

# Dry Northern Forests & Pine Barrens

Michigan's Wildlife Action Plan 2015-2025

*Today's Priorities, Tomorrow's Wildlife*



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## [What Are Dry Northern Forests & Pine Barrens?](#)

The historic fire regime led to a mix of habitats in northern Michigan that shifted between Pine Barrens and Dry Northern Forest depending on fire frequency and intensity.

Dry Northern Forest is a pine or pine-hardwood forest found throughout the Upper Peninsula and northern Lower Peninsula. The over-story is dominated by jack pine (*Pinus banksiana*) and red pine (*P. resinosa*), which are frequently associated with northern pin oak (*Quercus ellipsoidalis*). Jack pine requires fire to open its cones and spread its seeds. Dry Northern Forests are found on excessively drained, extremely to very strongly acidic sands with low nutrient content. The community occurs primarily on sandy glacial outwash plains and lakeplains, and is also common on upland sand ridges within peatlands on poorly drained glacial outwash plains or lakeplains. Historically, Dry Northern Forest dominated by jack pine typically originated in the wake of catastrophic fire. Whereas, frequent low-intensity ground fires maintained red pine systems by removing competing hardwoods. In addition to fire, natural processes that influence species composition and community structure include windthrow, insect outbreaks, and severe growing-season frosts.

Pine Barrens are a coniferous, fire-dependent savanna community that consists of scattered and clumped jack pine, and are frequently associated with northern pin oak. These ecosystems occur on level sandy outwash plains and sandy glacial lakeplains in the northern Lower Peninsula and infrequently in the Upper Peninsula. Pine Barrens are found on very strongly to strongly acidic, droughty sands with very poor water-retaining capacity and low nutrient availability. Fire, severe growing-season frosts, and droughty, low-nutrient soils maintain species composition and community structure.

- Adapted from Cohen et al. 2015



## Plan Contributors

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Kirtland's Warbler Alliance

Michigan Department of Natural Resources

The Nature Conservancy

U.S. Fish and Wildlife Service

U.S. Forest Service

## What Uses Dry Northern Forests & Pine Barrens?

*Focal species in bold*



**American Woodcock**



**Black Bear**



**Snowshoe Hare**



**White-tailed Deer**



**Elk**



**Kirtland's Warbler**



**Eastern Massasauga**



**Dusted Skipper**

## Why Are Dry Northern Forests & Pine Barrens Important?

Born of fire, our Dry Northern Forests and Pine Barrens eke out a living on lands too poor for most plant life to survive. They stabilize sandy soils and fight erosion. They slowly, over generations, add organic matter to enrich the land. And despite this, they provide support for the wildlife and people of northern Michigan. Timber harvest fuels local economies as does tourism by visitors eager for a glimpse of these forests' unique denizens: Kirtland's Warbler and Elk. Local residents mark the seasons by collecting harvests from these forests: fiddlehead ferns in the spring, blueberries in the heat of summer, and firewood in the fall. Spring and fall bring the hunters in search of Wild Turkey, American Woodcock, Black Bear, Snowshoe Hare, and White-Tailed Deer. And these forests shelter some of the state's most treasured trout streams to the delight of anglers. Winter marks the arrival of snowmobilers and cross country skiers. We lost these forests once, in the 1800s, due to hubris and a lack of foresight, and with them went species like the Greater Prairie Chicken and Woodland Cariobou. Careful stewardship today will ensure that generations to come will be able to use and enjoy the fruits of our Dry Northern Forests and Pine Barrens.

## What is the Health of Dry Northern Forests & Pine Barrens?

The proportion of pine dominated forests in the overall landscape has declined since circa 1800 (DNR 2010); remnants of Dry Northern Forest are one of the rarest forest types in the Great Lakes Region. In Michigan, jack pine communities have increased since circa 1800 (DNR 2010). Jack pine harvest levels have been relatively high and steady, and age-classes are currently skewed towards 0-9 and 10-19 years of age in the northern Lower Peninsula (DNR 2013a), whereas in the Upper Peninsula that age-class distribution is more balanced (DNR 2013b).

