



United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Standing Analysis for the All-Species Michigan Determination Key

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1 INTRODUCTION

1.1 PURPOSE OF STANDING ANALYSIS

This Standing Analysis provides an optional, streamlined alternative consultation process for Federal Action Agencies to address potential effects of future actions, pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act), to the following species and critical habitat(s)¹ that occur in Michigan:

Animals

Birds

- Whooping Crane (*Grus americana*)- NEP (Nonessential Experimental Population)
- Piping Plover (*Charadrius melodus*)- E
- Rufa Red Knot (*Calidris canutus rufa*)- T

Freshwater Mussels

- Clubshell (*Pleurobema clava*)- E
- Northern Riffleshell (*Epioblasma torulosa rangiana*)- E
- Rayed Bean (*Villosa fabalis*)- E
- Snuffbox (*Epioblasma triquetra*)- E
- Round hickorynut (*Obovaria subrotunda*) - T
- Salamander mussel (*Simpsonaias ambigua*) – proposed E

Insects

- Hine’s Emerald Dragonfly (*Somatochlora hineana*)- E
- Hungerford’s Crawling Water Beetle (*Brychius hungerfordi*)- E
- Karner Blue Butterfly (*Lycaeides melissa samuelis*)- E
- Mitchell’s Satyr (*Neonympha mitchelli mitchelli*)- E
- Poweshiek Skipperling (*Oarisma poweshiek*)- E
- Monarch butterfly (*Danaus plexippus*) - Candidate

Mammals

- Canada Lynx (*Lynx canadensis*)- T
- Gray Wolf (*Canis lupus*)- E
- Indiana Bat (*Myotis sodalis*)- E
- Northern Long-eared Bat (*Myotis septentrionalis*)- E
- Tricolored Bat (*Permyotis subflavus*)- proposed E

Reptiles

- Copperbelly Water Snake (*Nerodia erythogaster neglecta*)- T
- Eastern Massasauga Rattlesnake (*Sistrurus catenatus*)- T

Plants

- American Hart’s-Tongue Fern (*Asplenium scolopendrium* var. *americana*)- T
- Dwarf Lake Iris (*Iris lacustris*)- T

¹ C = candidate, CH = critical habitat, E = endangered, NEP = nonessential experimental population, P = proposed, T = threatened

- Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)- T
- Houghton’s Goldenrod (*Solidago houghtonii*)- T
- Lakeside Daisy (*Hymenoxys herbacea*)- T
- Michigan Monkey-Flower (*Mimulus michiganensis*)- E
- Pitcher’s Thistle (*Cirsium pitcheri*)- T

Critical Habitats (CH)

- Hine’s Emerald Dragonfly CH
- Piping Plover CH
- Poweshiek Skipperling CH
- Salamander Mussel – Proposed CH

The U.S. Fish and Wildlife Service (Service) developed this standing analysis to streamline the process of reviewing actions that would result in a “may affect, not likely to adversely affect” (NLAA) determination for the subject species and critical habitat(s). This standing analysis also provides proactive technical assistance to Federal Action Agencies in making a “No Effect” determination.

This standing analysis provides an optional consultation process that is available to Federal Agencies for Federal Actions that meet the criteria described below as delivered through a Determination Key (DKey) in the Service’s Information for Planning and Consultation (IPaC) application. To obtain consultation documents, including technical assistance for NE and concurrence with NLAA determinations, Federal Agencies may use the associated DKey in IPaC to answer questions about the proposed action. By screening the project through the DKey, all or part of the standing analysis is adopted by the Federal Action Agency and used to submit a concurrence request to support their NLAA determination. It also provides technical information to help agencies determine whether an action will have no effect on the species or critical habitat. Actions which an Action Agency determines will have no effect on species or critical habitat do not require submittal to the Service. This key may also include provisions from programmatic consultations that address actions with adverse effects to listed species in specific scenarios.

Although consultation (section 7 of the Act) is not required in absence of a Federal nexus, this standing analysis also provides technical assistance for non-Federal actions to assist applicants in screening for potential impacts to listed species. See Section 3 for additional information on the Michigan Dkey’s applicability for both Federal and non-Federal projects.

Throughout the remainder of this document, statements regarding this standing analysis refer to both the standing analysis and the associated DKey.

2 BENEFITS OF THE STANDING ANALYSIS

For those actions that the Service has accumulated significant knowledge in analyzing previously, the Service is able to develop a standing analysis to streamline the consultation process for eligible actions. The streamlined process facilitated by this standing analysis will

reduce the amount of Service staff time necessary to review actions requesting consultation and provide Federal Agencies, consultants, and other project proponents a predictable, consistent, and timely response for qualified actions. In addition, development of a standing analysis to assess the impacts of individual projects allows the Service to more efficiently track multiple independent actions on listed species and critical habitat.

2.1 ELIGIBILITY FOR USE OF THE STANDING ANALYSIS

A standing analysis does not convey concurrence with NLAA determinations for individual projects. Rather, it serves as a streamlining tool. Action Agencies may use it to develop their request for concurrence from the Service and support their finding that the action is not likely to adversely affect species and critical habitat. The standing analysis also allows the Service to quickly evaluate an Action Agency's analysis of effects to listed species and critical habitat. If the Action Agency's proposed action is consistent with covered² area and covered activities, including any required conservation measures in the standing analysis, the Service will concur that the action will have insignificant, discountable, or completely beneficial effects on the relevant listed species and critical habitat (i.e., NLAA).

The standing analysis may also provide technical information to help Agencies identify actions that will have no effects to the listed species and critical habitat. For projects that do not qualify to use the standing analysis, Action Agencies/project proponents should coordinate directly with the Michigan Ecological Services Field Office (MIFO) and address any consultation requirements, as appropriate.

2.2 ENSURING ACCURATE DETERMINATIONS

The Service relies on complete and accurate information provided by Federal Action Agency or non-Federal project proponent during consultation or coordination. To apply this standing analysis to a project, it is the responsibility of the Action Agency/project proponent to provide information that is truthful and accurate and that fully represents the entire scope of the project in order to comply with the Act.

Where appropriate in our analysis, we make note of which activities are expected to have no effects³ on a species or critical habitat. This information is provided as technical assistance to Action Agencies making no effect/may affect determinations.

² The term "covered" is used throughout this document to define the limits of use of a standing analysis. Although a defined area (i.e., Michigan), activities, and species are "covered" by the standing analysis, impacts of proposed actions are not automatically "covered" by the standing analysis. Instead, Action Agencies or non-Federal project proponents must utilize the information in the standing analysis to assess potential impacts of the proposed action on listed species and habitats and request Service concurrence that the action is NLAA for listed species and critical habitat (either through the Dkey or by coordinating with Service outside the Dkey), as necessary.

³ A "no effect" determination is appropriate when a listed species is either not present in the Action Area or not exposed to any possible stressors or impacts from the proposed action.

2.3 UPDATES TO THE STANDING ANALYSIS

This standing analysis will be reviewed annually and updated as needed to ensure the analysis contains the best scientific and commercial data available. This update process will include regular reviews to ensure that the analysis is accurate and valid, and that the standing analysis still meets the Act's requirements. All updates will also ensure that the logic is sound and determinations are appropriate for covered activities.

