

## METHODS

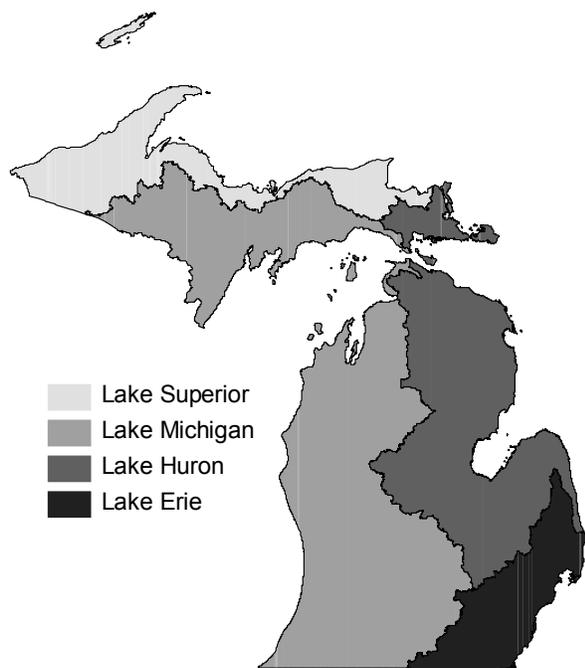
### Ecological Frameworks

Terrestrial and aquatic species use Michigan's spatial landscapes in significantly different ways. Thus, the WAP presents aquatic and terrestrial landscape feature data within two different but overlapping ecological frameworks.

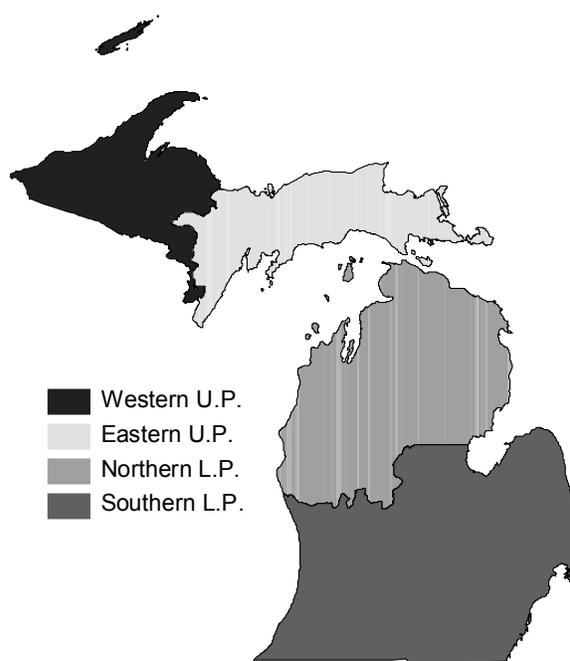
The ecological framework for aquatic landscape features is defined by the four Great Lakes drainage basins (Lake Erie, Lake Huron, Lake Michigan and Lake Superior) within the State (DNR 2005a; Fig. 2). The DNR and other agencies currently use this framework for planning, research and management activities. It also corresponds to conservation activities being conducted at the watershed scale within these lake basins.

The ecological framework for terrestrial landscape features is defined by Albert (1995; Fig. 3). The ecoregions identified by this framework are similar to those defined by Bailey et al. (1980). Again, many conservation partners in Michigan are already using this framework, and the DNR is using it to direct ongoing ecoregional planning activities.

The State Overview chapter provides brief descriptions of terrestrial ecoregions and lake basins, whereas the Landscape Features & Conservation Needs section provides detailed descriptions.



**Figure 2.** Lake basins framework.



**Figure 3.** Terrestrial ecoregions framework.

### Landscape Features

#### Identification

The 48 aquatic landscape features (Table 3) were based on an existing stream classification for Michigan (Seelbach et al. 1997), general wetland types (USEPA 2005a), lake features (Wetzel 2001,

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Kalff 2002), and other landscape components or characteristics identified through scientific literature review as important to a significant number of aquatic SGCN. Location/distribution maps of aquatic landscape features were generated using spatial data from several sources, including the DNR (Seelbach et al. 1997, Breck 2004, DNR 2004a, DNR 2005a), Detroit Zoological Institute (2005), Environmental Systems Research Institute (ESRI 2000), MNFI (2005), the National Ocean and Atmospheric Association (NOAA 2004), The Nature Conservancy (TNC; DePhilip 2001), the University of Michigan (2005), USFWS (USFWS 2005) and the U.S. Geological Survey (USGS 2005a). The maps are included in the Landscape Features & Conservation Needs section.

