

Floodplain Forests

Michigan's Wildlife Action Plan 2015-2025

Today's Priorities, Tomorrow's Wildlife



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What Are Floodplain Forests?

Floodplain Forests are the interface between terrestrial and aquatic ecosystems. These dynamic ecosystems are found in low-lying areas adjacent to larger streams and rivers (third order or greater) that are subject to periodic over-the-bank flooding. Floodplain Forests are shaped by processes including hydrology, ice scour, windthrow, and infrequent fires. Hydrogeomorphic processes such as over-the-bank flooding, transport and deposition of sediment, and erosive and abrasive water movement cause the floodplains of large rivers to exhibit a variety of fluvial landforms, each of which supports a particular vegetation assemblage. The Floodplain Forest is a broadly defined community type, where species composition and community structure vary regionally along with varying flooding frequency and duration. Silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), and red ash (*Fraxinus pennsylvanica*) are the major over-story trees. However, the introduced Emerald Ash Borer has locally decimated canopy ash in southern Lower Michigan.

- Adapted from Cohen et al. 2015



Plan Contributors

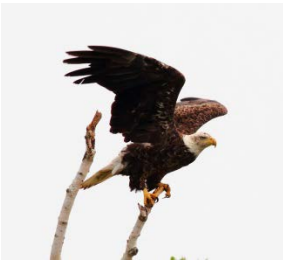
Michigan Audubon
Michigan Department of Natural Resources
Michigan Department of Environmental Quality
Michigan Natural Features Inventory
Michigan Nature Association

What Uses Floodplain Forests?

Focal species in bold



American Woodcock



Bald Eagle



Baltimore Oriole



Wild Turkey



Wood Duck



Cerulean Warbler



Copperbelly Water Snake



Indiana Bat

[Why Are Floodplain Forests Important?](#)

Floodplain Forests are valuable for both people and wildlife. Healthy Floodplain Forests provide natural places for water to be stored during flooding, and subsequently seep into the ground to recharge aquifers. These areas help filter out pollutants and sediments from rivers, increasing water quality. Historically, large rivers played a major role in the settlement of Michigan; they were important to settlements of Native Americans, as well as fur traders and early loggers. Significant archeological sites often can be found in Floodplain Forests. The dynamic nature of these

ecosystems, with waters continually flooding and receding, creates diverse micro-habitats for a variety of wildlife. Spring flooding has been shown to thaw soils earlier than surrounding areas allowing insects to hatch earlier. This plentiful food source becomes available just as migrating songbirds are passing through Michigan. These forests are also used as travel corridors for wildlife to move from habitat to habitat, which is especially critical in more fragmented landscapes like southern Michigan. Because of these unique characteristics, Floodplain Forests are great places for wildlife viewing. They also provide scenic views for people canoeing, kayaking, boating, or fishing.

What is the Health of Floodplain Forests?

Natural communities are tracked in the state's Natural Heritage Database, which provides information about their location, their quality, and often the plants and wildlife found there. This data provides an index of the overall health of Floodplain Forests across the state. In the Lower Peninsula between 2005 and 2015, an additional 4 Floodplain Forests were added to the Natural Heritage Database for a total of 34 tracked occurrences. Twelve of these were assessed between 2005 and 2015 to determine quality or health of the ecosystem; of those assessed, 33% were downgraded in quality.

An element occurrence is the basic unit of record for documenting and delimiting the presence and geographic extent of a species or natural community on the landscape in the state's Natural Heritage Database. Element occurrences are defined as an area of land and/or water where a species is, or was, present, and which has practical conservation value; for species, element occurrences commonly reflect populations or subpopulations.

Goals

- Identify priority Floodplain Forests based upon size, connectivity, and quality.
- Maintain existing large blocks of bottomland and upland forest where Cerulean Warblers are known to occur.
- Protect and conserve known Indiana Bat roosting habitats. ^[IB]
- Increase size and connectivity of suitable habitat complexes to maintain existing Copperbelly Water Snake populations. ^[CBW]
- Increase acreage at existing Copperbelly Water Snake sites in long-term conservation (e.g., easements, acquisition). ^[CBW]

Associated Rare Plants



Cattail sedge (*Carex typhina*)



Pumpkin ash (*Fraxinus profunda*)



Twinleaf (*Jeffersonia diphylla*)



Red mulberry (*Morus rubra*)



Heart-leaved plantain (*Plantago cordata*)



Snow trillium (*Trillium nivale*)

What Are the Floodplain Forest Focal Species?

