MICHIGAN 2015 - 2025

PRAIRIES & SAVANNAS

Wildlife Action Plan

Today's Priorities, Tomorrow's Wildlife

WHAT ARE PRAIRIES & SAVANNAS?

Prairies are diverse, fire-dependent native grassland communities that were historically abundant in southern Lower Michigan, and occur infrequently in the northern Lower Peninsula and the far western counties in the Upper Peninsula. They are dominated by warm-season grasses, herbs, and flowers with no or few trees. Prairies occur on glacial outwash plains, pitted outwash plains, lakeplains, coarse-textured end moraines, and glacial till plains on a variety of soils including sands, loamy sands, sandy loams, loams, and silt loams. Natural processes that influence species composition and community structure include fire, fluctuating water levels, drought, and, for Prairies occurring in northern Michigan, growing-season frosts and low-nutrient soils.

Savannas are also fire-dependent ecosystems characterized by a grass-dominated ground layer with scattered overstory of oaks and sometimes conifers with typically less than 60% canopy cover. Savannas are now rare, but were once widespread throughout Michigan on a variety of landforms including sandy outwash plains, sandy glacial lakeplains, coarse-textured end moraines, and kettle-kame topography. They occur on a variety of soils, including sands, loamy sands, sandy loams, and loams with soil moisture ranging from droughty to mesic. Natural processes that influence species composition and community structure include fire, fluctuating water levels, drought, and, for Savannas occurring in northern Michigan, growing-season frosts and low-nutrient soils. The Savanna natural communities addressed in this mini-plan do not include Pine Barrens, as they are addressed in the Dry Northern Forests & Pine Barrens mini-plan.

– Adapted from Cohen et al. 2015

Rusty-patched Bumble Bee

Eastern Box Turtle

Wild Turkey

Eastern Cottontail

WHAT USES PRAIRIES & SAVANNAS?

WHY ARE PRAIRIES & SAVANNAS IMPORTANT?

The roots of Michigan's Prairies and Savannas grew under the hooves of Bison and the feet of dancing Greater Prairie-chickens. With the loss of many of our original Prairies and Savannas, we said farewell to the last of these two species, but it is not too late to save our Prairies for generations of Michiganders yet to come. These fragments and remnants of what had been a rich natural heritage still provide vital services for the communities where they can be found. Prairie patches in agricultural landscapes anchor topsoil in place and slow erosion with their root systems. These large, complex root systems also improve soil structure to help rainwater percolate through the soil and prevent runoff and flooding. They can capture nutrients as they leach from fertilized fields, and use it to convert carbon dioxide to grasses and wildflowers, protecting both our waterways and our air. The diversity of plants found in Prairies and Savannas supports pollinators throughout the growing season – pollinators that we depend on to produce a variety of crops. Prairies and Savannas are home to some of our most popular wildlife species, such as Ring-necked Pheasant and Wild Turkey, and some of our rarest, including Karner Blue Butterflies and Henslow's Sparrows. We may never see Bison roaming free in Michigan again, but we can act to ensure that future generations will always know the buzzing wonder of a Prairie in bloom and the tranquility of a summer Savanna.

PLAN CONTRIBUTORS

- Detroit Zoological Society
- Grand Traverse Regional Land Conservancy
- Gratiot Conservation District
- Michigan Department of Natural Resources
- Michigan Nature Association
- Michigan Natural Features Inventory
- Michigan State University
- Pheasants Forever
- Pierce Cedar Creek Institute
- U.S. Fish and Wildlife Service

WHAT IS THE HEALTH OF PRAIRIES & SAVANNAS?

Natural communities are tracked in the state's Natural Heritage Database, which provides information about their location, quality, and often the plants and wildlife found there. This data provides an index of the overall health of Prairies and Savannas across the state. Between 2005 and 2015, two Prairies were added to the Natural Heritage Database for a total of 50 tracked ecosystems. Eighteen were assessed between 2005 and 2015 to determine quality or health of the ecosystem; of those assessed 67% were downgraded. Between 2005 and 2015, ten oak Savanna communities were added to the Natural Heritage Database for a total of 46 tracked ecosystems. Fifteen were assessed since 2005 to determine quality; 7% were upgraded in quality and 67% 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. For species, element occurrences commonly reflect populations or subpopulations.

GOALS

- Increase quality and maintain existing acres of Prairie and Savanna.

