. Aquatic invasive species (e.g. several species of carp, non-native invertebrates and aquatic plants) compete with native species and degrade habitat for fish Species of Greatest Conservation Need in Wisconsin.

Conservation Actions. Wisconsin's invasive species law (NR40) sets the stage for many related actions that include education and awareness as well as development and implementation of best management practices among recreational users and the commercial fishing, navigation, and aquatic species trade to prevent and control aquatic invasive species. Many conservation actions to address this issue have already been established and can be expanded and implemented throughout the state by conservation organizations, state and local agencies and other entities.

Issue. Lack of information is identified as a threat primarily in the areas of 1) inventory and monitoring; 2) conservation planning for preservation and restoration projects in aquatic habitats for not only fish, but aquatic invertebrates and plants; and 3) understanding the relationship between changing climate (especially water temperature and variable flow/depth) and appropriate habitat management actions. There is little long term monitoring of rare fish populations in our state. Much of what we currently know is incidental to fisheries inventories.

Conservation Actions. Collection of rare fish data may be incorporated into monitoring programs for game species. Opportunities for combined or expanded objectives are underutilized. Conduct large-scale conservation planning efforts with private and public stakeholders in the upper Mississippi River, Wisconsin River and their large river tributaries, including adjacent floodplain. Identify aquatic conservation opportunity areas that target assemblages of aquatic species, including fish, aquatic insects, mussels, etc. Criteria for identifying these areas should incorporate climate change adaptation and other large-scale environmental changes, as well as shifting land use patterns and pressures.

3.3.5 Issues and Conservation Actions Specific to One or a Few Fish SGCN

The Actions Database has some actions that are species-specific or relevant to a particular natural community or habitat. This section briefly identifies those that currently reside at the forefront of species-specific efforts.

Issue: Water quality alteration, commercial and residential development, agricultural development.

Conservation Actions: Restore appropriate habitat in the lower Wolf, Mississippi and lower Wisconsin Rivers for shoal chub. Restore Ozark minnow habitat in the watersheds and tributaries of the Platte River. Restore habitat for the longear sunfish in the rivers and lakes where they occur, with emphasis on improving water clarity.

3.3.6 References for Fish Species of Greatest Conservation Need

The following references were used in the evaluation and assessment of fish species for Species of Greatest Conservation Need status as well as the specific issues, challenges and conservation actions presented in this section. It is impossible however, to document all the references used by the many people providing technical input to the WWAP revision. Conversely, there are many gaps in the published literature—funding or people to cover all important areas of research, inventory or monitoring is always limited. Some information about rare species locations is confidential⁴ or comes to us through informal technical reports or memos. For these various reasons, we also relied significantly on expert and professional observations and unpublished data.

Becker, G.C. 1983. Fishes of Wisconsin. University of Wisconsin Press, Madison, Wisconsin, 1052 pp.

Lyons, J., P.A. Cochran, and D. Fago. 2000. Wisconsin Fishes 2000: status and distribution. Publication WISCU-B-00-001, University of Wisconsin Sea Grant Institute, Madison, Wisconsin, 87 pp.

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NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 47.1.4. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. Accessed 2015 June 18, May 14.

⁴ Information related to the Natural Heritage Inventory database, which shows the name and/or specific location of rare species is confidential, but may be shared through agreements or permissions with the WDNR-NHI program. Information at a county level or higher is publicly available. <http://dnr.wi.gov/topic/nhi/> (Search Terms: Wisconsin Natural Heritage Inventory)