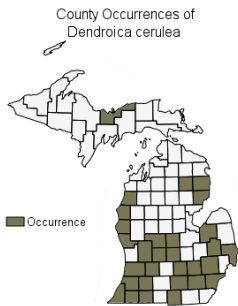
Where we are now and what we think we can realistically achieve over the next 10 years with expected resources.

*Cerulean Warbler (*Dendroica cerulea*) –*

State Threatened



This beautiful blue songbird is often heard and rarely seen because they nest and feed high in the treetops. The females are often called bungee jumpers; jumping out of the nest head first with wings tucked into her body until well below the nest and only then opening her wings to fly. Ideally, Cerulean Warblers require large tracts (>3,000 ha) of mature deciduous forest with an understory containing 85% canopy cover and some forest gaps (Potter et al. 2007); smaller tracts (700 ha) will support smaller populations (USFWS 2006; MNFI 2007). In Michigan, Bottomlands, particularly floodplains, are usually preferred over upland areas (Hyde et al. 2000); the birds are known to use black locust, black walnut, and black cherry in a greater proportion than available for both nesting and foraging (Department of Defense 2015). Habitats are dominated by silver maple, ash, and sycamore (*Platanus occidentalis*). The North American Breeding Bird Survey trend data suggest a significant decline of 2.98% annually between 1966 and 2010 (Partners in Flight Science Committee 2013). The estimated breeding population in Michigan is 5,000 birds. This species appears to be declining at a similar level within their core range in the Appalachian Mountains (Buehler et al. 2013).



Goals

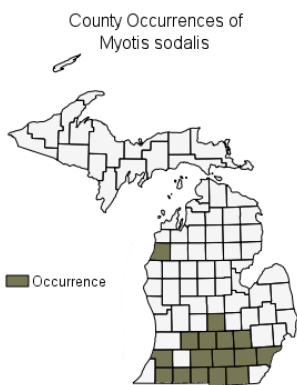
- Stabilize population trend in Michigan.

Indiana Bat (Myotis sodalis) –

Federally and State Endangered



Like all bats, the Indiana Bat eats insects and can consume over half of its body weight every night. It has been estimated that a colony of 150 bats can eat nearly 1.3 million pest insects each year (Boyles et al. 2011). Male and female bats roost under peeling bark in trees with an average diameter of 33 cm and 45 cm, respectively, and where the roost receives direct sunlight for more than half the day; trees are typically in gaps in or along edges of forests (USFWS 2007). In Michigan they are more often found in elms (*Ulmus* spp.), ashes (*Fraxinus* spp.), or maples (*Acer* spp.), and will change trees every few days (Kurta et al. 2002). Indiana Bats show long-term site fidelity, which may facilitate conservation and management (Mellos et al. 2014). Unfortunately, white-nose syndrome was recently found in Michigan. Since 2005 the disease has killed over a million bats in other states. In 2015, 99% of the range-wide population of Indiana Bats was hibernating in sites either confirmed or suspected of infections of white-nose syndrome. Many of Michigan's Indiana Bats hibernate in Indiana, Ohio, and Kentucky; Indiana and Ohio have seen some of the largest hibernacula losses since 2013 (USFWS 2015). Indiana Bats have been found in 14 counties in Michigan and 25 general locations.



Goals

- No net loss of Indiana Bat element occurrences. ^[18]
- Obtain a more accurate summer population estimate.

Copperbelly Water Snake (*Nerodia erythrogaster neglecta*)-

Federally Threatened and State Endangered



The Copperbelly Water Snake is a pretty, orange-bellied, non-venomous snake. These snakes move between wetlands more often than other water snakes, so fragmentation of habitats has significantly impacted their populations. These snakes will hibernate in the same area year to year, and will use crayfish burrows to wait out the winter. In Michigan, Copperbelly Water Snakes are more likely to be in areas close to water, habitat margins or shorelines, and in areas with more open tree canopies, thick shrub cover, herbaceous emergent vegetation cover, and log cover (Herbert 2003; Kingsbury et al. 2003; Lee et al. 2005; Lee et al. 2007). Records for this subspecies in Michigan are scarce, and current distribution and relative abundance need to be better defined. This snake has been documented in 7 counties but

observations in 6 of the counties occurred before 1998. In 2010, Copperbelly Water Snakes were newly documented in Hillsdale County.



