MICHIGAN'S WILDLIFE CONSERVATION STRATEGY

Natural resources have helped to define Michigan throughout history. Both the native peoples of Michigan and more recent residents have understood the value of these natural resources and the need for management of Michigan's wildlife and habitats. Early wildlife management efforts focused on restoration of game species and their habitats. In 1937, the U.S. Congress passed the Federal Aid in Wildlife Restoration Act (commonly known as the Pittman–Robertson Act) to support States' wildlife restoration efforts. In 1950, the U.S. Congress adopted companion funding under the Federal Aid in Sport Fish Restoration Act (commonly known as the Dingle–Johnson Act) to support sport fish restoration. In 1984, the Wallop–Breaux Amendment enhanced this earlier action. For nearly 40 years, these programs, along with State hunting and fishing license revenues, provided the primary financial support for wildlife conservation and restoration in Michigan.

Conservation actions directed toward game species also benefited many nongame species by improving habitat conditions. Although these programs have had successes, some species have continued to decline. Limited resources, specifically limited funds and restrictions on the use of funds, have constrained the conservation and management of the full diversity of terrestrial and aquatic wildlife species in Michigan. Additional funding sources provided some assistance with this problem. For example, in 1973, the U.S. Congress passed the Endangered Species Act, providing funding to focus on recovery of federally threatened and endangered species. In 1983, the State passed legislation to create the Nongame Fish and Wildlife Trust Fund. Monies donated to this fund through a State income tax check-off and the sale of specialty vehicle registration plates have supported projects specifically directed toward nongame wildlife conservation, education and recreation.

Even with the addition of these funding sources, Michigan, like other States, has struggled to comprehensively conserve and manage the diversity of its wildlife. In general, the availability of funding for nongame wildlife conservation and management has remained largely insufficient and unpredictable. This uncertainty has resulted in conservation efforts that are opportunistic rather than strategic, especially for declining species which are not yet listed as threatened or endangered, and for taxonomic groups that remain relatively unstudied, such as some snails and insects. Coordination and strategic planning for the conservation and management of the entire range of wildlife diversity in Michigan, with consideration of long-term goals and broad scales, is needed.

To help address unmet wildlife conservation needs, the U.S. Congress began appropriating Federal funds in 2001 through the State Wildlife Grants program (SWG). Michigan is embracing this program by developing a comprehensive strategy that will serve as a coordinated plan of action for all partners working toward conservation of wildlife and wildlife habitats across the State. The Michigan Department of Natural Resources (DNR) has been coordinating this planning effort in compliance with its legal mandate to protect and conserve the State's natural resources, including all wildlife species. However, the strategy's development has been, and its implementation must be, a collective endeavor of Michigan's conservation partners, including State, Federal and tribal agencies, local governments, conservation organizations, universities, and private landowners.

The goal of Michigan's Wildlife Conservation Strategy (WCS) is to provide a common strategic framework that will enable Michigan's conservation partners to jointly implement a long-term holistic approach for the conservation of all wildlife species.

This strategy:

- provides an ecological, habitat-based framework to aid in the conservation and management of wildlife;
- identifies and recommends actions to improve habitat conditions and population status of

species with the greatest conservation need (SGCN), which are those species with small or declining populations or other characteristics that make them vulnerable;

- recommends actions that will help keep common species common;
- identifies and prioritizes conservation actions, research and surveys needs, and long-term monitoring to assess the success of conservation efforts;
- complements other conservation strategies, funding sources, planning initiatives, and legally mandated activities;
- incorporates public participation throughout development and implementation to provide an opportunity for all conservation partners and Michigan residents to influence the future of resource management;
- provides guidance for use of SWG funds and fulfills Federal requirements associated with these funds; and
- provides a clear process for reviewing and revising this plan as necessary to address changing conditions and to integrate new information as it becomes available.

Definition of Wildlife

For the purposes of this strategy, '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.

General Approach

This strategy adheres to the principles of ecosystem management. This approach to conservation planning is increasingly common in natural resource management, and is the management paradigm already adopted by the DNR and many other conservation partners. The WCS is one of many tools which work together within an ecosystem management process to integrate ecological, social and economic factors into a comprehensive approach aimed at protecting and enhancing sustainability, diversity and productivity of natural resources. Because many different views must be represented within this comprehensive perspective, a large and diverse group of conservation partners were asked to participate in development of this document. Information presented herein is based on the best scientific data available, and recommendations for additional research are offered to help address knowledge gaps and poorly understood natural resource relationships at various ecological levels. This strategy recognizes that ecosystem processes operate over a wide range of spatial and temporal scales. Implementation of recommended conservation actions should proceed with recognition that ecosystem processes are dynamic, and change and evolution are inherent in ecosystem sustainability. Therefore, the WCS incorporates adaptability to aid in conservation of these processes over the long term and to maximize benefits to Michigan's citizens, visitors and future generations.

Coarse Filter/Fine Filter Approach

Historically, wildlife conservation efforts have tended to focus on single species. However, as humans continue to change the landscape, a species-by-species approach may not be the most effective means to conserve biodiversity. Maintenance of ecological processes rather than management for individual wildlife taxonomic groups may be a more productive way to use limited resources to benefit the greatest number of species. The WCS was developed upon this premise. A comprehensive planning effort for each of the SGCN was not feasible, nor would that approach have achieved the goal of addressing the full array of wildlife in Michigan. Additionally, species have requirements for survival that are inextricably tied to their habitats, and degradation or loss of habitat is often the primary threat to species viability. Therefore, the WCS primarily uses a coarse-filter approach based on the habitat

needs of wildlife to more effectively conserve rare, declining and common species statewide.

Individual wildlife species, however, cannot be ignored, and the set of SGCN provides a complementary fine-filter approach. Some species' needs may not be sufficiently met through habitat- or ecosystem-based approaches and the strategy's goal is to address conservation needs of all wildlife species in Michigan. When particular species do not respond positively to habitat- or ecosystem-based conservation approaches, additional management specifically directed toward their unique requirements will be necessary. These unique species include those that respond to very specific changes within their habitat or ecosystem, species for which degradation or loss of habitat is not the primary threat, and species that do not share habitat associations with other SGCN, and, therefore, may not be adequately conserved through efforts for species assemblages. Using a species-based fine filter to assess and address the needs of these species in conjunction with the habitat-based coarse filter will allow comprehensive conservation of Michigan's wildlife diversity.

Additionally, the coarse filter is applied within a regional context (ecoregions for terrestrial systems and Great Lakes basins for aquatic systems), and high priority wildlife conservation issues are identified and addressed at a statewide level. These considerations add even more potential broad-scale filters for identifying and addressing conservation needs of wildlife and wildlife habitats.

Coarse Filter: Landscape Features

The primary organizational units for this strategy are 'landscape features,' which are broadly defined as 'components of the overall landscape used by wildlife, differentiated by vegetative, geologic, hydrologic and structural elements, which may occur at various scales.' Landscape features may be equivalent to ecosystems, they may incorporate multiple ecosystems, or they may be components of ecosystems, including isolated structures within a diverse matrix. Different landscape features are often divergent in scale and are not necessarily spatially exclusive; together they therefore provide the variety of characteristics, both structural and spatial, that are essential for wildlife. They include broad ecosystems such as prairies and ponds, as well as small-scale structural characteristics that species require, such as snags or gravel substrates. Where landscape features overlap, they act as multiple variables that together describe a place on the landscape.

