Michigan Wildlife Action Plan
2015-2025

Approach, Methods & Survey Needs

Today's Priorities, Tomorrow's Wildlife

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Executive Summary

The goal of Michigan's Wildlife Action Plan is to provide a common strategic framework to coordinate conservation in Michigan for wildlife and their habitats by working together voluntarily and cooperatively toward shared goals. This plan outlines 301 species of greatest conservation need (SGCN). Resources are limited, so priorities were chosen to focus conservation actions on a subset of focal SGCN and key habitats/issues. The below table outlines the priorities for the Wildlife Action Plan for 2015-2025.

For each priority, conservation partners helped develop mini-plans that outline: 1) the habitat, 2) who contributed to the plan, 3) focal SGCN, 4) key habitats and 10-year goals for each focal SGCN, 5) critical threats, 6) key conservation actions, 7) climate vulnerability of focal SGCN, 8) places for partnerships, and 9) monitoring and surveys that are needed. Other state or national conservation and management plans have been cross-referenced with identified actions, goals, and monitoring needs. Each mini-plan is a stand-alone document that can be used independently of the entire plan, although overarching survey needs are identified in the *Approach, Methods, & Survey Needs* chapter.

	Wildlife Action Plan Priorities 2015-2025	
	Key Habitats/Issues	**Focal SGCN**
1	Warmwater Streams & their Headwaters	Orangethroat Darter, Redside Dace, Silver Shiner, Southern Redbelly Dace, Northern Clubshell, Rayed Bean, Riverine Clubtail Dragonfly
2	Littoral Zones	Pugnose Shiner, Starhead Topminnow, Blanchard's Cricket Frog
3	Big Rivers	Lake Sturgeon, River Redhorse, Snuffbox
4	St. Clair – Detroit River System	Lake Sturgeon, Mooneye, Northern Madtom, Pugnose Minnow, Mudpuppy
5	Inland Cisco Lakes	Cisco, Ives Lake Cisco, Siskiwit Lake Cisco
6	Great Lakes Ciscoes	Cisco, Kiyi, Shortjaw Cisco
7	Great Lakes Marsh & Inland Emergent Wetlands	Black Tern, Black-crowned Night-heron, Eastern Fox Snake, King Rail
8	Open Dunes & Sand-Cobble Shores	Piping Plover, Common Tern
9	Floodplain Forests	Cerulean Warbler, Indiana Bat, Copperbelly Watersnake
10	Fens	Eastern Massasauga, Mitchell's Satyr, Tamarack Tree Cricket, Yellow Rail, Poweshiek Skipperling, Hine's Emerald Dragonfly
11	Prairies & Savannas	Karner Blue, Frosted Elfin, Eastern Box Turtle, Rusty-patched Bumble Bee, Blazing Star Borer, Eastern Massasauga, Monarch Butterfly
12	Large Grasslands	Henslow's Sparrow, Dickcissel, Grasshopper Sparrow, Monarch Butterfly

	Wildlife Action Plan Priorities 2015-2025	
13	Young Forests	Golden-winged Warbler
14	Dry Northern Forests & Pine Barrens	Kirtland's Warbler, Dusted Skipper, Secretive Locust, Eastern Massasauga
15	Emerging Diseases	Eastern Massasauga, Northern Long-eared Bat, Indiana Bat, Tri-colored Bat, Little Brown Bat

Acknowledgements

Introduction

Every state has a Wildlife Action Plan, which taken together create a national conservation strategy for safeguarding wildlife and their habitats for current and future generations. Each state's action plan is uniquely designed to serve the needs of that state. These plans provide a framework for proactive conservation and management of fish and wildlife before they become imperiled, which is more effective, straightforward, and cost-efficient.

In 2005, Michigan developed the first version of the Wildlife Action Plan, a comprehensive strategy that served as a status assessment and baseline for 404 species of concern for all partners working toward the conservation of wildlife diversity and their habitats across the State (Eagle et al. 2005). The first version of Michigan's Wildlife Action Plan set the stage for better understanding our current knowledge and information gaps. This document is the revision of Michigan's Wildlife Action Plan and is based on new data and research, collaborative partnerships, and lessons learned over the last decade. This revision focuses on conservation priorities and identifies key actions needed over the next decade to achieve the goals outlined within the plan. The work outlined in this plan can be linked with many state and national conservation and management plans that were developed over the past 10 years.

The overarching goal of Michigan's Wildlife Action Plan is to provide a common strategic framework to coordinate the conservation of wildlife and habitats in Michigan. This framework will help move wildlife conservation forward by highlighting ways to work together voluntarily and cooperatively towards shared goals.

Funding Wildlife Conservation

Fish and wildlife are important to the cultural fabric of the United States. They provide recreational opportunities, and aesthetic, intrinsic, and spiritual values. Public funding for state-level wildlife conservation has a long history in this country starting in 1937 with the passage of the Wildlife Restoration Act. This Act, popularly known as the Pittman-Robertson Act (or PR), provided funding to states for restoration, conservation, management, and enhancement of wild bird and mammal populations and their habitats. Then in 1950, the United States passed the Sport Fish Restoration Act, commonly known as the Dingell-Johnson Act (or DJ), which provided funding to states to restore, conserve and manage fish and their habitats. Enacted in 1973, the Cooperative Endangered Species Conservation Fund provides funding to States and Territories to conserve threatened and endangered species.

State Wildlife Grants
State Wildlife Action Plans are designed to be used and moved forward by a variety of conservation

agencies and organizations. To help address the unmet wildlife conservation needs identified in each state's plan, the U.S. Congress began appropriating Federal funds in 2001 through the State Wildlife Grants program, a key dedicated funding source to implement these plans. This program is administered by the U.S. Fish and Wildlife Service (USFWS) and provides funds to be used with matching non-Federal funds for programs and projects that implement state Wildlife Action Plans. These funds are distributed to States and Territories using to a formula based on land area and population and are appropriated on an annual basis, meaning the State Wildlife Grants program is currently not a continuous or guaranteed funding source.