Projects reviewed under this standing analysis must rely on the version that is current on the date consultation is completed. For reference, both current and previous versions of the standing analysis will be maintained by the lead field office.

Our Michigan Determination key library, including our standing analysis, is located here: <https://www.fws.gov/library/collections/michigan-determination-key-d-key>. Additional details on updating our Dkey, based on our auditing process, can be found below in section 3.1.

3 BACKGROUND ON ALL-SPECIES MICHIGAN DETERMINATION KEY

3.1 DEVELOPMENT AND USAGE OF MICHIGAN DKEY

In Fiscal Year 2019 (prior to the MIFO's implementation of the Dkey), the MIFO received over 1,270 projects that it reviewed and determined would not significantly affect or result in the prohibited take of species or habitats listed under the Act. The routine nature of the review of various Federal and non-Federal projects provides an opportunity for the MIFO to programmatically evaluate the effects of common activities on threatened and endangered species. Most incoming projects overlap with the Area of Influence (AOI) of multiple listed species in Michigan. The availability of a Dkey covering all threatened and endangered species and critical habitats in Michigan eliminates the need for the MIFO to individually review large numbers of projects and provides Federal Action Agencies, consultants, and project proponents with immediate and consistent responses to their requests for consultation, technical assistance, or conservation planning assistance.

Since the release of the initial version of the Michigan Dkey in December 2020, IPaC has generated well over 6,000 letters (Figure 1). Availability of our all-species, state-wide Dkey has resulted in increased coordination with Federal Agencies and non-Federal partners and resulted in significant streamlining for MIFO staff as well as applicants.

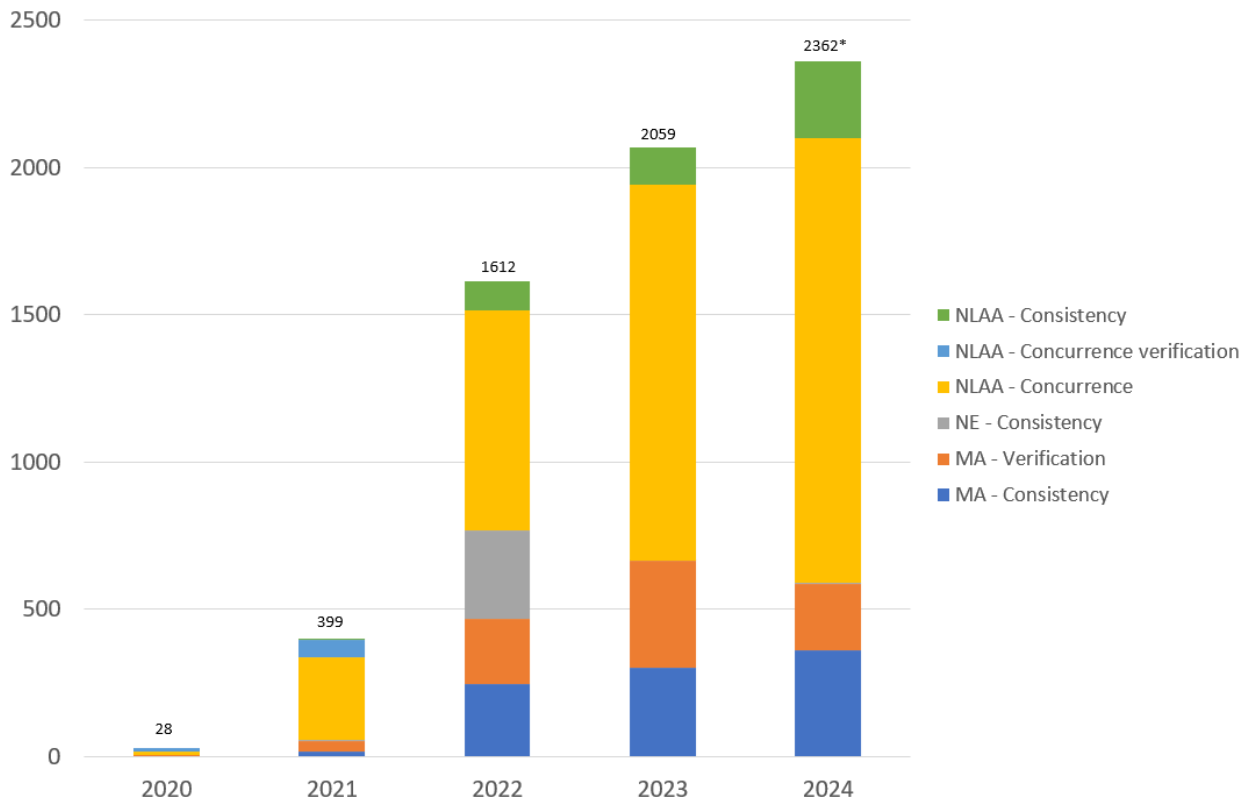


Figure 1. Michigan Dkey usage (*as of September 23, 2024).

To use the Michigan Dkey, applicants enter their project area in IPaC, and the program determines whether the project’s geographic extent intersects AOI of any federally listed species. The applicant has the option to complete an available determination key, including the Michigan Dkey, for those species for which their project area intersects an AOI. The Dkey starts by asking a series of questions to determine if the project qualifies for the Dkey (see General Limits/Sideboards below). If the project does not qualify for the Dkey, they will be notified that they must consider effects to threatened and endangered species outside of the Dkey. If the user’s project qualifies for the Dkey, they will receive questions based on the specific species that may be present in the Action Area. Depending on how they answer the questions and the corresponding determinations that are reached, they will receive one of 5 types of output letter from IPaC (Table 1). The majority of letters that are generated by users are “NLAA Concurrence” (Figure 1).

The MIFO has an internal “auditing” process by which a biologist “audits” or reviews the letters generated by IPaC to determine whether the Dkey is functioning properly and that the appropriate determinations are delivered. We also update the Dkey regularly to improve function based on feedback from applicants and auditors. We follow up with applicants when we need clarification regarding a letter or project or if we believe there is an error in a particular determination.

Table 1. Types of letters generated by the Michigan Dkey and instructions to applicants on whether there is a verification period or if additional action is needed.

File name	Subject line	Comments
NE Consistency Letter_ Michigan Federal Endangered Species Determination Key DATE	Subject: Consistency letter for PROJECT NAME	NE determination for all species/critical habitats. No additional action is needed.
NLAA Consistency Letter_ All Species Michigan Determination Key DATE	Subject: Consistency letter for PROJECT NAME	Non-Federal projects; NLAA or NE determination for all species/critical habitats. No additional action is needed.
NLAA Concurrence Letter_ All Species Michigan Determination Key DATE	Subject: Verification letter for PROJECT NAME	Federal project; NLAA or NE for all species/critical habitats. 30-day verification period.
MA Verification Letter_ All Species Michigan Determination Key DATE	Subject: Verification letter for PROJECT NAME	NE or NLAA for all listed species/critical habitats; candidate or experimental populations get MA. No additional action is needed. 30-day verification period.
MA Consistency Letter_ All Species Michigan Determination Key DATE	Subject: Consistency letter for PROJECT NAME	Dkey could not provide automated clearance for at least one species; section 7 consultation NOT complete for projects with Federal nexus. Not reviewed by MIFO automatically depending on workload.