Landscape features provide a common denominator between existing classifications used by conservation partners in Michigan. These landscape features are not proposed as a new classification system, but as an organizing tool that can be used by any planner or manager to focus conservation efforts at a relative spatial scale. They describe current, rather than potential or desired, conditions on the landscape. As a result, they include human-influenced systems that are used by wildlife, even if they do not represent the preferred habitat.

The WCS identifies 43 terrestrial and 48 aquatic landscape features within broad categories (Table 1). Like ecosystems, landscape features are diverse, with regional differences in composition and combinations of natural communities, species and other characteristics. Conserving this biological diversity and structural complexity will help to protect landscape features and the wildlife species that depend on them.

Table 1. Basic landscape feature framework

Terrestrial			Aquatic		
Category	**# Features**	**Examples**	**Category**	**# Features**	**Examples**
Grassland	9	Prairie, pasture	Great Lakes	3	Shoreline, offshore
Shrubland	2	Lowland shrub, upland shrub	Inland lakes	4	Ponds, large lakes
Forest	7	Lowland hardwood, dry conifer	Lake characteristics	7	Eutrophic, stratified
Inland wetlands/water	10	Bog, swamp	Rivers	13	Cold medium rivers, very large rivers
Great Lakes/ coastal	6	Coastal emergent wetland, coastal dune and beach	River characteristics	8	Slow gradient, intermittent
Other features	5	Cave/mine, suburban/small town	Wetlands	6	Bog, swamp
Terrestrial characteristics	4	Snag/cavity, down woody debris	Aquatic characteristics	7	Rock substrates, woody structures

Landscape Feature Summaries

The greater part of this document individually addresses each aquatic and terrestrial landscape feature within each defined Great Lake basin or ecoregion, respectively. This information will be most valuable to conservation partners working within a particular ecoregion or lake basin or at a specific site, regardless of the ownership type or spatial extent of the area of focus.

The landscape feature summaries provide sets of priority species, significant threats to the landscape features and associated wildlife, and conservation actions needed to address the identified threats. Additionally, they include recommendations for research, surveys, and monitoring efforts that will assist in assessing conditions and trends and the success of conservation actions. In combination with other available data, this information will enable conservation partners to make informed decisions and define conservation needs within an area of focus. As each conservation partner has different priorities and available resources, not all of the information provided will be pertinent or useful to all conservation partners.

Each landscape feature summary includes the following components (see terrestrial and aquatic examples following the executive summary).

Location Maps

Aquatic landscape feature maps show where within the lake basin the landscape feature in question is known to exist. They also include known location data for SGCN, when locations occur in association with the landscape feature and spatial data are available. Terrestrial maps indicate the probable distribution within the ecoregion of the landscape feature in question, based primarily on remotely sensed data. Both aquatic and terrestrial maps also include point locations for known associated natural communities, when available.

Description

Landscape feature summaries include general descriptions of the structure, composition and other characteristics of the landscape feature that will assist in identifying its presence within a landscape.

General Condition of Feature

Attendees at regional technical workshops (natural resource professionals from State, Federal and local agencies, non-governmental organizations, and universities) were asked to estimate the percentage of each landscape feature across the entire ecoregion or lake basin within each of five relative condition categories (Excellent, Good, Fair, Degraded, Highly Degraded). Averages of these values were used to provide general condition information for each landscape feature. When applicable, regional and global statuses of associated natural communities also are provided as a measure of condition.

Associated Natural Communities

As part of their conservation planning and implementation processes for terrestrial systems, many conservation partners use the natural communities classification described by Michigan Natural Features Inventory (MNFI). Presence of natural communities is frequently indicative of high quality systems. Therefore, associated natural community types are included for each landscape feature summary, as appropriate.

Associated Species of Greatest Conservation Need

Within each ecoregion and lake basin, the importance of each landscape feature to each SGCN was assessed based on information found in the scientific literature and provided by experts on specific wildlife taxonomic groups in Michigan.

The landscape feature summaries list those SGCN that principally or occasionally use the landscape feature. The summaries do not list those species which never or infrequently use the landscape feature. Also included in the summaries are SGCN that are believed to have an association with the landscape feature, however importance to, or frequency of use by, the species is unknown.

Associated Threats

Standardized threat categories and individual threats to landscape features and wildlife were developed by modifying previously existing threat classifications for terrestrial and aquatic systems. Associations between threats and landscape features within each ecoregion and lake basin were based primarily on the knowledge and opinion of natural resource professionals who attended regional technical workshops, because the scientific literature rarely presented information on regional differences in susceptibility to threats of landscape features or wildlife species.

Conservation Actions Needed

Conservation actions are those programs, projects or activities that will address identified threats to wildlife species and their habitats. Conservation actions provided in the landscape feature summaries are based primarily on discussions held at regional technical workshops and subsequent communication with participants and other knowledgeable individuals. Scientific literature and previously existing strategies and plans developed by State and national conservation partners were also referenced. Identified conservation actions do not differentiate between efforts that may already be ongoing and those yet to be initiated.

Research & Survey Needs

Research and survey needs generally include gaps in the collective knowledge of Michigan's conservation partners regarding species natural history information, natural resource relationships, or the effects of threats on landscape features and species. Research and survey needs listed within the landscape feature summaries were developed using the same sources as the conservation actions.

Monitoring

Monitoring addresses the need to periodically and systematically measure and assess changes to landscape feature conditions and species to determine whether their health/quality is changing and whether implemented conservation actions have been effective. Each landscape feature summary outlines the monitoring necessary to assess conditions and trends associated with the landscape feature and evaluate the success of implemented conservation actions. Sources for the monitoring information included in the landscape feature summaries are the same as those for the conservation actions.

Fine Filter: SGCN

Species of greatest conservation need are defined as wildlife species with small or declining populations or other characteristics that make them vulnerable. They include species currently federally or State listed as threatened or endangered, and other species identified through analyses of available data and recommendations from experts on particular wildlife taxonomic groups of Michigan. They are limited to wildlife species that have been documented within Michigan, and that depend on resources available within the State during any life stage or phenological stage (e.g., breeding, migration, wintering). Species documented within the State, but believed to be accidental or infrequent visitors, were excluded.

The WCS identifies 404 SGCN within nine major taxonomic groups: mussels, snails, crayfish, insects (aquatic and terrestrial), fish, amphibians, reptiles, birds and mammals (Table 2). Data required to evaluate conservation needs were not available for many wildlife taxonomic groups, such as freshwater sponges, jellyfish and shrimp, roundworms, flatworms, spiders, bees, wasps, ants, and many others; therefore, these groups were not included.

Table 2. Numbers of Michigan wildlife species in each of nine major taxonomic groups State listed as threatened or endangered, special concern*, and SGCN.