Goals

- Prevent extirpation. ^[CBW]
- Obtain a more accurate population estimate. ^[CBW]

Call Out Box: How Vulnerable are Focal Species to Climate Change?

Hoving et al. (2013) determined climate vulnerabilities for focal species, and Handler et al. (2014) determined climate vulnerabilities for habitats. Floodplain Forests are likely to have fewer threats and more conservation opportunities than other habitats due to climate change. Floodplain Forests will provide needed ecosystem services, such as stormwater storage, during more extreme storms.

Climate vulnerabilities are based on projected changes in the abundance or range of a species by 2050 – extreme = greatly reduced or the species would disappear; moderate = likely decrease.

	Climate Vulnerability
Cerulean Warbler	Moderate
Indiana Bat	Moderate
Copperbelly Water Snake	Extreme
Lowland-riparian hardwoods	Moderate



What are the Conservation Threats and 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 & Other Problematic Species, Genes & Diseases

- Invasive plants and animals can out-compete native plants or kill mature trees (Tepley et al. 2004; Kost et al. 2007).

Natural Systems Modifications

- Hydrological modifications such as human-made levees, impoundments, channelization, dams, as well as changes in land use and climate can cause higher flood pulses, and generally higher water levels over the entire year, while eliminating periods of very low flow (which were once common in the fall) (Knutson et al. 1996; Tepley et al. 2004).

Residential & Commercial Development

- Conversion of habitats to industrial, residential, and agricultural land use fragment and destroy large mature bottomland deciduous forests (USFWS 2007).

Agriculture & Aquaculture

- Incompatible timber management, specifically management for shorter rotations and even-aged stands, can degrade habitat for focal species (Knutson et al. 2001).

Conservation Actions for Habitat

Land & Water Management

- H1. Restore, maintain, and protect existing floodplain forests, upland buffers, and adjacent wetlands for focal species. [CC-1.1, 7.1; CBW-1; SWR1; SWR2]
- H2. Implement best management forestry practices in Floodplain Forests. [BSGA; SWR2]
- H3. Conduct targeted invasive species management in priority places for high-threat invasive species. [SWR2; TIS; AIS]
- H4. Implement invasive species decontamination and prevention protocols. [TIS]
- H5. Continue early detection and rapid response efforts for invasive species; continue management to eradicate feral swine in Michigan. [TIS]
- H6. Allow reforestation of fragments within larger targeted forest blocks that are important for focal species. [BSGA; CC-7.1; SWR1; CW-DOD]

Raising Awareness

- H7. Support and participate in initiatives and events that benefit or promote Floodplain Forests and the wildlife that rely on them. [PIF]
- H8. Promote and educate land managers and private landowners regarding the values of floodplain forests and forestry best management practices.

Conservation Designation & Planning

- H9. Incorporate Floodplain Forests and adjacent large forest blocks important to focal species into Department of Natural Resources master plans, watershed management plans, and other planning efforts. [SWR2; CC-2.1; CW-DOD]
- H10. Work proactively with land planners and local governments to suggest large areas of floodplain to contain river flooding during extreme precipitation events. Many State Game Areas were developed to minimize flooding in nearby towns and cities. Under new precipitation and land use regimes, those areas may need to be expanded to the benefit of wildlife and floodplain habitat, and at a cost-savings to downstream cities over expensive new stormwater systems. [CC-7.1]
- H11. Develop adaptation plans to address loss of plant species due to invasive species, disease, and/or climate change. [CC-2.1]
- H12. Identify high-quality Floodplain Forests in climate-resilient landscapes and incorporate into conservation planning and management; currently being developed by The Nature Conservancy. [CC-1.2]
- H13. Evaluate dams to remove to restore hydrology and increase available habitat, and dams to keep for mitigating hydrologic changes, sea lamprey and other invasive species impacts, and climate change effects. [CC-7.3; AIS]

Livelihood, Economic & Moral Incentives

- H14. Promote and work with landowner incentive programs like the U.S. Fish and Wildlife Service's partners program, Michigan Department of Natural Resources private lands program, etc. [CBW-1.7]
- H15. Work with Farm Bill programs like Environmental Quality Incentives Program (EQIP) and Wetland Reserve Easements (WRE) to benefit Floodplain Forests and focal species. [CBW-1.7]

Law & Policy

H16. Continue to administer an effective Michigan Department of Environmental Quality protection program for wetlands and provide incentives for conservation practices.

