Chapter 6. Ohio's Habitats

The purpose of Ohio's State Wildlife Action Plan (SWAP) is to provide strategic and tactical direction for conserving wildlife diversity in Ohio. A rich diversity of wild animals is a valuable ecological, social, and economic asset for Ohio. Wildlife populations have been stressed by a number of factors such as invasive species, chemicals in the environment, and climate variability to name a few. However, in Ohio habitat quantity and quality are unquestionably the principal factors influencing the status of Ohio's wildlife species. Consequently, Ohio's SWAP is focused on habitats from an organizational standpoint. This habitat approach to organization of conservation threats and actions allows species to be arranged into manageable categories, with the habitats serving to focus the conservation threats and actions intended to benefit wildlife species. However, despite the fact that the Action Plan is organized around habitat categories, it is species that are the metric for determination of the success of conservation actions. Success of habitat-based conservation actions will be reflected in the condition of the fish and wildlife that inhabit them.

The majority of conservation actions, in order to benefit the most species, will be aimed at maintaining and improving their associated habitats. Implementation of habitat-based conservation actions is key to sustaining wildlife diversity in Ohio. Many of the threats and actions contained within the Plan may not be directly related to the species they are intended to benefit. However, the cumulative effect of these actions – direct upon habitats, indirect upon species – will lead to healthy and sustained wildlife populations. Actions that maintain and improve the quality, quantity, and connectivity of habitats will have as much positive impact on species as actions focused directly on the species themselves.

Like most other states, there is no single statewide comprehensive habitat classification system for Ohio. Ohio's SWAP draws from a number of habitat data sources to classify and categorize the diversity of habitat types across the state. Fifteen habitat categories form the basis for Ohio's SWAP – and these are based on Ohio's pre-settlement habitat, habitat information from the ODNR Division of Natural Areas and Preserves Natural Heritage Database Program, the National Land Cover Database, and expert opinions. The habitat categories chosen are somewhat broad, and often include several sub-habitat categories (e.g., Wetlands includes natural marshes, diked marshes, vernal pools, bogs, and fens). Arguments can be made for and against using broad versus very specific habitat categories. Our intent here was to choose habitat categories that identify landscape-scale terrestrial and aquatic ecosystems, and as mentioned above, provide an organizational framework for arranging of wildlife, and related conservation threats/actions. We felt that there was more utility in using broad habitat categories, and that the more specific sub-categories could be adequately addressed within the threats/actions under each broad category.

There are limitations to the habitat classification/categorization system that Ohio has chosen to use in this Action Plan. Information in the habitat chapters should be interpreted and used with these limitations in mind. These limitations stem primarily from the fact that it is not possible to fit a very complex and dynamic natural environment into a very structured systematic classification system. The interface between habitat boundaries is often not clearly delineated and habitat boundaries change over time. Habitats often tend to bleed into one and other – and "hybridize" to a degree. Habitats affect and are affected by surrounding habitats. The quality of habitat data varies – and often does not accurately reflect the true spatial extent and/or configuration of individual habitats. The natural world simply does not lend itself to fine scale mapping/classification, especially on a protracted temporal scale. Acknowledging that Ohio is an interwoven system of habitats, the information and maps in this Action Plan are intended to be used as a general guide for the types and distribution of habitats across the state.

6.0 Habitat Categories

Fifteen habitat categories provide the foundation for Ohio's SWAP. Split between terrestrial (7), aquatic (7), and one habitat type that encompasses both, they represent the breadth of Ohio's ecosystems – albeit on a relatively broad scale. The categories chosen are a reflection of the state of habitat data

available today. Finer scale habitat types within these larger categories are acknowledged and addressed within the conservation threats and actions for each of the following categories:

Terrestrial Habitats
Forests - Composition (oak-hickory, beech, etc.), Growth Stage (early successional through mature)
Grasslands - Prairies, Pastures/Hayfields, Old Fields
Wetlands - Marshes (Natural, Diked), Vernal Pools, Bogs, Fens
Lake Erie Islands
Oak Savannas
Boreal Communities
Caves & Mines
Artificial/Man-made Environments (Agricultural Fields, Skyscrapers, Bridges/Overpasses, Human Structures (boat docks, lowhead dams, etc.), Urban/Suburban Homes/Yards, Barns & Other Rural Structures)

Aquatic Habitats
Lake Erie
Lake Erie Tributaries
Ohio River
Ohio River Tributaries
Headwater and Small Inland Streams
Man-made Lakes and Ponds
Natural Lakes

6.0.1 Forests, Grasslands, Wetlands

The focus will be to identify strategies that will guide the Division on restoration, maintenance, and enhancement of these habitats and the diversity of wildlife species that occupy them. Emphasis will be on providing adequate quality and quantities of each of these habitat types to meet these goals. The management strategies for these habitats will be statewide in nature, leaving site-specific (Conservation Opportunity Area) initiatives to be addressed by individual tactical plans.

6.0.2 Lake Erie Islands, Oak Savannas, Boreal Communities, Caves & Mines

At the time of European settlement, Ohio's landscape was primarily a vast expanse of forest, with a few large grassland and wetland areas. Also scattered throughout the state, in smaller amounts, were other significant habitats – Ohio's primary examples of these include Lake Erie islands, oak savannas, the boreal (snowbelt) community, and both natural and man-made caves/mines. While most of our native wildlife needs will be addressed through the major terrestrial habitat programs (grasslands, forests, wetlands), some species (including several listed species) are dependent upon these very specialized habitat types that are not addressed by the major habitat programs. These habitat types generally occur in relatively small quantities and relatively isolated areas. They are capable of supporting types of wildlife with highly specialized habitat requirements or species at the fringe of their wider U.S. range – for example snowshoe hares were only found in boreal communities in northeastern Ohio. These habitats must be protected, and in some cases enhanced to ensure survival of several wildlife species. Management strategies will focus on providing adequate amounts of these habitats, and the focus will be much narrower in scope compared to the other terrestrial habitat programs.

6.0.3 Artificial/Man-made Environments (this habitat category contains both aquatic and terrestrial components)

Ohio is the 34th largest, 7th most populous, and 10th most densely populated state – consequently very little of this state has not been altered to some degree. The most significant alteration in terms of scale is the conversion of wetlands, grasslands, and forests to agriculture. Urban/suburban development is also extensive, and the amount of man-made infrastructure is significant. While the extensive alteration (and sometimes loss) of natural habitats has extirpated a number of species, many others have adapted and taken advantage of the food, shelter, and breeding habitat that man-made environments provide. Many species of wildlife feed in grain fields, peregrine falcons nest on skyscrapers, barn owls nest in old barns, bats utilize mines as hibernacula and bridge expansion joints/seams as roosting sites, and fish use docks,

piers, and bridge abutments for cover and feeding areas – just to name a few. Management strategies for this habitat category will revolve around ways to make existing and future development more wildlife friendly. Many opportunities exist to enhance man-made structures which simulate natural habitats for a variety of wildlife species.