State Wildlife Grants funding is annually appropriated by Congress, and leverages significant additional funding from state agencies and conservation partners, benefiting all wildlife and their habitats in Michigan. As a requirement of accepting State Wildlife Grants, each State and Territory must have a current Wildlife Action Plan, and commit to revising that plan at least every 10 years. As a requirement of accepting State Wildlife Grants, each State and Territory must have a current Wildlife Action Plan, and commit to revising that plan at least every 10 years.

Value of Wildlife to Michigan

As early as 1658, French fur traders were developing trade routes in the Great Lakes region (DNR 1990). The fur trade drove early exploration and settlement of the State: ease of access for processing and shipping pelts determined the location of settlements like Sault Ste. Marie, Detroit, Mackinac City and St. Joseph. During this period, Michigan's furbearing wildlife was an important basis for trade among Native Americans and settlers.

Michigan also gained prominence as a source of wild meat for large markets in the East and Midwest. Market hunters harvested a wide variety of animals including deer, waterfowl, shorebirds, passenger pigeons, and small game for meat. Birds were also taken for their plumage to adorn hats or for stuffing in bedding or pillows (Petersen 1979). By 1876, market hunters were killing approximately 70,000 White-tailed Deer and untold numbers of birds each year.

Intensive commercial fishing on the Great Lakes began in 1820 on Lake Erie and quickly spread to the other lakes (Garling et al. 1995). By 1905, approximately 47.5 million pounds of fish were removed each year. The catch was dominated by species such as Cisco (Lake Herring), Lake Whitefish, Lake Trout and several species of suckers. Noticeable declines in the Great Lakes fish harvests first began to occur around 1862. By the 1960s, many commercial fish stocks had crashed due to overexploitation and the accidental introduction and population explosion of the parasitic Sea Lamprey.

The list of species in Michigan whose extinction can be partially linked to commercial exploitation, through intentional take and incidental capture, includes (with date of last record): Passenger Pigeon (1898), Blue Pike (1965), Longjaw Cisco (1957), Blackfin Cisco (1969), and Deepwater Cisco (1951). Many other species, including Wild Turkey and Lake Sturgeon, experienced severe population declines.

With the advent of the industrial age and modern agricultural methods, the reliance on wildlife for meat and revenue waned, and due to severe population declines, commercial harvest of some species was no longer economically viable. During the same time period, people began to recognize the importance of protecting sustainable wildlife populations for other economic purposes and began to enact broad wildlife protection laws and create public agencies to enforce those laws and conduct wildlife conservation.

Soon after the turn of the last century, sport hunting and fishing largely replaced commercial harvest. The monetary value of an animal no longer depended on its market price; its value became anchored in recreation, and could be measured by the amount of money expended for licenses, equipment and other amenities necessary for its pursuit. In 1955, the USFWS began measuring these expenditures. The 12th survey, conducted in 2011, found the total estimated annual value of sport fishing and hunting-related activities in Michigan by U.S. citizens (16 years old and older) to be $2.4 billion and $2.3 billion, respectively (U.S. Department of the Interior et al. 2011).

Currently, bird watching, wildlife viewing and nature photography represent the fastest growing segment of all wildlife-related recreation. Surveys conducted in 1980 and 1990 indicated a 63% growth in trips related to these activities (Duda and Young 1994). Recent estimates place the annual value of these non-consumptive activities in Michigan at $1.2 billion (U.S. Department of the Interior et al. 2011).

Wildlife can still hold great value for people who don't participate in wildlife-based recreation or other outdoor recreation activities. More than three-fourths of Michigan citizens strongly agreed with the statement 'whether or not I see wildlife, just knowing that wildlife exists in Michigan is important' (Koval and Mertig 2002). This result supports the premise that wildlife possesses intrinsic value to people; intrinsic value is recognized as the worth of a resource for its own sake (Callicott 1986). In a national survey (Belden et al. 2002), respondents affirmed the intrinsic value of wildlife when they agreed with the following statements: "one of the most important things to me, in my life, is living in a world with a wide variety of plants and animals'" (90% agreed); and "nature provides me with inspiration and peace of mind" (94% agreed).

Whether wildlife or landscapes are measured simply as commodities for their value to an economy or for their intangible values, their conservation, restoration and protection for current and future generations, remains a critical mission for Michigan's conservation partners and citizens.

Review & Evaluation of the First 10 Years (2005-2015)

Filling Data Gaps
For many species, information about their distribution and abundance is severely lacking. Over the last 10 years, concerted efforts went towards developing a better understanding of the distribution and abundance of insects, birds, and fish. Seventeen insects were removed from the species of greatest conservation need (SGCN) list because new data suggested that these species are more common than once thought. Sampling efforts for fish have typically focused on game fish, but over the last 10 years, additional effort went towards sampling and identifying non-game fishes, resulting in more data on the distribution and population status of many species. Comprehensive surveys and identification training have resulted in the removal of 20 fish species from the SGCN list. We have gained critical information about the status, distribution, and life history of many species; but more work is needed and priorities will be identified in this revision.

Conserving SGCN and their Habitats

Over the last 10 years, a lot of work has been undertaken to benefit SGCN and other wildlife on state, federal, and private lands. Two reports (DNR 2012, DNR 2015; both are available online) outline the work Michigan's Department of Natural Resources (DNR) conducted to benefit SGCN. The work included habitat management, the development of tools to aid conservation, research, and surveys. Many partners worked with the DNR on these projects, and many partners conducted additional work on their own or in larger conservation partnerships to benefit SGCN.

Important tools have been developed to aid conservation of SGCN, such as the development of GIS data and analyses, creation of climate vulnerably assessments of wildlife, and documentation of best management practices for invasive species. Much of this work has guided on the ground management, as well as the revision of this plan. We continue to conduct habitat management that benefits wildlife and conserves their habitats, and we continue to learn more about how management influences SGCN.