White false indigo
(Baptisia lactea)

Prairie coreopsis
(Coreopsis palmata)

Side-oats grama grass
(Bouteloua curtipendula)

Prairie-smoke
(Geum triflorum)

Western silvery aster
(Symphyotrichum sericeum)

Leadplant
(Amorpha canescens)

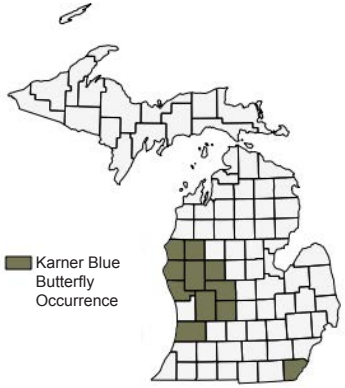
ASSOCIATED RARE PLANTS

WHAT ARE THE PRAIRIE & SAVANNA FOCAL SPECIES?

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

Karner Blue Butterfly
(Lycaeides melissa samuelis)
Federally Endangered & State Threatened

Karner Blue Butterflies are nickel-sized butterflies and the males are a vibrant, silvery blue. The caterpillars of these pretty little butterflies feed only on lupine, whereas the adults nectar on a variety of plants including butterfly weed (*Asclepias tuberosa*) and blazing star (*Liatris aspera*). Ants and Karner Blue may have a mutually beneficial relationship where the ants feed on the sweet secretions produced by larvae and in return the ants help protect the butterfly larvae from predators or parasitoids (Rabe 2001). There are currently 146 element occurrences, however, only 32 are considered viable (MNFI 2007). Habitat management efforts are ongoing and needed actions are well known at existing sites.

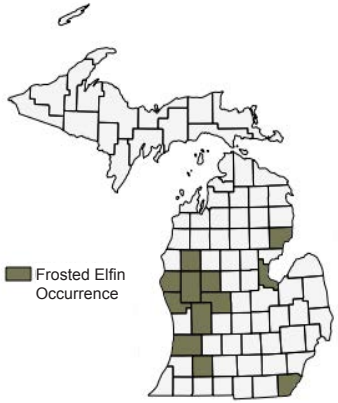


GOALS

- Retain current viable element occurrences (of A, B, or C ranking).

Frosted Elfin
(Incisalia irus)
State Threatened

The Frosted Elfin is a sedentary butterfly that sits around on its host plant until it is disturbed, at which point it flies close to the ground and looks for another perch (Gehring 2006). The caterpillars typically use lupine or wild indigo as their host plants and adults nectar on blueberry blossoms (*Vaccinium spp.*). These butterflies use small openings within woodlands or overgrown Savanna. They have undergone a significant range reduction since the 1960s, and many of the known sites are in degraded habitats (Nielsen 1994). It is estimated that Frosted Elfin populations have declined between 50% and 90%. There are only 12 records of this species in Michigan within the last 20 years (MNFI 2007).



GOALS
- Determine statewide distribution and relative abundance.
- Manage 3 existing sites for Frosted Elfin.

GOALS
- Establish baseline status and distribution

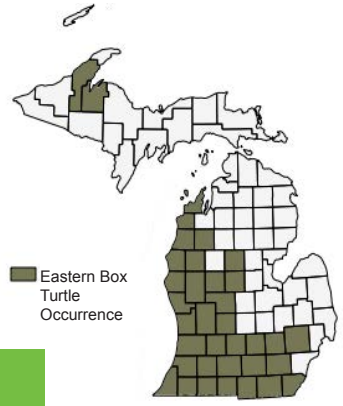
Rusty-patched Bumble Bee
(Bombus affinus)
Special Concern

The Rusty-patched Bumble Bee is an important pollinator, like other bumble bees. They do not rely on one flower but visit many wild flowering plants as well as crops. Bumble bees are able to fly in cool temperatures and lower light levels than other pollinators, and will "buzz pollinate" (Hatfield et al. 2012). Buzz pollination occurs when the bee grabs the flower's anthers, and vibrates to dislodge pollen that would otherwise remain trapped; some plants including tomatoes, peppers, and cranberries require buzz pollination (Hatfield et al. 2012). Populations range-wide are rapidly declining by an estimated 87% (Xerces Society 2015), yet it is unclear why. There are currently no records in the state's Natural Heritage Database; however, three sightings have been documented in Bumble Bee Watch (2013).