6.0.4 Lake Erie, Lake Erie Tributaries

The Lake Erie program addresses Ohio's 2.24 million acre portion of Lake Erie. The lake's tributaries will be addressed separately for the purposes of this Action Plan, but are clearly an important component of the lake ecosystem, and affected by lake-related management strategies. Lake Erie's tributaries are important habitats for a number of lake species. The interjurisdictional nature of the lake (4 states and Ontario share this resource) complicates management, and necessitates constant communication and cooperation among partners. Lake Erie and its tributaries contain a diverse mix of economically important species (walleye, yellow perch, smallmouth bass), as well as rare species (lake sturgeon, popeye shiner, cisco, burbot). Invasive species and water quality issues affect our management ability on the lake more so than on most other aquatic ecosystems around the state.

6.0.5 Ohio River, Ohio River Tributaries

The southern boundary of Ohio includes 451 miles of the Ohio River. The Ohio River program will cover the mainstem and tributary embayments. Ohio River tributaries will be addressed separately, but clearly have a large influence on the river itself. Ohio River tributaries drain huge watersheds, impacting river water quality and flow. While the Ohio River is an extremely modified system due to the numerous dams, hydropower, and navigation systems, it contains many wildlife populations of economic, social, and ecological significance. Like Lake Erie, the interjurisdictional nature of the Ohio River (West Virginia and Kentucky share the river adjacent to Ohio) complicates management efforts and necessitates good working relationships with our partner states.

6.0.6 Headwater and Small Inland Streams

This program focuses on the inland streams that combine to create the primary tributaries to Lake Erie and the Ohio River. These are important habitats for a diverse assemblage of aquatic species, especially species that need good water quality and stream gradient to survive. A number of listed fish, mussels, crayfish, and aquatic insects are dependent upon these types of habitats. While primarily an aquatic wildlife habitat program, management strategies may also benefit species of terrestrial wildlife due to the importance of riparian corridor habitat. The strategies for this program will be statewide in nature, leaving site-specific (Conservation Opportunity Watersheds) initiatives to be addressed by individual tactical plans.

6.0.7 Man-made Lakes & Ponds

Between Lake Erie and the Ohio River, Ohio's numerous lakes and ponds support diverse populations of aquatic wildlife. These waters range from small farm ponds and borrow pits to large reservoirs. While functioning as important habitats for aquatic species, many were created for multiple purposes, some of which are incompatible with wildlife management. On-stream lakes are affected by, and in turn affect the stream they impound. Lake water quality may be compromised by silt and excess nutrients delivered by inflowing streams, and excessive withdrawal of water could exacerbate the downstream hydrologic alteration caused by the dam. Dam operation (timing, frequency, duration, and magnitude of water releases) also affects downstream hydrology and habitat.

6.0.8 Natural Lakes

The majority of Ohio's natural lakes formed in the aftermath of the most recent ice age. A few are post-glacial in origin, created from cutoff stream oxbows. There are 110 natural lakes in Ohio larger than five acres, covering a total surface area of 4,658 acres. These lakes occur in 21 of Ohio's 88 counties. Many of Ohio's natural lakes have been altered to some degree by human activities. Some lakes have been enlarged by the addition of levees or dikes, and some have had outlet control structures installed, or outlet streams enlarged, to allow for controlling of lake levels (Black 1991). While not a significant habitat on an acreage basis, several listed fish species occur in natural lakes (blacknose shiner, western banded killifish, Iowa darter, pirate perch).

6.1 Conservation Opportunity Areas (CO Areas)

The Division of Wildlife's approach to enhancing and maintaining the highest level of terrestrial wildlife diversity in the state is to use a conservation opportunity area concept to sustain viable populations of as many native species of wildlife as possible. The idea is to concentrate efforts and resources to provide all the necessary habitat requirements in a few, relatively large landscapes of major habitat types, along with the remnants of other significant but rare habitats, for species that are of limited distribution or have low populations.

Conservation Opportunity Areas (referred to as Focus Areas in Ohio's original CWCS) were identified for each terrestrial habitat category. Areas chosen are of sufficient size and quality to maintain viable populations of most native wildlife species dependent upon that particular habitat type. Within each CO Area the goal is the development of specific habitat objectives to benefit priority wildlife species as identified in state, federal, and regional conservation plans, and conducting a coordinated monitoring protocols to determine the success of these efforts. Within each terrestrial habitat category are detailed descriptions of the locations, habitat specifics, and management plans for each Conservation Opportunity Area.

This multi-scale conservation approach ensures the persistence and potential recovery of species at risk while simultaneously keeping the common species abundant. Several widely separated Conservation Opportunity Areas for each of the forestland, grassland, and wetland habitats have been selected to reduce the risk of extirpation of species as a result of natural disasters, disease outbreaks, etc. Typically, CO Areas are associated with relatively large holdings of public land where future land practices can be managed. In addition, they were selected because they contain the largest amount of the best remaining habitat of that type currently available. Within each CO Area the habitat requirements of the more vulnerable species were used to calculate the minimum area needed to maintain viable self-sustaining populations.

6.2 Conservation Opportunity Watersheds (CO Watersheds)

While many of Ohio's historically degraded streams/watersheds have received considerable funding and restoration efforts to improve habitat and water quality, many of the state's high quality (i.e., least impacted) streams have received less funding and attention. The objective of conservation opportunity watersheds is to prioritize high quality streams/watersheds on a statewide basis using a multi-metric approach involving stream monitoring results from four categories – physical habitat, biological integrity, biological diversity, and recreational opportunity. With limited funding dedicated to stream protection, the goal is to prioritize streams to make sure the funding that is available is well directed. It is less expensive to protect healthy streams/watersheds and their faunas than to try and restore them later.

Conservation Opportunity Watersheds (referred to as Focus Watersheds in Ohio's original CWCS) were identified from previous work in Ohio and were derived from *ODNR Candidate Streams for Protection and Restoration* (Figure 7). This system rates Ohio watersheds by integrating measures of physical and biological integrity, biodiversity, and recreational opportunity. All watersheds received a prioritization score which ranks their relative importance for protection and restoration activities. The DOW has identified 11 Conservation Opportunity Watersheds in which to concentrate efforts related to the aquatic portion of this SWAP (Figure 8). These include the highest scoring watersheds in Ohio. Watersheds in both the Lake Erie and Ohio River drainages representing all of Ohio's major ecoregions have been included. All have diverse habitat types with high aquatic life use designations and excellent biodiversity, and most are Ohio Scenic Rivers.