For Federal projects that reach a NLAA determination, there is a 30-day “verification period” to allow the Service time to review the project details and ensure the action meets the criteria for a NLAA determination. Output letters will indicate that if the project proponent does not hear otherwise within that timeframe, the NLAA determination is verified, and they can proceed with their action as described in the IPaC report and concurrence verification letter. This verification period allows the MIFO to apply local knowledge to evaluation of the action and ensure actions do not have unanticipated impacts. Thus, there may be a small subset of actions for which the MIFO may request additional information during this timeframe to verify the effects determination reached through the DKey. There is no verification period for non- Federal projects or for NE determinations, although MIFO staff still review these for accuracy. If the user gets a MA determination for any species, they are advised to contact the MIFO to complete consultation outside of the Dkey. MA determinations, in the context of the Dkey, mean the Dkey

was not able to assist the user in making a determination. It does not necessarily mean that adverse effects to listed species or critical habitats are expected.

All output letters include reinitiation language as follows: “The Service recommends that your agency contact the Service or re-evaluate the project in IPaC if: 1) the scope or location of the proposed action is changed; 2) new information reveals that the action may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occur, additional consultation with the Service should take place before project changes are final or resources committed”.

3.2 BENEFITS OF AN ALL-SPECIES DETERMINATION KEY APPROACH IN MICHIGAN

The all-species, statewide Dkey approach taken in Michigan has improved ESA compliance, consistency, and efficiency for project proponents and the MIFO:

Compliance: Previously, many users in Michigan filed their official species lists or single-species Dkey (e.g., Range-wide NLEB Dkey) output letter and considered their section 7 obligations met, even if their species lists or species-focused Dkey letters clearly indicated additional consultation was needed. Availability of the Michigan Dkey has allowed users to more easily consider all listed species and critical habitats.

Consistency: Our Dkey utilizes local, Michigan-specific data regarding species ecology, landscape and habitat availability, climate, and potential stressors. The logic is consistent with the approach the Field Office takes for consultation outside of determination keys and the IPaC system, and it is based on the best available information for listed species populations in Michigan. We work closely with our state partners at the Michigan Department of Natural Resources and Michigan Department of Environment, Great Lakes, and Energy to ensure our approach is consistent with the state agency’s approach to implementing state authorities.

Efficiency: Our Dkey provides a comprehensive approach that is convenient for the user. Project proponents can complete one set of questions about their project and can often obtain a concurrence letter that covers all listed species and critical habitat. The auditing process described above allows the MIFO to quickly review the large volume of projects being screened using the Dkey.

Our statewide Dkey also allows us to integrate other authorities that are helpful to project proponents. For example, in our Michigan Dkey output letters we are able to provide: comments on communications towers and impacts to migratory birds under the Migratory Bird Treaty Act (Appendix A); information related to the Bald and Golden Eagle Protection Act; recommendations for projects intersecting a Coastal Barrier Resources

Act unit; siting recommendations for solar projects; recommendations for state-listed species; and recommended permit conditions for projects applying for a state wetland permit. We can use a Michigan-specific post-Dkey questionnaire to help us better understand project impacts individually and cumulatively. This allows for greater conservation outcomes and better communication with project proponents. We have found that our approach has also allowed us to interact and build relationships with agency staff and consultants through our various outreach efforts around our Dkey.

In summary, project proponents greatly appreciate having a “one-stop shop” for their projects by using the Michigan Dkey which allows them to use IPaC to generate a concurrence letter for their project that considers all federally listed species and habitats. Based on our observations during the implementation of both state-specific and range-wide Dkeys over the last several years, we believe the statewide approach also improves compliance, because applicants consider all species without additional steps or coordination.

4 COVERED AREA

This standing analysis applies throughout the state of Michigan. To qualify to use this standing analysis, a project’s Action Area must fall completely within Michigan. Projects that extend into Canada or other states within the U.S. are not able to use the Michigan Dkey.

5 COVERED SPECIES AND CRITICAL HABITAT

The following section includes a summary of relevant background information on the species and critical habitat(s) used to develop this standing analysis. A complete description of the species can be found on ECOS (<https://ecos.fws.gov>). This overview is included to inform the reader of the species prior to the analysis of the effects of the action presented below. Species and critical habitats within a project’s Action Area that may be affected by the proposed action, but are not covered by this standing analysis, will require individual consultation with the MIFO.

5.1 NONESSENTIAL EXPERIMENTAL POPULATION OF WHOOPING CRANE (*GRUS AMERICANA*)

The whooping crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. Bulrush is the dominant vegetation type in the potholes used for nesting, although cattail, sedge, musk-grass, and other aquatic plants are common. Nest sites are primarily located in shallow diatom ponds that contain bulrush. During migration, whooping cranes use a variety of habitats; however, wetland mosaics appear to be the most suitable. For feeding, whooping cranes primarily use shallow, seasonally and semi permanently flooded palustrine wetlands for roosting, and various cropland and emergent wetlands.

The whooping crane has been federally listed as endangered since 1967 due to habitat loss and over-hunting. Wild whooping cranes currently exist in two flocks, a non-migratory flock in

Florida, and a migratory flock that summers in Wood Buffalo National Park in Canada and winters near and at Aransas National Wildlife Refuge in Texas along the Gulf coast. It is possible that all or most of these birds could be wiped out from a single event such as a hurricane, disease outbreak, toxic spill, or prolonged drought, making the species vulnerable to extinction. To ensure that the whooping crane survives, the International Whooping Crane Recovery Team recommended that an additional flock of whooping cranes be established that is separate from the single remaining natural wild migratory population. On June 26, 2001, the Service published a final rule in the Federal Register to establish a Nonessential Experimental Population (NEP) within a 20-state area in the eastern U.S., which includes Michigan (USFWS 2012a).

For the purposes of section 7 of the ESA, we treat NEPs as threatened species when the NEP is located within a National Wildlife Refuge (NWR) or National Park (NP), and therefore section 7(a)(1) and the consultation requirements of section 7(a)(2) of the ESA apply in NWRs and NPs. Section 7(a)(1) requires all Federal Agencies to use their authorities to conserve listed species. Section 7(a)(2) requires that Federal Agencies consult with the Service before authorizing, funding, or carrying out any activity that would likely jeopardize the continued existence of a listed species or adversely modify its critical habitat.

For Federal projects outside a NWR or NP, we treat the population as proposed for listing and only two provisions of section 7 would apply: section 7(a)(1) and section 7(a)(4). In these instances, NEPs provide additional flexibility because Federal Agencies are not required to consult with us under section 7(a)(2). Section 7(a)(4) requires Federal Agencies to confer with the Service on actions that are likely to jeopardize the continued existence of a proposed species. The results of a conference are advisory in nature and do not restrict Agencies from carrying out, funding, or authorizing activities.