**Table 3. Aquatic landscape features**

Category	Landscape feature	Description
Great Lakes	Shoreline	0–3 m deep
	Nearshore	3–30 m deep
	Offshore	>30 m deep
Inland lakes	Ponds	Open water ≤5 acres
	Small lakes	Open water 5–99 acres
	Medium lakes	Open water 100–999 acres
	Large lakes	Open water ≥1000 acres
Lake characteristics	Wave-washed shore	
	Trophic status: eutrophic	
	Trophic status: mesotrophic	
	Trophic status: oligotrophic	
	Stratified	
	Connectivity: drainage	
Rivers	Cold headwaters/small tributaries	<40 mi <sup>2</sup> catchment area
	Cool headwaters/small tributaries	<40 mi <sup>2</sup> catchment area
	Warm headwaters/small tributaries	<40 mi <sup>2</sup> catchment area
	Headwaters/small tributaries	<40 mi <sup>2</sup> catchment area
	Cold medium	40–179 mi <sup>2</sup> catchment area
	Cool medium	40–179 mi <sup>2</sup> catchment area
	Warm medium	40–179 mi <sup>2</sup> catchment area
	Medium	40–179 mi <sup>2</sup> catchment area
	Cold large	180–620 mi <sup>2</sup> catchment area
	Cool large	180–620 mi <sup>2</sup> catchment area
	Warm large	180–620 mi <sup>2</sup> catchment area
	Large	180–620 mi <sup>2</sup> catchment area
	Very large	>620 mi <sup>2</sup> catchment area
	River characteristics	Gradient: slow
Gradient: moderate		5.0–9.9 ft/mi
Gradient: fast		10.0–69.9 ft/mi
Gradient: very fast		≥70.0 ft/mi
Banks: sand		
Banks: clay		
Banks: rock		
Wetlands	Intermittent	
	Bog	Characterized by floating or surface vegetative mats, such as sphagnum moss mats, and most of water is provided by precipitation

<b>Category</b>	<b>Landscape feature</b>	<b>Description</b>
	Fen	Nutrient-rich wetland fed primarily through ground and surface waters
	Ephemeral wetland	Semi-permanent wetlands that vary dramatically seasonally or annually
	Inland emergent wetland	Areas with permanent water dominated by non-woody vegetation that breaks the surface (e.g., marshes)
	Swamp	Areas with permanent water dominated by woody vegetation
	Floodplain	
Aquatic characteristics	Rock substrates	Bedrock, rock, cobble and gravel substrates
	Soft substrates	Sand, silt, mud and organic substrates
	Clay substrates	
	Vegetation	
	Woody structure	
	Turbid water	
	Clear water	

Land cover types common to several existing terrestrial classification systems were the basis for most of the 43 terrestrial landscape features (Table 4). Natural communities (MNFI 2003), the DNR's multi-scaled vegetation inventory (Donovan et al. 2004), general wetland types (USEPA 2005a), and other information were considered in the development of terrestrial features.

A description of the relationships between natural communities and terrestrial landscape features (Appendix C) was completed to help conservation partners identify how landscape features correspond with ongoing conservation efforts. These relationships also are described in the Landscape Features & Conservation Needs section. Many terrestrial landscape features correspond closely to higher-level natural community groupings (e.g., lowland shrub, savanna, bog). Review of scientific literature revealed that some land cover types not incorporated within the natural community classification are important to SGCN (e.g., agricultural lands) or highly prevalent within the State (e.g., urban and suburban/small town).

The terrestrial landscape features also correspond to many classes in the DNR's multi-scaled vegetation inventory (e.g., upland conifer forest, upland shrub, urban). However, some classes, including many forest classes, were too fine for use within this edition of the WAP because the information needed to differentiate their importance to SGCN was unavailable in the scientific literature. Other classes, such as 'herbaceous open land,' were too coarse; for example, the importance to SGCN and the susceptibility to threats of native grasslands differ from those of agricultural grasslands.

In addition to the land covers already discussed, several other landscape components and characteristics were identified through scientific literature review as important to a significant number of SGCN and at risk to threats. These landscape features, such as 'down woody debris' and 'large contiguous natural landscape,' are not captured by land covers and generally occur at scales much larger or smaller than the previously discussed terrestrial landscape features.

Location/distribution maps of terrestrial landscape features were generated using DNR and MNFI spatial data (DNR 2003a, DNR 2003b, Donovan et al. 2004, MNFI 2005) and are included in the Landscape Features & Conservation Needs section.