Taxonomic Group	Total number	Threatened/ endangered	Special concern	SGCN
Mussels	77	10	8	28
Snails	180	4	29	36
Crayfish	6	0	0	2
Insects	15,000–20,000	19	75	138
Fish	152	15	11	44
Amphibians	23	2	2	14
Reptiles	29	4	6	16
Birds	414[+]	21	21	99
Mammals	66	6	4	27
Totals		**81**	**156**	**404**

* Special concern species are not legally protected, but have been identified by Michigan Natural Features Inventory (MNFI) as being of concern because of declining or relict populations in the State.

[+] This number includes the 233 species known to breed in Michigan, as well as species which migrate through the State.

Currently, the set of SGCN is limited to wildlife species and does not include plants. This strategy focuses on the needs of wildlife and wildlife habitats because SWG funds, which are the primary monetary support for implementation of the WCS, may not currently be used for projects that are solely for conservation of plants. However, future editions of this strategy will explore inclusion of plants that have obligate relationships with wildlife SGCN, are indicators of high-quality natural communities, or are in need of conservation for other reasons, because they are essential elements of the systems in which

Michigan's wildlife exists.

SGCN Summaries

To address SGCN needs not addressed within the landscape feature summaries, supplemental information on each SGCN is provided. These SGCN summaries will likely be most valuable to conservation partners focusing on a particular species or group of species, or attempting to identify SGCN that may be in a particular area of interest. Additionally, this information will help to identify species that should be considered indicators of landscape feature condition. The information presented in the SGCN summaries is based on available data, scientific literature reviews, and the informed opinions of experts knowledgeable about specific wildlife taxonomic groups in Michigan.

SGCN were categorized as aquatic (use only aquatic landscape features during all life stages), terrestrial (use only terrestrial landscape features during all life stages), or crossover (use both aquatic and terrestrial landscape features during their life cycles). Crossover species were considered in discussions and analyses of both terrestrial and aquatic landscape features throughout development of the strategy.

Each SGCN summary includes the following components (see terrestrial and aquatic examples following the executive summary).

Distribution Maps

A population distribution map is provided for each species for which there are available data. Distributions for aquatic species are identified by point locations, whereas distributions for terrestrial species are identified by county. Crossover species distribution maps were created in the manner that best represents the available data. Spatially explicit data were not available for all species known to use resources within Michigan's landscapes nor for all known locations of SGCN. When location data for a species were sparse, historical and more recent locations were combined to create a distribution map that more accurately represents the potential distribution of the species.

Distribution & Abundance

Each SGCN summary includes a statement regarding the distribution and abundance of the species in Michigan, if known. Additionally, each summary notes whether the species is currently federally or State listed as endangered or threatened, or whether the species has been recognized as a Special Concern species by MNFI. Species considered extirpated in the State may still be protected under the State endangered species legislation, and, therefore are included in the set of SGCN.

Associated Landscape Features

The associations with landscape features identified within the SGCN summaries include all landscape features used by the species, regardless of frequency of use or preferences, based on review of scientific literature and comments from species experts.

Associated Threats

All identified threats, not just those to which the species is most susceptible, are included in the summary.

Comments

The comments in the SGCN summaries are intended to provide information specific to the species that is not available elsewhere in the strategy, and include recommended conservation actions, research and survey needs and monitoring, and any other information pertinent to conservation of the species.

Priority Conservation Needs

This strategy has been developed for use by all of Michigan's citizens and conservation partners, who have different scopes of interest and different sets of available resources. As implementation of the strategy begins, each of these partners will need to make decisions about their own priorities and abilities for implementing the recommended conservation efforts.

Priority conservation needs are identified in the WCS at three scales: statewide, regional, and species-level.

Statewide Priorities

The Statewide Conservation chapter within the Introductory Text & Statewide Assessments section provides detailed information about priority threats, other priority issues and priority conservation needs at a statewide level. Conservation needs were identified based on contributions from conservation partners involved in the development of this strategy, as well as from reviews of scientific literature and previously existing plans and strategies.

Statewide Priority Threats
These fourteen threats, a subset of the 50 aquatic and terrestrial threats originally identified within standardized categories, were identified by regional natural resource professionals as being of at least Medium severity in all four ecoregions or all four lake basins, or greater than Medium severity in three of the four ecoregions or lake basins. Actions to address these threats would have a great influence on wildlife conservation statewide. Many threats overlap and have common sources. 'Industrial, commercial and residential development' was recognized as a terrestrial threat in our threats framework, but the threat was limited to habitat conversion (i.e., when a grassland is converted to a parking lot). However, 'development' in general, and the many ways that it can threaten and affect wildlife, was a pervasive issue throughout discussions at workshops and meetings associated with creation of this strategy. As a result, although development is not addressed individually as a priority threat, it is addressed through many other priority threats identified.

The statewide priority threats identified are: invasive species; fragmentation; wetland modifications; dredging, channelization; riparian modifications; dams; non-consumptive recreation; altered sediment loads; disease and pathogens; altered hydrologic regimes; altered fire regime; lack of scientific knowledge; and social attitudes. Of these, invasive species and fragmentation were repeatedly identified, through the regional evaluation process and in discussion at meetings and workshops, as being the highest priority threats to wildlife and landscape features in both aquatic and terrestrial systems throughout Michigan.

Other Statewide Priority Issues
These issues were identified by participants at meetings and workshops as being of high importance to conservation of wildlife and the landscapes that they use in Michigan. However, they are not adequately addressed in the landscape feature summaries or SGCN summaries, because they generally occur at scales significantly larger than most of the landscape features and regions or are associated with multiple SGCN. Again, implementation of the recommended conservation efforts associated with these issues would have a great influence on wildlife conservation statewide.

The other statewide priority issues identified are: landscape mosaics; ecosystem representation and networks; bird migration routes and stopover sites, migratory obstructions, and wintering areas; hybridization; rarity; and urban, municipal and industrial pollution.

Statewide Priority Conservation Needs
Although all conservation actions, research and monitoring recommended to address the above

statewide priority threats and issues are important, implementation of some conservation efforts would have far broader influence than others.

In an effort to provide some index of importance, very similar conservation needs were grouped into categories, regardless of which statewide priority threat or issue they address. The number of conservation needs in each category was then counted. Successful implementation of conservation actions, research and monitoring to fulfill needs in categories with the greatest totals will have the widest influence on wildlife conservation statewide, because those conservation needs were repeatedly identified to address multiple threats and issues. This summary analysis provides a starting point for discussion and a way for conservation partners to begin considering where they can best direct their efforts.

The following categories (no order implied) have the greatest number of associated conservation needs, which should be considered statewide priorities.

- Identification and conservation of representative areas, high-quality areas and other areas of high ecological significance (includes development of site conservation plans and any formal protection determined to be necessary)
- Identification and conservation of areas facing serious threats (e.g., invasive species, lack of disturbance regime, contamination)
- Development and use of best management practices, recommended strategies, or recommended plans for conservation and management in specific situations
- Identification and elimination of significant information gaps for SGCN, landscape features and ecological processes, including responses to threats
- Assistance to private landowners and creation of partnerships between conservation organizations/agencies and private landowners for conservation of wildlife and landscape features

Although the following categories (again, no order implied) have slightly fewer associated conservation needs, those needs should also be considered statewide priorities.

