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MICHIGAN 2015 - 2025

LITTORAL ZONES

Wildlife Action Plan

Today's Priorities, Tomorrow's Wildlife

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WHAT ARE LITTORAL ZONES?

The Littoral Zone in lakes extends from the shoreline area that is influenced by wave action to the depth where sunlight can no longer pernetrate to grow aquatic plants. The size of the Littoral Zone in relation to the open water zone varies among lakes, and is largely dependent on lake basin morphology and accumulated sediments. In shallow lakes the Littoral Zone may extend far from the shoreline, whereas lakes with steep drop-offs will have a narrow littoral band. Littoral Zone plant communities are influenced by lake size and depth, water clarity, wave energy, and sediment composition. Shallow nearshore areas support emergent vegetation, such as cattails and rushes. As water depth increases, floating-leaf plants such as white and yellow water lillies become more abundant. Submersed aquatic plants, such as wild celery and a variety of pondweeds, occur at all depths but become dominant beyond depths of 10 feet. This diversity of plant life along with the microhabitats provided by sand, gravel, rock and organic substrates are essential for all lake-dwelling species, and provides the platform for the aquatic food chain. Aquatic plants provide crucial habitats at different life stages of many fish species. They serve as substrates for eggs and refuges for juvenile fish, as well as provide habitat for species that require plants for their existence (O'Neal and Soulliere 2006).

Healthy Littoral Zones are equally important to wetland wildlife, and often overlap with inland emergent wetlands. The distribution and abundance of aquatic plants directly influences foraging activity by ducks, geese, and wading birds. Some species of shorebirds are reliant on shallow, vegetated areas, while others depend on forage found in the mudflats of the upper Littoral Zone (Soulliere et al. 2007). Many ducks and other Littoral Zone-inhabitating birds nest in the emergent vegetation, and often incorporate aquatic plant material in the construction of their nests. Other wetland-dependent species, including amphibians and reptiles, rely on this habitat for breeding, rearing, and foraging. Several species of aquatic mammals spend much of their lives within the nearshore areas of the Littoral Zone.

Painted Turtle

Mallard

Pugnose Shiner

Largemouth Bass

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WHAT USES LITTORAL ZONES?

WHY ARE LITTORAL ZONES IMPORTANT?

The Littoral Zone in inland lakes is the nearshore area occupied by emergent, floating-leaf, and submersed aquatic plants. This relatively shallow water area is the interface between the adjacent uplands and the open waters of the lake, and as such, contributes significantly to the productivity and overall metabolism of the lake. Healthy Littoral Zones contain a diversity of plant types that are the habitats for all types of animals: invertebrates, fish, amphibians, reptiles, shorebirds, waterfowl, and mammals. The aquatic plants growing in the Littoral Zones play an important role in maintaining water quality by absorbing phosphorus, nitrogen, and other nutrients in the water that could otherwise cause nuisance algal blooms. Healthy stands of floating-leaf and emergent plants protect the shoreline by dissipating erosive wave action. Quality recreational fisheries depend directly on the condition of the Littoral Zone. Fish and wildlife resources associated with Littoral Zones in Michigan Lakes are vast and provide significant recreational, ecological, and economic benefits to the citizens of the state. Fishing, waterfowl hunting, and wildlife viewing are important cultural activities collectively valued in the millions of dollars.

PLAN CONTRIBUTORS

Michigan Department of Environmental Quality

Michigan Department of Natural Resources

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WHAT IS THE HEALTH OF LITTORAL ZONES?

Littoral Zones can be impaired by human disturbance associated with agricultural and urban land uses, and connectivity is severely limited by high levels of fragmentation from dams (Cooper et al., in preparation). Increased nutrient loading and demand for unobstructed boating and swimming have resulted in routine and often dramatic removal of aquatic vegetation in many Littoral Zones. Many Littoral Zones in Michigan have been altered by shoreline armoring and removal of fallen trees. The greatest degree of change has occurred in the Littoral Zones of larger lakes and lakes in the southern portion of the state (Wehrly et al. 2012).

GOALS

- Increase protection of Littoral Zone habitats including natural shorelines and associated wetlands, native floating, emergent, and submergent vegetation, large wood, and native riparian vegetation.

Hardened Shoreline

Construction of seawalls fragment the interface between the uplands and the Littoral Zone preventing free movements of wildlife. Seawalls also remove the natural energy dissipating capacity of a sloped shoreline and natural vegetation resulting in increased erosive energy along the shoreline and increased scour in littoral zones.