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 Dry Northern Forests and Pine Barrens across the state. In the Lower Peninsula between 2005 and 2015, an additional 11 Dry Northern Forests and Pine Barrens occurrences were added to the Natural Heritage Database for a total of 42 tracked ecosystems. Seventeen of these were assessed between 2005 and 2015 to determine quality or health of the ecosystem. Of those assessed only 12% were upgraded in quality, and 53% were downgraded.

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; species element occurrences commonly reflect populations or subpopulations.

## Goals

- Maintain or increase Pine Barrens acreage and quality. <sup>[FRD; FRD2]</sup>
- Establish an average of 3,830 acres of breeding habitat annually for Kirtland's Warbler. <sup>[KW2-C.1; FRD; FRD2; FRD3]</sup>

## Associated Rare Plants



Hill's thistle (*Cirsium hillii*)



Prairie agoseris (*Agoseris glauca*)



Rough fescue (*Festuca altaica*)

## What Are the Dry Northern Forest & Pine Barren Focal Species?

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

### *Kirtland's Warbler (Dendroica kirtlandii) –*

Federally and State Endangered



This bird is a great conservation success story! The Kirtland's Warbler is one of the rarest warblers in North America. Directed habitat management and Brown-headed Cowbird management has helped this species exceed its recovery goal. Yet Kirtland's Warbler is conservation reliant, and long term management will continue to play an important role in its sustained recovery. Kirtland's Warbler is a ground nester and prefers young jack pine forests (5-22 years old) of at least 84 acres in size. Once jack pines reach about 18 feet and the lower branches begin to die, the ground cover changes and is no longer used for nesting (Olson 2002). The Number of singing males in Michigan is estimated to be 2,344 and 2,365 range-wide (includes Canada and Wisconsin). The species has broadened its breeding range distribution across the Lower Peninsula and into the Upper Peninsula of Michigan and Wisconsin in response to available habitat and its increasing population.



### Goals

- Sustain the Kirtland's Warbler population throughout its known breeding range above 1,000 breeding pairs using an adaptive management framework. [KW2-C.1]
- Establish sufficient funds to ensure continued management of Kirtland's Warbler threats to allow this species to be delisted. [KW2-C.1]

### *Dusted Skipper (Atrytonopsis hianna) –*

#### Special Concern



The Dusted Skipper is a small (28-34mm) dark colored butterfly with a raccoon-like masked appearance. This butterfly darts from perch to perch covering a lot of territory, and males when disturbed will fly long distances (Cuthrell 2006). Dusted Skippers occur in remnant dry sand prairies, openings within oak and oak-pine barrens, and dry open fields where native warm season grasses occur (Cuthrell 2006). Adults have been observed visiting various flowers, but the larval host plants are big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*) (Cuthrell 2006). There are currently 43 known locations for this species since 1994.





Goals

- Establish baseline status and distribution.

*Eastern Massasauga (Sistrurus catenatus catenatus)* –

Federal Proposed as Threatened, Special Concern



Eastern Massasauga is Michigan's only rattlesnake, and is a shy docile snake that prefers to remain hidden. When threatened, they will sound their rattle and try to escape, preferring to avoid confrontations. Hedgcock (1992) found that the only thing that elicited a striking response from a Massasauga was being stepped on, and that was only 7% of the time. This snake offers little threat to reasonably careful people willing to leave them alone. Eastern Massasaugas in northern Michigan are most often associated with lowland coniferous forests, open wetlands, prairies, savannas, barrens, and forest openings. Structural characteristics appear to be more important than vegetative composition; important habitat characteristics include open, sunny areas intermixed with shaded areas, hibernation areas with the water table near the surface, and juxtaposition of wetland and upland areas for use during different times of year (Lee and Legge 2000). Michigan is the last stronghold for this snake in the United States, which is listed as endangered in every other state and province in which it occurs. The species has likely declined by 30% over the last 30 years, although it appears to be somewhat stable in the southwest and northern portions of its range in Michigan. According to the state's Natural Heritage Database there are 127 potentially viable element occurrences in Michigan.



Goals

- Maintain known populations and continue to identify additional populations.