- Development of new regulations/legislation to protect SGCN and landscape features (Most of the conservation needs in this category were related to invasive species.)
- Development of artificial techniques and engineering of new structures that mimic natural processes
- Education of the public about primary threats to wildlife and landscape features, biodiversity and essential ecological processes
- Development of survey, monitoring and response protocols to identify and address new disease, pathogens, and invasive species

A group of representatives from conservation organizations that attended the WCS 'Kick-off' Workshop in March 2005 were asked to evaluate the same categories of conservation needs and provide opinions on importance and urgency of the needs associated with each category. The results of this evaluation were similar to the summary analysis above. However, workshop participants felt strongly that the following additional categories, not identified as priorities through the analysis above, were very important and urgently needed for wildlife conservation in Michigan.

- Development of conservation plans for landscapes (e.g., mosaics, networks, adjacent landownerships)
- Identification and protection of corridors between large areas and isolated habitat patches

- Monitoring of natural resource metrics for changes from historical/natural ranges of variation and development of plans/actions to restore to historical/natural ranges of variation

Workshop participants added one additional category of conservation needs that they felt was very important and urgently needed, even though associated needs were not specifically identified to address any of the statewide priority threats or issues: development of explicit measurable goals for landscape features and SGCN. This is one of many priority research and monitoring needs addressed in the WCS.

Regional Priorities

The regional overviews that precede the landscape feature summaries for each ecoregion and lake basin identify threats evaluated by natural resource professionals as significant in that ecoregion or lake basin. These overviews also identify the conservation actions most frequently recommended to address threats within each landscape feature category. If these frequently repeated conservation actions are implemented, they will have the greatest possible overall effect, because each individual effort will address the needs of multiple landscape features and associated wildlife at the same time. Although there is some consistency between ecoregions and between lake basins, regional priority conservation actions generally reflect the highest priority threats for that ecoregion or lake basin. Those threats that are consistently recognized as being the highest priority threats across most or all regions are addressed at a statewide level.

Species-Level Priorities

The most frequent need identified in the SGCN summaries is filling knowledge gaps about species' distribution and population status. Need for knowledge about habitat usage, threats and general life-history is also commonly mentioned. In addition to those previously mentioned, priority needs for fish include identification of spawning habitat and movement information, and priority needs for mussels and snails include identifying host species.

Value of the WCS to Michigan

Value to Michigan's Wildlife

As programs and projects are successfully implemented, fulfilling conservation needs identified in the WCS, Michigan's wildlife will benefit in numerous ways. Status of many species with declining populations will improve, making it unnecessary to include them on lists of State and federally threatened or endangered species. Additional support for ongoing efforts to restore currently listed species and eventually remove them from these lists will improve probabilities of success. Species presently considered common will benefit from the conservation of all of the varied habitats that cover Michigan's diverse landscapes. New information acquired and generated will also improve conservation of these landscapes and associated wildlife. Reducing the rate of occurrence of invasive species introductions and establishments, landscape fragmentation, habitat conversion and other broad-scale threats will benefit many species and landscapes. Perhaps most importantly, communication and cooperation between conservation partners will be improved, leading to more effective management of Michigan's lands and waters, which will benefit the full diversity of Michigan's wildlife and the landscapes it uses.

Value to Michigan's Conservation Partners

Non-governmental organizations, other interest groups, and private individuals participated in developing this document, and their assistance in implementing its vision is anticipated. This strategy identifies priorities to help guide use of funds for addressing the needs of species and natural communities that have not been the primary targets of past conservation efforts. The WCS creates a collaborative framework for wildlife conservation that addresses the needs of all wildlife in the State,

with an ultimate objective of protecting biodiversity. Protection of biodiversity has been a goal of many conservation partners for many years.

Coordination and exchange of information is critical to the conservation of wildlife. This strategy provides a baseline assessment of the current status of Michigan's landscape features and wildlife species to which future assessments can be compared. The WCS provides a framework for describing, assessing, evaluating and addressing the efforts needed to conserve and manage for the diversity of ecosystems and wildlife in Michigan, and it provides specific recommendations for conservation actions, research and monitoring within the framework. Many recommendations were drawn from the ongoing efforts of conservation partners across the State. Coordination within this framework will decrease redundancies between conservation partners and will result in more effective and efficient conservation efforts. Ultimately, successful holistic conservation of wildlife can only be achieved through partnerships between public agencies, private organizations, and private individuals.

This strategy is a tool that provides additional information for planners and managers to use in making informed decisions, regardless of the location or extent of the land or water they manage. The intent is not to provide operational objectives, but to provide strategic goals on which operational plans can be based. The strategy provides a snapshot of wildlife conditions today, and when used with other plans, inventories and projects, will give managers additional insight to help develop options and make decisions.

Value to the DNR

The Constitution of the State of Michigan of 1963 (as amended), Article 4, § 52 states: 'The conservation and development of the natural resources of the State are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people.' To address this concern, the Michigan Legislature enacted Public Act 451, Natural Resources and Environmental Protection Act (as amended) and established the DNR and assigned its duties ('The department shall protect and conserve the natural resources of this State…'). Under the public trust doctrine, the DNR holds all wildlife, including mussels, snails, crayfish, insects, fish, amphibians, reptiles, birds and mammals, in trust for the benefit of the people of Michigan. This strategy is a tool that will aid the DNR in complying with its mandate, and can be integrated, as appropriate and applicable, into the DNR's many public trust responsibilities and management efforts. Many recommendations for conservation actions, research, surveys and monitoring presented within this strategy were drawn from existing DNR efforts.

Many DNR programs address the conservation of natural resources on a wide range of scales. At a statewide scale, planning efforts produce strategic analyses that provide direction for desired future condition of the landscape and suggest programs and activities required to fulfill diverse societal needs. At a regional scale, planning efforts identify the unique contributions of a particular region within Michigan to the desired future condition of the State's landscape and help to adapt programs and activities to that ecoregion or lake basin. At an operational scale, managers determine how their management activities contribute to the strategic direction set forth at the regional level. The framework presented within the WCS, as an organizing tool for understanding SGCN and their habitats, links and integrates the DNR planning efforts conducted at these different scales.

In addition, DNR programs reflect the broad range of benefits and values that people desire from natural resources. Natural resources and human needs change over time; the challenge of natural resource management is to adapt and adjust plans and activities in response to these changes while ensuring the health of natural resources into the future. This strategy is designed to change over time as the resource, human interests and societal needs change.

Value to Michigan's Residents, Visitors & Future Generations

This strategy provides information that can be used by any individual to assist in making decisions about how to manage land and water in ways that will benefit wildlife.

As this strategy is implemented, Michigan's citizens and visitors will potentially benefit from: enhanced wildlife-related recreational activities and experiences, such as bird watching, hunting and fishing; improved quality of life by having diverse and sustainable wildlife and habitats; and economic rewards associated with increased opportunities for nature tourism. Implementation of this strategy will also help to ensure sound management of our ecosystems, resulting in healthy and functioning natural systems that provide ecologically and economically important services such as flood control, nutrient and contaminant processing, soil maintenance, and carbon sequestration.