Research & Monitoring

H17. Delineate and assess intactness of Floodplain Forests to better determine distribution and status; work with Michigan Department of Environmental Quality on landscape level assessments of wetlands.

H18. Evaluate hydrological changes in southern Michigan to assess future threats and potential for mitigation. ^[CC-4.2, 5.3]



Threats to Cerulean Warbler

Lack of Knowledge

- Lack of information on life history, nesting success rates, and other limiting factors (Flaspohler 1993; Hyde et al. 2000; Potter et al. 2007).

Conservation Actions for Cerulean Warbler

Land & Water Management

CW1. Where feasible, follow Cerulean Warbler management guidelines for enhancing breeding habitat from Appalachian Hardwood Forests during forest management. ^[CW-MG]

Species Management

CW2. Follow Cerulean Warbler Conservation Plan, where feasible. ^[CW]

Research & Monitoring

CW3. Work with partners, including industry, to acquire more data on the distribution of Cerulean Warbler. ^[CC-7.1]

CW4. Assess productivity of Cerulean Warbler at known sites to aid management. ^[PIF; IB-2.4; CBW-2.2; JV]



Threats to Indiana Bat

Lack of Knowledge

- Lack of information on population biology and full distribution.

Invasive & Problematic Species, Pathogens

- Population impacts from white-nose syndrome (for more information, see the Emerging Diseases mini-plan of the Wildlife Action Plan).

Energy Production & Mining

- Wind turbine mortality (USFWS 2007).

Biological Resource Use

- Loss of standing snags and other suitable living roost sites (USFWS 2007).

Conservation Actions for Indiana Bat

Land & Water Management

IB1. Protect and manage known summer roosting locations, especially maternity colonies. [IB-2]

Conservation Designation & Planning

IB2. Develop, finalize, and implement multi-state bat Habitat Conservation Plan (HCP).

Research & Monitoring

IB3. Work with partners, including industry, to acquire more data on the distribution of Indiana Bat. [CC-7.1; IB-2]

IB4. Determine migration pathways between maternity and hibernacula sites for Indiana Bat. [IB-3]

IB5. Assess productivity of Indiana Bat at known sites to aid management. [IB-2.4]



Threats to Copperbelly Water Snake

Lack of Knowledge

- Lack of information on life history, fecundity rates, and effects of diseases on populations (USFWS 2008).

Natural System Modifications

- Inbreeding depression is a concern due to low population numbers (USFWS 2008).

Human Intrusions & Disturbance

- Human persecution and collection (USFWS 2008).

Transportation & Service Corridors

- Roads and other barriers can fragment habitat and individuals can be killed (USFWS 2008).

Conservation Actions for Copperbelly Water Snake

Raising Awareness

CB1. Build local support for conservation and recovery of Copperbelly Water Snake. [CBW-5]

Conservation Designation & Planning

CB2. Work within the Copperbelly Water Snake work group to identify sites and feasibility of reintroduction, introduction, and/or translocation as part of recovery efforts; determine best techniques for reintroduction. [CBW-4; CC-2.2]

CB3. Use conservation easements and acquisition to protect and secure occupied and possible future reintroduction sites. [CBW-1.7]

Research & Monitoring

CB4. Research effective culvert options to allow safe movements of Copperbelly Water Snakes between habitats. [CBW-1.5]

CB5. Investigate alternative, cost-effective methods for surveying and monitoring Copperbelly Water Snakes (e.g., eDNA, camera traps). [CBW-2.1]