*Secretive Locust (Appalachia arcana) –*

Special Concern



Secretive Locusts are small, short-winged grasshoppers that cannot sing or fly. They spend most of their day sunning themselves and move with the sun (Rabe et al. 1996). They appear to be endemic to Michigan and are listed as globally vulnerable/ imperiled. They are best known from leatherleaf-dominated sphagnum bog areas surrounded by jack pine and some tamarack (*Larix laricina*). Disturbance and frost play an important role in maintaining habitat for Secretive Locust (Cuthrell 2006). Currently there are 55 known locations for this grasshopper that have been verified since 1994.



Goals

- Establish baseline status and distribution.

### 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. See threats section for more specific information about how climate change may affect species and habitats.

Vulnerability analyses have different assumptions, and those assumptions can lead to uncertainties in predicting responses to climate change, especially at the scale of an individual species. For example, Hoving et al (2013) ranked Kirtland’s Warbler as Presumed Stable and Handler et al (2014) ranked their habitat as High-Moderate Vulnerability. The warbler analysis is valid for mid-century, does not include impacts to the wintering grounds, and assumes that the population will move elsewhere. The jack pine analysis is for late century and assumes that, unlike migratory birds, forests cannot move to track their optimal climate.

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; high = significantly decrease; moderate = likely decrease.

	<i>Climate Vulnerability</i>
Kirtland’s Warbler	Stable
Dusted Skipper	Moderate
Eastern Massasauga	High
Secretive Locust	Moderate
Jack Pine (including Pine-Oak)	High/Moderate
Barrens	Low/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 out-compete native plants or can kill mature trees (Comer 1996; Cohen 2002; Szymanski et al. 2015).

### *Natural Systems Modifications*

- Fire suppression has led to changes in the size and seasonality of fires (USFWS 1976; Cohen 2002; Cuthrell 2006; Szymanski et al. 2015).
- Conversion from jack pine to red pine stands naturally or through land management activities (USFWS 1976; Cohen 2002; Cuthrell 2006).
- Fragmentation makes it difficult to maintain connectivity, and increases invasive species pathways (Comer 1996; Cohen 2002; Szymanski et al. 2015).
- Encroachment of woody vegetation or conversion to other land uses in forest openings (Comer 1996; Cuthrell 2006; Szymanski et al. 2015).

### *Agriculture & Aquaculture*

- Jack pine management may be restricted in the future due to shifting timber markets.
- Loss of habitats due to the expanding scope and intensification of agricultural practices (Szymanski et al. 2015).

### *Energy Production & Mining*

- Oil and gas exploration can fragment habitats and increase pathways for invasive species colonization.

### *Human Intrusions & Disturbance*

- Negative public perceptions of clear-cutting and fire management practices.

### *Climate Change & Severe Weather*

- Climate change could have a variety of impacts: conflicting predictions of the future climate leads to large uncertainty for managers; increased precipitation and longer growing seasons could move systems towards oak and cherry; invasive species may have a competitive advantage due to increased temperatures and carbon dioxide.

## *Conservation Actions for Habitat*

### *Land & Water Management*

- H1. Where feasible, restore or mimic natural disturbance regimes to maintain habitat for focal species; focus on larger blocks of habitat. [KW-1; KW2; EMR; PIF]
- H2. Manage habitats for a diverse landscape of Dry Northern Forests and Pine Barrens. [PIF2; FRD; FRD2]
- H3. Implement invasive species decontamination and prevention protocols. [TIS; CC-1.4]
- H4. Implement the Michigan Terrestrial Invasive Species State Management Plan. [TIS]
- H5. Continue early detection and response efforts for invasive species. [TIS]

### *Raising Awareness*

- H6. Establish a public-private collaborative working group for conservation across the landscape.
- H7. Educate land managers, local communities, and the public on the value of intensive management practices such as fire and clear-cutting. [CG-4B]
- H8. Increase communications between biologists and fire professionals through the Michigan Prescribed Fire Council.
- H9. Promote voluntary best management practices for stopping the introduction and spread of invasive species for recreational users, researchers and industry. [TIS]
- H10. Work with land use planners and local governments to encourage conservation of Northern Dry Forest and Pine Barrens and the wildlife that rely on them. Provide resources to aid them in considering these values in their decisions. [PIF2]