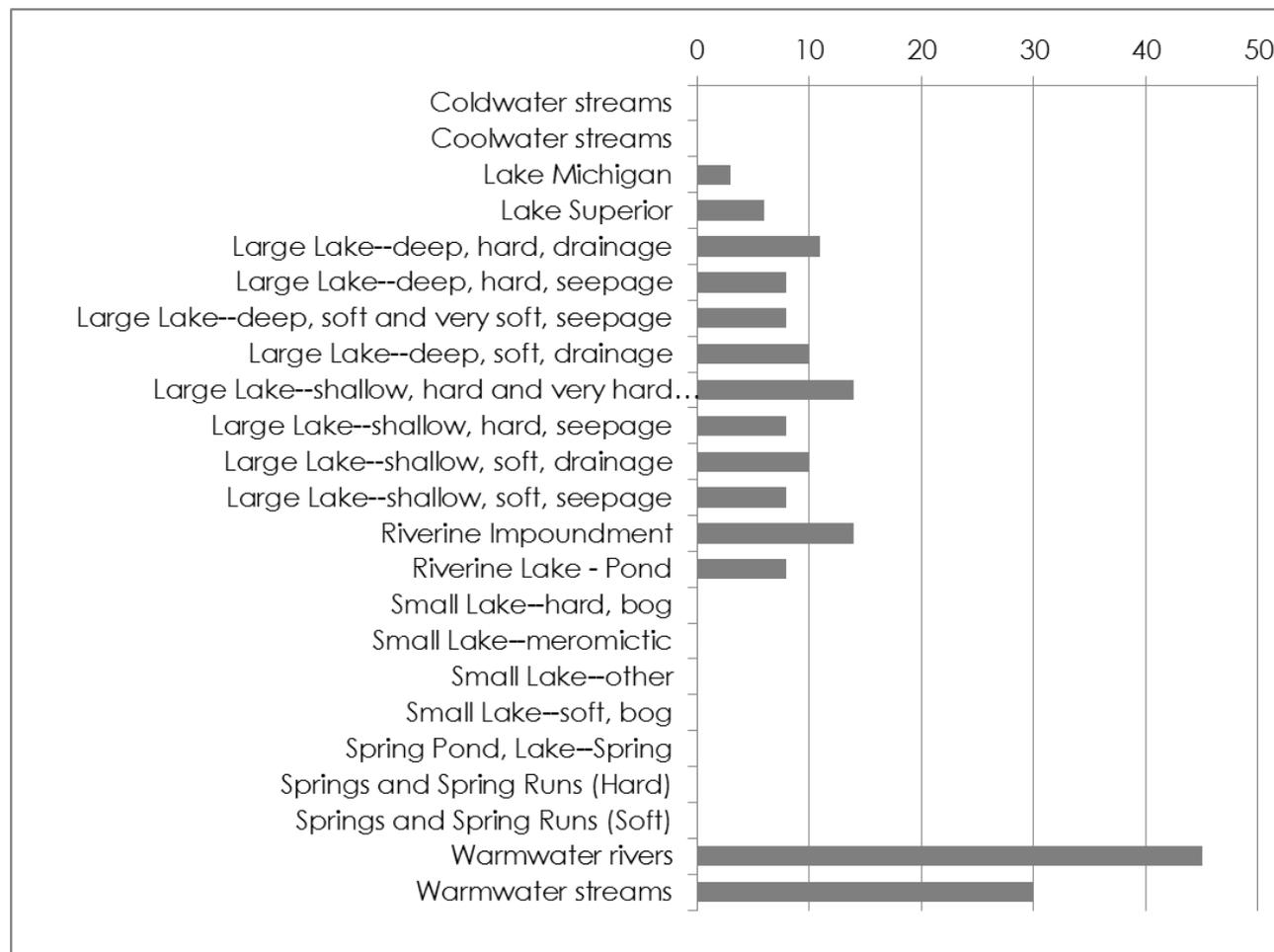
Stewart, J., S. Westenbroek, M. Mitro, J. D. Lyons, L. Kammel, and C. Buchwald. A model for evaluating stream temperature response to climate change in Wisconsin. USGS. Scientific Investigations Report 2014-5186.