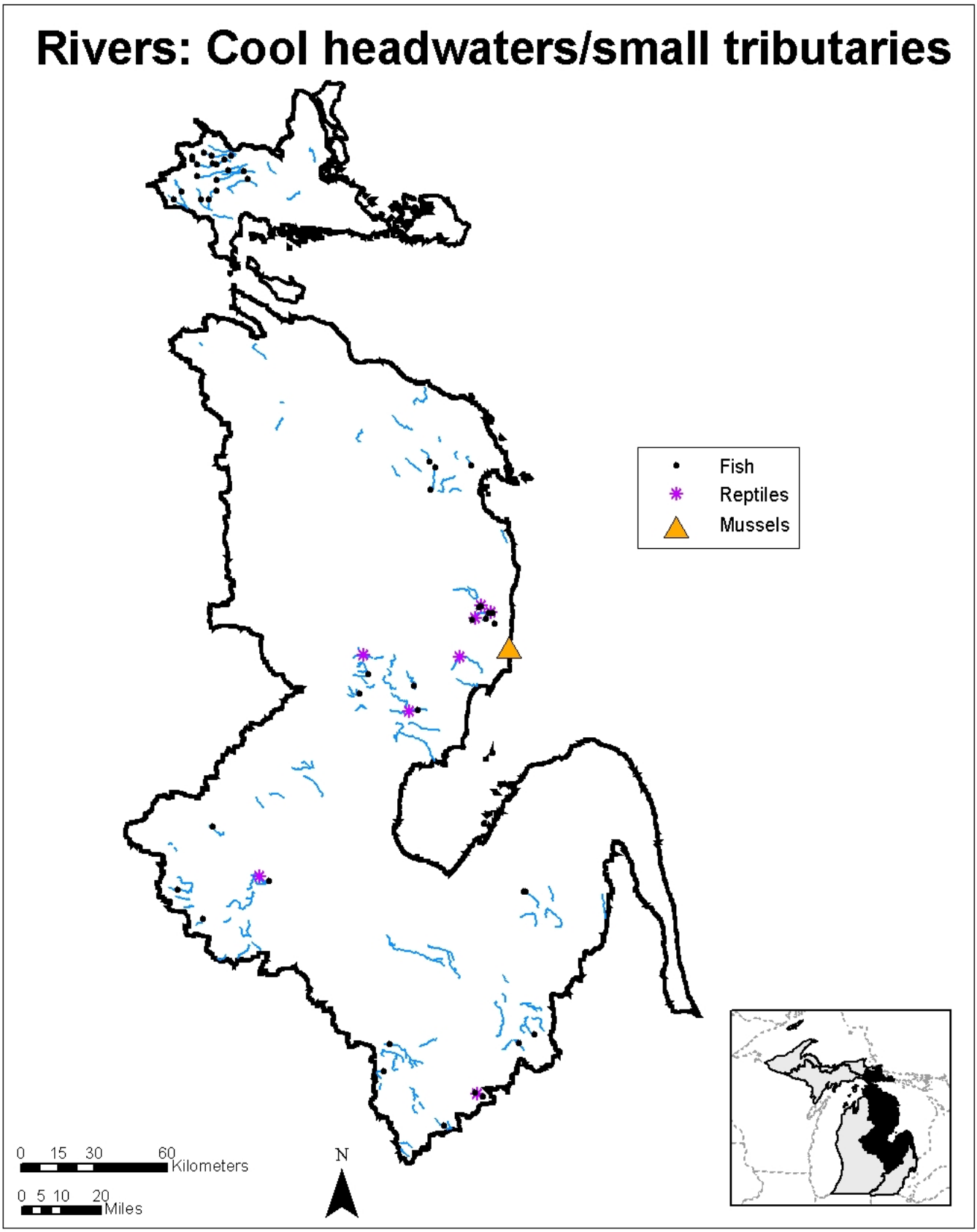
This strategy is expected to improve the allocation and use of Federal and State funds. Conservation and restoration of Federal and State threatened and endangered species tends to be an expensive and controversial process. Actions recommended within this strategy can help reduce these costs to Michigan's taxpayers by improving the status of species listed as threatened or endangered, assisting species in decline before they are listed, addressing potential threats before they become severe, and leveraging State dollars through partnerships with non-State entities.

In the short term, individuals will gain the satisfaction of having had an opportunity to influence the scope and future of resource management by participating in development of this strategy. In the long term, success of this strategy will enable residents and visitors to experience the diversity of Michigan's natural resources in perpetuity.

Comprehensive & Cooperative Conservation

By considering all landscape features in all ecoregions and lake basins and as many wildlife taxonomic groups as currently possible, the resulting conservation framework, including all potential filter levels, addresses much of the diversity and health of Michigan's wildlife. However, as this is the first edition of the WCS, gaps are present. The information and management approach presented within the strategy will require continued review and revision to fill the gaps and incorporate new information resulting from implemented actions, research, survey and monitoring efforts, and additional data contributed by conservation partners.

Although this strategy has been developed for use by all conservation partners, no implication of individual or organizational/agency accountability should be construed. Although some public agencies may have legal mandates to protect and conserve wildlife, the actions recommended herein are completely voluntary and non-regulatory, even though some recommended actions pertain to regulatory changes. Each conservation partner, whether government, tribe, organization or individual, will determine for itself which actions are most appropriate to help fulfill its mission and goals. Some of these decisions have already been made; that is, many of the conservation needs identified in this document were drawn from existing strategies and plans, and implementation of efforts to fulfill those needs may already be in progress. In this way, Michigan's conservation partners have already started on the path toward ensuring representation of the full diversity of Michigan's wildlife species and their habitats. Success will require continued coordination, cooperation and a common vision for the conservation of natural resources in Michigan.


Rivers: Cool headwaters/small tributaries
Fish
Reptiles
Mussels
0 15 30 60 Kilometers
0 5 10 20 Miles
N

Rivers: Cool Headwaters & Small Tributaries (Lake Huron Basin)

Description

Headwater streams and small tributaries are wadeable systems that have a midpoint catchment area (the land area above the midpoint of the stream from which water drains towards the stream) less than 40 square miles. These low stream order systems join together to form larger streams and rivers, or run directly into other streams, rivers, and lakes. They have great influence on the collective health and functioning of the primary stream network to which they belong. Headwater streams and small tributaries tend to be strongly affected by riparian vegetation.

Cool headwater streams and small tributaries are usually low-gradient, runoff-driven systems with fair to moderate baseflows and moderate to high peak flows. Many of these systems pass through unconfined alluvial valleys. July weekly mean temperature in cool headwater streams range from 19-22°C. These systems are common in the till plains of the Lake Huron basin.

General Condition of Feature

This habitat is considered 60% in good to excellent condition, 20% in fair condition, and 20% in degraded to very degraded condition.

Associated Species of Greatest Conservation Need

MUSSELS
rainbow (*Villosa iris*)

INSECTS
Hungerford's crawling water bettle (*Brychius hungerfordi*)

FISH
brassy minnow (*Hybognathus hankinsoni*)
striped shiner (*Luxilus chrysocephalus*)
finescale dace (*Phoxinus neogaeus*)

FISH cont.
fantail darter (*Etheostoma flabellare*)
least darter (*Etheostoma microperca*)
channel darter (*Percina copelandi*)

AMPHIBIANS
pickerel frog (*Rana palustris*)

REPTILES
Specific associations with this landscape feature were not found in the literature

Associated Threats

MODIFICATION OF NATURAL PROCESSES
- Altered hydrologic regimes: In-line ponds; Road crossings; Culverts

POLLUTION
- Altered sediment loads: Erosion; Sedimentation
- Thermal changes: Increased thermal loading

HABITAT CONVERSION
- Dams: Beaver dams; Impoundments
- Dredging and channelization: Dredging; Filling
- Riparian modification: Land use practices within stream corridors, for example logging, urbanization, agriculture, etc.