Coordinating Conservation

Coordination is critical to the success of any plan. Michigan's initial Wildlife Action Plan (Eagle et al. 2005) provided a status assessment that served as a great resource for partners across the state. Partners used the plan to focus habitat management, research, grant applications, and partnerships. Partnerships over the last 10 years focused on existing workgroups (e.g., Mitchell's Satyr Workgroup, and Kirtland's Warbler Workgroup) and on specific projects.

Lessons Learned

The first version of Michigan's Wildlife Action Plan (Eagle et al. 2005) provided a needed baseline for the state on 404 wildlife species and their habitats. Partners across the state have worked towards conserving SGCN in a variety of ways. Implementing the plan has provided some key insights into how to make the revision stronger:

➢ Identifying priorities and goals can be useful in focusing efforts and better evaluating the plan at the end of 10 years.
➢ More regular communication among partners can increase opportunities for partnerships and sharing of lessons learned.

How to Read the Revised Wildlife Action Plan

Michigan's Wildlife Action Plan is organized by chapters or mini-plans. This first chapter describes the approach and methods for how the entire plan was developed, and has a list of priority species for surveys. Following this chapter, each mini-plan details a key habitat, its focal SGCN, current threats and needed conservation actions to address them, places for partnerships, monitoring needs, and goals for the next 10 years.

Once readers becomes familiar with how the Wildlife Action Plan was developed, they can choose to read the entire plan or only those mini-plans that best align with their interests and priorities. Each mini-plan is a stand-alone document and can be used independently of the rest of plan.

Definition of Wildlife

For the purposes of this action plan, 'wildlife' is defined as 'any species of wild, free-ranging animal, including, but not limited to, mussels, snails, crayfish, insects, fish, amphibians, reptiles, birds and

mammals.' Wildlife also includes animals in captive-breeding programs designed to reintroduce individuals of a depleted native species into a previously occupied range.
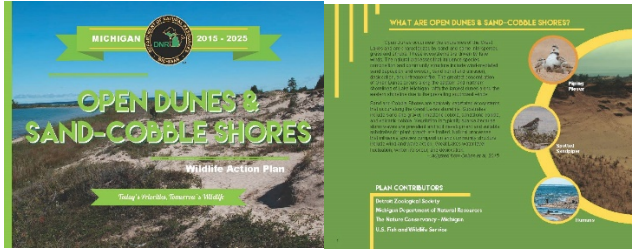
Required Parts of a Wildlife Action Plan

Each state Wildlife Action Plan is required to have eight elements, and states can address each of the elements to suit their own individual needs. The eight elements are:

1. *Species of Greatest Conservation Need (SGCN):* distribution and abundance of species of wildlife, including low and declining populations that are indicative of the diversity and health of wildlife of the state.
2. *Habitats:* descriptions of the locations and relative condition of key habitats and community types essential to the conservation of each state's SGCN.
3. *Threats and Needs:* descriptions of problems which may adversely affect SGCN or their habitats, and priority research and surveys needed to identify factors that may assist in restoration and improved conservation of SGCN and their habitats.
4. *Conservation Actions:* descriptions of the actions necessary to conserve SGCN and their habitats and establishes priorities for implementing such conservation actions.
5. *Monitoring:* descriptions of the provisions for periodic monitoring of SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting conservation actions as appropriate to respond to new information or changing conditions.
6. *Revision:* description of provisions to review plan at intervals not to exceed 10 years.
7. *Coordination:* description of provisions for coordination during the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian Tribes that manage significant areas of land or water within the State, or administer programs that significantly affect the conservation of species or their habitats.
8. *Public Participation:* description of provisions to provide the necessary public participation in the development, revision, and implementation of the plan.

Elements one through five are addressed in each mini-plan. Element 1 is also addressed in Appendix 3; Element 2 is also addressed in Appendices 4 and 5. The last three elements are described in detail in this *Approach, Methods & Survey Needs* section.

Species of Greatest Conservation Need

Identification of SGCN

Species of Greatest Conservation Need are limited to wildlife species (by definition, both aquatic and terrestrial) for which a population has been documented within Michigan and which depend on resources available within the State during a life stage (e.g., breeding, migration, wintering).The plan excludes

species documented within the State, but believed to be accidental or infrequent visitors.

Wildlife listed as Federally or State endangered or threatened or identified as special concern are automatically included on the SGCN list. This list was updated based on recommendations from Michigan's Taxa Advisory Committee's; members represent the species experts in the state for each particular taxa. Each Taxa Advisory Committee was asked to review and provide recommended changes to the criteria for listing a species as state endangered, threatened or special concern. The revised criteria were used to make recommended changes to the state threatened and endangered species list and the list of SGCN. Additional species could be recommended for addition to the SGCN list with sufficient documentation of rationale and a review by the Wildlife Action Plan development team. The process of revising the SGCN list has been directly tied to the state threatened and endangered species list review to streamline and increase the transparency of the process. Through this process, 301 species are now identified as SGCN for the next 10 years (Table 1; Appendix 1); 167 species were removed from the list and rationales for removal are detailed in Appendix 2.

Distribution and Abundance of SGCN

The distribution and relative abundance of each SGCN is detailed in Appendix 3. Distribution maps were included when data were available. Data from a variety of sources were used including, the state's Natural Heritage Database and the Department of Natural Resources Fish Collection System. Distribution maps were based on documented locations of species, to the greatest extent possible, but some maps were supplemented with current range maps. Abundance information is described in the accompanying text. This section was included in the original Wildlife Action Plan (Eagle et al. 2005), and was updated in this revision to include new information when available.

Table 1. Status and changes for the list of SGCN.