For purposes of section 9 of the ESA, individual species within a NEP area are treated as threatened regardless of the species' designation elsewhere in its range. Under section 4(d) of the ESA, we have greater discretion in developing management programs and special regulations for threatened species than we have for endangered species. Section 4(d) of the ESA allows us to adopt whatever regulations are necessary to provide for the conservation of a threatened species. The special 4(d) rule contains the prohibitions and exemptions necessary and appropriate to conserve that species. Because of the flexibility, regulations issued under a 4(d) rule are generally compatible with routine human activities in the reintroduction area. For whooping crane in the NEP in Michigan, purposeful take is prohibited under the special rule; actions that cause take that is accidental and occurred incidentally to an otherwise lawful activity that was being carried out in full compliance with all applicable laws and regulations, is not prohibited under the ESA. In the case of an intentional actions (e.g., intentional shooting), the full protection of the ESA could apply.

For additional information on the whooping crane, including a five-year status review and recovery plan, please see the [species profile](#).

5.2 PIPING PLOVER (*CHARADRIUS MELODUS*)

The piping plover is a small shorebird that nests in three separate geographic populations in the U.S.: the Great Plains states, the shores of the Great Lakes, and the shores of the Atlantic coast. Birds from all populations winter on the southern Atlantic and Gulf coasts in the U.S (Saunders et al 2014).

In the Great Lakes, piping plovers nest, feed, and rear their young in open, sparsely vegetated sandy areas, including sand spits and sand beaches with wide, unforested dunes and swales or in the flat pans behind the primary dune. Piping plovers begin arriving in Michigan in late April, and most mated pairs are nesting by mid to late May. Eggs typically hatch from late May to late July, with chicks fledging 21 to 30 days after hatching. Although piping plovers typically produce one brood per year, they sometimes bring off two broods during a summer. Piping plovers feed on exposed beach surfaces by pecking for invertebrates that are 1/2 inch or less below the surface. They feed mostly during the day and eat insects, marine worms, crustaceans, and mollusks as well as eggs and larvae of flies and beetles. Most adults depart for their wintering grounds by mid-August. Young birds hatched during the summer start their migration a few weeks later than adults, and most are gone from the Great Lakes by late August.

The Great Lakes population of the piping plover was listed as endangered in 1986 (USFWS 2020b). An active recovery program in Michigan, aided by many volunteers, has helped the plover population to steadily increase. In 2019, there were 71 breeding pairs (142 individuals) (USFWS unpubl. data 2020). Of these, 49 pairs nested in Michigan, while 22 pairs were found outside the state, including one pair in Chicago, Illinois, one pair in Pennsylvania, ten pairs in Wisconsin, and nine pairs in Ontario, Canada. A single breeding pair discovered in 2007 in the Great Lakes region of Canada represented the first confirmed piping plover nest there in over 30 years. In 2019, a pair of piping plovers had their first successful nesting site at Montrose Beach in Chicago, Illinois in more than 60 years.

The species remains extremely vulnerable to extinction from factors that include disease, habitat destruction, and unpredictable changes in the environment. Recent studies of Great Lakes Piping Plovers indicate that predation and human-caused disturbance also continue to negatively affect the population. During 2019, as many as 11 adults were lost due to predation by merlins, snowy owls, and off-leash dogs (USFWS unpubl. data 2020).

For additional information on the piping plover, including a recent five-year status review and recovery plan, check out the [species profile](#).

Under the terms of a court order, the Service designated CH for the Great Lakes breeding population of the piping plover on May 7, 2001. This includes 35 units in 8 states, including 23 units in Michigan:

- St. Louis County, Minnesota
- Douglas, Ashland, Marinette, and Manitowoc Counties, Wisconsin
- Lake County, Illinois
- Porter County, Indiana
- Erie and Lake Counties, Ohio
- Erie County, Pennsylvania

- Oswego and Jefferson Counties, New York
- Alger, Schoolcraft, Luce, Mackinac, Chippewa, Iosco, Presque Isle, Cheboygan, Emmet, Charlevoix, Leelanau, Benzie, Mason and Muskegon Counties, Michigan.

The final CH designation includes approximately 201 miles (325 km) of mainland and island shoreline for the Great Lakes breeding population in these 26 counties. Within the 35 critical habitat units, only the areas that contain the primary constituent elements of piping plover habitat, as described above, are designated as CH. See <https://www.fws.gov/species-publication-action/etwp-final-determination-critical-habitat-great-lakes-breeding> for more information about piping plover CH in Michigan.

5.3 RUFA RED KNOT (*CALIDRIS CANUTUS RUFA*)

The rufa red knot is a migratory shorebird that breeds in the Canadian Arctic and winters in parts of the United States, the Caribbean, and South America. Some red knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants in the animal kingdom (USFWS 2020a). Major migration stopover areas occur along the Gulf coast and Atlantic coasts of North and South America. However, red knots have been regularly sighted in inland areas of the United States within the Atlantic and central flyways, including the coasts of the Great Lakes in Michigan. Red knots generally nest in dry, slightly elevated tundra locations, often on windswept slopes with little vegetation. Best available information indicates nest sites are within 600 feet of a freshwater wetland, and, although nests are typically within 31 miles (50 kilometers [km]) of the ocean, knots do not typically use saltwater habitats on the breeding grounds (Smith pers. comm. 2019).

The Service listed the rufa subspecies of red knot as threatened under the ESA on December 11, 2014. The reason for listing was due to loss of both breeding and nonbreeding habitat; likely effects related to disruption of natural predator cycles on the breeding grounds; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies (mismatches) in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions.

For additional information on the rufa red knot, including a recovery outline, please see the [species profile](#).

5.4 FEDERALLY LISTED FRESHWATER MUSSEL IN MICHIGAN

The Michigan Freshwater Mussel Survey Protocols and Relocation Procedures (<https://www.fws.gov/media/michigan-freshwater-mussel-survey-protocols-and-relocation-procedures-rivers-and-streams>) provide project proponents with guidance to minimize impacts to mussel species that are currently identified as threatened or endangered by the USFWS. These protocols are designed to document the potential presence or absence of state or federally listed mussel species as well as provide guidance for survey and relocation activities to minimize impacts to native mussels in Michigan.

As part of the Michigan Freshwater Mussel Survey Protocols and Relocation Procedures Michigan rivers and streams have been grouped according to existing knowledge of mussel distribution and individual species conservation status. The Mussel Protocol Stream Groups are designed to document the potential presence or absence of state or federally listed mussel species. The layer was created by modeling the habitat suitability for each mussel species and may not correspond directly with a documented location for a listed mussel. A segment may be predicted as suitable for a number of mussel species, so the stream group number was assigned to the most restrictive of the potential mussel species present. The watersheds have associated mussel species data and can be queried to generate a species list. These stream groups determine the necessary level of coordination by project proponents with the USFWS as well as the appropriate survey protocol applicable to the project site. Below are the stream groupings, which are available via Michigan Natural Features Inventory Mussel Map Viewer (<https://mnfi.anr.msu.edu/resources/michigan-mussels>). The Mussel Map Viewer is an interactive tool to allow users to explore listed native mussels across the Michigan landscape. Watershed level species lists are available alongside the Mussel Protocol Stream Groups.