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**Table 4.** Terrestrial landscape features

<b>Category</b>	<b>Landscape feature</b>	<b>Description</b>
Grassland	Prairie	Natural grassland with <5% canopy cover
	Idle/old field	Grassland community of opportunistic species that colonized following cessation of long-term human disturbance (e.g., agriculture)
	Hayland	Agricultural grassland from which the 'grass' is harvested (including small grain crops)
	Pasture	Agricultural grassland used for grazing of livestock
	Row crop	Agricultural fields planted with a single species in evenly spaced rows and harvested annually
	Right-of-way	Linear grassland associated with roadways, railways, powerlines, pipelines and other linear human structures
	Fence row	A linear area of idle vegetation that interrupts large blocks of continuous grassland
	Savanna	Non-agricultural grassland with 5–60% tree canopy cover
	Orchard	Agricultural land with linear rows of fruit-bearing or early harvested trees, such as Christmas tree farms
Shrubland	Lowland shrub	Dominated by woody shrub vegetation in seasonally or permanently saturated soils
	Upland shrub	Dominated by woody shrub vegetation in moist to dry soils
Forest	Lowland hardwood	Seasonally or permanently saturated area dominated by moisture-tolerant hardwood trees and hydric soils
	Mesic hardwood	Hardwood forest characterized by moist soils
	Dry hardwood	Hardwood forest characterized by dry (xeric) soils
	Lowland conifer	Seasonally or permanently saturated area dominated by moisture-tolerant conifer trees and hydric soils
	Mesic conifer	Conifer forest characterized by moist soils
	Dry conifer	Conifer forest characterized by dry (xeric) soils
	Forest opening	Area of little to no canopy cover surrounded by forest; may be grassland or wetland
Inland wetlands/ water	Bog	Characterized by floating or surface vegetative mats, such as sphagnum moss mats, and most of water is provided by precipitation
	Inland emergent wetland	Area frequently or continually inundated with water and dominated by non-woody vegetation that breaks the surface (e.g., marshes)
	Submergent wetland	Area with permanent water dominated by vegetation that does not break the surface, generally occurring at edges of ponds, lakes and rivers
	Fen	Nutrient-rich wetland fed primarily through ground and surface waters
	Ephemeral wetland	Semi-permanent wetlands in which water levels vary dramatically seasonally or annually
	Swamp	Areas dominated by trees or shrubs with saturated soils during part of the year and standing or slowly moving water at other times
	Pond	Open water <5 acres
	Inland lake	Open water ≥5 acres
	Inland island	Island within an inland lake or river
	River/stream/riparian/ floodplain corridor	River or stream and the linear vegetation zone that borders and interacts with it
Great Lakes/coastal	Great Lakes offshore	Great Lakes area >30 m deep
	Great Lakes nearshore	Great Lakes area 3–30 m deep

<b>Category</b>	<b>Landscape feature</b>	<b>Description</b>
	Coastal emergent wetland	Great Lakes shoreline 0–3 m deep with vegetation dominated by non-woody plants (e.g., bulrush, cattail)
	Coastal dune/beach	Great lakes coastal, open landscape with minimal to moderate vegetation; includes sand, gravel and cobble substrates
	Alvar/rock	Various rocky shoreline along the Great Lakes, including bedrock lakeshores and rocky cliffs
	Great Lakes island	Island within a Great Lake
Other features	Edge	Transitional area between feature types
	Inland rock/cliff/ledge	Rocky area not located along the Great Lakes, such as cliffs or a rock outcropping
	Urban	High-density urban area
	Suburban/small town	Low-density urban area
	Cave/mine	Natural or artificial subterranean structure
Terrestrial characteristics	Snag/cavity	Standing dead trees or live trees with cavities
	Large contiguous unfragmented landscape	A relatively large area of a particular land-cover or a mosaic of land-covers that is unfragmented by industrial, residential or urban (low- or high-density) development
	Late successional forest	Characterized by a multi-layered canopy and complex structure, with trees of a diverse age-class distribution
	Down woody debris	Characterized by decaying wood matter of multiple decomposition classes and sizes

### General Condition

Information about the general condition of each landscape feature throughout the applicable ecoregion or lake basin was solicited from attendees at Regional Technical Workshops (see Table 7 in the Participation & Outreach chapter). Attendees 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 the general condition information for each landscape feature in the Landscape Features & Conservation Needs section. When applicable, regional and global statuses of associated natural communities are also provided as a measure of condition. Regional workshop participants were sometimes uncomfortable evaluating the general condition of landscape features, because many landscape features are broadly defined, participants found the term 'condition' to be ambiguous, and the information necessary to determine general condition for most features is currently unavailable or insufficient.