Taxonomic Group	Total Species Count in MI	SGCN (2005)	SGCN Removed	SGCN Added	SGCN (2015)
Mussels	77	28	3	13	38
Snails	180	36	2	27	61
Crayfish	6	2	2	2	2
Insects	15,000–20,000	138	60	12	90
Fish	154	44	20	2	26
Amphibians	23	14	6	3	11
Reptiles	29	16	2	3	17
Birds	Over 414	99	55	1	45
Mammals	66	27	17	1	11
Totals		**404**	**167**	**64**	**301**

Establishing Priorities

The SGCN list continues to demonstrate that there is a significant set of species for which there is concern about their population status. However, limited resources available for conservation do not allow for work on all 301 species. We chose to prioritize conservation actions on a subset of SGCN and key habitats, which allows us to focus efforts on shared goals improving collaboration between partners, implementation, and evaluation of the plan.

Prioritizing SGCN

Plan coordinators drafted an initial list of criteria to facilitate discussions at partner meetings and participants added additional criteria to consider. Participants discussed the criteria and made recommendations on the importance of each criterion – low, medium, or high importance for use in setting priorities. The criteria recommended were:

1. Species is endemic or unique to Michigan or the Great Lakes;
2. Michigan is the stronghold for this species;
3. Species relies on obligate plants for host or nectar that are rare or threatened;
4. Species relies on obligate habitat that is threatened (defined as natural communities with a G1 or G2 rank, or landscape features where condition is ≥70% degraded based on version 1 of the Wildlife Action Plan);
5. Species has specific existing priorities to one of the Wildlife Action Plan partners. These can be reflected in Habitat Conservation Plans (HCPs), Candidate Conservation Agreements with Assurances (CCAAs), existing management plans, etc.;
6. There is an imminent threat to the species that is specifically defined and could cause the extirpation of the species in a very short timeframe (e.g., White-nose syndrome in cave-dwelling bats);
7. Species is globally rare (defined as G1 or G2); or
8. Species is designated as critically imperiled or at very high risk of extirpation in the state (S1).

Each SGCN was reviewed in light of the criteria; sources of data included NatureServe Explorer, Michigan Natural Features Inventory data and expertise, Wildlife Action Plan version 1 (Eagle et al. 2005), and species and taxa experts. If a species met any of the criteria, it was elevated to the next level of prioritization and evaluation.

Focal Species and Key Habitats

After the criteria were applied to the list of SGCN, the resulting priority species were placed into groups based on their critical conservation needs. Some species had multiple critical needs and therefore were placed in multiple groups. In general, most of the conservation needs involved critical habitat management (identified as key habitats in this plan).

For groups with a large list of priority species, a subset of species was chosen to focus conservation efforts. These focal species were chosen by looking at the species distribution, the feasibility of monitoring the species, whether it was already a priority for a conservation partner, and whether conservation actions could improve population status in a measurable way.

These draft priorities, both key habitats and focal SGCN, were then reviewed by Michigan Department of Natural Resources staff and revised based on their input. This revised list of priorities was then presented to partners, and their feedback was incorporated into the final list of key habitats and focal SGCN.

For 2015-2025, Michigan's Wildlife Action Plan focuses conservation efforts on priorities, which are detailed in the following mini-plans and outlined in the table below.

	Wildlife Action Plan Priorities 2015-2025	
	Key Habitats/Issues	**Focal SGCN**
1	Warmwater Streams & their Headwaters	Orangethroat Darter, Redside Dace, Silver Shiner, Southern Redbelly Dace, Northern Clubshell, Rayed Bean, Riverine Clubtail Dragonfly
2	Littoral Zones	Pugnose Shiner, Starhead Topminnow, Blanchard's Cricket Frog
3	Big Rivers	Lake Sturgeon, River Redhorse, Snuffbox
4	St. Clair – Detroit River System	Lake Sturgeon, Mooneye, Northern Madtom, Pugnose Minnow, Mudpuppy
5	Inland Cisco Lakes	Cisco, Ives Lake Cisco, Siskiwit Lake Cisco
6	Great Lakes Ciscoes	Cisco, Kiyi, Shortjaw Cisco
7	Great Lakes Marsh & Inland Emergent Wetlands	Black Tern, Black-crowned Night-heron, Eastern Fox Snake, King Rail
8	Open Dunes & Sand/Cobble Shores	Piping Plover, Common Tern
9	Floodplain Forests	Cerulean Warbler, Indiana Bat, Copperbelly Watersnake
10	Fens	Eastern Massasauga, Mitchell's Satyr, Tamarack Tree Cricket, Yellow Rail, Poweshiek Skipperling, Hine's Emerald Dragonfly
11	Prairies & Savannas	Karner Blue, Frosted Elfin, Eastern Box Turtle, Rusty-patched Bumble Bee, Blazing Star Borer, Eastern Massasauga, Monarch Butterfly
12	Large Grasslands	Henslow's Sparrow, Dickcissel, Grasshopper Sparrow, Monarch Butterfly
13	Young Forests	Golden-winged Warbler
14	Dry Northern Forests & Pine Barrens	Kirtland's Warbler, Dusted Skipper, Secretive Locust, Eastern Massasauga
15	Emerging Diseases	Eastern Massasauga, Northern Long-eared Bat, Indiana Bat, Tri-colored Bat, Little Brown Bat

Habitats for SGCN

Habitats for All SGCN

Primary and occasional habitats (labeled landscape features) are identified for each SGCN in Appendix 3; this was drawn from the original Wildlife Action Plan (Eagle et al. 2005) and was updated if new species were added to the SGCN list. Locations of all habitats were described in the original Wildlife Action Plan (Eagle et al. 2005); habitats are defined and relative locations are portrayed in Appendix 4 (terrestrial habitats) and Appendix 5 (aquatic habitats).

Key Habitats & Relative Condition

Most of the priorities revolve around key habitats for focal SGCN. Habitat definitions for terrestrial habitats generally follow the Natural Communities of Michigan (Cohen et al. 2015). Definitions for aquatic habitats were primarily based on habitat suitability modeling (Yeh et al. in preparation). These are

described in the mini-plans under the *What are "habitat"?* section (e.g., What are Floodplain Forests).