BIOLOGICAL INTERACTIONS
- Invasive plants and animals: (low threat)

CONSUMPTIVE BIOLOGICAL RESOURCE USE
- Forestry practices: Land use practices such as logging practices

EDUCATION
- Social attitudes:

Conservation Actions Needed (Threats addressed)

LAND & WATER PROTECTION
- Create or expand conservation easements (all threats)
- Support land conservancy purchase of undeveloped land (all threats)

LAND, WATER & SPECIES MANAGEMENT
- Avoid stream relocations (altered hydrologic regimes, altered sediment loads, dredging and channelization, riparian modification)
- Continue working with and educating Drain Commissioners (altered hydrologic regimes, altered sediment loads, dredging and channelization)
- Develop comprehensive management plans that consider all interest groups (all threats)
- Encourage use of, maintain, or establish riparian buffers of at least 50 ft., but 500 ft. or wider maximizes conservation benefits (altered hydrologic regimes, altered sediment loads, thermal changes, riparian modification, forestry practices)

- Engineered drainage channels should mimic natural stream channel stability (channel dimension, pattern, and profile) (altered hydrologic regimes, altered sediment loads, dredging and channelization)
- Explore other options to dams (i.e., seasonal electric barriers) (dams)
- Manage beaver populations for a variety of natural resource uses (dams)
- Remove dams to rehabilitate riparian & stream habitat and natural hydrology when possible (altered flows, altered sediment loads, dams)
- Rehabilitate channel diversity (dredging and channelization)
- Rehabilitate rivers to their original flow paths and hydrologic functions (i.e., seasonal flooding, connect meanders, throughflow, wetlands, etc.) (altered hydrologic regimes)
- Rehabilitate wetlands (altered hydrologic regimes, altered sediment loads)
- Work with road commissions to fix perched culverts and rehabilitate eroding stream crossings (altered hydrologic regimes, altered sediment loads)
- Work with road commissions to site and build effective new stream crossings (altered hydrologic regimes, altered sediment loads)

LAW & POLICY

- Assess dam siting to ensure minimal affects and require fish passage both upstream and downstream, using natural fishways (exp. Rock arch ramps and bypass channels) where feasible (dams)
- Continue regulating facilities that remove and discharge water into rivers (altered hydrologic regimes, thermal changes)
- Continue working with, developing, and refining planning and zoning regulations and ordinances (altered hydrologic regimes)
- Discourage and limit water withdrawals in flow limited and groundwater fed systems (altered hydrologic regimes)
- Enforce the use of sediment barriers and best management practice's during road siting, construction, and maintenance (altered sediment loads)
- Ensure that existing environmental laws are enforced (altered sediment loads)
- Protect and rehabilitate groundwater recharge by requiring that all development-related runoff be captured by infiltration basins (altered hydrologic regimes)
- Protect riparian greenbelts through adoption and enforcement of zoning standards (altered sediment loads)
- Protect the natural hydrologic regime of streams by protecting existing wetlands, floodplains, and natural upland areas (altered hydrologic regimes)
- Protect the public trust by requiring dam owners to make appropriate financial provisions for future dam removal or perpetual maintenance (dams)
- Redraft the Michigan Drain code (altered hydrologic regimes)
- Work with regulatory agencies to restrict dredging and channelization activities, especially during spawning & breeding and migration seasons and around mussel beds (dredging and channelization)

EDUCATION & AWARENESS

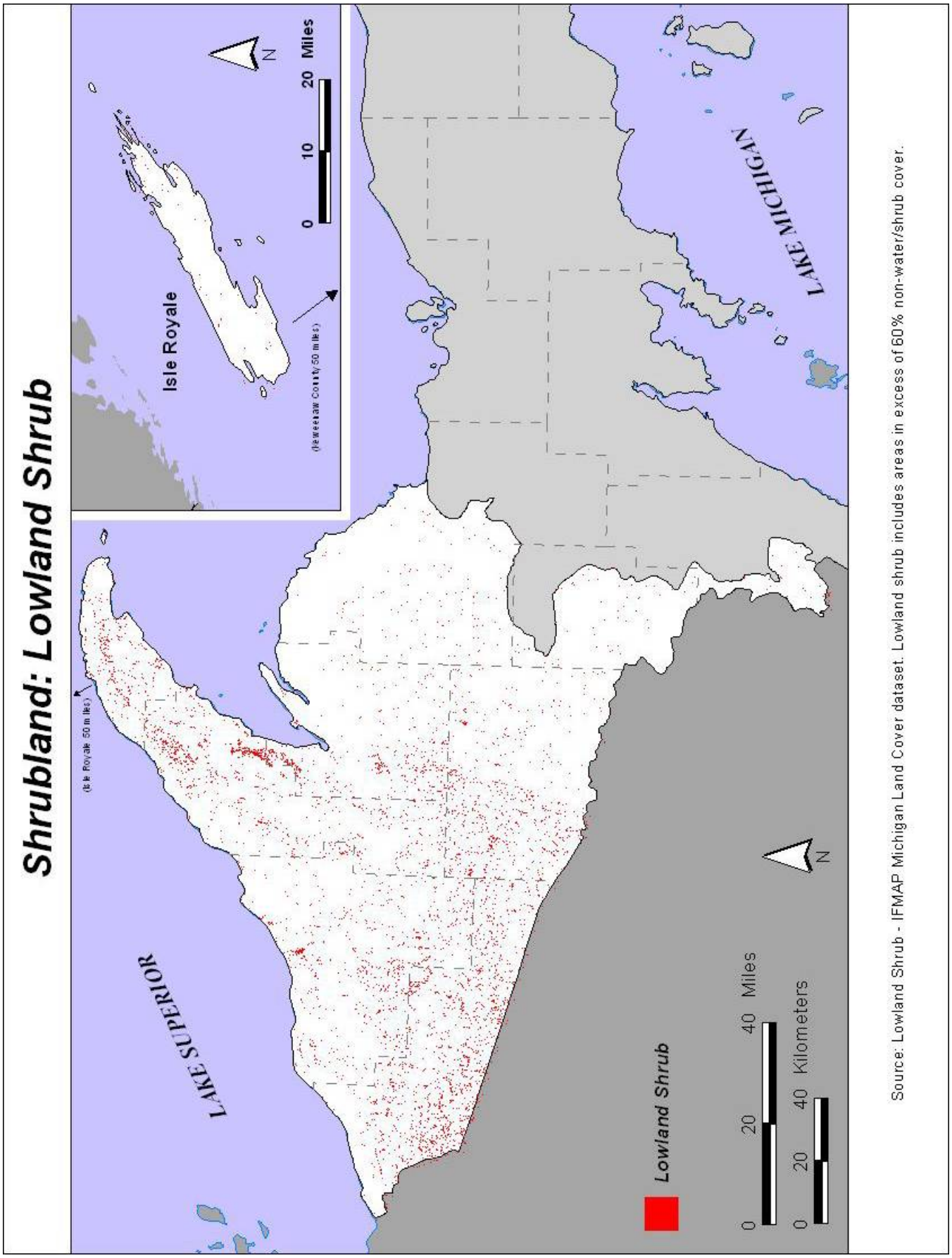
- Educate legislators, local planning boards, and other policy makers on the importance of natural processes
- Educate riparian land owners and townships on the importance of vegetated riparian buffers along streams (altered hydrologic regimes, altered sediment loads, riparian modification, social attitudes, thermal changes)