Eastern Massasauga
(Sistrurus catenatus catenatus)
Federal Proposed Threatened, Special Concern

The 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. Hedgecock (1992) found that the only thing that elicited a striking response from a Massasauga was being stepped on, and that only occurred 7% of the time. This snake offers little threat to reasonably careful people willing to leave them alone. 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. This species has likely declined by 30% over the last 30 years. Massasaugas appear to be somewhat stable in the southwestern and northern portions of their range in Michigan. According to the state's Natural Heritage Database there are 127 potentially viable element occurrences in Michigan.

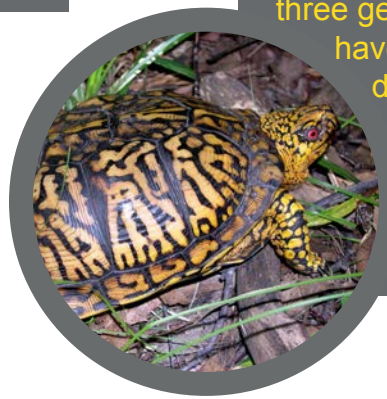
GOALS
- Maintain known populations and continue to identify additional populations.



GOALS
- Improve recruitment at long-term management sites for Eastern Box Turtle.

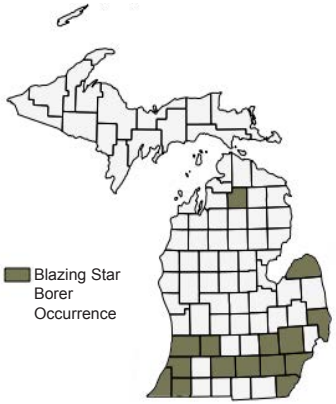
Eastern Box Turtle
(Terrapene carolina carolina)
Special Concern

The Eastern Box Turtle is a land turtle that has yellow or orange markings on its domed shell; the bottom part, or plastron, hinges to allow the turtle to hide its head, legs, and tail within its closed shell. These turtles are found in forest habitats with sandy soils and water nearby but require open, unshaded, and sandy nesting areas (Hyde 1999). Populations are rapidly declining in the state. Over their entire range, population reductions likely exceed 30% over three generations and Michigan populations have likely experienced greater than 50% declines. It is estimated that both egg and juvenile mortality range from 70-100%. There are 25 viable element occurrences in the state's Natural Heritage Database.



Blazing Star Borer
(Papaipema beeriana)
Special Concern

Blazing Star Borer larvae can be found on the plant blazing star (*Liatris spp.*) by looking for a small hole at the base of the plant and looking for frass (caterpillar feces) near the opening (Cuthrell 1999). This species overwinters in the duff making it susceptible to fires in early spring. The Blazing Star Borer is globally rare and is a species of special concern in Michigan. There is a long-term trend of declines greater than 90%. There are 24 occurrences of this species in Michigan since 1984 (MNFI 2007).

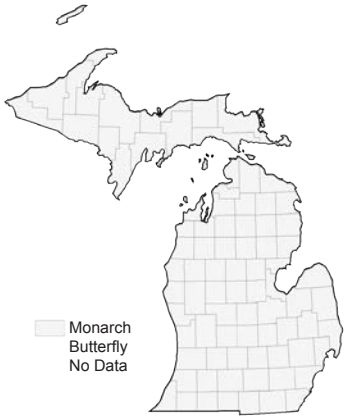


GOALS

- Determine statewide distribution and relative abundance.
- Manage 3 extant sites for Blazing Star Borer.

GOALS

- Increase outreach efforts on the Monarch Butterfly and what people can do to aid conservation.
- Establish baseline status and distribution.



Monarch Butterfly
(Danaus plexippus)

Monarch Butterflies are famous for their migrations from their wintering grounds in the Sierra Nevada Mountains of Mexico to many eastern states and Canada, including Michigan. The first three generations during the summer live only for 2-6 weeks and will continue to move northward. But the fourth generation can live up to 9 months, and these butterflies will migrate south for the winter. It is an amazing lifecycle and a spectacle to see during their migrations south because tens of thousands of individuals will land on a single tree. The overwintering population of monarchs has declined over the last twenty years, leading to a petition to place the Monarch on the federal threatened and endangered species list. In Michigan, current evidence suggests populations have stayed stable (Badgett and Davis 2015).