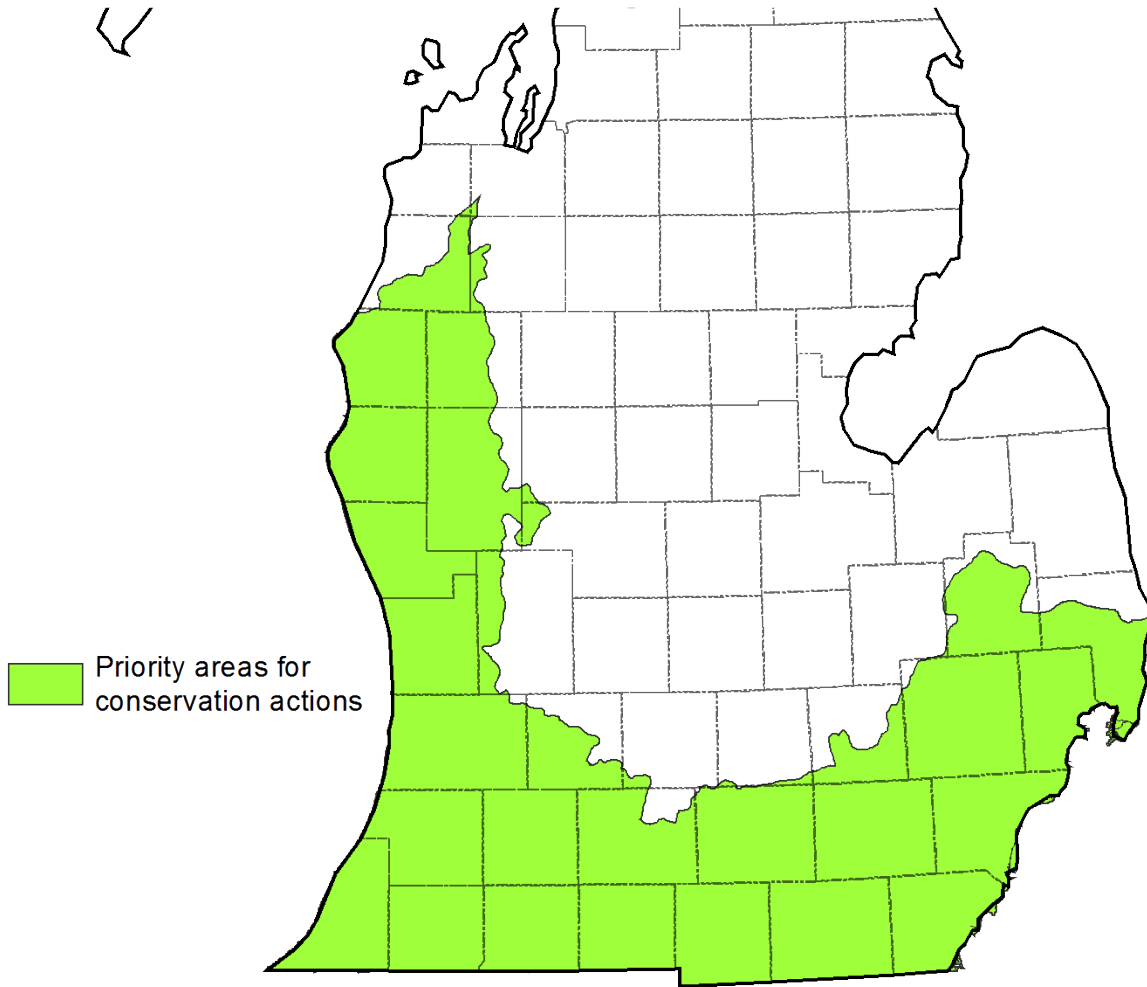
CB6. Assess productivity of Copperbelly Water Snakes at known sites to aid management. [CBW-2.2]



Where Are There Places for Partnership?

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





This map is based on focal species occurrences in level III and IV Ecoregions of Michigan.

How Will We Monitor?

Assessing status and measuring progress towards goals.

Habitat



- Implement developed distribution and status methodology to assess trends of Floodplain Forests at the end of ten years.
- Continue to survey and update quality rankings for Floodplain Forest natural communities in the state's Natural Heritage Database.

Cerulean Warbler



- Continue annual North American Breeding Bird Survey for population trends. ^[CW; JV]
- Continue the Michigan Breeding Bird Atlas.
- Use citizen science programs, such as eBird, to help assess distribution and relative abundance.
- Continue to update element occurrences in the state's Natural Heritage Database.