The state of Ohio has approximately 61,532 total miles of streams. Of the 4,223 named streams, more than 1,588 have had fish and or aquatic macroinvertebrate assemblages sampled. The majority of biological data collected from Ohio streams is stored in the Environmental Conservation Online System (Ohio ECOS), a statewide multi-agency biological database maintained by the Ohio Environmental Protection Agency. Although less than half of all Ohio streams have been sampled, virtually all of the unassessed streams are small headwater streams many of which have drainage areas of less than 20

square miles. Until these streams can be assessed, the CO Watershed designation will apply only to watersheds for which there is adequate data to make this determination.

A total of 17 stream attributes within four categories (physical habitat, biological diversity, biological integrity, and recreational opportunities) were used to rank Ohio streams. Each attribute had a minimum quantitative or qualitative value associated with it to allow the attributes to function as metrics. A brief description of each attribute is listed in Appendix 1. Streams were then scored on a met/not met basis for each of the 17 attributes.

As the result of this study, 196 Ohio streams (Appendix 2) were scored for each of the 17 attributes listed in Appendix 1. Streams that met 4 or more of the criteria are listed in Table 14. Approximately 71% of Ohio's land area is contained within the 11 Conservation Opportunity Watersheds.

Within the Lake Erie Tributaries and Ohio River Tributaries habitat categories are detailed descriptions of the physical and hydrological characteristics of the Conservation Opportunity Watersheds taken from Schiefer (2002). Data for figures showing land cover and protected lands in Conservation Opportunity Watersheds was provided by the ODNR Division of Natural Areas and Preserves' Natural Heritage Database Program.

Table 14. Ohio's Conservation Opportunity Watersheds.

Watershed*	**Prioritization Score**	**Ohio Drainage (mi^2)**
Little Miami River	14	1755
Grand River	11	705
Scioto River	11	6510
Paint Creek	11	
Big Darby Creek	13	
Little Darby Creek	10	
Muskingum River	11	8038
Kokosing River	9	
Walhonding River	9	
Great Miami River	10	3948
Stillwater River	6	
Cuyahoga River	8	425
Ohio Brush Creek	8	435
Little Beaver Creek	7	510
Maumee River	6	4862
Sandusky River	6	1420
Chagrin River	4	264
	Total:	28,872
	Ohio (land area):	40,953

Percentage of Ohio covered by Conservation Opportunity Watersheds = 71%
**Italicized* are important sub-watersheds within the CO Watersheds

Figure 7. Candidate streams for protection and restoration. Prioritization scores are out of a maximum possible 17 points (no streams scored higher than 14 points in this study).

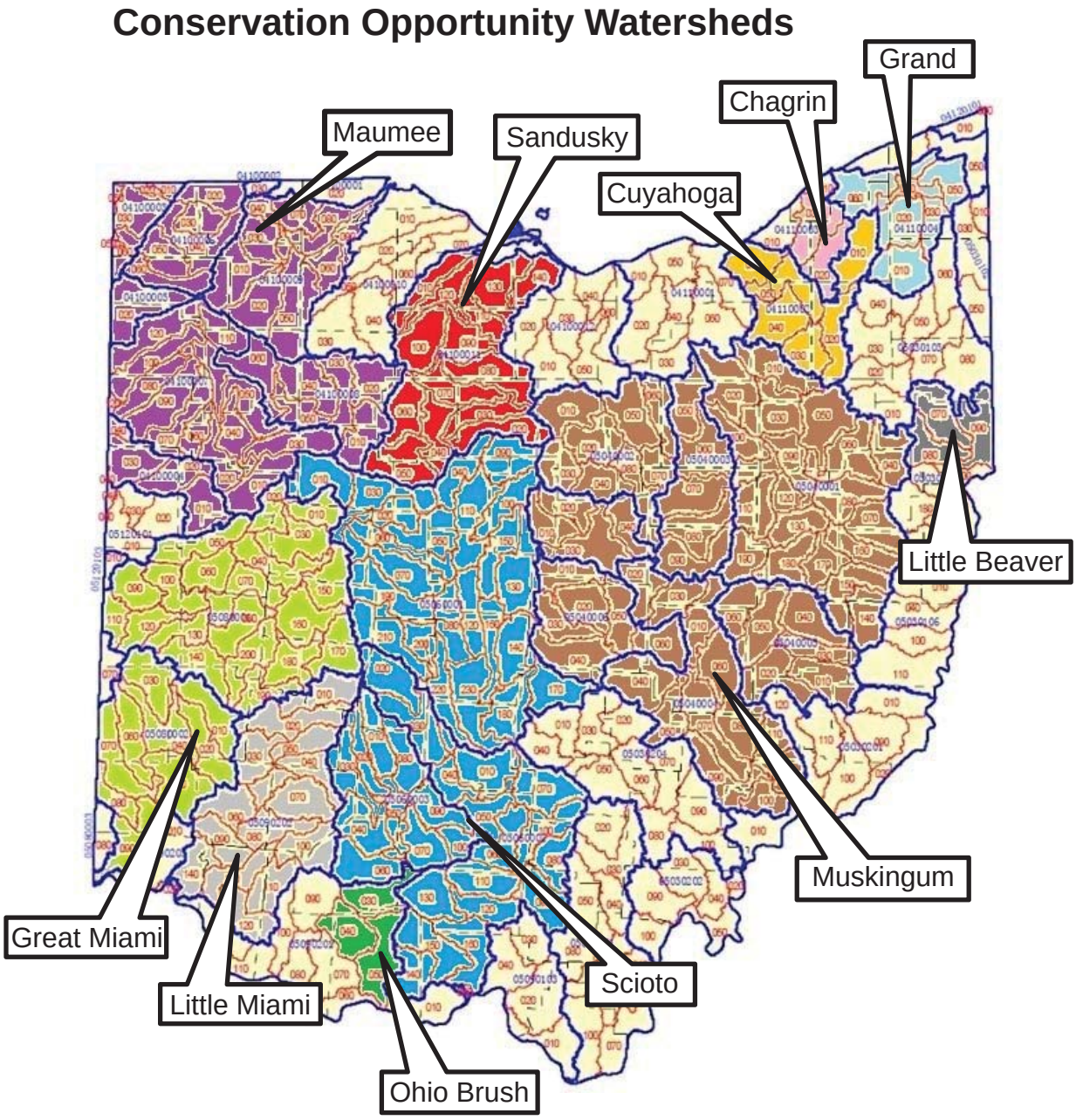

Figure 8. Conservation Opportunity Watersheds derived from candidate streams for protection and restoration (------ = HUC 8 basin boundaries). Each CO Watershed is color coded (Maumee, Sandusky, Cuyahoga, Chagrin, Grand, Little Beaver, Muskingum, Scioto, Ohio Brush, Little Miami, Great Miami).