DID YOU KNOW?

While not as extensive as those of the western states, native grassland complexes once occurred in almost every county of Michigan's Lower Peninsula. In the early to mid-1800s, the Lower Peninsula supported approximately 73,000 acres (29,500 ha) of upland prairie, covering a gradient of moisture conditions from moderate to dry (Kost and Slaughter 2009). Historically, areas of Crawford and Newaygo counties each supported approximately 5,000 acres (2,000 ha) of dry grassland, the largest areas of dry sand prairie in the state (Kost 2004). Today, only 2% of the original upland prairie remains intact in all of Lower Michigan (Kost and Slaughter 2009). Once common plants and animals remain on the fringes of their former habitats as they attempt to adapt to a landscape now heavily impacted by humans.

GET ENGAGED!

Check out these citizen science opportunities:

Michigan Butterfly Network
www.michiganbutterfly.org

•••

Monarch Larva Monitoring Project
www.mlmp.org

•••

Bumble Bee Watch
www.bumblebeewatch.org

•••

Amphibian and Reptiles
www.miHerpAtlas.org

•••

Tracking Invasive Species
www.misin.msu.edu

HOW VULNERABLE ARE FOCAL SPECIES TO CLIMATE CHANGE?

Hoving et al. (2013) determined climate vulnerabilities for focal species. See threats section for more specifics about how climate change may affect species and habitats.

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.

	Climate Vulnerability
Karner Blue Butterfly	High
Frosted Elfin	High
Blazing Star Borer	Unknown
Eastern Box Turtle	High
Rusty-patched Bumble Bee	Stable
Eastern Massasauga	High
Monarch Butterfly	Not Assessed

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 & Other Problematic Species, Genes & Diseases

- Invasive plants outcompete native plants and change the structure of habitats needed for focal species (Kost et al. 2007).

Natural Systems Modifications

- Succession to more forested ecosystems (USFWS 2003).
- Suppression of fire and current prescribed burn practices can change plant diversity (Kost et al. 2007).
- Fragmentation of habitats to smaller tracts (USFWS 2003).

Climate Change & Severe Weather

- Changes in climate could have a variety of impacts: ecosystems may be driven to more mesic conditions due to increased precipitation, and changes in temperature could alter the timing of plant growth (USFWS 2003).

Conservation ACTIONS for Habitat

Land & Water Management

H1. Conduct habitat management to mimic natural disturbance regimes to maintain species diversity and community structure. [BSB; EMR; KBB-1.2; KBB2; PBMP]

H2. Avoid disking remnant Prairie and Savanna habitats.

H3. Use prescribed fire as a management tool and consider burning throughout the year or at varying times to increase plant diversity; include refuge areas in known or suspected focal species sites. [BSB; EMR; KBB-1.2; KBB2; PBMP]

H4. When setting back succession and connecting habitats, use a combination method of prescribed fire and then cutting of sub-canopy to more effectively manage red maple invasion.

H5. Conduct targeted management in priority locations for high-threat invasive species. [CC-7.3; TIS]

H6. Continue early detection and response efforts for invasive species. [CC-7.3; TIS]

H7. Implement invasive species decontamination and prevention protocols. [CC-1.4; TIS]

H8. Work with private landowners adjacent to public or land conservancy holdings to manage and expand the size of suitable habitats and create connections to other suitable habitats for focal species. [CC-1.4; KBB-1.3]

Conservation Designation & Planning

H9. Use conservation easements and acquisitions to increase long-term viability of remnant Prairie and Savanna habitats, and to create important linkages for focal species needs. [CC-1.2]

H10. Work with the Natural Resources Conservation Service (NRCS) and the Farm Bill program to focus on protection and management of Prairie and Savanna habitats, creating a wildlife-friendly matrix across the landscape for the focal species. [CC-7.1]

H11. Identify high-quality Prairies and Savannas in climate resilient landscapes, and incorporate them into conservation planning and management; currently being developed by The Nature Conservancy. [CC-1.2]

Raising Awareness

H12. Support education efforts on the value of native plants, pollinators, Prairies, Savannas, and focal species. [KBB-4]

H13. Work with land use planners and local governments to encourage conservation of Prairies and Savannas and the wildlife that rely on them. Provide resources to aid them in considering these values in their decisions.

H14. Promote management and restoration of Prairie and Savanna habitats and the positive impacts it has on improving deer and turkey hunting experiences.