### *Conservation Designation & Planning*

- H11. Identify high-quality Dry Northern Forests and Pine Barrens in climate resilient landscapes and incorporate into conservation planning and management; currently being developed by The Nature Conservancy. [CC-1.2]
- H12. Conduct scenario planning workshops with land managers to better incorporate climate change uncertainty into management. [CC-4.2]
- H13. Incorporate wildland fire use into fire management plans to include modified fire suppression options.

### *Law & Policy*

- H14. Keep prohibited species list (NREPA Part 413) current and implement enforcement.

### *Research & Monitoring*

- H15. Assess cost-efficiency of alternative management strategies to inform management.
- H16. Monitor for Mountain Pine beetle, a direct threat to jack pine. [TIS]
- H17. Use and promote the Midwest Invasive Species Information Network (MISIN) to monitor invasive species. [CC-7.3; TIS]

### *Threats to Kirtland's Warbler*

#### *Invasive & Problematic Species, Pathogens & Genes*

- Nest parasitism by Brown-headed Cowbird (USFWS 1976).

#### *Climate Change & Severe Weather*

- Climate change could have a variety of impacts: potential sea-level rise at wintering grounds could cause habitat loss; increased frequency or intensity of tropical storms would impact a large number of individuals, potential phenological mismatches in the timing of food sources and migration (Hoving et al. 2013).

### *Conservation Actions for Kirtland's Warbler*

*Species Management*

KW1. Implement the Kirtland's Warbler Conservation Plan. <sup>[KW2]</sup>

*Research & Monitoring*

KW2. Develop and implement a long-term, cost-effective monitoring strategy for Kirtland's Warbler. <sup>[KW-4]</sup>



*Threats to Dusted Skipper*

*Lack of Knowledge*

- Lack of information on distribution and specific habitat characteristics (Cuthrell 2006).

*Natural Systems Modifications*

- Poorly timed prescribed burns in fall or early spring may be detrimental to larvae. In early spring, when a substantial number of larvae may still be in elevated leaf shelters and in the fall when they require insulating leaf litter and dead vegetation (Cuthrell 2006).

*Climate Change & Severe Weather*

- Climate change could cause a loss of diversity and abundance of nectar sources and create potential phenological mismatches with nectar sources (Hoving et al. 2013).

*Conservation Actions for Dusted Skipper*

*Land & Water Management*

DS1. At known sites, conduct prescribed burns in late spring, and include refuge areas, to avoid significant impacts to populations.

*Research & Monitoring*

DS2. Develop degree day models to better target survey efforts for Dusted Skipper. <sup>[CC-4.1]</sup>

DS3. Develop survey protocols.

DS4. Promote and use the Michigan Butterfly Network, and other citizen science efforts.



*Threats to Eastern Massasauga*

*Lack of Knowledge*

- Lack of information on the effects of snake fungal disease on Massasauga populations, hibernacula habitat requirements and locations, gestation or parturition locations, and factors that affect persistence and viability (Szymanski et al. 2015; for more information about snake fungal disease, see the Disease mini-plan).

#### *Natural System Modifications*

- Poorly timed habitat management without refuge provisions (Szymanski et al. 2015).

#### *Residential & Commercial Development*

- Fragmentation and lack of connectivity of transition zones between key habitats can be a significant limiting factor (Szymanski et al. 2015).

#### *Human Intrusions & Disturbance*

- Persecution from humans and mortality from roads (Szymanski et al. 2015).

#### *Climate Change & Severe Weather*

- Growing season droughts due to climate changes may cause increased predation, decreases in prey, and decreases in reproductive success (Hoving et al. 2013).

### *Conservation Actions for Eastern Massasauga*

#### *Land & Water Management*

- EM1. Implement and promote the Eastern Massasauga Candidate Conservation Agreement with Assurances practices, which provides guidance for habitat management to limit negative impacts on massasauga. <sup>[EMR]</sup>
- EM2. Identify and conserve important habitats for Eastern Massasauga. <sup>[CC-1.1]</sup>

#### *Conservation Designation & Planning*

- EM3. Incorporate habitat needs of Massasauga into management plans.
- EM4. Develop an Eastern Massasauga conservation strategy for the state.