Conservation Opportunity Watershed Objectives
The following issues and objectives represent a list common to all of Ohio's CO Watersheds. Watershed-specific information, threats, and conservation actions are contained in the aquatic habitat categories sections in this chapter.

Ohio's aquatic species and their habitats are continually impacted by development. An environmental review process established in Revised Code provides a means to influence the severity of those impacts.

- Impacts to fish and wildlife resources are minimized through a streamlined environmental review process for permits and projects.
- The amount of time needed to complete project reviews is minimal to help reduce impacts to aquatic species and their habitats.
- The environmental review process is consistent, especially within specific project categories, in order to minimize impacts to aquatic resources
- All projects conducted by ODNR staff are reviewed for compliance with applicable environmental regulations to minimize impacts to aquatic resources

Aquatic invasive species (AIS) negatively impact Ohio's aquatic species and their habitats statewide.

- Leadership on AIS issues in Ohio is provided by the Division which maintains an active role in the Ohio AIS Committee and regional and national AIS groups.
- Forward looking management and regulatory actions have been taken to reduce the introduction of new AIS into Ohio
- An effective and comprehensive AIS monitoring program is in place to provide for effective early detection of new AIS in Ohio.
- A system is in place to prioritize existing AIS problems focus management activities, prioritize AIS research, and focus outreach efforts.

Ohio's Conservation Opportunity Watersheds can serve as models for the restoration/enhancement of aquatic species and their habitats.

- Restoration of stream connectivity is a high priority among Ohio's conservation community
- Protection and/or restoration of riparian habitat on private and public lands is a high priority among Ohio's conservation community
- Education programs are in place at multiple levels to help the public understand the value of steams and watersheds.
- Additional sources of funding have been identified/developed for streams and watersheds projects.

A centralized database to facilitate Conservation Opportunity Watershed research and management activities will increase efficiency and effectiveness.

- The Ohio Biodiversity Database is a current and comprehensive storehouse of data related to the distribution of state-listed and other rare plant and animal species, significant natural habitats, geologic features and lands managed for conservation
- The Ohio Biodiversity Database is an effective tool to help direct conservation efforts - including environmental review, research, conservation planning and species listing decisions.

6.3 Conservation Threats/Actions Related to Habitat Categories

The tables following this section contain a summary of conservation threat impacts among Ohio's terrestrial and aquatic habitat categories. As suggested in AFWA's Best Practices for SWAPs guide, we used the definitions and hierarchical classification in Salafsky et al. (2008) *A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions* to describe and to categorize threats and actions. Adopting a consistent framework for threats and conservation actions will help ensure consistency across SWAPs and will facilitate the identification of shared threats across states.

Threat impact scores (Tables 15 & 17) were calculated using the IUCN Threats Calculator, with scores based on estimates of the scope, severity, and timing for applicable individual threats to the species or

ecosystem (Master et al.2012). Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Other categories of threat impacts are Negligible (used when scope or severity is negligible), and Not a Threat (used when severity is scored as neutral or potential benefit). See the Habitat Categories Template section for a more detailed description.

To help facilitate the order in which conservation actions may be carried out in the future, an objective way of prioritizing those actions was needed. A system described by the Georgia DNR in their SWAP, in our opinion, provided the consistency in method and appropriateness of ranking criteria to produce a logical and defensible priority order for conservation actions. Consequently, conservation action priority ranks (Tables 16 and 18) were determined using the seven ranking criteria developed by the Georgia Department of Natural Resources – Wildlife Resources Division (Georgia DNR 2005) where rating reflects the relative contribution or significance of a conservation action for each criterion. Internal species/habitat experts assessed the contribution of each conservation action for each of these criteria and assigned scores. The resulting point totals were used to sort the conservation actions into categories by priority. See the Habitat Categories Template section for a more detailed description.