H15. Promote voluntary best management practices for stopping the introduction and spread of invasive species by recreational users, researchers, and industry. [TIS]

Law & Policy

H16. 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. [TIS]

Research & Monitoring

H17. Continue research on effective biocontrol for key invasive species with minimal negative side effects to native species. [TIS]

H18. Use and promote the Midwest Invasive Species Information Network (MISIN) to monitor invasive species. [CC-7.3; LMBCS-6.3; TIS]

THREATS to Karner Blue Butterfly

Invasive & Other Problematic Species, Genes & Diseases

- Degradation of available food/nectar sources for Karner Blue by excessive deer browse in certain areas (USFWS 2003).

Natural Systems Modifications

- Improperly timed habitat management, and changes from mechanical to chemical treatments (USFWS 2003; USFWS 2012).

Pollution

- Pesticides may significantly impact populations close to agricultural fields (Rabe 2001; USFWS 2012; Pecenka and Lundgren 2015).

Climate Change & Severe Weather

- Climate change could have a variety of impacts: populations could shift to 3 flights per year creating a mismatch in phenology with its host plant, as lupine becomes a lower quality food source toward the end of the growing season or may even die off before the third flight is completed; lack of consistent snow cover can cause eggs to desiccate; and extreme storms and precipitation during the flight can kill larvae and adults (Hoving et al. 2013).

Conservation ACTIONS for Karner Blue Butterfly

Land & Water Management

KB1. Implement and promote the Karner Blue Butterfly Habitat Conservation Plan (HCP), this provides guidance for habitat management to limit negative impacts on the species. [KBB-1.2; KBB2]

KB2. Conduct habitat management in cooler and wetter microclimates to adapt to changes in the climate. [CC-1.3; KBB-1.2]

Conservation Designation & Planning

KB3. Incorporate habitat needs of Karner Blue into land management plans. [KBB-1.3]

Species Management

KB4. Implement the Karner Blue Butterfly Recovery Plan. [KBB]

KB5. Develop policies to guide translocations of Karner Blue. [CC-2.2; KBB-2]

Research & Monitoring

KB6. Explore the use of occupancy modelling to evaluate habitat management and its effects on populations. [KBB-5]

KB7. Determine if herbicides and pesticides are affecting populations. [KBB-5]

THREATS **to Frosted Elfin**

Lack of Knowledge

- Lack of information on distribution, abundance, and the potential effects on populations from climate change, pesticides, and high deer herbivory (Gehring 2006).

Climate Change & Severe Weather

- Climate change could have a variety of impacts including the possibility of host plant phenological mismatches and extreme storms and precipitation during the flight that can kill larvae and adults (Hoving et al. 2013).

Conservation ACTIONS **for Frosted Elfin**

Land & Water Management

FE1. Manage small openings within woodland and overgrown Savanna at known sites for Frosted Elfin. [PBMP]

Conservation Designation & Planning

FE2. Incorporate habitat needs of Frosted Elfin into land management plans.

Research & Monitoring

FE3. Determine if herbicides and pesticides are impacting populations.

THREATS to Rusty-patched Bumble Bee

Lack of Knowledge

- Lack of information on current distribution and reasons for decline.

Pollution

- Pesticides may significantly impact populations close to agricultural fields (Hopwood et al. 2012). Increased use of insecticides in crop fields (blueberries, cherries, raspberries, etc.) to control Spotted Wing Drosophila (*Drosophila suzukii*), as well as spraying in adjacent natural habitats to protect crops (Xerces Society 2015).

Agriculture & Aquaculture

- Removal of habitat to control or eliminate alternative wild hosts for crop pollinators in areas adjacent to agricultural fields (Xerces Society 2015).

Conservation ACTIONS for Rusty-patched Bumble Bee

Land & Water Management

RB1. Protect and manage habitats where Rusty-patched Bumble Bees are found.

Research & Monitoring

RB2. Collaborate with other states to investigate the cause of bumble bee population declines.

THREATS to Eastern Massasauga

Lack of Knowledge

- Lack of information on the effects of snake fungal disease on 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 Emerging Diseases mini-plan).

Natural System Modifications

- Poorly timed or inappropriate 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 (Lee and Legge 2000; Szymanski et al. 2015).