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WHAT ARE THE LITTORAL ZONES FOCAL SPECIES?

Where we are now and what we think we can realistically achieve over the next 10 years.

Pugnose Shiner
(Notropsis anogenus)
State Endangered

The Pugnose Shiner is a little, straw-colored minnow with a distinctively small, upturned mouth. This species has a dark lateral band that extends from the tail through the eye and around the snout. The Pugnose Shiner inhabits clear, well-vegetated lakes and vegetated pools in low gradient rivers, and requires dense stands of aquatic plants in nearshore areas (Scott and Crossman 1973, Trautman 1981). Historically this species was found in 18 watersheds in Michigan's Lower Peninsula. In the past 20 years, the Pugnose Shiner is known from only three locations. This species is rare or critically imperiled throughout its range.

GOALS

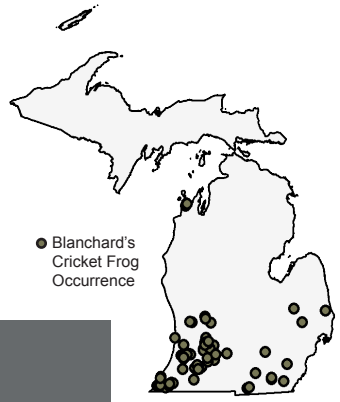
- Maintain existing populations.
- Develop a better understanding of critical life stage characteristics and habitat use.

Starhead Topminnow
(Fundulus dispar)
Special Concern

The Starhead Topminnow is a small, olive-tan minnow-like fish with a series of red to brown spots arranged horizontally along the sides. This killifish has a conspicuous gold spot on top of the head. Starhead Topminnows inhabit shallow, quiet waters with an abundance of submersed vegetation (Becker 1983). This species is uncommon, and any reductions in its populations or habitats could cause it to become state threatened.

GOALS
- Establish baseline status and distribution.
- Develop a better understanding of critical life stage characteristics and habitat use.

GOALS
- Establish baseline population status and distribution.



Blanchard's Cricket Frog
(Acris blanchardi)
State Threatened

Blanchard's Cricket Frog is a member of the treefrog family. Adults have moist, warty skin that is gray, reddish brown, green, or olive colored. As their name implies, Blanchard's Cricket Frogs are small, only 1.5 inches. Blanchard's Cricket Frogs are the most aquatic of all tree frogs. Specific habitat needs include permanent water with sparse emergent vegetation and sloping mud flats or sandy shores. Historically, Blanchard's Cricket Frog occurred throughout the southern third of Michigan's Lower Peninsula. There are recent observations (2000 – 2014) throughout the historical range, although information on abundance is lacking.

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DID YOU KNOW?

Below the water surface, large wood structures, in the form of fallen trees, provide crucial fish cover and substrate for aquatic insects. Fisheries research has demonstrated removal of trees from the Littoral Zone can affect the distribution of fish (Sass 2006, Ahrenstorff et al. 2009). Above the water surface fallen trees provide perches for Cedar Waxwings and other songbirds, loafing and basking areas for turtle and waterfowl, and feeding platforms for mink and other mammals.

HOW VULNERABLE ARE FOCAL SPECIES TO CLIMATE CHANGE?

Cooper et al. (in preparation) and Hoving et al. (2013) determined climate vulnerabilities for focal species.

	Climate Vulnerability
Pugnose Shiner	High
Starhead Topminnow	Low
Blanchard's Cricket Frog	High

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WHAT ARE THE CONSERVATION THREATS & ACTIONS?

Major threats that need to be addressed and key actions that need to be implemented over the next 10 years.

THREATS to Habitat

Invasive and Problematic Species, Pathogens, Genes

- Invasive species can become established (e.g., Eurasian water milfoil, starry stonewort, Phragmites, European frog-bit) when native aquatic plants are suppressed and shoreline vegetation is removed (O'Neal and Soulliere 2006).
- Introduction of invasive fishes such as grass carp, may result in loss of high quality aquatic plant beds, increased turbidity, and nuisance algal growths (Dibble and Kovalenko 2009).