- Group 1: Stream and rivers known to support mussels considered to be special concern by the State, but lacking mussel occurrence data at the project site.
- Group 2: Streams and rivers known to support populations of State threatened and endangered mussels.
- Group 3a: Small and medium streams and rivers with a drainage area less than 300 mi² that support populations of federally listed mussels.
- Group 3b: Large rivers (drainage area greater than 300 mi²) that support populations of federally listed mussels.

5.4.1 Clubshell (*Pleurobema clava*)

The clubshell is a freshwater mussel that prefers clean, loose sand and gravel in medium to small rivers and streams. Clubshells will bury themselves in the bottom substrate to depths of up to four inches (Watters 1990). Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. The striped shiner (*Notropis chrysocephalus*), central stoneroller (*Campostoma anomalum*), blackside darter (*Percina maculata*), and logperch (*Percina caprodes*) have been capable of serving as hosts of the clubshell under laboratory conditions.

Clubshell was listed as endangered in 1993. The clubshell was once found from Michigan to Alabama, and from Illinois to West Virginia. Clubshell originally inhabited 100 streams across this range. Currently there are 13 extant populations of clubshell in the Ohio River and Lake Erie Basins. Portions of 21 streams potentially support populations of clubshell. Evidence of recent successful recruitment has been reported in 10 streams: the Allegheny River, French Creek, LeBoeuf Creek, Muddy Creek, Tippecanoe River, Middle Branch of the North Fork Vermilion River, Green River, Elk River, Little Darby Creek, and Shenango River. In several streams, clubshell populations appear to comprise only older adults, and the populations are in decline and possibly extirpated: East Fork of the West Branch St. Joseph River, Fish Creek, Hackers Creek, Walhonding River, Cassadaga Creek, Pymatuning Creek, Conneaut Outlet, and Conneauttee Creek (USFWS 2019c).

The distribution of clubshell is very limited in Michigan and only occurs in the East Branch of the West Fork of the St. Joseph River, Maumee drainage. Reasons for its decline in the upper Ohio and Wabasha watersheds have been principally due to pollution from agricultural runoff and industrial wastes, and extensive impoundments for navigation. These are thought to be also responsible for its decline elsewhere as well. An added threat now is the zebra mussel, a fast-spreading exotic species accidentally introduced in ballast water from the Caspian Sea area. These tiny mussels reproduce in enormous numbers which tend to cover and suffocate native mussels (USFWS 2019c). In the St. Joseph watershed, water quality degradation as a result of land-based activities such as agriculture and development is a major threat. These types of activities result in excess sedimentation and pollutants that may affect clubshell survival, growth, and reproduction. It is likely that there are barriers within the watershed that also have altered habitat, hydrology, temperature, and sediment transport, limiting the range of clubshell as well as potentially directly affecting certain localized populations. Lastly, instream activities such as bridge and road construction also have the potential to impact localized populations of clubshell.

For additional information on the clubshell mussel, including a recent five-year status review, please see the [species profile](#).

5.4.2 Northern Riffleshell (*Epioblasma torulosa rangiana*)

This mussel is found in a wide variety of streams, including large streams and small rivers, where it buries itself in firmly packed sand or gravel in riffle areas. It is also found in Lake Erie. Like all freshwater mussels, northern riffleshell require a stable, undisturbed habitat and a sufficient population of host fish for reproduction. The mottled sculpin (*Cottus bairdi*), banded darter (*Etheostoma zonale*), bluebreast darter (*Etheostoma camurum*), and brown trout (*Salmo trutta*) are potential host species (Watters 1996).

Northern riffleshell was listed as endangered in 1993. Historically, the northern riffleshell was found in the Ohio river drainage in Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and west Virginia, and into southeastern Michigan and southwestern Ontario. Of the 54 streams once known to be occupied by northern riffleshell, it is known to currently occur in 13 populations, 4 of which are stable and recruiting. Of the four recruiting populations, three are apparently large and occur in the Allegheny River, French Creek, and East Branch Sydenham River. A fourth, smaller population occurs, as of 2006, in the AuSable River. In Michigan the current status of northern riffleshell is unknown with only shells found during a 2007/2008 survey of the Detroit River and Lake St. Clair. It is possible that these populations are extirpated as a result of the introduction of nonnative zebra and quagga mussels (USFWS 2019a). Numerous threats persist for the remaining northern riffleshell populations, including invasive species, the effects of small population sizes, habitat alteration, land-use changes, changing precipitation and temperature patterns, and point and non-point source pollution.

For additional information on the northern riffleshell mussel, including the five-year status review, please see the [species profile](#).

5.4.3 Rayed Bean (*Villosa fabalis*)

The rayed bean is a small mussel usually estimated around 1.5 inches (3.8cm) in length (Cummings and Mayer 1992; Parmalee and Bogan 1998; West et al. 2000). Generally, they live in smaller, headwater creeks, but it is sometimes found in large rivers and wave-washed areas of glacial lakes (Cummings and Mayer 1992; Parmalee and Bogan 1998, West et al. 2000). It prefers gravel or sand substrates and is often found in and around roots of aquatic vegetation. Adults spend their entire lives partially or completely buried in substrate, filtering water through their gills to remove algae, bacteria, detritus, microscopic animals, and dissolved organic material for food (Murray and Leonard 1962; Silverman et al. 1997; Nichols and Garling 2000; Christian et al. 2004; Strayer et al. 2004). Juvenile mussels, called glochidia, use fish as hosts, allowing the species to move upstream and populate habitats it could not otherwise reach. At the time of listing, the Tippecanoe darter (*Etheostoma tippecanoe*) was the only reported known host fish for the rayed bean. Gibson et al. (2011) also verified the spotted darter (*Etheostoma maculatum*) as a suitable host fish (USFWS 2018a).

Rayed bean was listed as endangered in 2012. Rayed bean was listed as endangered in 2012. The Species Status Assessment (SSA) for rayed bean was completed by the Service in 2022. The SSA summarizes the best available scientific information on the biological condition and viability of the species. The analysis of the current condition of rayed bean in the SSA was conducted at the U.S. Geological Survey hydrologic unit scale (HUC) of HUC8, which is at the subbasin scale. Demographic population condition was assessed as high, moderate, low, or very low/functionally extirpated based on specific criteria and estimated a probability of persistence over 2 lifespans of rayed bean (30 years) (USFWS 2022b). Five primary risk factors were also evaluated including water quality/contaminants, hydrological regime, landscape, connectivity, and invasive species (USFWS 2022b). Risk factors were assigned a category of high, moderate, or low, and assigned a probability of persistence over 50 years (USFWS 2022b).

The rayed bean historically occurred in at least 115 streams, lakes, and some human-made canals in 10 states: Illinois, Indiana, Kentucky, Michigan, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia; and Ontario, Canada. Rayed bean is currently considered to be extant in 28 streams and 1 lake in seven states and 2 streams in one Canadian province: Indiana, Michigan, New York, Ohio, Pennsylvania, Tennessee, and West Virginia; and Ontario, Canada (total of 31 streams and lakes). The rayed bean's range within the Great Lakes basin includes a portion of Canada, Indiana, Michigan, and Ohio. Nine populations are considered extant in the Great Lakes basin. The demographic condition of four populations is categorized as high and the other five populations are categorized as low (USFWS 2022b).