Research and Survey Needs

- Determine mussels distributions
- Determine use of cool headwaters and small tributaries by reptile SGCN
- Develop alternatives to current drainage practices
- Inventory dams and determine those which no longer serve a useful purpose
- Inventory erosion sites and conduct remediation activities

Monitoring

- Dam operations
- Dredging and channelization
- Indicator species
- Riparian modification
- Sediment loading
- Stream modification
- Water temperature


Shrubland: Lowland Shrub
Isle Royale
(Keweenaw County 50 miles)
(Isle Royale 50 miles)
0 10 20 Miles
N
LAKE MICHIGAN
LAKE SUPERIOR
Lowland Shrub
0 20 40 Miles
0 20 40 Kilometers
N
Source: Lowland Shrub - IFMAP Michigan Land Cover dataset. Lowland shrub includes areas in excess of 60% non-water/shrub cover.

Shrubland: Lowland shrub (Western Upper Peninsula Ecoregion)

Description

Lowland shrub areas have seasonally or permanently saturated soils and are dominated by woody shrubs. These areas are often adjacent to open wetlands, lakes, rivers, or streams. Many of these areas are disturbance dependent; windthrow, fluctuating water table, seasonal flooding, and beaver limit tree establishment.

General Condition of Feature

Much of the lowland shrub area in the Western Upper Peninsula is considered to be in fair to good condition (~60%) and many additional areas are considered in excellent condition (~25%). Most of the remaining areas are considered degraded.

Associated Natural Communities

Inundated Shrub Swamp
Northern Shrub Thicket

Associated Species of Greatest Conservation Need

SNAILS
- eastern flat-whorl *(Planogyra asteriscus)*

INSECTS
- incurvate emerald dragonfly *(Somatochlora incurvata)*
- frigga fritillary *(Boloria frigga)*
- freija fritillary *(Boloria freija)*
- hoary comma *(Polygonia gracilis)*

REPTILES
- blue racer *(Coluber constrictor foxii)*
- western fox snake *(Elaphe vulpina)*
- wood turtle *(Glyptemys insculpta)*

BIRDS
- American Black Duck *(Anas rubripes)*
- Sharp-tailed Grouse *(Tympanuchus phasianellus)*
- Northern Bobwhite *(Colinus virginianus)*
- American Bittern *(Botaurus lentiginosus)*
- Least Bittern *(Ixobrychus exilis)*
- Great Blue Heron *(Ardea herodias)*
- Green Heron *(Butorides virescens)*
- King Rail *(Rallus elegans)*

BIRDS cont.
- Wilson's Snipe *(Gallinago delicata)*
- American Woodcock *(Scolopax minor)*
- Black-billed Cuckoo *(Coccyzus erythropthalmus)*
- Yellow-billed Cuckoo *(Coccyzus americanus)*
- Long-eared Owl *(Asio otus)*
- Northern Flicker *(Colaptes auratus)*
- Northern Shrike *(Lanius excubitor)*
- Brown Thrasher *(Toxostoma rufum)*
- Golden-winged Warbler *(Vermivora chrysoptera)*
- Canada Warbler *(Wilsonia canadensis)*
- Eastern Towhee *(Pipilo erythrophthalmus)*
- Savannah Sparrow *(Passerculus sandwichensis)*

MAMMALS
- arctic shrew *(Sorex arcticus)*
- pygmy shrew *(Sorex hoyi)*
- water shrew *(Sorex palustris)*
- moose *(Alces alces)*
- southern bog lemming *(Synaptomys cooperi)*
- lynx *(Lynx canadensis)*
- snowshoe hare *(Lepus americanus)*

Associated Threats

MODIFICATION OF NATURAL PROCESSES
- Altered hydrologic regimes: Altered hydrologic regimes may contribute to the colonization of invasive plants and changes in the nutrient load due to run-off. Changes in the incidence of flooding may impact species composition and system health.
- Fragmentation

HABITAT CONVERSION
- Industrial, residential and recreational development: Road construction impacts run-off, nutrient and chemical loads, drainage patterns, and the rate of water flow.
- Wetland modifications
- Conversion to agriculture: Landowners don't recognize the value of shrublands and convert theirs to other features which may have differing values to wildlife (e.g. food plots).
- Incompatible natural resource management

POLLUTION
- Urban, municipal, and industrial pollution: Run-off from adjacent uplands impacts the nutrient load in bordering lowlands.
- Pesticides and herbicides: Run-off from adjacent uplands impacts the nutrient load in bordering lowlands.

NONCONSUMPTIVE BIOLOGICAL RESOURCE USE
- Non-consumptive recreation: Lowlands are sensitive to uncontrolled ATV and ORV use.

BIOLOGICAL INTERACTIONS
- Invasive plants and animals: Invasive plant species such as glossy buckthorn *(Rhamnus frangula)* may impact species composition.

EDUCATION

- Social attitudes: There is a lack of attention focused on shrublands as they aren't as prominently advocated as forest, wetland, and grassland features. Shrublands aren't easily defined as they are a transitory stage on the landscape. Some members of the general public do not like older thickets for aesthetic reasons.

Conservation Actions Needed [Threats addressed]

LAND & WATER PROTECTION

- Expand conservation easement programs [variety of threats]
- Support and expand conservation purchase of high quality occurences [variety of threats]

LAND, WATER, & SPECIES MANAGEMENT

- Reduce and disperse effluent flows to minimize flooding. [Altered hydrologic regimes; Wetland modifications]
- Develop and implement plans for invasive species control and prevention. [Invasive plants and animals]
- Consider wildife values, timber values, and natural landcover and conditions when selecting vegetative species composition as part of management of these areas [Incompatible natural resource management]
- Support Landowner Incentive Programs to foster conservation on private land [variety of threats]

LAW & POLICY

- Develop stronger wetland protection and mitigation laws. [Altered hydrologic regimes; Urban, municipal, and industrial pollution; Pesticides and herbicides; Industrial, residential, and recreational development; Wetland modifications]
- Work with municipalities to promote planning and zoning insuring adequate protection for lowland shrub or their conversion to features that have greater value to wildlife. Develop ordinances to retain larger parcel sizes in shrublands. [Fragmentation; Industrial, residential, and recreational development; Conversion to agriculture]
- Develop and enforce pollution control and prevention regulations. [Pesticides and herbicides; Urban, municipal, and industrial pollution]
- Ensure that local setback ordinances are enforced. [Industrial, residential, and recreational development]
- Develop and enforce regulations to curtail recreational activities that cause significant damage. [Non-consumptive recreation]