Natural Systems Modifications

- Loss and degradation of habitats occurs when nearshore areas are filled, and largescale lake-bottom dredging for recreational boating (O'Neal and Soulliere 2006).
- Loss of connectivity between habitats occurs due to the hardening of shorelines with seawalls and riprap (Derosier 2004; Wehrly et al. 2012).
- Loss of emergent vegetation and stable shorelines due to lake-level control structures that establish artificially high lake levels in the open water months and abnormally low levels during periods of ice cover (O'Neal and Soulliere 2006).
- Simplification of habitats by the removal of coarse woody material in shallow water (Wehrly et al. 2012).
- Beach grooming, mechanical harvest and application of aquatic herbicides remove crucial native emergent and submersed vegetated habitats for focal species (O'Neal and Soulliere 2006; Environment Canada 2011).
- Increased siltation and turbidity results from changes in land use within the watershed (Becker 1983; Derosier 2004).

Residential & Commercial Development

- Loss of emergent and submersed wetland habitats from the development of shorelines (O'Neal and Soulliere 2006; Environment Canada 2011).

Human Intrusions & Disturbance

- Shoreline erosion and degradation of emergent habitat due to wave energy associated with high-speed recreational boating (O'Neal and Soulliere 2006).

Pollution

- Nutrient enrichment from local sources (e.g., lawn fertilizer, leaking septic tanks) or watershed sources (e.g., agricultural, stormwater runoff) causes shifts in the phytoplankton community, increased turbidity, nuisance plant growths, and fluctuations in dissolved oxygen concentrations (O'Neal and Soulliere 2006; Wehrly et al. 2015).

Conservation ACTIONS for Habitat

Land & Water Management

H1. Develop partnerships with lake associations and riparian landowners to protect natural shorelines, large wood, and aquatic vegetation. [CON; GRA; KRA; MILP-3]

H2. Implement Michigan's Aquatic Invasive Species State Management Plan. [AIS]

H3. Implement invasive species decontamination and prevention protocols. [AIS; CC-1.4]

H4. Continue early detection response efforts for invasive species. [AIS]

Raising Awareness

H5. Work with conservation districts and lake associations to increase awareness of the ecological values of healthy Littoral Zone habitats and best management practices. [CON; GRA; KRA]

H6. Use existing relationships with the Department of Environmental Quality, Michigan Inland Lakes Partnership, and the Michigan Natural Shoreline Partnership to curtail the spread of aquatic invasive species, abate nonpoint source pollution, and maintain natural shoreline habitats. [AIS]

Conservation Designation & Planning

H7. Protect natural shorelines, aquatic vegetation, and large wood through the review of environmental permits.

H8. Establish conservation guidelines for aquatic plant treatments that achieve landowner goals while maintaining the biological integrity of the lake ecosystem.

Law & Policy

H9. Continue to administer an effective Michigan Department of Environmental Quality protection program for wetlands, lakes, and streams, and provide incentives for conservation practices.

H10. Take appropriate enforcement actions for violations of the Invasive Species Order, and maintain the Prohibited and Restricted Species list pursuant to the Natural Resources and Environmental Protection Act, 451 of 1994, as amended. [AIS]

Research & Monitoring

H11. Develop acoustic survey methods to map aquatic plant beds in inland lakes.

H12. Determine if large-quantity water withdrawals are impacting focal species, and work to minimize potential affects.

H13. Refine species maps, habitat suitability models, and priority maps based on field data, updated GIS layers, and updated downscaled climate projections (Cooper et al. in preparation; Wehrly et al. in preparation; Yeh et al. in preparation).

H14. Develop and implement targeted habitat surveys.

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THREATS to Pugnose Shiner

Lack of Knowledge

- Lack of information on distribution, relative abundance, limiting factors, biology, specific habitat needs, impacts of aquatic herbicides, and vegetation removal on populations (Derosier 2004; COSEWIC 2013).

Invasive & Other Problematic Species & Genes

- Increased mortality through introductions of predatory fish species (COSEWIC 2013).

Conservation ACTIONS for Pugnose Shiner

Research & Monitoring

PS1. Develop and implement targeted surveys to update the distribution and status of Pugnose Shiner.

PS2. Determine specific habitat requirements for all life stages of the Pugnose Shiner.

PS3. Determine if aquatic herbicides pose a significant threat to Pugnose Shiners.

THREATS to Starhead Topminnow

Lack of Knowledge

- Lack of information on distribution, relative abundance, limiting factors, biology, specific habitat needs, and the impacts of aquatic herbicides and vegetation removal on populations (MNFI 2015).

Invasive & Other Problematic Species & Genes

- Increased mortality through introductions of predatory fish species.