Major threats to rayed bean are modification and destruction of river and stream habitat, primarily by the construction of impoundments. Other factors contributing to the reduction in range include dredging and channelization, chemical contamination, oil and gas production, sand and gravel mining, and siltation.

In addition, there are other emerging threats such as disease and climate change. Little is known about diseases in freshwater mussels (Grizzle and Brunner 2007, USFWS 2018a). However, mussel die-offs have been documented in streams within the range of rayed bean, some researchers believe that disease may be a factor contributing to the die-offs (USFWS 2018a).

For additional information on the rayed bean mussel, including a recent five-year status review, please see the [species profile](#).

5.4.4 Snuffbox (*Epioblasma triquetra*)

The snuffbox is usually found in riffles and shoals of small- to medium-sized streams and rivers due to higher flow activity (Cummings and Mayer 1992, Parmalee and Bogan 1998). Adults often burrow deep in substrates, except when they are spawning (Parmalee and Bogan 1998). They are suspension feeders, typically feeding on algae, bacteria, detritus, microscopic animals, and dissolved organic material (Christiansen et al. 2004). Snuffbox females can reach a maximum length of about 1.8in (4.5cm), while males reach up to 2.8in (7.0cm) in length (USFWS 2012, Cummings and Mayer 1992, Parmalee and Bogan 1998). Their life span is estimated to be approximately 20 years.

Snuffbox was listed as endangered in 2012. The Species Status Assessment (SSA) for snuffbox was completed by the Service in 2022. The SSA summarizes the best available scientific information on the biological condition and viability of the species. The analysis of the current condition of snuffbox in the SSA was conducted at the U.S. Geological Survey hydrologic unit scale (HUC) of HUC8, which is at the subbasin scale. Demographic population condition was assessed as high, moderate, low, or very low/functionally extirpated based on specific criteria and estimated a probability of persistence over 2 lifespans of snuffbox (40 years) (USFWS 2022a). Five primary risk factors were also evaluated including water quality/contaminants, hydrological regime, landscape, connectivity, and invasive species (USFWS 2022a). Risk factors were assigned a category of high, moderate, or low, and assigned a probability of persistence over 50 years (USFWS 2022a).

Snuffbox was historically known from 211 streams and lakes in 18 states and Canada (USFWS 2018). Snuffbox is currently considered to be extant in 83 streams in 14 states (Alabama, Arkansas, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin) and Ontario, Canada (USFWS 2018, USFWS 2022a). The current condition is summarized at the HUC8 scale as following: Great Lakes basin has 11 extant populations; of these, 4 are at high risk, 5 are at moderate risk, and 1 is at low risk (one population in Canada was not able to be fully analyzed); Ohio basin has 30 extant populations; 13 of which are at high risk, 15 are at moderate risk, and 2 are at low risk; Tennessee basin has five populations, three at high risk and two at moderate risk; Upper Mississippi basin has four populations, and the Lower Mississippi basin has one population, and all populations in these basins are at high risk (USFWS 2022a). The Arkansas-White-Red basin has four populations, two are at high risk, one is at moderate risk, and one is at low risk (USFWS 2022a).

Most populations are small and geographically isolated from one another, further increasing their risk of extinction.

Habitat loss and degradation continues to be one of the major threats to snuffbox (USFWS 2018b). Water quality degradation from point and non-point sources including agricultural runoff, municipal effluents, industrial sources, and spills continue to contribute sediment, organic compounds, heavy metals, pesticides, and a wide variety of newly emerging contaminants to the

aquatic environment. (USFWS 2018). Other factors contributing to the reduction in range include dredging and channelization, oil and gas production (including water withdrawal), and sand and gravel mining, and development. Exotic species, including the zebra mussel, Asian clam, round goby, and black carp, threaten the snuffbox, or its host fish, or both, through mechanisms such as habitat modification, competition, and predation (USFWS 2018b).

For additional information on the snuffbox mussel, including a recent five-year status review, please see the [species profile](#).

5.4.5 Salamander Mussel (*Simpsonaias ambigua*)

The salamander mussel is frequently found bedding under flat rocks in rivers, streams, creeks, or lakes of moderate flow. They are a small, thin-shelled mussel ranging around 2-inches long and 1-inch high (Watson et al. 2001). It is the only North American freshwater mussel species within the Unionidae family known to have a non-fish host, the mudpuppy, for reproduction. Age of sexual maturity is not known. The females hold the glochidia in their marsupial gills over the winter until they are released the following spring or summer (Watson 2001).

Salamander mussels were proposed for listing as endangered on August 22, 2023. A species status assessment was completed on May 1, 2023. They are historically found in small streams or large rivers throughout 14 states (Arkansas, Missouri, Tennessee, Kentucky, Iowa, Illinois, Indiana, Minnesota, Wisconsin, Michigan, Ohio, Pennsylvania, New York, and Virginia). The current distribution of Salamander mussels in Michigan is Black River (Sanilac Co.), Pine River (St. Clair Co.), near Belle Isle (Wayne Co.), Macon Creek (Monroe Co.), and Clinton River (Oakland Co.).

The primary threat to survival of this species is contaminants, hydrological regime, landscape alterations, lack of connectivity, invasive species, and host vulnerability. Movement and presence of host species is critical to development and distribution of mussel (Watters 1992; Haag and Warren 1998).

For additional information on the salamander mussel please see the [species profile](#).

5.5 HINE'S EMERALD DRAGONFLY (*SOMATOCHLORA HINEANA*)

The Hine's emerald dragonfly lives in calcareous (high in calcium carbonate) spring-fed marshes and sedge meadows overlaying dolomite bedrock. Adult males defend small breeding territories, pursuing and mating with females who enter. The female lays eggs by repeatedly plunging the tip of her body into shallow water (Cashatt and Vogt 1996, Service 2001). Later in the season or the following spring, immature dragonflies, called nymphs, hatch from the eggs. The nymph lives in the water for two to four years, eating smaller aquatic insects and shedding its skin many times. The nymph then crawls out of the water and sheds its skin a final time, emerging as a flying adult. The adults may live only four to five weeks.

The principal threat to the species is habitat destruction and alteration. Commercial and residential development, quarrying, landfills, roadways, construction of pipelines, and filling of wetlands could decrease the area of suitable habitat available to the species and fragment

populations (USFWS 2001). Changes in surface and sub-surface hydrology could also be detrimental to this species. Alteration of hydrologic regimes could adversely affect the larval and breeding habitat of the species by changing water temperature, flow, chemistry, and volume. Municipal and private wells, addition of impervious surfaces, and alteration of surface drainage patterns could all cause reductions in the suitability of habitat or the outright loss of suitable larval and breeding habitat.

The Hine's emerald dragonfly was listed as endangered on January 26, 1995 (60 FR 5267). Historically, the Hine's emerald dragonfly was found in Alabama, Indiana, and Ohio, and probably has been extirpated in those states. Today, the dragonfly can only be found in Illinois, Michigan, Missouri, and Wisconsin. Hine's emerald dragonfly was first discovered in Michigan at seven sites in 1997 (Steffens 1997). Known sites in the state are in both the Upper and Lower Peninsulas. Most are near the Straits of Mackinac, with the exception of the Menominee County site. The species is known from 20 sites in six counties in Michigan. Ten of these sites occur on the Hiawatha National Forest, and five sites are owned and managed by the Michigan Department of Natural Resources.