University of Wisconsin Sea Grant. 2013. Wisconsin Fish Identification (online and mobile app). University of Wisconsin Sea Grant Institute, Madison, WI. (<http://www.seagrant.wisc.edu/home/Default.aspx?tabid=604>)

Wisconsin DNR. 2000d. Wisconsin's Lake Sturgeon Management Plan. Bureau of Fisheries Management and Habitat Protection, Wisconsin Department of Natural Resources. 12 pp.

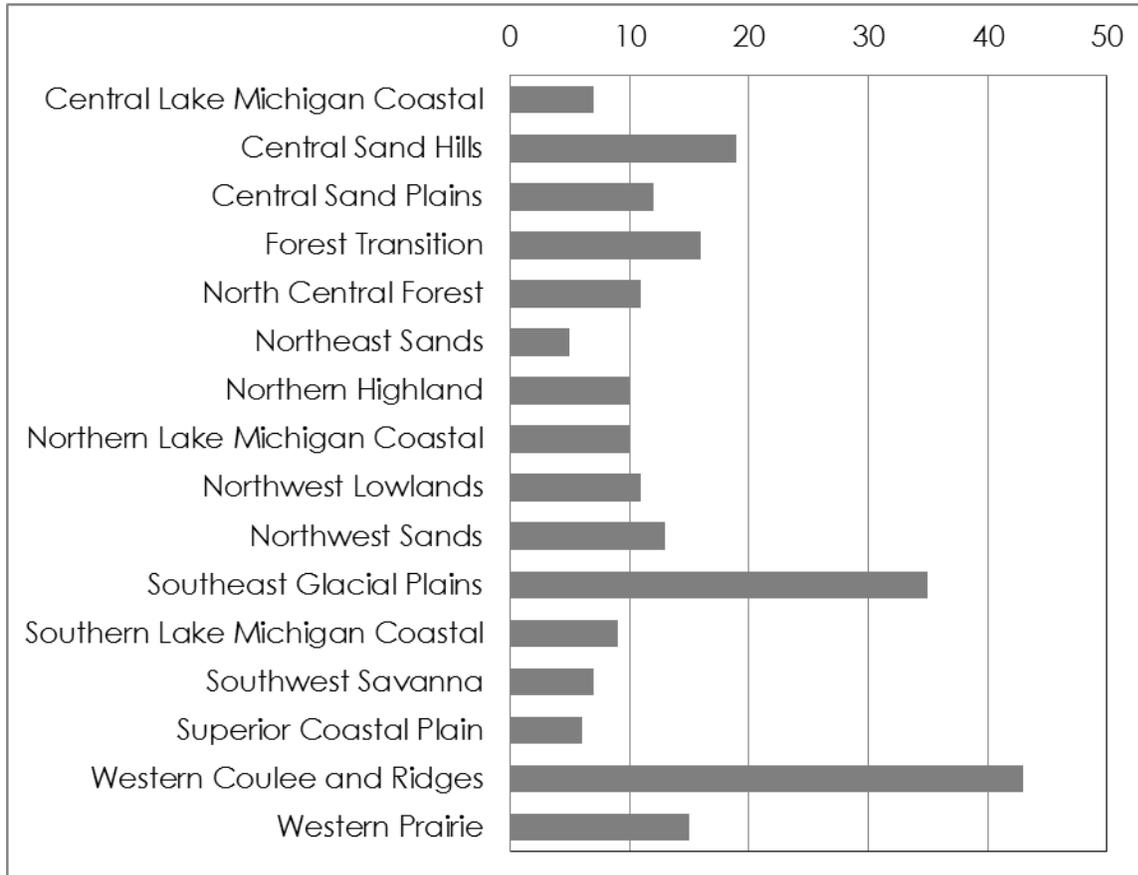
Wisconsin DNR. 2015, Wisconsin fish distribution maps (detailed maps of the distribution and abundance of Wisconsin fishes. (https://cida.usgs.gov/wdnr_fishmap/map/).