### **Species of Greatest Conservation Need**

#### Identification

Species of Greatest Conservation Need are limited to wildlife species (by definition, both aquatic and terrestrial) 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.

Species federally or State listed as threatened or endangered or identified by MNFI as 'special concern' (MNFI 2002) have already been recognized through their respective review and listing processes as being in need of conservation. Therefore, each of these 237 species was automatically included in the set of SGCN, even if the species is believed to be extirpated from Michigan. An additional 167 species also were identified as being in greatest need of conservation due to declining populations or other characteristics that may make them vulnerable.

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A draft set of SGCN was compiled from suggestions made by DNR and MNFI staff, and from review of: U.S.D.A. Forest Service (USFS) 'sensitive species' for national forests in Michigan (USFS 2004); Michigan species included on the International Union for Conservation of Nature and Natural Resources (IUCN) 'Red List' (IUCN 2003); birds identified as 'primary focus' species in TNC's 'Great Lakes bird ecoregional planning' report (Ewert 1999); birds identified through an analysis of the Partners in Flight's Species Assessment Database (Rocky Mountain Bird Observatory 2002); information available on Nature Serve's web site (Nature Serve 2004); and the Michigan Odonata Survey Master Database (University of Michigan Museum of Zoology 2003).

Individuals who were asked for SGCN recommendations were provided with a set of criteria for identifying species of greatest conservation need, suggested by the IAFWA Teaming with Wildlife Committee. Under the provided criteria, SGCN should include:

- Imperiled species (globally rare)
- Declining species
- Endemic species
- Disjunct species
- Vulnerable species
- Species with small, localized 'at-risk' populations
- Species with limited dispersal
- Species with fragmented or isolated populations
- Species of special (conservation) concern
- Focal species (keystone species, wide-ranging species, species with specific needs)
- Indicator species
- 'Responsibility' species (i.e., species that have the center of their ranges within a State)
- Concentration areas (e.g., migratory stopover sites, bat roosts/maternity sites)

Information was not available to fully address some groups, such as spiders and beetles. The need for further research to fill these and other knowledge gaps is provided in more detail in the Statewide Conservation chapter.

A list of Michigan wildlife species experts was compiled based on recommendations of DNR and MNFI staff and species experts themselves. This list of individuals (Appendix D) continued to grow throughout the action plan development process. These species experts were associated primarily with academic institutions, but also included DNR biologists, Michigan Department of Environmental Quality (MDEQ) employees, USFWS biologists, NGO-affiliated individuals and other non-affiliated individuals. Species experts were consulted throughout the action plan development process.

A revised set of SGCN was developed based on comments received at SGCN Workshops (see Table 7 in the Participation & Outreach chapter), comments from individual species experts, and information collected at the suggestion of species experts. Species experts were asked to make recommendations based on information from research and projects focused on Michigan wildlife, as well their personal observations and knowledge. Clarifications and additional suggestions were requested when necessary.

The revised set of SGCN was distributed for review and comment. Reviewers included species experts, DNR staff, individuals on the action plan listserve group (see the Participation & Outreach chapter), 120 Michigan conservation organizations, and attendees at public meetings. Additionally, the set of SGCN has been available for review and comment on the action plan website.

The set of Michigan wildlife species identified as SGCN is expected to change over time. As the action plan is implemented and goes through further review and revision, species will be added or removed

when new data indicate changes are warranted. During the development process, several species were added or removed due to availability of new information. An example of a late addition to the list is the evening bat. Until recently, this species had not been documented in Michigan since 1969 and was considered to be extirpated. In August 2004, however, an evening bat maternity colony was discovered in southern Michigan by Dr. Alan Kurta, one of our species experts. Because the evening bat is an edge-of-range species and little is known about its habitat needs in Michigan, it was added to the set of SGCN.

The process of identifying SGCN is not part of the State's official threatened and endangered species listing process; rather, it identifies species and their habitats that will be the focus of funds, conservation actions, research and monitoring associated with implementation of Michigan's WAP. However, information about SGCN acquired during development and implementation of the WAP may be referenced during future reviews and revisions of the State's threatened and endangered species list.