Relative conditions of key habitats are described for each priority; this information was pulled from different sources. These are detailed in the mini-plans under the *What is the health of "habitat"?* section.

For the terrestrial habitats, we looked at the element occurrences of natural communities associated with the priority habitat within the State's Natural Heritage Database from 2005 and compared them with the current (Sept. 2015) information in the database. An element occurrence is the basic unit of record for documenting and delimiting the presence and geographic extent of a species or natural community on the landscape in the state's Natural Heritage Database. Element occurrences are defined as an area of land and/or water where a species or natural community is, or was, present and which has practical conservation value. For each key habitat, we looked at the total number of element occurrences and the changes in their viability. This information was summarized and used to describe the current condition. This is the best available data for the condition of key habitats and will provide a consistent approach to document changes in relative condition over time.

For streams and inland lakes, habitat condition was determined using a GIS-based assessment of watershed disturbance and fragmentation (Cooper et al. in preparation). Habitat condition for Great Lakes habitats was based on input from partners.

Threats to SGCN

Threats to All SGCN

Threats were identified for each SGCN in Appendix 3. This section was drawn from the original Wildlife Action Plan (Eagle et al. 2005) and was updated as warranted.

Threats to Key Habitats & Focal SGCN

Threats were identified for key habitats and focal SGCN by reviewing the scientific literature. Partners participating in plan development workshops refined this list of threats, and identified those that were most critical. Threats were categorized using the IUCN-CMP Threats Classification Beta Version 2.0 (Salafsky et al. 2008, updated 2015) and were detailed in the mini-plans under the *What are the Conservation Threats and Actions?* section.

Climate Vulnerability

For the terrestrial, and selected other aquatic (Great Lakes Ciscoes, Mooneye, Northern Madtom, Mudpuppy, Riverine Clubtail, and Blanchard's Cricket Frog) focal SGCN, climate vulnerability was drawn from Hoving et al. (2013). To understand which species may be most at risk due to changes in climate, they used the NatureServe Climate Vulnerability Index (CCVI; Young et al. 2011) to assess the relative risks to Michigan's wildlife. Index scores for each species were based on 26 aspects of exposure or sensitivity, which included exposure to local climate change using downscaled climate predictions, indirect exposures such as natural or anthropogenic barriers to dispersal, and species-specific sensitivities based on factors like dispersal ability. Rankings included: extremely vulnerable indicating that the abundance or range of the species would be greatly reduced or the species would disappear by 2050, highly vulnerable indicating that the abundance or range of the species would significantly decrease by 2050, moderately vulnerable indicating that the abundance or range of the species would likely decrease by 2050, not vulnerable/presumed stable indicating that the abundance or range of the species is not likely to change substantially by 2050, not vulnerable/increase likely indicating that abundance or range of the species would likely increase by 2050, or insufficient evidence indicating that there is not enough data to

assess the climate vulnerability of the species (Hoving et al. 2013).

For terrestrial habitats, climate vulnerability was drawn from Handler et al. (2014). In habitat climate analysis they modeled future forest health by incorporating the current status of a habitat, factors currently affecting the habitat, and the projected change in climate into model projections. A low vulnerability ranking indicates that the habitat has a relatively high adaptive capacity and the potential impacts of climate change will be relatively positive whereas a high vulnerability ranking indicates that the habitat has a lower adaptive capacity and the potential impacts of climate change will be more negative.

For other aquatic focal SGCN, climate vulnerability was based on Jacobson et al. (2010) for Cisco, and Cooper et al. (in preparation) for the remaining aquatic species. For this analysis, habitat suitability models were constructed for each species under current climate. These model were then used to predict the amount of change in suitable habitat and consequently species distributions by 2050 based on regionally down-scaled climate projections. Climate vulnerability rankings for each species were based on the amount of change in their current distribution and accounted for natural and anthropogenic barriers to dispersal. Rankings included: extremely vulnerable indicating that a species range would be reduced by more than 50% Conservation Actions, Research, and Surveys Needed (Elements 3 & 4) or the species would disappear by 2050, highly vulnerable indicating that a species range would be reduced by 10-50% by 2050, moderately vulnerable indicating that a species range would decrease by 1-10% by 2050, and not vulnerable/presumed stable indicating that a species range would likely increase or remain unchanged by 2050.

Climate vulnerability rankings were detailed in the mini-plans under the *How Vulnerable are Focal Species to Climate Change?* section.
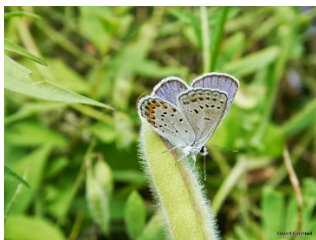
Conservation Actions, Research, and Survey Needs for Key Habitats and Focal SGCN

Conservation actions, research, and survey needs were identified for key habitats and focal SGCN based on literature review and input from partners who participated in plan development workshops. We focused on the most critical needs that could be addressed over the next 10 years given current levels of available resources. We also developed a list of needs that could be addressed if additional resources were made available. Conservation actions, research, and survey needs were listed and categorized under the IUCN-CMP Action Classification Beta Version 2.0 (Salafsky et al. 2008, updated 2015). These needs, as well as links to existing plans, were detailed in the mini-plans under the *What are the Conservation*

Threats & Actions? section.

Many state and national conservation and management plans have been developed over the past ten years. To capitalize on existing efforts and to facilitate expansion of partnerships, we cross-referenced actions in our mini-plans with actions identified in other conservation and management plans. Within each mini-plan, we included superscripts at the end of actions that could be linked to existing plans as well as a list of these planning documents. For conservation plans with distinct numbered objectives, the objective or strategy number was also included.

Places for Partnerships to Implement Conservation Actions

Maps were developed with partners to identify priority areas to implement conservation actions. Maps were based on areas that were most valuable for focal SGCN, areas where current conservation efforts were ongoing, and areas where there was the potential to expand conservation actions. The priority areas are delineated by ecoregion, county, or watershed. We hope to focus 80% of conservation effort identified in the Wildlife Action Plan on these priority areas. However, we recognize that significant conservation opportunities may exist outside of the priority areas identified. Priority area maps were detailed in the mini-plans under the *Where are There Places for Partnerships?* section.