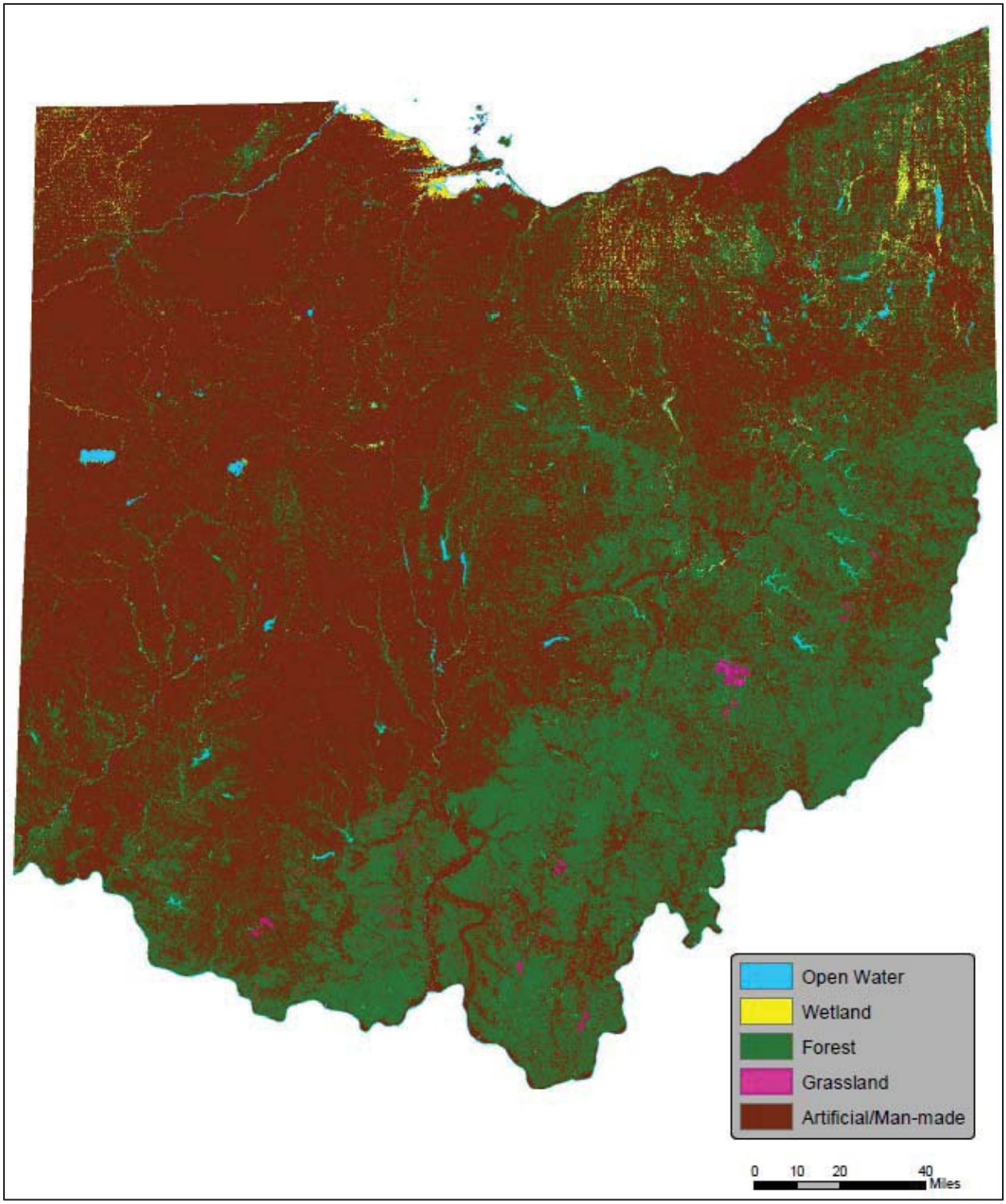

Figure 9. Ohio's State Wildlife Action Plan terrestrial habitat categories (*note: caves and mines not included, oak savannas included in grassland, boreal community included in forest*).

Table 15. Direct threats impact by habitat category for each terrestrial habitat, and overall threat impact for all terrestrial habitats combined. Overall threat impact is the threat impact averaged across all habitat categories, and rounded up when the average value fell between impact ranks.

DIRECT THREATS FOR 1st & 2nd LEVEL OF CLASSIFICATION*	THREAT IMPACT BY HABITAT CATEGORY								OVERALL THREAT IMPACT
	FOREST	GRASSLAND	WETLAND	LAKE ERIE ISLANDS	OAK SAVANNAS	BOREAL COMMUNITY	CAVES And MINES	ARTIFICIAL/ MAN-MADE ENVIRONMENTS	ALL HABITAT CATEGORIES
Residential & Commercial Development	medium	low	high	high	high	medium	medium	very high	high
housing and urban areas	high	low	high	high	high	high	medium	very high	high
commercial & industrial areas	low	low	medium	high	high	low	medium	very high	high
tourism & recreation areas	low	not a threat	low	high	low	low	medium	medium	medium
Agriculture & Aquaculture	low	medium	low	medium	low	low	negligible	high	medium
annual & perennial non-timber crops	negligible	very high	medium	high	low	low	negligible	very high	high
wood & pulp plantations	low	not a threat	negligible	negligible	medium	low	negligible	negligible	low
livestock farming & ranching	low	low	low	low	low	low	negligible	not a threat	low
marine & freshwater aquaculture	negligible	negligible	low	negligible	negligible	negligible	negligible	negligible	negligible
Energy Production & Mining	high	low	medium	low	low	low	medium	high	medium
oil & gas drilling	high	low	low	negligible	low	medium	low	high	medium
mining & quarrying	high	low	low	medium	medium	low	high	low	medium
renewable energy	low	low	medium	negligible	low	low	negligible	medium	low
Transportation & Service Corridors	low	negligible	high	high	low	medium	low	low	medium
roads & railroads	medium	negligible	high	high	medium	medium	negligible	low	medium
utility & service lines	medium	negligible	high	medium	low	medium	low	low	medium
shipping lanes	negligible	negligible	medium	negligible	negligible	negligible	negligible	negligible	negligible
flight paths	negligible	negligible	low	medium	negligible	negligible	negligible	negligible	low
Biological Resource Use	low	negligible	medium	low	low	low	low	low	low
hunting & collecting terrestrial animals	negligible	not a threat	low	low	low	negligible	low	negligible	low
gathering terrestrial plants	low	negligible	low	negligible	low	negligible	negligible	medium	low
logging & wood harvesting	medium	negligible	medium	negligible	low	low	negligible	negligible	low
fishing & harvesting aquatic resources	negligible	negligible	medium	negligible	negligible	negligible	low	negligible	negligible
Human Intrusions & Disturbance	low	low	medium	high	low	low	medium	low	medium
recreational activities	medium	negligible	medium	high	medium	low	medium	low	medium
war, civil unrest & military exercises	low	negligible	negligible	negligible	negligible	low	negligible	negligible	negligible
work & other activities	low	medium	medium	low	low	low	low	low	low
Natural System Modifications	low	low	medium	low	low	low	medium	medium	low
fire & fire suppression	low	negligible	low	negligible	medium	low	low	medium	low
dams & water management/use	low	negligible	medium	negligible	negligible	low	low	medium	low
other ecosystem modifications	low	low	low	low	low	low	medium	medium	low
Invasive & Other Problematic Species & Genes	medium	high	medium	high	medium	high	medium	medium	high
invasive non-native/alien species	high	medium	high	high	high	very high	high	high	high
problematic native species	low	high	low	medium	low	high	medium	medium	medium
introduced genetic material	low	low	medium	negligible	low	low	negligible	negligible	low
Pollution	low	low	medium	low	low	low	low	low	low
household sewage & urban wastewater	low	negligible	low	low	low	low	negligible	low	low
industrial & military effluents	low	negligible	low	low	low	low	high	low	low
agricultural & forestry effluents	low	medium	high	negligible	low	low	low	low	low
garbage & solid waste	low	negligible	low	low	low	low	low	low	low
air-borne pollutants	low	not a threat	low	negligible	negligible	medium	negligible	low	low
excess energy	low	negligible	low	negligible	negligible	low	negligible	low	low

Table 15. continued

Geological Events	low	negligible	low	low	negligible	low	low	negligible	low
volcanoes	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
earthquakes/tsunamis	low	negligible	low	negligible	negligible	low	medium	negligible	low
avalanches/landslides	low	negligible	low	low	negligible	low	low	negligible	low
Climate Change & Severe Weather	low	negligible	high	low	medium	medium	negligible	high	medium
habitat shifting & alteration	low	negligible	high	low	medium	high	negligible	high	medium
droughts	low	negligible	high	negligible	high	low	negligible	very high	medium
temperature extremes	low	negligible	medium	low	medium	low	negligible	medium	low
storms & flooding	low	negligible	high	low	low	low	low	high	medium
OVERALL THREAT IMPACT FOR EACH HABITAT	medium	low	high	high	medium	medium	medium	high	

*for each category, 1st level threats in **bold**, 2nd level threats in *italics*

Table 16. Conservation actions by habitat category for each terrestrial habitat, and overall action benefits for all terrestrial habitats combined.