Indiana Bat



- Continue and expand hibernacula surveys to visit known or priority sites more frequently. ^[IB]
- Develop and implement a collaborative survey-monitoring program to evaluate bat distribution, abundance, trends, and habitat use during the summer; this could include using acoustic surveys following protocols from the North American Bat Monitoring Program (Loeb et al. 2015) or U.S. Fish and Wildlife Service, while continuing to evaluate and resolve Michigan-specific survey issues and needs. ^[IB]
- Continue to update element occurrences in the state's Natural Heritage Database.

Copperbelly Water Snake



- Continue occupancy monitoring of known populations and monitor habitat on a regular basis. ^[CBW]
- Continue to update element occurrences in the state's Natural Heritage Database.

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.

[BSGA] Barry State Game Area Master Plan (DNR 2015a).

[CBW] Northern Population Segment of the Copperbelly Water Snake (*Nerodia erythrogaster neglecta*) Recovery Plan (USFWS 2008).

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

[CW] A conservation action plan for the Cerulean Warbler (*Dendroica cerulea*) (USFWS 2007).

[CW-MG] Management guidelines for enhancing Cerulean Warbler breeding habitat in Appalachian hardwood forests (Wood et al. 2013).

[CW-DOD] Establishing regional mentor sites for the management of the cerulean warbler and other mature forest avifauna (DOD 2015).

[IB] Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (USFWS 2007).

[JV] Upper Mississippi River and Great Lakes Region Joint Venture landbird habitat conservation strategy (Potter et al. 2007).

[NWR] Shiawassee National Wildlife Refuge Comprehensive Conservation Plan. U.S. Fish and Wildlife Service (USFWS) 2001.

[PIF] Partners in Flight bird conservation plan for the Upper Great Lakes Plain (Knutson et al. 2001).

[SWR1] Wildlife Division Southwest Regional Habitat Guidance -Mature and unfragmented mature forests (DNR 2015b).

[SWR2] Wildlife Division Southwest Regional Habitat Guidance- Riparian Corridors (DNR 2015c).

[TIS] Michigan terrestrial invasive species state management plan (DNR draft)

[For More Information/References](#)

Boyles, J.G., P.M. Cryan, G.F. McCracken, and T.H. Kunz. 2011. Economic importance of bats in agriculture. *Science*, Vol. 332, April 1, 2011.

Buehler, D.A., P.B. Hamel, and T.J. Boves. 2013. Cerulean Warbler (*Setophaga cerulea*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/>

Christie, J., and P. Bostwick. 2012. Climate change adaptation plan for coastal and inland wetlands in the State of Michigan. Association of State Wetland Managers. Windham, ME. 37 pp.

Cohen, J.G., M.A. Kost, B.S. Slaughter, and D.A. Albert. 2015. A field guide to the natural communities of Michigan. Michigan State University Press. East Lansing, Michigan. 362 pp.

Department of Defense Legacy Resource Management Program (DOD). 2015. Project 13-634: Establishing regional mentor sites for the management of the Cerulean Warbler and other mature forest avifauna. 45 pp.

Flaspohler, D.J. 1993. Wisconsin Cerulean Warbler recovery plan. Bureau of endangered resources technical publication #96. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Handler, S., M.J. Duveneck, L. Iverson, E. Peters, R.M. Scheller, K.R. Wythers, L. Brandt, P. Butler, M. Janowiak, P.D. Shannon, C. Swanston, A.C. Eagle, J. G. Cohen, R. Corner, P.B. Reich, T. Baker, S. Chhin, E. Clark, D. Fehring, J. Fosgitt, J. Gries, C. Hall, K.R. Hall, R. Heyd, C.L. Hoving, I. Ibáñez, D. Kuhr, S. Matthews, J. Muladore, K. Nadelhoffer, D. Neumann, M. Peters, A. Prasad, M. Sands, R. Swaty, L. Wonch, J. Daley, M. Davenport, M.R. Emery, G. Johnson, L. Johnson, D. Neitzel, A. Rissman, C. Rittenhouse, and R. Ziel. 2014. Michigan forest ecosystem vulnerability assessment and synthesis: a report from the Northwoods Climate Change Response Framework Project. Gen. Tech. Rep. NRS-129. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 229 pp.

Herbert, N.R. 2003. Comparative habitat use of two water snakes, *Nerodia erythrogaster neglecta* and *Nerodia sipedon sipedon*, and implications for conservation. Unpublished thesis. Indiana-Purdue University, Ft. Wayne, Indiana. 79 pp.