For the terrestrial priorities, Michigan Natural Features Inventory (Cohen et al. 2014) provided a preliminary evaluation of element occurrences for focal and other SGCN and intersecting high-quality natural communities to identify potential priority areas through GIS analysis, prioritized scoring, and data interpretation. For the aquatic priorities, a map-based assessment of conservation priority areas was developed for each habitat based on habitat suitability for focal SGCN, levels of landscape disturbance and fragmentation, and vulnerability to climate change (Wehrly et al. in preparation). These preliminary evaluations were used at the plan development workshops to start discussions about priority areas for conservation actions. Partners at the plan development workshops used these data and their knowledge of focal SGCN and habitats to develop the maps.

Monitoring

Monitoring Key Habitats & Focal SGCN

Each mini-plan identifies specific monitoring and survey needs for focal SGCN and key habitats. They identify existing protocols and programs that will be used or whether new monitoring protocols or efforts are needed. Monitoring and survey needs were detailed in the mini-plans under the *How Will We Monitor?* section.

We cross-referenced monitoring needs in our mini-plans with monitoring needs identified in other conservation and management plans. Within mini-plans, we included superscripts at the end of monitoring needs that could be linked to existing plans as well as a list of these planning documents.

Monitoring All SGCN

We are using focal SGCN to prioritize conservation actions, but at the end of 10 years we still need to assess the status of the full list of SGCN. For some taxa groups we have regular standardized surveys, which provide solid information on which to base decisions. However, for some taxa groups we do not have existing survey programs and rely on opportunistic sampling efforts and data. These opportunities may come through additional effort to existing surveys, new targeted efforts, or by working with citizen scientists. Surveys and monitoring are critical to the identification of SGCN, as well as their management needs. However, funding for surveys is often limited. Below are the survey and monitoring mechanisms

that we will use for each taxa group.

Mussels

Continue to conduct surveys using standard protocols (Strayer and Smith 2003); surveys for mussels in Michigan occur fairly regularly. We will continue to rely on information in the state's Natural Heritage Database to evaluate distribution, relative abundance, and trends.

Snails

There are currently no regular systematic snail monitoring programs; surveys will be opportunistic based on available resources and interest. We will continue to rely on information in the state's Natural Heritage Database to evaluate distribution, relative abundance, and trends.

Crayfish

There are currently no regular systematic crayfish monitoring programs; surveys will be opportunistic based on available resources and interest. We will continue to rely on information in the state's Natural Heritage Database to evaluate distribution, relative abundance, and trends.

Insects

We will use citizen science efforts to help evaluate distribution, relative abundance, and trends for insects; citizen science efforts could include the Michigan Butterfly Network, Butterflies and Moths of North America, Bumble Bee Watch, Michigan Odonata Survey, and others. We will continue to rely on information in the state's Natural Heritage Database as well.

Fish

There are many regular and standardized fish surveys throughout Michigan, and the following data will be used: DNR Status and Trends Stream and Lake Surveys, DNR Trap Net Surveys, DNR Trawl Surveys, DNR Lake Sturgeon Assessments, USFWS Adult Fish Community Gill Net Assessments, USFWS Small Benthic Fish Surveys, U.S. Geological Survey (USGS) Juvenile Seining Surveys, USGS Pelagic Larval Fishes, and USGS Bottom Drift Larval Fishes. Targeted surveys may also be needed. We will continue to use the DNR GIS group to evaluate distribution, relative abundance, and trends.

Amphibians

Amphibian surveys occur regularly within Michigan. For calling frogs, we will continue to use Michigan's Frog and Toad Survey, a volunteer citizen-science survey that has been ongoing for over 25 years. The Michigan Herp Atlas, another citizen science program, also provides valuable data on distribution, relative abundance and trends. We will continue to rely on information in the state's Natural Heritage Database.

Reptiles

Reptile surveys occur regularly within Michigan. We will continue to use information from the Michigan Herp Atlas and the state's Natural Heritage Database.

Birds

Multiple long-term data collection efforts for birds are available as well as several smaller or more recent efforts. We will continue to use the annual North American Breeding Bird Survey for population trends, as well as the Michigan Breeding Bird Atlas. Additionally, we will look to citizen science programs, such as eBird, to help assess distribution and relative abundance. We will continue to rely on information in the state's Natural Heritage Database.

Mammals

There are currently no regular systematic mammal monitoring programs; surveys will be opportunistic.

We will continue to rely on information in the state's Natural Heritage Database.

Assessing Effectiveness of Conservation Actions

Assessing effectiveness of conservation actions can take many different forms depending on the importance and uncertainty of a project or action, the available resources, and the types of questions we are trying to answer. It can be as simple as monitoring photo points to look for changes in vegetation over time as a result of management actions, or visiting a site after an action has occurred to see whether the intended species is using the improved habitat. It can also be time intensive and statically rigorous to answer specific research questions. We recommend that each individual project determine their needs and work to meet those needs. The Association of Fish and Wildlife Agencies' Teaming With Wildlife Committee produced a report that recommended a framework of effectiveness measures that states and partners can use to enhance performance reporting (Association of Fish and Wildlife Agencies 2011).

Coordination, Partnerships & Public Participation

We focused our coordination and public participation on conservation partners interested in working to conserve SGCN or their habitats; we took this approach to strengthen partnerships. We provided five distinct opportunities for partners to engage in the revision of the Wildlife Action Plan (see Appendix 5 for list of participating partners).

Engagement Opportunities

Prioritizing Efforts
We held a workshop with partners on October 27, 2011, to develop criteria to prioritize the SGCN list; 13 partner organizations participated. See *Prioritizing the SGCN List* for more information about the workshop.