Additional information on each SGCN, including distribution and abundance, is given in the SGCN Status & Species-Specific Issues section. Spatially explicit data were not available for all known locations of SGCN and, therefore, some locations may not be included on distribution maps, even when mentioned in the accompanying text. Available data were of a variety of types, from a variety of sources. Aquatic distribution maps are based completely on documented locations of species, whereas the terrestrial maps are based on a mixture of documented locations and current range, with the data type reflected in the map legend. When location data for a species were limited, historical and more recent locations were combined to create a distribution map that more accurately represents the potential distribution of the species. When the distribution represented on the map differs significantly from the known current locations, this difference is recognized in the accompanying text.

#### Associating SGCN to Landscape Features

Each species in the set of SGCN was placed in one of three categories: Aquatic, Crossover or Terrestrial. Crossover species, such as dragonflies and amphibians, use both aquatic and terrestrial landscape features during all or some of their life cycles. Therefore, their associations with both terrestrial and aquatic landscape features were considered in discussions and analyses throughout development of the action plan.

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. The categories of importance assigned to each region/landscape feature/species association were:

- Principal: landscape feature is primarily used, essential, optimal and/or most preferred by the species in this ecoregion/lake basin
- Occasional: landscape feature is sometimes used and/or less preferred than the Principal landscape features in this ecoregion/lake basin
- Infrequent: landscape feature is rarely used and/or only used if the Principal or Occasional landscape features are not available in this ecoregion/lake basin
- Unknown: landscape feature is potentially used, but its importance to the species and/or frequency of use is unknown in this ecoregion/lake basin
- Not used: landscape feature is not used by the species in this ecoregion/lake basin

Some importance associations were later refined based on review by species experts and comments received at Regional Technical Workshops (see Table 7 in the Participation & Outreach chapter). The Associated Landscape Features listed in the SGCN Status & Species-Specific Issues section include all categories of importance, except "Not used." The Associated Species of Greatest Conservation Need included in the Landscape Features & Conservation Needs section are those species that were

found to have Principal, Occasional or Unknown importance associations with each landscape feature.

**Threats**

Identification

The Core Development Team (see the Participation & Outreach chapter) identified standardized threat categories and individual threats to landscape features and wildlife by modifying previously existing threat classifications for terrestrial and aquatic systems (Richter et al. 1997a, Salafsky et al. 2003). The same categories were used for both terrestrial and aquatic features, but the threats within these categories reflect the differences between these systems (Tables 5 & 6).

**Table 5. Aquatic threats**

<b>Category</b>	<b>Threats</b>	<b>Examples</b>
Habitat conversion	Wetland modifications	Draining wetlands, filling wetlands
	Riparian modifications	Marinas, seawalls, shoreline development, shoreline structures, vegetation clearing, habitat simplification, forest clearing, and other modifications along rivers, streams or lakes
	Dredging and channelization	Channelization, dredging, habitat simplification, navigation/shipping
	Dams	Hydroelectric dams, impoundments, beaver dams
	Incompatible natural resource management	Beaver management, trout management, management to convert habitat
Consumptive biological resource use	Mining practices	Inorganic (e.g., ore), organic (e.g., peat moss harvesting)
	Forestry practices	Removal of trees from forests and associated activities that have a direct influence on wildlife and landscape features, regardless of how well or poorly the practices are implemented (e.g., road construction, soil compaction, sedimentation, loss of interior forest habitat)
	Removal of wildlife	Legal harvest, illegal harvest, incidental harvest
Non-consumptive biological resource use	Macrophyte removal	De-vegetation of shoreline
	Non-consumptive recreation	All-terrain vehicles, snowmobiles, biking, jet skis
Pollution	Altered sediment loads	Siltation, stream bank erosion, riparian erosion, bed sediment-load changes, turbidity
	Altered nutrient inflows	Increases in nutrient inputs, changes in organic matter inputs, municipal pollution/waste, dissolved oxygen changes, fertilizers, changes in organic matter inputs
	Pesticides and herbicides	Agricultural, golf course, molluscicides/lampricides
	Urban, municipal and industrial	Urban runoff (e.g., oil, chloride), municipal pollution, industrial pollution (chemical), acid rain, oil and gas drilling/mining, gas stations
	Thermal changes	Surface runoff (urban, agricultural, golf courses), industrial pollution (thermal), water temperature increases (due to riparian vegetation removal, channelization)
Biological interactions	Invasive plants and animals	Invasive fish, invasive zooplankton, invasive molluscs, invasive plants, other invasive animals; includes native and exotic species