Human Intrusions & Disturbance

- Human persecution (Lee and Legge 2000; Szymanski et al. 2015).

Climate Change & Severe Weather

- Growing season droughts due to climate changes may cause increased predation and loss of prey (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. [EMR]

EM2. Identify and conserve important habitats for Eastern Massasauga. [CC-1.1]

Conservation Designation & Planning

EM3. Incorporate habitat needs of Massasauga into land 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.

Research & Monitoring

EM6. Develop a cost-effective monitoring protocol for determining the status of Eastern Massasauga.

EM7. Determine impacts of different management activities on Eastern Massasauga populations to better inform management and policies.

EM8. Survey and assess viability of Eastern Massasauga at new sites to focus active management.

THREATS to Eastern Box Turtle

Lack of Knowledge
- Lack of information on how habitat management and operational maintenance affects populations, factors that affect recruitment, impacts of red maple invasions on hibernation areas, and habitat needs.

Invasive & Problematic Species, Pathogens & Genes
- Nest predation by mesopredators (e.g., raccoons) (Hyde 1999).

Human Intrusions & Disturbance
- Vehicle mortality and illegal collection (Hyde 1999).

Natural System Modifications
- Poorly timed habitat management using fire and mechanical treatments (Howey and Roosenburg 2013).

Agriculture & Aquaculture
- Agricultural fields may create habitat sinks as shading of the nests can make them unviable (A. Inken, personnal communication).

Conservation ACTIONS for Eastern Box Turtle

Land & Water Management
BT1. Restore, maintain, and protect connectivity between Prairie and Savanna, and adjacent forest habitats for Eastern Box Turtle.

Species Management
BT2. Designate places for long-term Eastern Box Turtle management; implement management.

BT3. Control mesopredators and protect nests in areas where there is evidence of Eastern Box Turtle reproduction.

BT4. Consider head starting Eastern Box Turtles at sites where effective mesopredator and nest protection efforts are ineffective.

Research & Monitoring
BT5. Determine factors outside of mesopredators that affect recruitment.

BT6. Determine impacts of different management and operational maintenance activities to better inform management and best practices guidelines.

THREATS to Blazing Star Borer

Lack of Knowledge

- Lack of information on general life history, distribution, relative abundance, and the potential effects on populations from climate change and pesticides (Cuthrell 1999).

Natural System Modifications

- Improperly timed habitat management; this species is very susceptible to fire (Cuthrell 1999).

Conservation ACTIONS for Blazing Star Borer

Land & Water Management

BSB1. Conduct habitat management for Blazing Star Borer to include its larval host plant, blazing star. [BSB]

Conservation Designation & Planning

BSB2. Incorporate habitat needs of Blazing Star Borer into land management plans.

Research & Monitoring

BSB3. Determine if herbicides and pesticides are impacting populations.

THREATS to Monarch Butterfly

Natural System Modifications

- Loss of milkweed and timing of management especially mowing when millkweed is at its peak (Commission for Environmental Cooperation 2008).
- Pale and black swallow-wort are population sinks for Monarch Butterflies (Casagrande and Dacey 2007).

Conservation ACTIONS for Monarch Butterfly

Land & Water Management

MB1. Identify and control pale and black swallow-wort in cooperation with Cooperative Invasive Species Management Areas. [TIS]

Raising Awareness

MB2. Support Monarch Butterfly education and conservation efforts. Promote best management practices for land managers to aid Monarch Butterfly conservation. Promote seed sources with a diversity of milkweed species. [PBMP]

WHAT ADDITIONAL CONSERVATION ACTIONS ARE NEEDED?

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

Species Management

1. Conduct management for nesting habitats of Eastern Box Turtle in key places. [EBT]

2. Assess opportunities for installing wildlife crossings for Eastern Box Turtle in areas where high vehicle mortality is affecting populations, and implement.

Raising Awareness

3. Develop programs for classrooms to learn about Eastern Box Turtles and their habitats.

Research & Monitoring

4. Determine effects of habitat management, and develop best management practices for Blazing Star Borer. [BSB]

5. Develop methods for attracting female Eastern Box Turtles to productive nesting areas and away from unproductive areas.

6. Develop habitat suitability model for Eastern Box Turtle, including identification of potential hot spots.

7. Determine population structure for Eastern Box Turtle.

8. Develop methodology or application to identify individual Eastern Box Turtles to better understand populations.

9. Determine hibernacula needs of Eastern Massasauga.

10. Monitor and assess genetic diversity of extant populations of Eastern Massasauga.

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.