#### *Raising Awareness*

- EM5. Continue outreach and education on snakes and their ecological value. <sup>[EMR2]</sup>

#### *Research & Monitoring*

- EM6. Develop a cost-effective monitoring protocol for determining the status of Eastern Massasauga.
- EM7. Conduct research to determine habitat parameters for Eastern Massasauga in northern Michigan.



### *Threats to Secretive Locust*

#### *Lack of Knowledge*

- Lack of information on distribution, specific habitat characteristics, and impacts of prescribed fire (Rabe et al. 1996).

### *Climate Change & Severe Weather*

- As the historical climate niche for the locust shifts northward, its poor dispersal capability and landscape barriers to movements may be an issue (Hoving et al. 2013).

### *Conservation Actions for Secretive Locust*

#### *Research & Monitoring*

- SL1. Develop survey protocols for Secretive Locust.
- SL2. Work with existing citizen science efforts to survey for Secretive Locust.
- SL3. Conduct studies to better understand habitat needs during different life stages, and effects of timber and fire management.



### *What Additional Conservation Actions Are Needed?*

*These additional conservation actions were identified by partners and should be addressed as resources become available.*

#### *Raising Awareness*

1. Engage private timber companies to better understand future markets for wood products and the potential impacts and opportunities for wildlife and their habitats.

#### *Conservation Designation & Planning*

2. Develop contingency plans for diseases, pests, and climate change that could significantly alter the forest and create biome shifts. <sup>[CC-2.1]</sup>
3. As climate shifts, allow some southern areas to move towards oak-pine barrens where they overlap with savanna prairies. <sup>[CC-1.1]</sup>