Updating SGCN List
We worked with the threatened and endangered species list Taxa Technical Advisory Committees who provided recommendations on updates to the SGCN list; 25 partner organizations participated in this effort. This process was streamlined by linking with the ongoing review of the state's threatened and endangered species list. This work occurred Summer 2014-January 2015. For more information, see *Identification of SGCN*.

Kick-off of Revision
We conducted a webinar to kick off the revision of the plan and to request that partners review the draft SGCN list and the draft priorities for the next 10 years. Over 100 organizations were invited to participate. We had 22 organizations provide comments on the draft SGCN list and priorities.

Plan Development Workshops

We held workshops for each of the priorities identified in the Wildlife Action Plan; all were in-person, full day meetings, except for the Disease priority, where we held 2-hour webinars for each disease topic. Thirty-eight conservation organizations participated in the workshops. We had 5-15 people in attendance at each workshop, which allowed for great discussions on threats, conservation actions, goals, monitoring, and priority areas. Each meeting was facilitated, and we worked with partners to identify the most important threats to the focal SGCN and key habitats, needed conservation actions and monitoring, goals, and priority conservation areas. Essentially, partners developed each mini-plan during the workshops. After the meetings, the draft mini-plans were emailed to partners for review. Mini-plans were then updated based on partner suggestions.

Final Public Review

The final draft of each mini-plan was available on the DNR's website for a two-week public review and comment period. Over 100 organizations were invited to review and comment on the final draft.

Implementation

The DNR will support periodic opportunities to bring together partners around the priorities outlined in the mini-plans to share progress and lessons learned. We also intend to work with partners on grants and projects to implement the actions identified in the plan. The Wildlife Action Plan will be available online at www.michigan.gov/dnrwildlifeactionplan. Additional resources will be added as needed to aid partners in implementation.

Revision

A comprehensive review and revision will occur in 2025 at the end of 10 years in accordance with the federal requirements.

This action plan should be considered a living document and may be updated before the 10 year comprehensive review; any change will be communicated to the U.S. Fish and Wildlife Service. Here is a list of possible reasons for updating the plan and how they will be addressed.

- If a species is newly added to the federal or state endangered species list or the special concern list but is not on our SGCN list and occurs in Michigan, it will automatically be added to the plan.
- If a new disease occurs that is expected to significantly impact populations (>50% declines) of any native species, that disease will be added to the disease priority and focal SGCN will be chosen to prioritize actions; additional SGCN may be added that are being significantly impacted by the disease. We will work with partners following the same approach we took during this revision. We will invite partners to a workshop or webinar to develop the new part of the disease mini-plan. The U.S. Fish and Wildlife Service will be notified of our intent and be given a copy of the update.
- If a new threat is introduced to Michigan within the 10 year period, and it is expected to significantly impact populations (>50% declines) of a native species, the threat will be added to the appropriate priority. If an affected species was not a SGCN, it will be added to the list. We will work with partners following the same approach we took during the revision. We will invite partners to a workshop or webinar to develop actions to address the new threat and update the mini-plan. We will also reassess as a group, which actions are still important to address over the next 10 years and which ones may drop off the list due to available resources. The U.S. Fish and Wildlife Service will be notified of our intent and be given a copy of the update.

Components of Each Mini-Plan

Each priority has its own mini-plan with the following sections; words underlined link to the eight elements required in each Wildlife Action Plan.

What are "habitat"? (e.g., What are fens?)

Description of the key habitats.

Why is this habitat important? (e.g., Why are fens important?)

Briefly outlines the benefits that each habitat provides, and offers rationale for additional benefits beyond protection of rare species. It describes ecological services of the habitat, recreational and economic values, and other important wildlife that rely on the habitat.

Plan Contributors?

A list of partners who helped develop the mini-plan.

Who Uses Habitat? (e.g., Who uses fens?)

A list of wildlife that use the key habitat that are easily identified and valued for hunting, bird watching, or other reasons, as well as focal SGCN.

What is the Health of Habitat? (e.g., What is the health of fens?)

Describes the relative condition of the habitat within that priority.

What are the Focal Species?

Identifies the focal SGCN that will be used to focus efforts and assess progress at the end of 10 years. The current status is detailed as well as specific habitat needs of the species.

Goals

Delineates 10-year goals for each focal SGCN, and the key habitat. These are goals the plan contributors felt were realistic given the available resources for conservation work over the next 10 years.

What are the Conservation Threats & Actions?

Details the threats for both the key habitat and each of the focal SGCN.

Conservation actions, research, and surveys that need to be implemented over the next 10 years to conserve the focal SGCN and their key habitats are listed. In some mini-plans there is an additional conservation actions section to show those conservation actions that were identified as important but where resources may not be currently available.

How Vulnerable are Focal Species to Climate Change?

Classifies the vulnerability to climate change for focal SGCN and some key habitats.

Where are Places for Partnerships?

Maps designed to help partners connect around important places for wildlife; they are places to voluntarily work together on conservation actions.

How Will We Monitor?

Monitoring and surveys that will be used to evaluate focal SGCN and habitat status after 10 years and determine whether we met our goals. This section includes specific ongoing and needed efforts.

How Does This Plan Link With Other Conservation Plans?

There has been a multitude of relevant planning efforts across the state and country over the past ten years. Bracketed superscripts throughout the Wildlife Action Plan indicate where the goal, conservation action, or monitoring strategy aligns with those from another plan. This linking of plans is meant to facilitate the expansion of partnerships.

Survey Needs

For many SGCN, we still do not have a good assessment of their distribution across the state or their relative abundance. Often existing survey efforts have not provided enough data on these species, and targeted surveys are needed. The following are the priority SGCN for survey efforts over the next 10 years. These SGCN met one or more of the criteria that partners developed for prioritizing conservation efforts (criteria are listed in the *Establishing Priorities* section); focal species are not included here.