Figure 3.3.1 Sum of All Fish SGCN-Natural Community Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Community Type



*Figure 3.3.1 takes all fish SGCN with an association of moderate (score = 2) and high (score = 3) for a given community type and then sums all the "2's" and "3's". Each bar in the graph represents that sum for the stated natural community. If fish SGCN have only a low or no association with a community type, the community is not listed. Higher scores indicate higher overall association of fish SGCN with that community type

Figure 3.3.2 Sum of All Fish SGCN-Ecological Landscape Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Landscape



*Figure 3.3.2 takes all fish SGCN with an association of moderate and high for a given ecological landscape and then sums all the 2's" and "3's". Each bar in the graph represents that sum for the stated landscape. If a fish has only a low or no association with a landscape, it is not listed. Higher scores indicate higher overall association of fish SGCN with that ecological landscape.

Table 3.3.1 Fish Species of Greatest Conservation Need

Species Name	Common Name	State THR/END	Federal LT/LE	Natural Heritage Inventory Global Rank	NHI SRank	New SGCN for WWAP2
<i>Acipenser fulvescens</i>	Lake Sturgeon			G3G4	S3	
<i>Alosa chrysochloris</i>	Skipjack Herring	END		G5	S1	
<i>Anguilla rostrata</i>	American Eel			G4	S2	
<i>Coregonus zenithicus</i>	Shortjaw Cisco			G3	S1	
<i>Crystallaria asprella</i>	Crystal Darter	END		G3	S1	
<i>Cycleptus elongatus</i>	Blue Sucker	THR		G3G4	S2	
<i>Erimystax x-punctatus</i>	Gravel Chub	END		G4	S1	
<i>Erimyzon sucetta</i>	Lake Chubsucker			G5	S3	
<i>Etheostoma asprigene</i>	Mud Darter			G4	S3	Y
<i>Etheostoma chlorosoma</i>	Bluntnose Darter	END		G5	S1	
<i>Etheostoma microperca</i>	Least Darter			G5	S3	
<i>Fundulus dispar</i>	Starhead Topminnow	END		G4	S2	
<i>Hiodon alosoides</i>	Goldeye	END		G5	S2	
<i>Hybopsis amnis</i>	Pallid Shiner	END		G4	S1	
<i>Ictiobus niger</i>	Black Buffalo	THR		G5	S2	
<i>Lepomis megalotis</i>	Longear Sunfish	THR		G5	S2	
<i>Luxilus chrysocephalus</i>	Striped Shiner	END		G5	S1	
<i>Lythrurus umbratilis</i>	Redfin Shiner	THR		G5	S2	
<i>Macrhybopsis hyostoma</i>	Shoal Chub	THR		G5	S2	
<i>Moxostoma carinatum</i>	River Redhorse	THR		G4	S2	
<i>Moxostoma duquesnei</i>	Black Redhorse	END		G5	S1	
<i>Notropis anogenus</i>	Pugnose Shiner	THR		G3	S2	



Species Name	Common Name	State THR/END	Federal LT/LE	Natural Heritage Inventory Global Rank	NHI SRank	New SGCN for WWAP2
<i>Notropis nubilus</i>	Ozark Minnow	THR		G5	S2	
<i>Noturus exilis</i>	Slender Madtom	END		G5	S1	
<i>Percina evides</i>	Gilt Darter	THR		G4	S2S3	
<i>Polyodon spathula</i>	Paddlefish	THR		G4	S2	

*For rank definitions see Tables 2.9 and 2.10 in Section 2. Approach and Methods

Table 3.3.2 Fish SINS and Other Fish Species that were Assessed, but are not SGCN

Species Name	Common Name	NHI GRank	NHI SRank	Result	SGCN in WWAP 1 but not in WWAP2
Fundulus diaphanus	Banded Killifish	G5	S3S4	NotSGCN	Y
Moxostoma valenciennesi	Greater Redhorse	G4	S3	NotSGCN	Y
Coregonus kiyi	Kiyi	G3G4	S3S4	NotSGCN	Y
Clinostomus elongatus	Redside Dace	G3G4	S3S4	NotSGCN	Y
Ammocrypta clara	Western Sand Darter	G3	S3	RankingSINS	