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. Michigan Department of Natural Resources Wildlife Division Report No. 3564. Lansing, Michigan. 82 pp.

Hyde, D., Thomson, D., and J. Legge. 2000. Special animal abstract for *Dendroica cerulea* (Cerulean Warbler). Michigan Natural Features Inventory, Lansing, Michigan. 4 pp.

[For More Information/References Continued](#)

Kingsbury, B.A., J.H. Roe, N.R. Herbert, and J. Gibson. 2003. Ecology and status of northern populations of the Copperbelly Water Snake. Final report for the Indiana and Ohio Departments of Natural Resources and the U.S. Fish and Wildlife Service. 186 pp.

Knutson, M.G., J.P. Hoover, and E.E. Klaas. 1996. The importance of floodplain forests in the conservation and management of neotropical migratory birds in the Midwest. Pages 168-188 in F. R. Thompson, ed. Management of midwestern landscapes for the conservation of neotropical migratory birds. General Technical Report NC-187. U.S. Forest Service, North Central Forest Experiment Station, St. Paul, Minnesota.

Knutson, M.G., G. Butcher, J. Fitzgerald, and J. Shieldcastle. 2001. Partners in Flight bird conservation plan for the Upper Great Lakes Plain (Physiographic area 16). USGS Upper Midwest Environmental Sciences Center in cooperation with Partners in Flight. La Crosse, Wisconsin.

Kost, M.A., D.A. Albert, J.G. Cohen, B.S. Slaughter, R.K. Schillo, C.R. Weber, and K.A. Chapman. 2007. Natural communities of Michigan: classification and description. Michigan Natural Features Inventory, Report No. 2007-21, Lansing, Michigan.

Kurta, A., S.W. Murray, and D.H. Miller. 2002. Roost selection and movements across the summer landscape. Pages 118-129 in: A. Kurta and J. Kennedy, eds. The Indiana Bat: biology and management of an endangered species. Bat Conservation International. Austin, Texas

Lee, Y., M. Kost, J. Cohen, and H. Enander. 2005. Surveys for the conservation and recovery of the northern population of the Copperbelly Water Snake (*Nerodia erythrogaster neglecta*): 2004 performance report. Unpublished report to the U. S. Fish and Wildlife Service, Region 3 Endangered Species Office, Twin Cities, MN. Michigan Natural Features Inventory, Lansing, Michigan. 17 pp.

Lee, Y., O. Attum, H. Enander, and B. A. Kingsbury. 2007. Population monitoring and habitat characterization for the conservation and recovery of the northern population of the Copperbelly Water Snake (*Nerodia erythrogaster neglecta*). Michigan Natural Features Inventory, Report No. 2007-04. Report to the U. S. Fish and Wildlife Service, East Lansing Field Office, East Lansing, MI. 52 pp. + appendices.

Lee, Y. 2010. Special animal abstract for *Nerodia erythrogaster neglecta* (Copperbelly Water Snake). Michigan Natural Features Inventory, Lansing, MI. 8 pp.

LIAA. 2014. Climate change adaptation & local planning for Michigan's coastal wetland resources. 31 pp. Accessed at http://www.greatlakeswetlandadaptation.org/uploads/2/6/5/3/26539851/final_wetlands_report_sept_2014.pdf. 10/14/2015

Loeb, S.C., T.J. Rodhouse, L.E. Ellison, C.L. Lausen, J.D. Reichard, K.M. Irvine, T.E. Ingersoll, J.T.H. Coleman, W.E. Thogmartin, J.R. Sauer, C.M. Francis, M.L. Bayless, T.R. Stanley, and D.H. Johnson. 2015. A plan for the North American bat monitoring program (NABat). General Technical Report SRS-208. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 112 pp.

[For More Information/References Continued](#)

Mellos, J., L. Denys, C. Johnson, C. Rockey, and A. Kurta. 2014. Long-term philopatry on Indiana Bat in St. Joseph County, Michigan. *Michigan Birds and Natural History*, 21(3): 222-226.

Michigan Department of Environmental Quality – Water Resources Division. 2015. State of Michigan wetland monitoring and assessment strategy. Michigan Department of Environmental Quality. 34 pp. Accessed at http://www.michigan.gov/documents/deq/Michigan_Wetlands_Monitoring_and_Assessment_Strategy_March_2015_FINAL_491217_7.pdf. 10/14/2015.