Amphibians

Boreal chorus frog (*Pseudacris triseriata maculata*)
Marbled salamander (*Ambystoma opacum*)
Northern dusky salamander (*Desmognathus fuscus fuscus*)
Smallmouth salamander (*Ambystoma texanum*)
Southern two-lined salamander (*Eurycea cirrigera*)

Birds

Barn owl (*Tyto alba*)
Common loon (*Gavia immer*)
Common moorhen (*Gallinula chloropus*)
Forster's tern (*Sterna forsteri*)
Long-eared owl (*Asio otus*)

Migrant loggerhead shrike (*Lanius ludovicianus migrans*)
Peregrine falcon (*Falco peregrinus*)
Prairie warbler (*Dendroica discolor*)
Short-eared owl (*Asio flammeus*)
Western meadowlark (*Sturnella neglecta*)
Wilson's phalarope (*Phalaropus tricolor*)
Yellow-throated warbler (*Dendroica dominica*)

Fish

Channel darter (*Percina copelandi*)
Creek chubsucker (*Erimyzon claviformis*)
River darter (*Percina shumardi*)
Sauger (*Sander canadensis*)
Silver chub (*Macrhybopsis storeriana*)

Freshwater Snails

Acorn Ramshorn (*Planorbella multivolvis*)
An aquatic snail (no common name; *Planorbella smithi*)
Broadshoulder physa (*Physella parkeri*)
Bugle fossaria (*Fossaria cyclostoma*)
Coldwater pondsnail (*Stagnicola woodruffi*)
Deepwater pondsnail (*Stagnicola contracta*)
Flanged valvata (*Valvata winnebagoensis*)
Gravel pyrg (*Pyrgulopsis letsoni*)
Lake Superior Ramshorn (*Helisoma anceps royalense*)
Petoskey pondsnail (*Stagnicola petoskeyensis*)
Purplecap valvata (*Valvata perdepressa*)

Insects: Beetles

Black lordithon rove beetle (*Lordithon niger*)
Douglas stenelmis riffle beetle (*Stenelmis douglasensis*)
Hungerford's crawling water beetle (*Brychius hungerfordi*)

Insects: Butterflies and Moths

3-striped oncocnemis (*Oncocnemis piffardi*)
Aweme borer (*Papaipema aweme*)
Culvers root borer (*Papaipema sciata*)
Doll's merolonche (*Merolonche dolli*)
Dukes' skipper (*Euphyes dukesi*)
Dune cutworm (*Euxoa aurulenta*)
Grizzled skipper (*Pyrgus wyandot*)
Leadplant moth (*Schinia lucens*)
Newman's brocade (*Meropleon ambifusca*)
Northern blue (*Plebejus idas*)
Northern hairstreak (*Fixsenia favonius ontario*)
Ottoe skipper (*Hesperia ottoe*)
Persius dusky wing (*Erynnis persius persius*)
Phlox moth (*Schinia indiana*)
Pipevine swallowtail (*Battus philenor*)
Silphium borer moth (*Papaipema silphii*)
Spartina moth (*Spartiniphaga inops*)
Sprague's pygarctia (*Pygarctia spraguei*)
Swamp metalmark (*Calephelis mutica*)
Three-staff underwing (*Catocala amestris*)

Insects: Cicadas and Hoppers

Angular spittlebug (*Lepyronia angulifera*)
Great Plains spittlebug (*Lepyronia gibbosa*)
Huron River leafhopper (*Flexamia huroni*)
Leafhopper (*Flexamia reflexus*)
Leafhopper (*Dorydiella kansana*)

Insects: Dragonflies and Damselflies

Grey petaltail (*Tachopteryx thoreyi*)
Pygmy snaketail (*Ophiogomphus howei*)
Russet-tipped clubtail (*Stylurus plagiatus*)

Insects: Grasshoppers and Crickets

Bog conehead (*Neoconocephalus lyristes*)
Davis's shield-bearer (*Atlanticus davisi*)
Delicate meadow katydid (*Orchelimum delicatum*)
Green desert grasshopper (*Orphulella pelidna*)
Lake Huron locust (*Trimerotropis huroniana*)

Insects: Mayflies

A mayfly (*Epeorus suffusus*)

Land Snails

A land snail (no common name; *Vertigo modesta parietalis*)
A land snail (no common name; *Vertigo modesta modesta*)
A land snail (no common name; *Vallonia gracilicosta albula*)
A land snail (no common name; *Catinella protracta*)
A land snail (no common name; *Catinella gelida*)
Banded globe (*Anguispira kochi*)
Carinate pillsnail (*Euchemotrema hubrichti*)
Cherrystone drop (*Hendersonia occulta*)
Copper button (*Mesomphix cupreus*)
Deep-throat vertigo (*Vertigo nylanderi*)
Hubricht's vertigo (*Vertigo hubrichti*)
Lambda snaggletooth (*Gastrocopta holzingeri*)
Pleistocene catinella (*Catinella exile*)
Six-whorl vertigo (*Vertigo morsei*)
Spike-lip crater (*Appalachina sayanus*)
Sterki's granule (*Guppya sterkii*)

Mammals

Prairie vole (*Microtus ochrogaster*)
Smoky shrew (*Sorex fumeus*)

Mussels

Black sandshell (*Ligumia recta*)
Fawnsfoot (*Truncilla donaciformis*)
Hickorynut (*Obovaria olivaria*)
Lilliput (*Toxolasma parvum*)
Northern riffleshell (*Epioblasma torulosa rangiana*)
Ornamented peaclam (*Pisidium cruciatum*)
Purple Lilliput (*Toxolasma lividus*)
Round hickorynut (*Obovaria subrotunda*)

Round lake floater (*Pyganodon subgibbosa*)
Salamander mussel (*Simpsonaias ambigua*)
Threehorn wartyback (*Obliquaria reflexa*)
White catspaw (*Epioblasma obliquata perobliqua*)

Reptiles

Kirtland's snake (*Clonophis kirtlandii*)
Six-lined racerunner (*Aspidoscelis sexlineata*)

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