For additional information on the Hine's emerald dragonfly, including a recent five-year status review, please see the [species profile](#).

Critical habitat for the species was first designated on September 5, 2007 (72 FR 51101) and later revised on April 23, 2010 (75 FR 21393). A total of 37 units, encompassing approximately 26,531.8 acres (10,737 hectares) in Cook, DuPage, and Will Counties in Illinois; Alpena, Mackinac, and Presque Isle Counties in Michigan; Crawford, Dent, Iron, Phelps, Reynolds, Ripley, Washington, and Wayne Counties in Missouri; and Door and Ozaukee Counties in Wisconsin, were included in the designation. These are lands of wet meadows, groundwater seeps, and associated wetlands that lie over dolomite bedrock and provide breeding and foraging habitat for the dragonfly. For more information on CH for Hine's emerald dragonfly in Michigan, see <https://www.fws.gov/species-publication-action/final-revised-critical-habitat-hines-emerald-dragonfly-somatochlora>.

5.6 HUNGERFORD'S CRAWLING WATER BEETLE (*BRYCHIUS HUNGERFORDI*)

Hungerford's crawling water beetles (HCWB) are found in the cool riffles of clean, slightly alkaline streams. All streams where this beetle has been found have moderate to fast water flow, good stream aeration, inorganic substrate, and alkaline water conditions. The highest densities of HCWB have been found below beaver dams or immediately below structures (e.g., culverts) that provide similar conditions.

Adults appear to be generalists in their food choice, feeding on algae including *Chara*, *Cladophora*, and *Dichotomosiphon*, as well as the epiphytic diatom *Cocconeis* (Grant and Vande Kopple 2009). The diet of adults may also change seasonally (Grant and Vande Kopple 2003). Larvae appear to prefer the alga *Dichotomosiphon tuberosus* (Grant and Vande Kopple 2009). *Dichotomosiphon*, although widespread, is not common. Its presence may be an important factor in determining the distribution of HCWB (Grant and Vande Kopple 2009).

At the time of listing in 1994, HCWB was known to occur in only three streams range wide. Currently, it is known to occur in 13 streams, with ten of these streams in northern Michigan and three in Ontario, Canada. It is unknown whether HCWB has a wider distribution or if the species' status is stable, increasing or decreasing. Species of *Brychius* tend to be highly localized and difficult to collect. Even when present, it is possible to sample an area and collect no specimens (Mousseau 2004; Grant et al. 2011). Additional surveys are necessary to determine the extent of HCWB's distribution. There is reason to believe HCWB may be more widely distributed than the streams where it has been previously documented. The types of streams inhabited by this species do not appear to be rare. In fact, streams similar to those in which the species is found appear to be common in northern Michigan and other surrounding states.

Hungerford's crawling water beetle was added to the List of Endangered and Threatened Wildlife and Plants on April 6, 1994 (59 FR 10580). The primary threat to the species is modification of its habitat. Actions that are potentially harmful include dredging, channelization, bank stabilization, and impoundment. Fish introductions or removals may also pose a threat to the species. The introduction of brown trout, for example, can result in increased predation of HCWB. Other management practices, such as the use of chemical treatments, may also be harmful to this rare beetle.

For additional information on the Hungerford's crawling water beetle, including a recovery plan and recent biological opinions, please see the [species profile](#).

5.7 KARNER BLUE BUTTERFLY (*LYCAEIDES MELISSA SAMUELIS*)

The Karner blue butterflies are small with a wingspan of about 2.5 cm. (one inch). The forewing length of adult Karner blues is 1.2 to 1.4 cm for males and 1.4 to 1.6 cm for females (Opler and Krizek 1984). Karner's were historically associated with native barrens and savanna ecosystems, but is now found in remnant barrens, savannas, highway and utility rights-of-way, gaps within forest stands, young forest stands, trails, and military camps that occur on the landscapes previously occupied by native prairie and savannas. The larvae are dependent upon wild lupine (*Lupinus perennis*), the only known larval food source, while wild adults use a variety of wild flowers for nectar (Scott 1986).

The Karner blue butterfly was federally listed as an endangered species in 1992. The butterfly is most widespread in Wisconsin, but is also found in portions of Indiana, Michigan, Minnesota, New Hampshire, New York, and Ohio (USFWS 2019d). It may also be present in Illinois Habitat throughout the range of the Karner blue butterfly has been lost as a result of land development and lack of natural disturbance, primarily wildfire. Such disturbance helps maintain the butterfly's habitat by setting back encroaching forests and encouraging lupine and flowering plant growth. Additionally, the Karner blue butterfly's rarity and beauty make it a desirable addition to butterfly collections. Because butterfly numbers are so low, the collection of even a few individuals could harm the species' populations.

For additional information on the Karner blue butterfly, including a recent five-year status assessment, please see the [species profile](#).

5.8 MITCHELL’S SATYR (*NEONYMPHA MITCHELLI MITCHELLI*)

In Michigan and Indiana, Mitchell’s satyrs are found exclusively in prairie fens and open parts of rich tamarack swamps. These systems are a mosaic of open, shrubby, and forested communities, with peat soils and alkaline groundwater seeps. Thin-leaved sedges usually dominate the ground layer in the fens. Mitchell’s satyr butterflies are rarely found in open fens without trees or tamarack swamps without openings.

The greatest threat to Mitchell’s satyr is direct destruction and modification of its habitat. Prairie fens supporting Mitchell’s satyr have disappeared or been altered for agricultural or urban development, which has led to species extirpation and further isolation of populations (Kost and Hyde 2009). Hydrological disruptions also constitute a serious threat, as groundwater diversion, pollution, warming of water sources, and other groundwater alterations lead to less-than-optimal habitat conditions. Offsite activities that affect groundwater flowing into prairie fens could inadvertently impact Mitchell’s satyr. For example, a prairie fen’s recharge source may be located near or far away from the fen, in a different watershed, county or state. As such, no matter the distance, altering the fen’s groundwater source will affect the quality, quantity, or flow of groundwater into the fen (Abbas 2011). Groundwater alteration leads to, among other things, drying of the fen and/or facilitating encroachment of invasive species.

Invasive species, such as buckthorn, hybrid cattail, narrowleaf cattail, multiflora rose, purple loosestrife, reed canary grass, and others, represent additional threats and can be a significant management problem (Tesauro and Ehrenfeld 2007). Removal of these plants is required at many occupied sites to maintain suitable habitat conditions.

Satyr populations in the northern part of the range have decreased drastically; however, multiple new populations of what appears to be Mitchell’s satyr continue to be discovered in the southeastern U.S. (Alabama, Mississippi, and Virginia). Ongoing genetics research will confirm and compare the taxonomy of the southern butterflies.

For additional information on the Mitchell’s satyr, including the recovery plan, please see the [species profile](#).