*For rank definitions see Tables 2.9 and 2.10 in Section 2. Approach and Methods

Table 3.3.3 Fish SGCN – Natural Community Association Scores for the Aquatic Community Group H = High Association; M = Moderate Association; L = Low Association; Blank = No Association*

Scientific Name	Common Name	Coldwater streams	Coolwater streams	Lake Michigan	Lake Superior	Large Lake--deep, hard, drainage	Large Lake--deep, hard, seepage	Large Lake--deep, soft and very soft, seepage	Large Lake--deep, soft, drainage	Large Lake--shallow, hard and very hard (marl), drainage	Large Lake--shallow, hard, seepage	Large Lake--shallow, soft, drainage	Large Lake--shallow, soft, seepage	Riverine Impoundment	Riverine Lake - Pond	Small Lake--hard, bog	Small Lake--meromictic	Small Lake--Other	Small Lake--soft, bog	Warmwater rivers	Warmwater streams		
Acipenser fulvescens	Lake Sturgeon			H	H	H			M	H		M		H	H						H		
Alosa chrysochloris	Skipjack Herring													L							L		
Anguilla rostrata	American Eel			L	L									L							L		
Coregonus zenithicus	Shortjaw Cisco				H																		
Crystallaria asprella	Crystal Darter																					H	
Cycleptus elongatus	Blue Sucker																					H	
Erimystax x-punctatus	Gravel Chub																					H	H
Erimyzon sucetta	Lake Chubsucker					M	M	M	M	M	M	M	M		M							L	M
Etheostoma asprigene	Mud Darter													H	L							H	L
Etheostoma chlorosoma	Bluntnose Darter																					H	

Scientific Name	Common Name	Coldwater streams	Coolwater streams	Lake Michigan	Lake Superior	Large Lake--deep, hard, drainage	Large Lake--deep, hard, seepage	Large Lake--deep, soft and very soft, seepage	Large Lake--deep, soft, drainage	Large Lake--shallow, hard and very hard (marl), drainage	Large Lake--shallow, hard, seepage	Large Lake--shallow, soft, drainage	Large Lake--shallow, soft, seepage	Riverine Impoundment	Riverine Lake - Pond	Small Lake--hard, bog	Small Lake--meromictic	Small Lake--Other	Small Lake--soft, bog	Warmwater rivers	Warmwater streams	
Etheostoma microperca	Least Darter					M	M	M	M	M	M	M	M								L	H
Fundulus dispar	Starhead Topminnow									M					H						M	H
Hiodon alosoides	Goldeye													M							M	
Hybopsis amnis	Pallid Shiner																				M	
Ictiobus niger	Black Buffalo													M							H	
Lepomis megalotis	Longear Sunfish					M	M	M	M	M	M	M	M									H
Luxilus chrysocephalus	Striped Shiner																					H
Lythrurus umbratilis	Redfin Shiner		L			L	L	L	L	L	L	L	L	M	L	L	L	L	L	L	H	M
Macrhybopsis hystoma	Shoal Chub																					H
Moxostoma carinatum	River Redhorse																					H
Moxostoma duquesnei	Black Redhorse																					H
Notropis anogenus	Pugnose Shiner					M	M	M	M	H	M	M	M									M

Scientific Name	Common Name	Coldwater streams	Coolwater streams	Lake Michigan	Lake Superior	Large Lake--deep, hard, drainage	Large Lake--deep, hard, seepage	Large Lake--deep, soft and very soft, seepage	Large Lake--deep, soft, drainage	Large Lake--shallow, hard and very hard (marl), drainage	Large Lake--shallow, hard, seepage	Large Lake--shallow, soft, drainage	Large Lake--shallow, soft, seepage	Riverine Impoundment	Riverine Lake - Pond	Small Lake--hard, bog	Small Lake--meromictic	Small Lake--Other	Small Lake--soft, bog	Warmwater rivers	Warmwater streams	
<i>Notropis nubilus</i>	Ozark Minnow																					H
<i>Noturus exilis</i>	Slender Madtom																					H
<i>Percina evides</i>	Gilt Darter																				H	H
<i>Polyodon spathula</i>	Paddlefish													M							H	

*Note that the "spring" aquatic communities were removed because they are marginally applicable to this species group. Redfin shiner and mud darter were noted as present in a couple of "spring" communities.