Conservation ACTIONS for Starhead Topminnow

Research & Monitoring

ST1. Develop and implement targeted surveys to update the distribution and status of Starhead Topminnow.

ST2. Determine specific habitat requirements for all life stages of the Starhead Topminnow.

ST3. Determine if aquatic herbicides pose a significant threat to Starhead Topminnows.

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THREATS to Blanchard's Cricket Frog

Lack of Knowledge

- Lack of information on distribution, relative abundance, population trends, and limiting factors (Lee et al. 2000; Lanoo 2006).

Residential & Commercial Development

- Dispersal, recolonization opportunities, and genetic mixing are restricted when connectivity between habitats is lost (Environment Canada 2011).

Invasive & Other Problematic Species & Gene

- Increased mortality through introductions of predatory fish species (Environment Canada 2011).

Pollution

- The viability of Blanchard's Cricket Frog eggs, and successful reproduction may decrease due to bioaccumulation of contaminants (Environment Canada 2011).

Conservation ACTIONS for Blanchard's Cricket Frog

Conservation Designation & Planning

CF1. Develop a conservation strategy for Blanchard's Cricket Frog.

Research & Monitoring

CF2. Develop and implement targeted surveys to update the distribution and status of Blanchard's Cricket Frog.

CF3. Determine causes of population decline.

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HOW WILL WE MONITOR?

Assessing status and measuring progress towards goals.

HABITAT

- Use Michigan Department of Natural Resources Status and Trends surveys and targeted surveys to determine status of habitat.
- Continue Michigan Department of Environmental Quality aquatic habitat and water quality monitoring.

PUGNOSE SHINER

- Conduct targeted surveys to determine current distribution, relative abundance, trends, and habitat needs.
- Continue to update element occurrences in the state's Natural Heritage Database.

STARHEAD TOPMINNOW

- Conduct targeted surveys to determine current distribution, relative abundance, trends, and habitat needs.
- Continue to update element occurrences in the state's Natural Heritage Database.

BLANCHARD'S CRICKET FROG

- Conduct targeted surveys to determine current distribution, relative abundance, trends, and habitat needs.
- Continue to update element occurrences in the state's Natural Heritage Database.
- Continue the Michigan Frog and Toad Survey.

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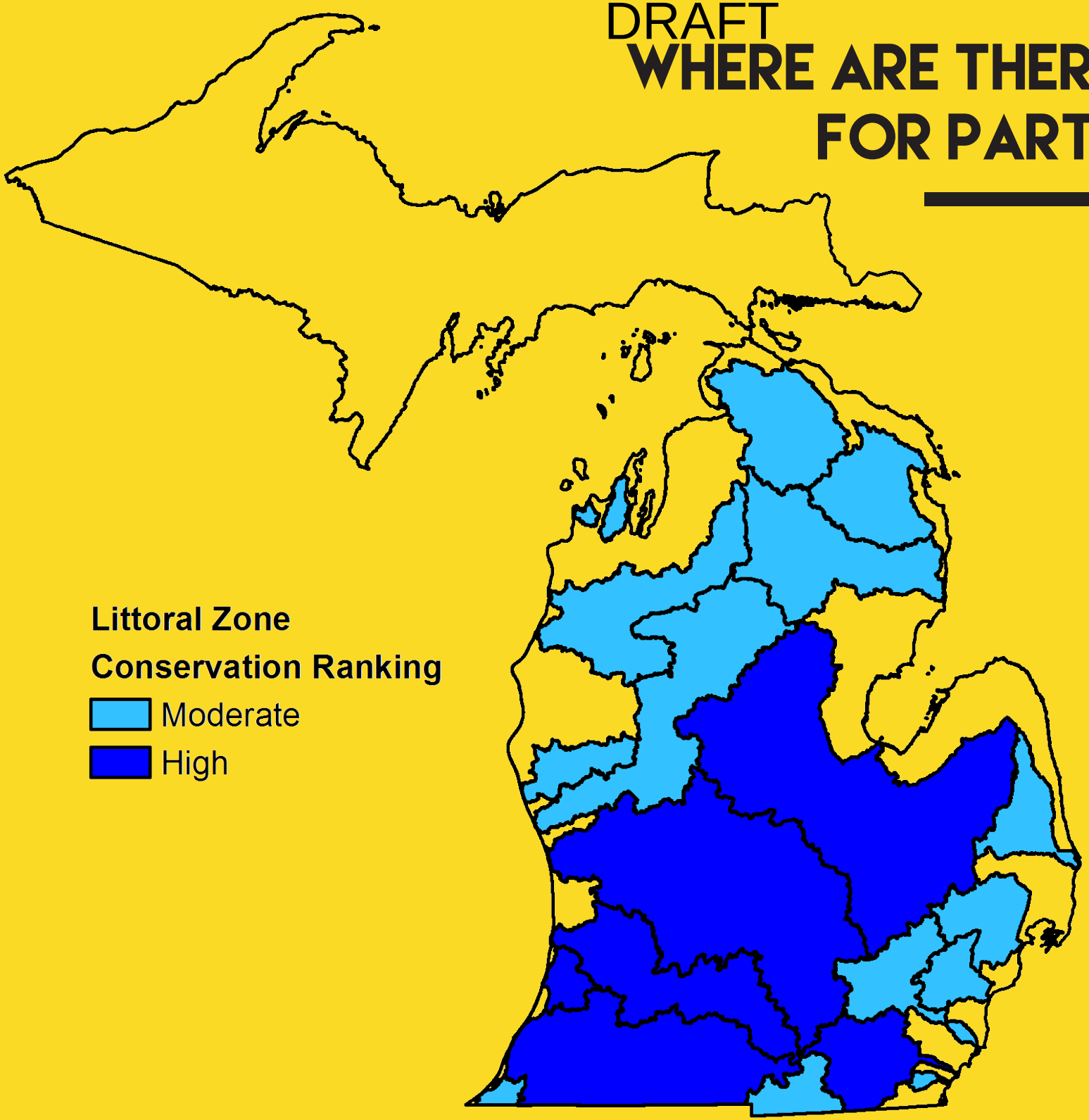
WHERE ARE THERE PLACES FOR PARTNERSHIP?