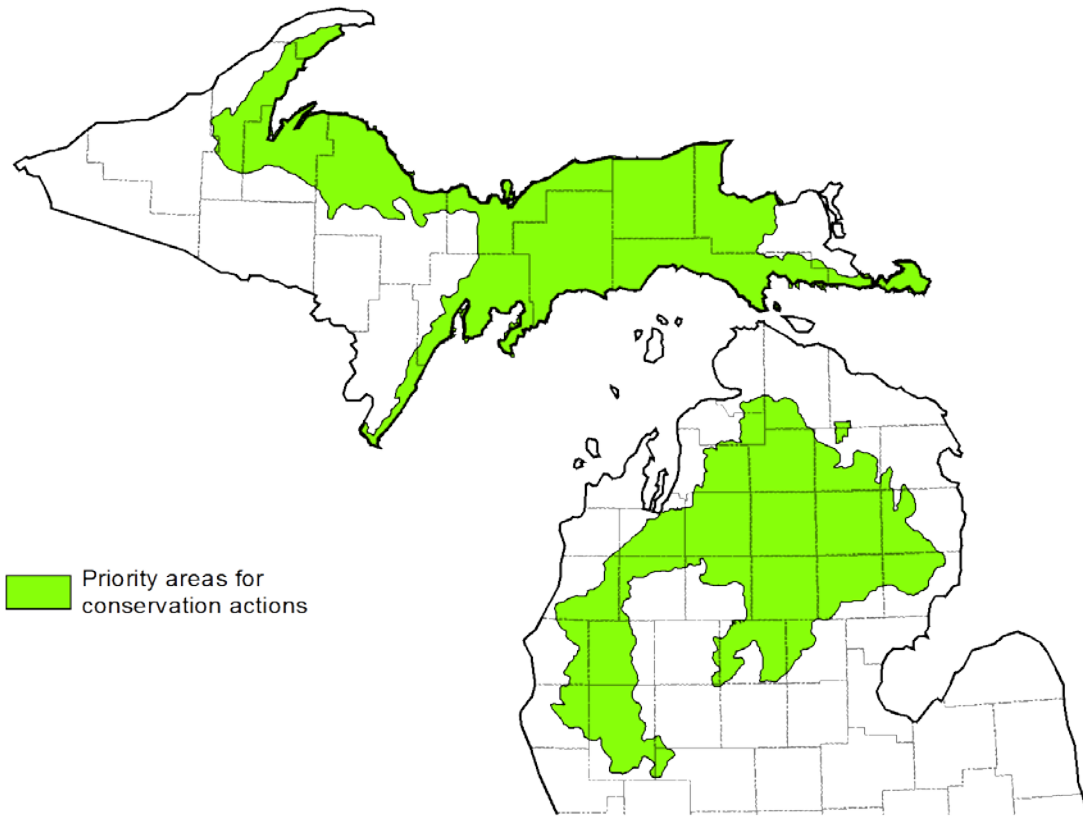
#### *Research & Monitoring*

4. Identify priority areas for conservation and priority areas for agriculture, and strategize with the agricultural sector to avoid conflict where there is overlap. <sup>[CC-1.1; CG-3B]</sup>
5. Quantify economic benefits of ecosystem services and wildlife-based recreation; tie to particular areas/ regions within the state when possible.

### *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 IV Ecoregions of Michigan and priority Kirtland's warbler areas.

## How Will We Monitor?

*Assessing status and measuring progress towards goals.*

### *Habitat*

- Number of acres for Kirtland's Warbler breeding habitat annually.
- Continue to survey and update quality rankings for Dry Northern Forests and Pine Barrens natural communities in the state's Natural Heritage Database.



### *Kirtland's Warbler*

- Continue to monitor Kirtland's Warbler populations. <sup>[KW2-C.1]</sup>
- Implement a long-term, cost effective monitoring strategy, once developed. <sup>[KW2-C.1]</sup>



### *Dusked Skipper*

- Implement developed survey protocol for Dusted Skipper regularly to determine distribution and relative abundance. <sup>[CG-4A]</sup>
- Continue to update element occurrences in the state's Natural Heritage Database.



### *Eastern Massasauga*

- Continue presence/ absence monitoring at known sites regularly.
- Continue to update element occurrences in the state's Natural Heritage Database.



### *Secretive Locust*

- Implement the developed survey protocol for Secretive Locust regularly to determine distribution and relative abundance. [CG-4A]
- 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 assist the expansion of partnerships.

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

[CG] Conservation planning for the Grayling subdistrict of Michigan (Muladore et al. 2006)

[EMR] Candidate conservation agreement with assurances for the Eastern Massasauga Rattlesnake *Sistrurus catenatus* in Michigan (DNR draft)

[EMR2] Eastern Massasauga species survival plan (Association of Zoos and Aquariums 2015)

[FRD] Northern Lower Peninsula regional state forest management plan (DNR 2013)

[FRD2] Eastern Upper Peninsula regional state forest management plan (DNR 2013b)

[FRD3] Western Upper Peninsula regional state forest management plan (DNR 2013c)

[KW] Kirtland's warbler recovery plan (USFWS 1985)

[KW2] Kirtland's Warbler Breeding Range Conservation Plan (DNR et al. 2014)

[PIF] Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004)

[PIF2] in Flight bird conservation plan for the boreal hardwood transition (Bird Conservation Region 12 – U.S. Portion) (Matteson et al. 2009)

[TIS] Michigan Terrestrial Invasive Species State Management Plan (DNR draft)

## [For More Information/References](#)

Association of Zoos and Aquariums. 2015. Eastern Massasauga species survival plan.

Cohen, J.G. 2002. Natural community abstract for Dry Northern Forest. Michigan Natural Features Inventory, Lansing, MI. 15 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, MI. 362 pp.

Comer, P.J. 1996. Natural community abstract for pine barrens. Michigan Natural Features Inventory, Lansing, MI. 4 pp.

Cuthrell, D.L. 2006. Special animal abstract for *Atrytonopsis hianna* (Dusted Skipper). Michigan Natural Features Inventory, Lansing, MI 3 pp.

Faust L., J. Szymanski, M. Redmer. 2011. Range wide extinction risk modeling for the Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*). U.S. Fish and Wildlife Service, Fort Snelling, MN. 66 pp.