Table 3.3.4. Fish SGCN – Ecological Landscape Association Scores
H = High Association; M = Moderate Association; L = Low Association; Blank = No Association

Scientific Name	Common Name	Central Lake Michigan Coastal	Central Sand Hills	Central Sand Plains	Forest Transition	North Central Forest	Northeast Sands	Northern Highland	Northern Lake Michigan Coastal	Northwest Lowlands	Northwest Sands	Southeast Glacial Plains	Southern Lake Michigan Coastal	Southwest Savanna	Superior Coastal Plain	Western Coulee and Ridges	Western Prairie	# of Ecological Landscapes present
Acipenser fulvescens	Lake Sturgeon	H	H	H	M	H	H	M	H	H	M	H	M		H	H	M	15
Alosa chrysochloris	Skipjack Herring															L	L	2
Anguilla rostrata	American Eel	L	L	L	L				L			L	L		L	L	L	10
Coregonus zenithicus	Shortjaw Cisco					L									H			2
Crystallaria asprella	Crystal Darter				H											H	H	3
Cycleptus elongatus	Blue Sucker		H	H	L											H	M	5
Erimystax x-punctatus	Gravel Chub											H		M				2
Erimyzon sucetta	Lake Chubsucker	L	L		L		L		L			H	L			M		8
Etheostoma asprigene	Mud Darter		M	L	L											H	M	5
Etheostoma chlorosoma	Bluntnose Darter															H		1
Etheostoma microperca	Least Darter		M	M	M	M	M	M	L		H	H	L	L		L		12
Fundulus dispar	Starhead Topminnow											H	L			H		3
Hiodon alosoides	Goldeye		L													H	M	3

Scientific Name	Common Name	Central Lake Michigan Coastal	Central Sand Hills	Central Sand Plains	Forest Transition	North Central Forest	Northeast Sands	Northern Highland	Northern Lake Michigan Coastal	Northwest Lowlands	Northwest Sands	Southeast Glacial Plains	Southern Lake Michigan Coastal	Southwest Savanna	Superior Coastal Plain	Western Coulee and Ridges	Western Prairie	# of Ecological Landscapes present
<i>Hybopsis amnis</i>	Pallid Shiner															H	L	2
<i>Ictiobus niger</i>	Black Buffalo		H	L	L							M		L		H	M	7
<i>Lepomis megalotis</i>	Longear Sunfish	L	L	L	L	H		H	M	M		H	M					10
<i>Luxilus chrysocephalus</i>	Striped Shiner												H					1
<i>Lythrurus umbratilis</i>	Redfin Shiner	L	L	L	H				M			H	M			L		8
<i>Macrhybopsis hyostoma</i>	Shoal Chub	M	H	L					H							H	L	6
<i>Moxostoma carinatum</i>	River Redhorse	M	L	M	L	L	L		L	H	H	H				H	M	12
<i>Moxostoma duquesnei</i>	Black Redhorse				H							L		L		L		4
<i>Notropis anogenus</i>	Pugnose Shiner		L		L	L		H	L	L	H	H	L					9
<i>Notropis nubilus</i>	Ozark Minnow				H							H		M		H		4
<i>Noturus exilis</i>	Slender Madtom											H		H		L		3
<i>Percina evides</i>	Gilt Darter			M	L	H				H	M					M	L	7
<i>Polyodon spathula</i>	Paddlefish		H	L												H	L	4