This map is designed to help partners connect around important places for focal species. Working together on conservation actions on a voluntary basis provides great benefits to wildlife and people.



HOW DOES THIS PLAN LINK WITH OTHER CONSERVATION PLANS?

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

[AIS] Michigan's aquatic invasive species state management plan 2013 update. (MDEQ et al. 2013)

[CC] National fish, wildlife and plants climate adaptation strategy (National Fish, Wildlife and Plants Climate Adaptation Partnership 2012)

[CG] Conservation guidelines for Michigan lakes and associated natural resources (O'Neal and Soulliere 2006)

[GRA] Grand River assessment (Hanshue and Harrington 2015)

[KRA] Kalamazoo River assessment (Wesley 2005)

FOR MORE INFORMATION/REFERENCES

Ahrenstorff, T.D., G.G. Sass, and M.R. Helmus. 2009. The influence of littoral zone coarse woody habitat on home range size, spatial distribution, and feeding ecology of largemouth bass (*Micropterus salmoides*). Hydrobiologia. 623:223–233.

Bailey, R.M., W.C. Latta, and G.R. Smith. 2004. An atlas of Michigan fishes with keys and illustrations for their identification. Miscellaneous Publication of Museum of Zoology, University of Michigan, No. 192. Ann Arbor, Michigan.

Becker, G.C. 1983. The fishes of Wisconsin. University of Wisconsin Press, Madison, Wisconsin.

Cooper, A.R., K.E. Wehrly, and K. Yeh. In preparation. Quantifying fragmentation, landscape disturbance, and climate change threats for fish species of greatest conservation need.

COSEWIC. 2013. COSEWIC assessment and status report on the Pugnose Shiner *Notropis anogenus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 32 pp.

Derosier, A.L. 2004. Special animal abstract for *Notropis anogenus* (Pugnose Shiner). Michigan Natural Features Inventory. Lansing, Michigan. 2 pp.

Dibble, E.D., and K. Kovalenko. 2009. Ecological impact of grass carp: a review of the available data. Journal of Aquatic Plant Management. 47:1-15.

Durocher, P.P., W.C. Provine and J.E. Kraai. 1984. Relationship between abundance of largemouth bass and submerged vegetation in Texas reservoirs. N. Am. J. Fish. Manage. 4:84-88.

Environment Canada. 2011. Recovery strategy for the Blanchard's Cricket Frog (*Acris blanchardi*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa.

Hanshue, S.K., and A.H. Harrington. 2015. Grand River Assessment. Michigan Department of Natural Resources Fisheries Report, Lansing, Michigan.