Priority areas for conservation actions

HOW WILL WE MONITOR?

Assessing status and measuring progress towards goals.

HABITAT

- Continue to survey and update quality rankings for Prairie and Savanna natural communities in the state's Natural Heritage Database.

KARNER BLUE BUTTERFLY

- Continue distance surveys for population trends. Additionally, habitat monitoring is needed especially at recovery sites where populations are low. [KBB]
- Use occupancy-based surveys or other new survey methods, where appropriate.
- Continue to update element occurrences in the state's Natural Heritage Database.

FROSTED ELFIN

- Develop a standard monitoring and survey protocol.
- Conduct targeted surveys in known and suspected areas to determine distribution and relative abundance.
- Use citizen science programs, such as the Michigan Butterfly Network, to help assess distribution and relative abundance.
- Continue to update element occurrences in the state's Natural Heritage Database.

RUSTY-PATCHED BUMBLE BEE

- Conduct targeted surveys in known and suspected areas to determine distribution and relative abundance. [PRAP-1.2]
- Use citizen science programs, such as the Bumble Bee Watch, to help assess distribution and relative abundance.
- Continue to update element occurrences in the state's Natural Heritage Database.

EASTERN MASSASAUGA

- Continue presence/ absence monitoring at known occupied sites regularly.
- Continue and expand intensive monitoring at a subset of known occupied sites that represent a range of conditions where Eastern Massasauga occurs.
- If cost-effective protocol is developed, implement.
- Continue to update element occurrences in the state's Natural Heritage Database.

EASTERN BOX TURTLE

- Use citizen science programs, such as the Herp Atlas, to help assess distribution and relative abundance.
- Continue to update element occurrences in the state's Natural Heritage Database.

BLAZING STAR BORER

- Develop a standard monitoring and survey protocol.
- Conduct targeted surveys in known and suspected areas to determine distribution and relative abundance.
- Continue to update element occurrences in the state's Natural Heritage Database.

MONARCH BUTTERFLY

- Use citizen science programs, such as the Michigan Butterfly Network and Monarch Larva Monitoring Project, to help assess distribution and relative abundance.

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.

[BSB] Conservation Assessment for Blazing Star Borer Moth (*Papaipema beeriana*) (USFS 2003)

[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)

[CW] A Conservation Action Plan for the Cerulean Warbler (*Dendroica cerulean*) (USFWS 2007a)

[EMR] Eastern Massasauga candidate conservation agreement with assurances (DNR in preparation)

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

[JV] Upper Mississippi River and Great Lakes Region Joint Venture Landbird Habitat Conservation Strategy (Potter et al. 2007)

[KBB] Final Recovery Plan for the Karner Blue Butterfly (*Lycaeides Melissa samuelis*) (USFWS 2003)

[KBB2] Michigan Karner Blue Butterfly Habitat Conservation Plan (DNR 2009)

[LMBCS] Michigami: great water. Strategies to conserve the biodiversity of Lake Michigan (Pearsall et al. 2012)

[NWR] Shiawassee National Wildlife Refuge Comprehensive Conservation Plan (USFWS 2001)

[PBMP] Pollinator-Friendly BMPs for Federal Lands (USFS 2015)

[PRAP] Pollinator Research Action Plan: Report of the Pollinator Health Task Force (The White House 2015)

[SWR] Wildlife Division Southwest Regional Habitat Guidance (DNR 2015b)

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

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Photo Credits

Eastern Box Turtle and Eastern Massasauga - Jennifer Moore

Rusty-patched Bumble Bee - Christy Stewart

Monarch - MNFI, Dave Cuthrell

Powesheik - USFWS, Corey Seeman

Blazing Star Borer - MNFI, Dave Cuthrell

White False Indigo (page 4) - Pierce Cedar Creek Institute

Prairie Corepsis and Western Silvery Aster (page 4) - MNFI, Brad Slaughter

Prairie Smoke (page 4) - MNFI

Frosted Elfin [pages 6, 13 (left photo), and 20] - MNFI

Habitat (page 9) - USFS

Habitat (page 10) - MNFI, Brad Slaughter

Frosted Elfin [page 13 (center and right photos)] – Kathy Malone

Habitat (page 20) - USFS

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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.