ACTIONS FOR 1st & 2nd LEVEL OF CLASSIFICATION*	ACTION BY HABITAT CATEGORY								OVERALL ACTION BENEFIT
	FOREST	GRASSLAND	WETLAND	LAKE ERIE ISLANDS	OAK SAVANNAS	BOREAL COMMUNITY	CAVES and MINES	ARTIFICIAL/ MAN-MADE ENVIRONMENTS	ALL HABITAT CATEGORIES
Land/water Protection	high	high	high	medium	medium	high	high	high	high
site/area protection	high	high	high	medium	high	high	high	high	high
resource & habitat protection	medium	high	medium	medium	low	high	high	high	high
Land/water Management	high	medium	medium	medium	medium	high	high	medium	high
site/area management	medium	medium	low	low	low	medium	high	medium	medium
invasive/problematic species control	high	medium	high	high	medium	high	high	medium	high
habitat & natural process restoration	high	high	medium	medium	medium	high	high	low	high
Species Management	high	medium	high	medium	medium	high	medium	medium	high
species management	high	medium	high	high	medium	high	low	medium	high
species recovery	high	medium	high	low	medium	high	high	medium	high
species reintroduction	medium	medium	medium	low	medium	low	low	low	medium
ex situ conservation	medium	medium	low	low	low	medium	medium	low	medium
Education & Awareness	high	medium	medium	high	low	medium	high	high	high
formal education	high	medium	medium	high	low	high	high	high	high
training	high	high	medium	high	low	medium	high	medium	high
awareness & communications	low	medium	medium	high	low	low	high	high	medium
Law & Policy	high	medium	medium	medium	low	medium	medium	high	medium
legislation	high	high	medium	medium	low	low	high	high	high
policies & regulations	high	medium	medium	medium	low	medium	medium	high	medium
private sector standards & codes	medium	medium	medium	high	medium	medium	medium	medium	medium
compliance & enforcement	medium	medium	medium	low	low	medium	medium	medium	medium
Livelihood, Economic, & Other Incentives	low	medium	medium	low	low	medium	medium	medium	medium
linked enterprises & livelihood alternatives	low	high	medium	low	low	high	low	low	medium
substitution	low	medium	low	low	low	low	low	low	low
market forces	medium	medium	high	low	low	low	medium	medium	medium
conservation payments	medium	high	medium	low	low	high	high	medium	medium
nonmonetary values	low	low	low	low	low	low	high	medium	low
External Capacity Building	medium	high	medium	low	medium	high	high	high	high
institutional & civil society development	medium	high	medium	low	medium	medium	high	high	medium
alliance & partnership development	medium	high	medium	low	medium	high	high	high	high
conservation finance	high	high	medium	medium	medium	high	high	medium	high
OVERALL ACTION BENEFIT FOR EACH HABITAT	medium	high	medium	low	low	medium	high	medium	

*for each category, 1st level threats in **bold**, 2nd level threats in *italics*

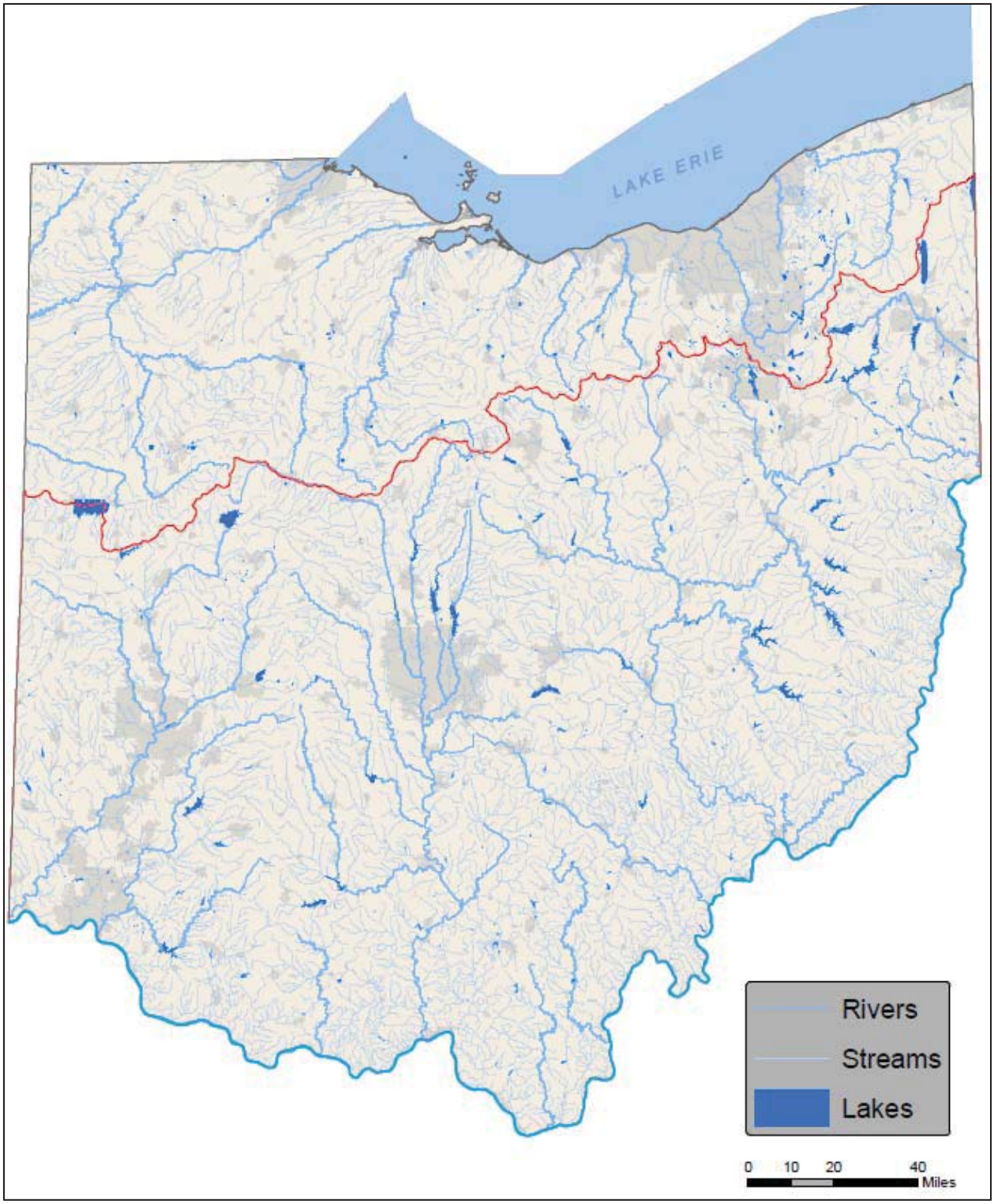

Figure 10. Ohio's State Wildlife Action Plan aquatic habitat categories. The red line separates the Lake Erie and Ohio River drainages.