EDUCATION & AWARENESS

- Educate private landowners on the value of lowland shrublands to wildlife. [Social attitudes]

RECREATION

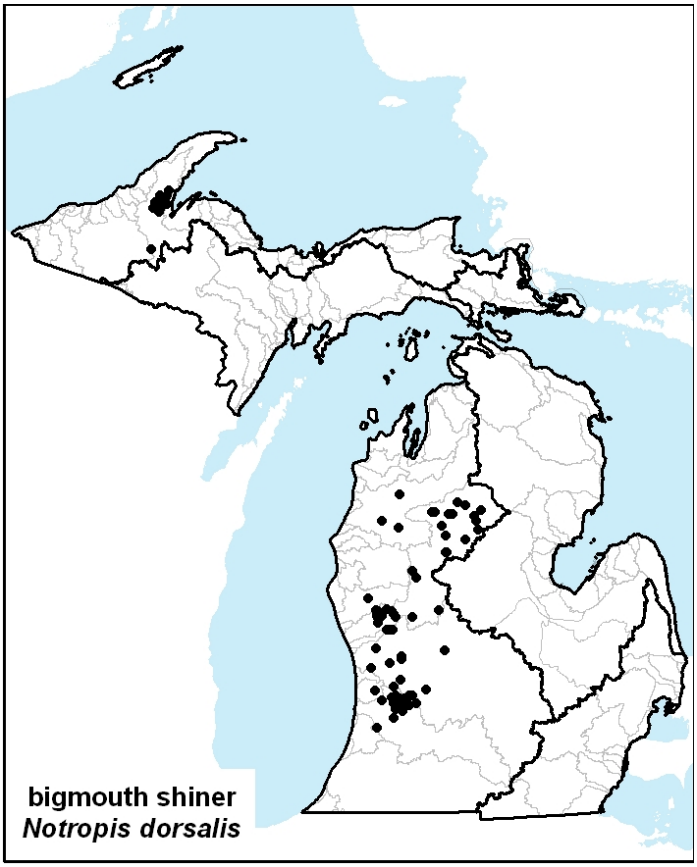
- Promote responsible ATV and ORV use in shrublands. [Non-consumptive recreation]

Research and Survey Needs

- An inventory needs to be conducted to determine the location, condition, and classification of remnants and of the opportunities for restoration.
- Test the assumption that remnants are widely dispersed and becoming more fragmented resulting in a loss of species diversity.
- A better understanding is needed of the management needs and appropriate management techniques to maintain and improve lowland shrub features.
- A better understanding is needed of the temporal distribution of fire and its influence.
- A better understanding is needed of the history of lowland shrub sites. Many sites have been retained through cultural activities that foster maintenance of lowland shrub features. Old agricultural areas with installed tiling that is failing may account for many lowland shrub sites.
- Techniques need to be developed using remote sensing and physical inventorying to create digital data sources for use in research and planning.
- Determine the impacts of nutrient inflow on lowland shrub systems. Many of these systems are adjacent to agricultural land and tend to accumulate nutrients.
- Identify sources of disturbance and their impacts. These were likely to involve hydrologic regimes and wind movement historically.
- Determine the value of pasturing livestock for creating, maintaining, and degrading lowland shrub sites. Pasturing may prevent succession to more forested feature types or it may prevent the establishment of shrubs in lowland grasslands.
- Identify the characteristics of lowland shrub systems that contribute to their value to wildlife and which species may be affected by changes in these characteristics.

Monitoring

- Identify and track the acreage and distribution of shrub communities in multiple successional stages.



bigmouth shiner

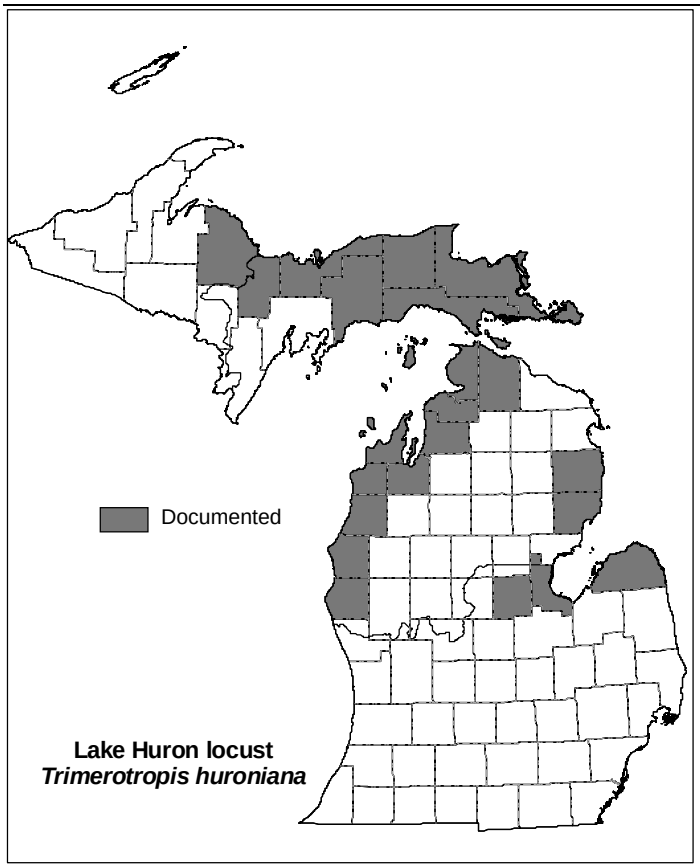
(Notropis dorsalis)

DISTRIBUTION & ABUNDANCE: Proposed special concern species. Experts believe there has been a 50% reduction in the number of occurrences compared to historic records. Abundance is unknown.

ASSOCIATED LANDSCAPE FEATURES: small lakes; medium lakes; cool headwaters & small tributaries; warm headwaters & small tributaries; cool medium rivers; warm medium rivers; cool large rivers; warm large rivers; gradient: slow; gradient: moderate; rock substrates; soft substrates; turbid water; clear water

ASSOCIATED THREATS: altered nutrient inflows; other biological interactions (hybridization, competition with silverjaw minnow, *Notropis buccatus*); riparian modification; urban, municipal & industrial pollution

COMMENTS: Spawning habits and movements are unknown. The silverjaw minnow has been suggested to be displacing the bigmouth shiner; this relationship needs to be further explored. Population status needs to be determined.



Lake Huron locust

(Trimerotropis huroniana)

DISTRIBUTION & ABUNDANCE: Occurs in dune areas along the Great Lakes shoreline in the Northern Lower Peninsula and Eastern Upper Peninsula. It is locally abundant where its habitat is suitable. Overall it is considered rare in Michigan and it is listed as a state threatened species. This species has a distribution limited to the upper Great Lakes and Michigan represents the core of the species distribution.

ASSOCIATED LANDSCAPE FEATURES: coastal dune/beach; Great Lakes island

ASSOCIATED THREATS: fragmentation; industrial/ residential/recreational development; invasive plants & animals; non-consumptive recreation

COMMENTS: Need surveys to assess abundance and distribution; need basic life history information; need to further identify threats. ORV traffic should be redirected around occupied areas. Due to dispersal limitations, the large-scale development of Great Lakes shoreline areas is likely to result in fragmentation of populations.

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