Category	Threats	Examples
Modification of natural processes	Disease, pathogens and parasites	largemouth bass virus, bacterial kidney disease, priscirickettsia, and yellow grub (fish); water mites & trematodes (mussels); and other diseases, pathogens and parasites
	Other biological interactions	Fish predators, hybridization, lack of predators, loss of key predators
	Climate change	Natural processes, human-influenced changes
	Altered hydrologic regimes	Water temperature changes, changes in flow regimes, surface runoff, interbasin water transfer, water withdrawal/dewatering
	Fragmentation	Dams, water temperature changes, highway projects, construction, bridge and pipeline crossings
Education	Lack of scientific knowledge	Lack of management or inappropriate management due to lack of knowledge
	Social attitudes	Persecution, ignorance, apathy
Unknown	Unknown	Unknown threats to landscape feature or species

**Table 6. Terrestrial threats**

Category	Threats	Examples
Habitat conversion	Industrial, residential and recreational development	Housing, industrial development, golf courses, ski areas, cell towers, wind farms, roads
	Wetland modifications	Tiling for agriculture, wetland filling for development
	Conversion to agriculture	Farms, plantations
	Dams	Impoundments, beaver dams
	Dredging and channelization	Changes to riparian corridors
	Incompatible natural resource management	Prescribed burn patterns and frequency, wetland and water-level manipulation, vegetative planting and manipulation, floodings and dam maintenance/removal
Consumptive biological resource use	Removal of wildlife	Legal harvest, illegal harvest, incidental harvest
	Forestry practices	Removal of trees from forests and associated activities that have a direct influence on wildlife and landscape features, regardless of how well or poorly the practices are implemented (e.g., road construction, soil compaction, sedimentation, loss of interior forest habitat)
	Removal of non-timber flora	Scientific collection, wildflower collection, mushroom harvest
	Mining practices	Oil and gas drilling, mineral extraction, peat moss mining
Non-consumptive biological resource use	Non-consumptive recreation	All-terrain vehicles, snowmobiles, hiking, biking, equestrian activities, jet skis
	Scientific research	Non-consumptive research
	Military maneuvers	Heavy artillery training, heavy equipment movements, bunker construction
Pollution	Urban, municipal and industrial	Solid waste, acid rain, oil and gas drilling/mining
	Pesticides and herbicides	Agriculture practices, golf course practices, mosquito control, gypsy moth control
Biological interactions	Invasive plants and animals	Expanding ranges, introduced plants, introduced animals, introduced predators, cats and dogs; includes native and exotic species

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	Disease, pathogens and parasites	West Nile Virus, Duck Virus Enteritis (duck plague), Leucocytozoonosis, Brainworm, Chytridiomycosis, Bovine tuberculosis and other diseases, pathogens and parasites
	Other biological interactions	Hybridization, loss of key predators
Modification of natural processes	Climate change	Natural processes, human-influenced changes
	Grazing and mowing patterns	Frequency of mowing, high-intensity grazing
	Altered fire regime	Fire suppression, challenges to using fire as a conservation tool
	Altered hydrologic regimes	Water withdrawal, drains, tiles, added water
	Fragmentation	Transportation infrastructure, rights-of-way
Education	Lack of scientific knowledge	Lack of management or inappropriate management due to lack of knowledge
	Social attitudes	Persecution, ignorance, apathy
Unknown	Unknown	Unknown threats to landscape feature or species

Threats to one species or landscape feature are sometimes the result of management actions intended to aid another. The intent of this action plan is not to resolve these conflicts, but to recognize they exist and to explore a process for resolving them.

Associating Threats to Landscape Features

Associations between threats and landscape features within each ecoregion and lake basin were based principally on the informed opinions of natural resource professionals because the scientific literature rarely presented information on regional susceptibility to threats by landscape features or wildlife species. Regional Technical Workshops (see Table 7 in the Participation & Outreach chapter) were attended by natural resource professionals from State, Federal and local agencies, NGOs, and universities. Attendees were asked to identify significant threats to landscape features within their ecoregion or lake basin of expertise. A list of potential threats, based on identified threats to SGCN associated with the landscape feature, was used as a starting point for discussion. The 'Associated Threats' and related comments given in the Landscape Features & Conservation Needs section are primarily the results of discussions at, and written comments from, the Regional Technical Workshops and subsequent contact with natural resource professionals, but also draw from previously existing strategies and plans, and reviewed scientific literature.

Threats at Regional and Statewide Scales

Natural resource professionals attending the Regional Technical Workshops were asked to give each threat a severity rank (high, medium, low, none, unknown) for their ecoregions or lake basins of expertise. These ranks were given numerical values and averaged to develop a mean severity value for each threat within each ecoregion and lake basin (Appendix E). Those threats with mean severity values at a medium to high level in all four ecoregions (10 threats) or all four lake basins (12 threats) were considered to be significant at the statewide scale and are described in greater detail in the Statewide Conservation chapter.