Hoving, C.L., Y. Lee, P.J. Badra, and B.J. Klatt. 2013. Changing climate, changing wildlife: a vulnerability assessment of 400 species of greatest conservation need and game species in Michigan. Wildlife Division Report No. 3564. Lansing, Michigan. 82 pp.

Lannoo, M. 2006. Amphibian Declines: The Conservation Status of United States Species. University of California Press. Berkeley.

Latta, W.C. 2005. Status of Michigan's endangered, threatened, special-concern, and other fishes. 1993-2001. Michigan Department of Natural Resources, Fisheries Research Report. 2019, Ann Arbor, Michigan.

Lee, Y., D.A. Hyde, and J. Legge. 2000. Special animal abstract for *Acris crepitans blanchardi* (Blanchard's Cricket Frog). Michigan Natural Features Inventory. Lansing, Michigan. 4 pp.

Michigan Departments of Environmental Quality, Natural Resources, Agriculture and Rural Development, and Transportation. 2013. Michigan's Aquatic Invasive Species State Management Plan 2013 Update.

Michigan Natural Features Inventory. 2015. Rare species explorer (Web Application). Accessed at mnfi.anr.msu.edu/eplorer

National Fish, Wildlife and Plants Climate Adaptation Partnership. 2012. National Fish, Wildlife and Plants Climate Adaptation Strategy, Association of Fish and Wildlife Agencies, Council on Environmental Quality, Great Lakes Indian Fish and Wildlife Commission, National Oceanic and Atmospheric Administration, and U.S. Fish and Wildlife Service. Washington, DC.

O'Neal, R.P., and G.J. Soulliere. 2006. Conservation guidelines for Michigan Lakes and associated natural resources. Michigan Department of Natural Resources, Fisheries Special Report 38, Ann Arbor, Michigan.

Sass, G.G., J.F. Kitchell, S.R. Carpenter, T.R. Hrabik, A.E.Marburg & M.G. Turner, 2006. Fish community and food web responses to a whole-lake removal of coarse woody habitat. Fisheries 31: 321–330.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Bulletin 184. Fisheries Research Board of Canada. 966 pp.

Soulliere, G.J., B.A. Potter, D.J. Holm, D.A. Granfors, M.J. Monfils, S.J. Lewis, and W.E. Thogmartin. 2007. Upper Mississippi River and Great Lakes Region Joint Venture waterbird habitat conservation strategy. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 68 pp.

Trautman, M.B. 1981. The fishes of Ohio. Ohio State University Press. 782 pp.

Wehrly, K.E., L. Wang, J.E. Breck, and L. Szabo-Kraft. 2012. Assessing local and landscape patterns of residential shoreline development in Michigan lakes. Lake and Reservoir Management 28(2):158-169.

Wehrly, K.E., D. Hayes, and T.C. Wills. 2015. Status and trends of Michigan inland lake resources 2002-2007. Michigan Department of Natural Resources, Fisheries Report 08, Lansing, Michigan.

Wehrly, K.E., A.R. Cooper and K. Yeh. In preparation. Landscape-based conservation prioritization for Michigan's aquatic species of greatest conservation need.

Wesley, J.K. 2005. Kalamazoo River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report 35, Ann Arbor, Michigan.

Yeh, K., K.E. Wehrly, and A.R. Cooper. In preparation. Modeling lake and stream habitat suitability of Michigan's fish species of greatest conservation need.

Photo Credits

Pugnose Shiner - Konrad Schmidt

Blanchard's Cricket Frog - James Harding

Painted Turtle - Amy L. Peterson

Largemouth Bass – U.S. Fish and Wildlife Service, Robert H. Pos

Muskrat - U.S. Fish and Wildlife Service, R. Town

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ABOUT THE WILDLIFE ACTION PLAN

Today's Priorities, Tomorrow's Wildlife

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

Michigan's Wildlife Action Plan was developed by conservation partners across the state. It provides information about those species in greatest conservation need. The plan is organized by chapters or mini-plans. Each mini-plan outlines priorities for the next 10 years. The mini-plans detail priority habitats and focal species of greatest conservation need, status of species and habitats, critical threats, needed conservation actions, places for partnerships, monitoring needs, and goals. This is one of 15 mini-plans. For more information about how the plan was built and to read other mini-plans, please visit:www.michigan.gov/wildlifeactionplan.