Table 17. Direct threats impact by habitat category for each aquatic habitat, and overall threat impact for all aquatic habitats combined. Overall threat impact is the threat impact averaged across all habitat categories, and rounded up when the average value fell between impact ranks.

DIRECT THREATS FOR 1st & 2nd LEVEL OF CLASSIFICATION*	THREAT IMPACT BY HABITAT CATEGORY							OVERALL THREAT IMPACT
	LAKE ERIE	LAKE ERIE TRIBUTARIES	OHIO RIVER	OHIO RIVER TRIBUTARIES	HEADWATER & SMALL INLAND STREAMS	MAN-MADE LAKES & PONDS	NATURAL LAKES	ALL HABITAT CATEGORIES
Residential & Commercial Development	medium	medium	low	medium	high	low	high	medium
housing & urban areas	medium	medium	low	medium	high	low	very high	high
commercial & industrial areas	medium	low	low	low	medium	low	low	medium
tourism & recreation areas	low	low	low	low	not a threat	low	low	low
Agriculture & Aquaculture	medium	medium	low	medium	high	low	medium	medium
annual & perennial non-timber crops	high	high	low	high	high	low	medium	high
wood & pulp plantations	negligible	negligible	low	low	negligible	low	low	low
livestock farming & ranching	low	low	low	low	low	low	medium	low
marine & freshwater aquaculture	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
Energy Production & Mining	low	low	low	low	high	medium	low	medium
oil & gas drilling	negligible	low	low	low	high	medium	low	medium
mining & quarrying	negligible	low	low	low	low	negligible	low	low
renewable energy	low	low	low	low	negligible	negligible	negligible	low
Transportation & Service Corridors	medium	medium	medium	low	medium	low	low	medium
roads & railroads	low	low	low	low	high	low	low	medium
utility & service lines	negligible	low	low	low	low	low	low	low
shipping lanes	medium	medium	medium	negligible	negligible	low	negligible	low
flight paths	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
Biological Resource Use	low	low	low	low	low	low	low	low
hunting & collecting terrestrial animals	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
gathering terrestrial plants	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
logging & wood harvesting	negligible	negligible	low	low	high	negligible	low	medium
fishing & harvesting aquatic resources	low	low	low	low	negligible	low	negligible	low
Human Intrusions & Disturbance	low	low	low	low	low	medium	low	low
recreational activities	low	low	low	low	negligible	medium	negligible	low
war, civil unrest & military exercises	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
work & other activities	negligible	negligible	low	negligible	low	negligible	low	low
Natural System Modifications	low	medium	high	medium	high	high	medium	high
fire & fire suppression	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
dams & water management/use	low	medium	high	medium	high	high	medium	high
other ecosystem modifications	low	medium	low	medium	low	low	high	medium
Invasive & Other Problematic Species & Genes	high	high	high	high	low	medium	high	high
invasive non-native/alien species	high	high	high	high	low	medium	high	high
problematic native species	low	low	low	low	negligible	low	low	low
introduced genetic material	negligible	negligible	low	low	negligible	low	negligible	low
Pollution	high	high	high	high	medium	medium	high	very high
household sewage & urban wastewater	high	high	high	high	low	low	high	high
industrial & military effluents	low	medium	medium	medium	low	low	low	medium
agricultural & forestry effluents	very high	very high	high	very high	high	high	high	very high
garbage & solid waste	low	low	low	low	low	low	low	low
air-borne pollutants	low	low	low	low	low	low	low	low
excess energy	negligible	negligible	low	negligible	negligible	negligible	negligible	negligible

Table 17. continued

Geological Events	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
volcanoes	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
earthquakes/tsunamis	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
avalanches/landslides	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible
Climate Change & Severe Weather	low	low	low	low	medium	low	high	medium
habitat shifting & alteration	low	low	low	low	high	low	very high	medium
droughts	low	low	low	low	low	low	low	low
temperature extremes	low	low	low	low	low	low	negligible	low
storms & flooding	medium	medium	medium	medium	low	low	negligible	medium
OVERALL THREAT IMPACT FOR EACH HABITAT CATEGORY	medium	medium	medium	medium	high	low	high	

*for each category, 1st level threats in **bold**, 2nd level threats in *italics*

Table 18. Conservation actions by habitat category for each aquatic habitat, and overall action benefits for all aquatic habitats combined.