Discussions and feedback received at meetings and workshops, written comments from species experts and natural resource professionals, and reviews of scientific literature identified several other issues important to Michigan's wildlife. They were usually not associated with specific landscape features; most were larger scale issues, such as the need for landscape mosaics, the importance of bird migration stopover sites and wintering areas, hybridization, rarity, lack of knowledge on certain species and taxonomic groups, and the need for conservation and restoration of representative natural communities and systems. These issues are described in greater detail and addressed at a statewide scale in the Statewide Conservation chapter.

## **Identifying Conservation Action, Research, Survey & Monitoring Needs**

Conservation actions are those programs, projects or activities needed to address threats to wildlife species and their habitats. Research and survey needs generally address gaps in the collective knowledge of Michigan's conservation partners regarding species natural-history, natural resource relationships, or the effects of threats on landscape features and species. Monitoring addresses the need to periodically and systematically measure and assess changes to landscape features and species to determine whether their condition/status is changing and whether implemented conservation actions have been successful.

The conservation action, research, survey and monitoring needs for each landscape feature are discussed in the Landscape Features & Conservation Needs section. This information was primarily generated through discussion and comments at Regional Technical Workshops (see Table 7 in the Participation & Outreach chapter). The conservation actions discussed in the Statewide Conservation chapter were identified from four general sources: previously existing strategies and plans developed by State and national conservation partners; discussions at meetings and workshops; information and suggestions provided by species experts and natural resource professionals; and reviewed scientific literature. The description of recommended conservation actions, research, surveys and monitoring does not differentiate between efforts that may already be ongoing and those yet to be initiated. An analysis to clarify these differences is needed (see Identifying Priorities below for more details).

Conservation actions in the Landscape Features & Conservation Needs section and in the Statewide Conservation chapter are categorized according to a previously existing conservation action taxonomy (Salzer and Salafsky 2004) that was slightly modified for use in this action plan.

## **Identifying SGCN Needs Not Associated with Landscape Features**

The species summaries in the SGCN Status & Species-Specific Issues section were developed to provide basic natural-history information on SGCN and to address specific threats that cannot be addressed through conservation of landscape features alone. The susceptibility of each SGCN to each threat was primarily assessed based on information found in scientific literature. The categories of susceptibility assigned to each threat–species association were High, Medium, Low, None (not a threat to the species) and Unknown (a threat, but susceptibility of the species to the threat is unknown). The Associated Threats described in each species summary include all categories of susceptibility, except “None.” Some susceptibility values were later revised based on review by species experts and discussions with natural resource professionals.

The Comments provided in the SGCN summaries include conservation actions, research, surveys and monitoring needed to address the associated threats that will not be addressed at the landscape feature scale, as well as other issues important to conservation of the species.

## **Identifying Priorities**

This action plan 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 action plan begins, these partners will need to make decisions about their own priorities and abilities for implementing the recommended conservation actions, research and monitoring. As the scale of planning and implementation becomes finer, determining priorities for specific sites will become easier because the threats to be addressed will likely become more limited in number.

The introductory text that precedes the landscape feature summaries for each ecoregion and lake basin (Landscape Features & Conservation Needs section) identifies threats that natural resource professionals indicated as most severe in that ecoregion or lake basin. Additionally, the introductory

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text lists conservation actions that were most frequently recommended within each category of landscape features for that ecoregion or lake basin. If implemented, these conservation actions will likely have the greatest overall effect, as each will address multiple landscape features. Although there is some consistency between ecoregions and between lake basins, the priority conservation actions identified 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 ecoregions or lake basins are addressed at a statewide level.

The general introduction to the SGCN Status & Species-Specific Issues section also identifies recommended conservation needs most frequently repeated in different species summaries.

The Statewide Conservation chapter also addresses priorities at a statewide level. Threats addressed within the 'Priority Threats' discussion were identified by 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; conservation actions, research and monitoring implemented to fulfill conservation needs that address these threats will have a great influence on wildlife conservation statewide. Issues addressed within the 'Other Priority Issues' discussion were identified by participants at meetings and workshops as being of high importance to conservation of wildlife in Michigan; again, implementation of conservation efforts to fulfill identified conservation needs will have a substantial positive effect on wildlife statewide.