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.

Hedgecock, K. 1992. Defensive behavior of the Eastern Massasauga Rattlesnake. Pp. 99–103, In B. Johnson and V. Mexies (Eds.). Proceedings of the International symposium and workshop on the conservation of the Eastern Massasauga rattlesnake, *Sistrurus catenatus catenatus*. Metro Toronto Zoo, West Hill, ON, Canada. 136 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. Wildlife Division Report No. 3564. Lansing, MI. 82 pp.

Lee, Y. and J. T. Legge. 2000. Special animal abstract for *Sistrurus catenatus catenatus* (Eastern Massasauga). Michigan Natural Features Inventory, Lansing, MI. 8 pp.

Matteson, S., K. Kreiting, G. Bartelt, G. Butcher, D. Sample, and T. Will. 2009. Partners in Flight bird conservation plan for the boreal hardwood transition (Bird Conservation Region 12 – U.S. Portion). Version 1.0. Partners in Flight. [www.partnersinflight.org](http://www.partnersinflight.org).

Michigan Department of Natural Resources (DNR). 2010. Michigan Forest Resource Assessment and Strategy. Lansing, MI. 124 pp.

Michigan Department of Natural Resources (DNR). 2013. Northern Lower Peninsula Regional State Forest Management Plan. Michigan Department of Natural Resources, Lansing, MI.

## [For More Information/References Continued](#)

- Michigan Department of Natural Resources (DNR). 2013b. Eastern Upper Peninsula regional state forest management plan. Michigan Department of Natural Resources, Lansing MI.
- Michigan Department of Natural Resources. 2013c. Western Upper Peninsula regional state forest management plan. Michigan Department of Natural Resources, Lansing MI.
- Michigan Department of Natural Resources (DNR). In Review. Candidate conservation agreement with assurances for the Eastern Massasauga Rattlesnake *Sistrurus catenatus* in Michigan.
- Michigan Department of Natural Resources (DNR). Draft. Michigan Terrestrial Invasive Species State Management Plan. Michigan Department of Natural Resources, Lansing MI.
- Michigan Department of Natural Resources, U.S. Fish and Wildlife Service, and U.S. Forest Service. 2014. Kirtland's Warbler Breeding Range Conservation Plan. May 27, 2014. 61 pp. +app.
- Muladore, J., S. Pendergrass, and R. Schillo. 2006. Conservation planning for the Grayling subdistrict. Final Project Report to The Nature Conservancy. 166 pp.
- 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.
- Olson, J. A. 2002. Special animal abstract for *Dendroica kirtlandii* (Kirtland's Warbler). Michigan Natural Features Inventory, Lansing, MI. 5 pp
- Pierce Cedar Creek Institute. Eastern massasauga rattlesnake management guidelines for prairie fen and associated oak savanna restoration in Michigan and Indiana. Pierce Cedar Creek Institute, Hastings, MI. Available: <http://www.cedarcreekinstitute.org/Massasauga%20Guidelines.pdf> [08/10/2015].
- Potter, B.A., G.J. Soulliere, D.N. Ewert, M.G. Knutson, W.E. Thogmartin, J.S. Castrale, and M.J. 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.
- Rabe, M.L., J.T. Legge, and D.A. Hyde. 1996. Special animal abstract for *Appalachia arcana* (Secretive Locust). Michigan Natural Features Inventory, Lansing, MI. 2 pp.
- Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Wlitas, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology. Ithaca, NY.
- Szymanski, J., C. Pollack, L. Ragan, M. Redmer, L. Clemency, K. Voorhies, and J. JaKa. 2015. Species status assessment for the Eastern Massasauga Rattlesnake (*Sistrurus catenatus*). U.S. Fish and Wildlife Service. July 23, 2015 (v1).

U.S. Fish and Wildlife Service (USFWS). 1976 (updated 1985). Kirtland's Warbler recovery plan. U.S. Fish and Wildlife Service, Bloomington, MN. 83 pp.

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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/dnrwildlifeactionplan](http://www.michigan.gov/dnrwildlifeactionplan).