ACTIONS FOR 1st & 2nd LEVEL OF CLASSIFICATION*	ACTION BY HABITAT CATEGORY							OVERALL ACTION PRIORITY
	LAKE ERIE	LAKE ERIE TRIBUTARIES	OHIO RIVER	OHIO RIVER TRIBUTARIES	HEADWATER & SMALL INLAND STREAMS	MAN-MADE LAKES & PONDS	NATURAL LAKES	ALL HABITAT CATEGORIES
Land/water Protection	medium	medium	high	medium	high	high	high	high
site/area protection	low	low	medium	low	high	medium	high	medium
resource & habitat protection	medium	high	high	high	high	high	high	high
Land/water Management	high	high	high	high	medium	medium	medium	high
site/area management	medium	low	low	low	low	low	medium	low
invasive/problematic species control	high	high	high	high	low	medium	medium	high
habitat & natural process restoration	high	high	high	high	high	high	high	high
Species Management	low	low	low	low	medium	low	medium	low
species management	low	low	medium	medium	low	low	low	low
species recovery	medium	medium	low	low	low	low	medium	medium
species reintroduction	low	low	low	low	medium	low	medium	low
ex situ conservation	low	low	low	low	medium	low	medium	low
Education & Awareness	medium	high	medium	high	high	medium	high	high
formal education	low	low	low	low	high	low	medium	medium
training	high	high	high	high	high	medium	high	high
awareness & communications	medium	high	medium	high	medium	medium	medium	medium
Law & Policy	high	high	medium	high	high	medium	medium	high
legislation	high	high	medium	high	high	medium	medium	high
policies & regulations	high	high	medium	high	medium	medium	medium	high
private sector standards & codes	low	low	low	low	high	medium	low	low
compliance & enforcement	medium	medium	low	medium	medium	medium	low	medium
Livelihood, Economic, & Other Incentives	medium	medium	medium	medium	medium	medium	low	medium
linked enterprises & livelihood alternatives	low	low	low	low	low	low	low	low
substitution	low	low	low	low	low	low	low	low
market forces	medium	high	medium	high	low	medium	low	medium
conservation payments	medium	high	medium	high	medium	medium	low	medium
nonmonetary values	low	low	low	low	high	low	low	low
External Capacity Building	medium	medium	medium	medium	high	medium	medium	medium
institutional & civil society development	medium	medium	low	medium	medium	medium	medium	medium
alliance & partnership development	high	high	high	high	medium	high	low	high
conservation finance	low	low	low	low	high	low	medium	low
OVERALL HABITAT PRIORITY FOR ALL ACTIONS COMBINED	medium	high	medium	high	high	medium	medium	

*for each category, 1st level threats in **bold**, 2nd level threats in *italics*

6.4 The Habitat Categories Template

This section describes the information contained within each habitat category, and how that information is organized. The following template is used to describe all of Ohio's terrestrial and aquatic habitats:

6.4.1 Statewide Habitat Distribution Map

The maps indicate statewide habitat distribution based upon the best information available. Given the statewide scale, the accuracy of these maps is compromised relative to habitat boundaries, and the locations of isolated habitat fragments. The maps are simply intended to give the viewer a qualitative representation of the distribution of each habitat category, and are not meant to be used for any kind of quantitative habitat analysis.

6.4.2 Habitat Status

This section contains a brief assessment of the current condition, condition trend, size, statewide scale relative to other habitats, and general distribution for each habitat category. The total area in acres and/or miles for each habitat is estimated from the best GIS data available.

6.4.3 Habitat Description

A historical perspective on how the habitat has changed over time is presented here. Habitat condition and distribution is characterized using the best and most current information available. Effects of an increasing population, changing land use practices, industrialization and urbanization are presented and discussed. Present day ownership of each habitat, benefits to wildlife, as well as current issues are also discussed.

6.4.4 Associated SGCN

Each habitat chapter contains a list of SGCN associated with that particular habitat. These habitat associations are not exclusive, but represent the most important and highly used habitats for the species on each list. Species lists are grouped by taxa (mammals, birds, fish, reptiles, etc.), and the order of species within each taxa reflects conservation status rank, as described in Chapter 3 – Species of Greatest Conservation Need.

6.4.5 Conservation Opportunity Areas/Conservation Opportunity Watersheds

Within some of the habitat categories, conservation opportunity areas (terrestrial) and watersheds (aquatic) are highlighted. These areas were designated "conservation opportunity" because of the quality of the habitat they contain, and their ability to support populations of species of greatest conservation need. These attributes make them worthy of additional conservation efforts to preserve and enhance these ecosystems. Maps of each area, habitat descriptions, management plans, noteworthy species, and other pertinent information are contained in this section.

6.4.6 Conservation Threats Table

For each habitat/species assessment there is a table illustrating the results using the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system. The direct threats classification uses a hierarchical approach with 3 different levels. Each first level threat category is sub-divided into several second level categories, and these in turn are divided into third level categories. The classifications are comprehensive and exclusive for the first and second levels – consequently we limited our threat analysis to first and second level categories. Determination of specific threats for each individual habitat (and associated SGCN) was guided by the second level categories (see Tables 15 and 17). These habitat-specific threats were then grouped under the first level categories in the threat tables for each habitat, with references to the second level categories to which they apply.

With this system, threats are characterized by determining the scope, severity, and timing of each. Subsequently, threat "impact" scores were calculated using the IUCN Threats Calculator, with scores based on estimates of the scope, severity, and timing for applicable individual threats to the species or ecosystem (Master et al. 2012). The threat classification system is described in detail by Salafsky et al. (2008). In the habitat specific threats tables, each threat includes an impact rank calculated as described above.

Direct threats are in general limited to human activities – with the exception of geological events, climate change, and severe weather. The rationale for these exceptions is that when humans put pressure on species and ecosystems, the effects of natural events can be more detrimental than they would otherwise be (Salafsky et al. 2008).

The specific threats for each habitat and associated SGCN were determined using information from a number of sources. Internal and external habitat and species experts (many of whom participated in the development of SGCN lists) provided the majority of the information. Ohio's Natural Heritage Database, as well as the Division's fisheries and wildlife databases provided key information for determining threats. Numerous survey reports by the Ohio EPA were consulted, especially for aquatic habitats and species (see Literature Cited). In addition, information from publications on a number of species (e.g., birds, amphibians, crayfish, fish, mussels) was extremely useful in the development conservation threats. Other useful information was taken from surveys by the USFWS, USGS, USEPA, ORSANCO, and a number of in-state conservation groups. Chapter 3 Species of Greatest Conservation Need contains more comprehensive list of sources of information used.

6.4.7 Conservation Actions Table

For each habitat/species assessment there is a table illustrating the results using the IUCN-CMP classification of conservation actions described by Salafsky et al. (2008). The conservation actions classification uses a hierarchical approach with 3 different levels. Each first level action category is sub-divided into several second level categories, and these in turn are divided into third level categories. The classifications are comprehensive and exclusive for the first and second levels – consequently we limited our conservation action analysis to first and second level categories.

Conservation action priority ranks were then determined using the seven ranking criteria (see bullets below) developed by the Georgia Department of Natural Resources (Georgia DNR 2005) where rating reflects the relative contribution or significance of a conservation action for each criterion. Internal species/habitat experts assessed the contribution of each conservation action for each of these criteria and assigned scores (1-3 points for each). The resulting point totals were used to sort the conservation actions into three categories: high priority (17-21 points), medium priority (12-16 points), and low priority (7-11 points).

Each conservation action in the table was evaluated and assigned a priority score using the following criteria:

- Benefits for High Priority Species/Habitats
- Addresses Un(der)funded Needs
- Importance to Ongoing Local Efforts
- Timeliness or Urgency
- Connections with Other Conservation Actions
- Building Public Support for Wildlife Conservation
- Probability of Success