The final part of the Statewide Conservation chapter, 'Priority Conservation Needs,' provides additional priorities at the statewide scale, based on the information presented in the first two parts of the chapter, and priorities identified at workshops and through scientific literature review. As with the landscape feature and SGCN summaries, conservation needs repeatedly identified to address multiple threats and issues are recognized as priorities, because, successful implementation of conservation actions, research and monitoring to fulfill these needs would have a broader influence on wildlife conservation. Additional information for establishing priorities came from discussions with and comments received from conservation partners involved in the development of this action plan.

One of the first actions that must be completed following development of this document is an analysis of the extent to which conservation partners are already addressing particular conservation needs and implementing recommended conservation actions, research and monitoring. Gaps in coverage will become priorities for the DNR or other conservation partners with the resources to address them. Further analysis to determine which conservation partner is best able to implement each of the recommended efforts would also be valuable.

**Review & Revision (revised 10/01/08)**

A full review and revision of this action plan will be completed ten years after the final release of this first edition following the federal requirements tied to SWG funding, which mandates reviews of the action plan are not to exceed ten years.

Although a full review and revision will not occur until the 10<sup>th</sup> anniversary, this action plan should be considered a living document. As conditions in Michigan change, the recommended conservation actions, research and monitoring must be updated as needed to adapt to these changes and integrate new information that becomes available. The immediacy of existing and emerging threats may warrant amendment prior to the next scheduled review and revision process. Additionally, addressing gaps identified during the initial project period will be a high priority.

The action plan will be adapted as appropriate, integrating information from conservation actions, research, surveys and monitoring as implemented. New information is anticipated from several sources, including: additional conservation partners; new research and publications, such as the

Breeding Bird Atlas, Herp Atlas and Biodiversity Atlas; planning processes occurring during the intervening years, such as the currently ongoing review of State listed threatened and endangered species, watershed assessments, State forest certification, and the Michigan Bird Conservation Initiative's development of priority bird species; and an additional full review of more recently published scientific literature. The incorporation of this information will improve the common knowledge base of conservation partners, fill information gaps in the action plan, and continue to increase the value of the action plan to Michigan.

Updates of landscape feature and SGCN summaries may be required to incorporate new information. To reflect these changes, priorities will be re-assessed at statewide, ecoregion, lake basin, and species levels. Any future evaluation of priorities must also include results of the analysis to determine gaps in coverage as described in the Identifying Priorities text above. Gaps that remain unaddressed should become progressively higher priorities with each edition of the action plan.

The review and revision process followed will be very similar to that used to develop this first edition. As well as those steps described above, this will include: a full review of the set of SGCN, with the assistance of species experts; an evaluation of the landscape feature and threat frameworks, with consideration of feedback received from participating conservation partners that have been involved with implementation of the action plan; and attempts to encourage participation in workshops and workgroups from additional conservation partners (as described earlier, conservation partners include State, Federal and tribal agencies, local governments, conservation organizations, universities, private landowners, and other interested individuals). Additionally, each edition will incorporate program assessment information and evaluate the effectiveness and success of the action plan thus far.

### **Next Steps (revised 10/01/08)**

The vision represented by the WAP can only be achieved through the continued cooperation of Michigan's conservation partners. Initially, these cooperative efforts should focus on the following actions.

- Begin implementation of actions, research and monitoring to fulfill identified priority conservation needs and support continuation of efforts for those already ongoing
- Continue building a common knowledge base by increasing information sharing between conservation partners
- Deliver the information in the action plan to those who need it, in a format they can use
- Identify and engage additional participating partners
- Identify gaps in the first edition of the action plan that can be addressed prior to the formal review, revision and development of a second edition
- Discuss potential changes to the action plan that will improve the value of the next edition to conservation partners
- Begin collecting data necessary for the ten-year formal review and revision of the action plan

To be most effective, these actions will require extensive and ongoing coordination between conservation partners. As the coordinating conservation partner in the strategic planning process, the DNR has the responsibility to develop a management review structure that will:

- ensure and oversee integration of the WAP with related DNR programs/initiatives and those of other conservation partners;
- complete an analysis to determine the extent to which conservation partners are already addressing particular conservation needs and to identify gaps in this coverage, as described

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above within Identifying Priorities;

- oversee program assessments to ensure the conservation actions, research and monitoring identified in the action plan are being implemented;
- develop an outreach and education strategy to provide information to those who would benefit, to develop public support, and to continue soliciting participation of additional conservation partners in ongoing development and implementation of the WAP;
- develop a process for identifying priority issues for use of SWG funds, with consideration of other funding sources; and
- coordinate the formal ten-year reviews and updates needed between full reviews.