Michigan Department of Natural Resources (DNR). 2015a. Barry State Game Area master plan.

Michigan Department of Natural Resources (DNR). 2015b. Wildlife Division Southwest Regional Habitat Guidance - Mature and unfragmented mature forests.

Michigan Department of Natural Resources (DNR). 2015c. Wildlife Division Southwest Regional Habitat Guidance- Riparian Corridors.

Michigan Department of Natural Resources (DNR). Draft. Michigan terrestrial invasive species state management plan. Michigan Department of Natural Resources, Lansing MI. Manuscript in preparation.

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.

Partners in Flight Science Committee. 2013. Population Estimates Database, version 2013. Available at <http://rmbo.org/pifpopestimates>. Accessed on 06/15.

Potter, B.A., G.J. Soulliere, D.N. Ewert, M.G. Knutson, W.E. Thogmartin, J.S. Castrale, and M. Roell. 2007. Upper Mississippi River and Great Lakes Region Joint Venture landbird habitat conservation strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN. 124 pp.

Robbins, C.S., D.K. Dawson, and B.A. Dowell. 1989. Habitat area requirements of breeding forest birds of the middle Atlantic states. *Wildlife Monographs* 103: 3-34.

Tepley, A.J., J.G. Cohen, and L. Huberty. 2004. Natural community abstract for floodplain forest. Michigan Natural Features Inventory, Lansing, Michigan. 15 pp.

U.S. Fish and Wildlife Service (USFWS). 2001. Shiawassee National Wildlife Refuge comprehensive conservation plan.

U.S. Fish and Wildlife Service (USFWS). 2006. Cerulean Warbler fact sheet. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota.

U.S. Fish and Wildlife Service (USFWS). 2007. Indiana Bat (*Myotis sodalis*) draft recovery plan: first revision. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 258 pp.

[For More Information/References Continued](#)

U.S. Fish and Wildlife Service (USFWS). 2008. Northern population segment of the Copperbelly Water Snake (*Nerodia erythrogaster neglecta*) recovery plan. Fort Snelling, Minnesota. ix + 79 pp.

U.S. Fish and Wildlife Service (USFWS). 2015. The 2015 rangewide population estimates for the Indiana Bat (*Myotis sodalis*) by USFWS. Midwest Region. Accessed Sept. 2015:

<http://www.fws.gov/midwest/Endangered/mammals/inba/pdf/2015IBatPopEstimate25Aug2015v2.pdf>

Wood, P.B., J. Sheehan, P. Keyser, D. Buehler, J. Larkin, A. Rodewald, S. Stoleson, T.B., Wigley, J. Mizel, T. Boves, G. George, M. Bakermans, T. Beachy, A. Evans, M. McDermott, F. Newell, K. Perkins, and M. White. 2013. Management guidelines for enhancing Cerulean Warbler breeding habitat in Appalachian hardwood forests. American Bird Conservancy. The Plains, Virginia. 28 pp.

Young, B., E. Byers, K. Gravuer, K. Hall, G. Hammerson, and A. Redder. 2011. Guidelines for using the NatureServe climate change vulnerability index, Release 2.1. NatureServe, Arlington, VA.

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Copperbelly Watersnake - Matt Williams

Indiana Bat - USFWS, Adam Mann

Cerulean Warbler - Roger Eriksson

Habitat (First photo page 1, page 8, and page 13) - MNFI, Yu Man Lee

Bald Eagle – Brad Silet

Habitat (Second photo page 1) – Michael A. Kost

American Woodcock – Laurie Johnson

Baltimore Oriole – USFWS

Wood Duck – Caleb Putnam

Cattail Sedge and Snow Trillium – MNFI, Brad Slaughter

Pumpkin Ash, Twinleaf, and Red Mulberry – MNFI, Jesse Lincoln

Heart-leaved Plantain – MNFI

Habitats (page 9) – MNFI, Josh G. Cohen and Yu Man Lee

[Recommended Citation](#)

Derosier, A.L., S.K. Hanshue, K.E. Wehrly, J.K. Farkas, and M.J. Nichols. 2015. Michigan's Wildlife Action Plan. Michigan Department of Natural Resources, Lansing, MI. <http://www.michigan.gov/dnrwildlifeactionplan>



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/dnrwildlifeactionplan.