5.9 POWESHIEK SKIPPERLING (*OARISMA POWESHIEK*)

The Poweshiek skipperling is an endemic tallgrass prairie butterfly species. Historically, this species occurred in Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota, South Dakota, Wisconsin, and Manitoba, Canada. However, the butterfly’s range has contracted significantly in the last decade, and can now only be found only at a few sites in a single Michigan county, in very limited numbers at one site in Wisconsin, and in Canada at the single Manitoba site. In Michigan, the skipperling occurs exclusively in prairie fens, specifically in peat domes within larger prairie fen complexes in a community typically composed of multiple, distinct zones of vegetation, some of which contain prairie grasses and forbs (Cuthrell and Slaughter 2012). In other locales (outside of Michigan), the species has or currently occurs in mesic prairies (Pogue et al. 2015; Selby 2016). Also within Michigan, Poweshiek skipperlings are rarely found a great distance from either prairie dropseed or mat muhly (Cuthrell and Slaughter 2012).

Poweshiek skipperling was listed as endangered in 2014. Habitat for this species been affected by altered hydrology, water pollution, sedimentation, invasive species, fire suppression, cattle grazing, and filling for development or dredging to create ponds or lakes (Kost and Hyde 2009). As a result, prairie fens are now very rare and those that remain require management to maintain appropriate habitat that supports native fen biota. Management of Poweshiek skipperling habitat is needed to maintain the basic high-quality native prairie conditions on which the species depends. Management is needed to prevent secondary succession to woody habitat types; to control invasive species; and, to ensure sufficient abundance and diversity of nectar plants. Control of invasive plants species is required to maintain important qualities of habitat, but care must be taken to ensure that treatments do not have adverse effects.

For additional information on the Poweshiek skipperling, including a recent five-year status assessment, check out the [species profile](#).

CH for the Poweshiek skipperling was designated on October 1, 2015. CH comprises approximately 25,900 acres in 56 units in Iowa, Michigan, Minnesota, North Dakota, South Dakota and Wisconsin. See <https://fws.gov/species/poweshiek-skipperling-oarisma-poweshiek> for more information about CH for the Poweshiek skipperling in MI.

5.10 MONARCH BUTTERFLY (*DANAUS PLEXIPPUS*)

Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side of the wings (Bouseman and Sternburg 2001). Adult monarchs are sexually dimorphic, with males having narrower wing venation and scent patches (CEC 2008). The bright coloring of a monarch serves as a warning to predators that eating them can be toxic.

During the breeding season, monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae emerge after two to five days (Zalucki 1982; CEC 2008). Larvae develop through five larval instars (intervals between molts) over a period of 9 to 18 days, feeding on milkweed and sequestering toxic chemicals (cardenolides) as a defense against predators (Parsons 1965). The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks; overwintering adults enter into reproductive diapause (suspended reproduction) and live six to nine months (Cockrell et al. 1993; Herman and Tatar 2001).

In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. This migration can take monarchs distances of over 3,000 km and last for over two months (Urquhart and Urquhart 1978). In early spring (February-March), surviving monarchs break diapause and mate at the overwintering sites before dispersing (Leong et al. 1995; van Hook 1996). The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again (Malcolm et al. 1993).

For additional information on the monarch, check out the [species profile](#).

5.11 CANADA LYNX (*LYNX CANADENSIS*)

Canada lynx and snowshoe hares are strongly associated with moist, cool, boreal spruce-fir forests. Landscapes with high snowshoe hare densities are optimal for lynx survival and reproduction, and research suggests that hare densities consistently at or above 0.5 hares per hectare (0.2 hares/acre) are needed to support persistent lynx populations (Ruggiero et al. 2000b; ILBT 2013). Hares are most abundant in young regenerating or mature multistoried forests with dense understory vegetation that provides food and cover. In the northern contiguous U.S., boreal forests become naturally patchy and marginal for lynx as they transition to temperate forest types that support lower hare densities. Such forests cannot support lynx populations, even though snowshoe hares may still be present. Snow also influences lynx distribution, and populations typically occur where continuous snow cover lasts four months or longer (Peers et al. 2012). Such areas are believed to provide lynx with a seasonal competitive advantage over other terrestrial hare predators like bobcats and coyotes.

Lynx are broadly distributed across most of Canada and Alaska, which combined encompass about 98% of the species breeding range (McKelvey et al. 2000b). The contiguous U.S. distinct population segment (DPS) accounts for the other two percent, and includes resident breeding populations in northern Maine, northeastern Minnesota, northwestern Montana/northern Idaho, and north-central Washington. An introduced population also occurs in western Colorado, and several other areas may have historically supported small resident populations (e.g., northern New Hampshire, Isle Royale, Michigan, northeastern Washington, and the Greater Yellowstone area of southwestern Montana and northwestern Wyoming). Lynx also have occurred temporarily in many other states, typically during irruptions (mass dispersal events) from Canada, when northern hare populations underwent dramatic cyclic declines roughly every 10 years. The Contiguous U.S. DPS of lynx was listed as threatened in 2000 because regulations on some Federal lands at that time were inadequate to ensure the conservation of lynx populations and habitats.

Currently, the best available information, including historic records and recent surveys, indicates that Canada lynx, if present in Michigan, are likely limited to a small number of dispersing individuals in the Upper Peninsula. There is no indication of recent or current lynx breeding within the state. Verified sightings of lynx in Michigan are infrequent and dispersed. In 2003, a lynx was incidentally captured in a bobcat trap on the Hiawatha National Forest, and in 2010 a lynx was observed on Sugar Island near Sault Ste. Marie. Most recently, a probable Canada lynx was photographed in Marquette County in 2022. Other recent records, include a Lynx trapped in the Lower Peninsula in early 2019 and was subsequently released in Schoolcraft County. Detection of a very low number of dispersing individuals may be difficult, however project assessment for potential effects to lynx in the Upper Peninsula may be prudent.

For additional information on the Canada lynx, please see the [species profile](#).

5.12 GRAY WOLF (*CANIS LUPUS*)

Gray wolves in North America, are primarily predators of medium and large mammals. They are highly territorial, social animals and group hunters, normally living in packs of seven or fewer, but sometimes attaining pack sizes of 20 or more wolves (Mech 1970; Mech and Boitani 2003;

Stahler et al. 2020). Wolves are capable of mating by age one or two and sometimes form a lifelong bond. On average, four to five pups are born in early spring and are cared for by the entire pack. For the first six weeks, pups are reared in dens. Dens are often used year after year, but wolves may also dig new ones or use some other type of shelter, such as a cave. After a year or two, young wolves often leave their packs to try to find a mate and form a pack or join other existing packs. Wolf packs occupy and defend territories, which range in size from less than 50 square miles to more than 1,000 square miles, depending on habitat and seasonal movements of available prey (Fuller et al. 2003; Mech and Boitani 2003; Sells et al. 2021). Wolves travel over large areas to hunt, as far as 30 miles in a day. Although they usually trot along at five miles per hour, wolves can run as fast as 40 miles per hour for short distances.

Wolves occur throughout Michigan's Upper Peninsula, and efforts to reintroduce a population of 20-30 wolves to Isle Royale were initiated in 2018. On November 3, 2020, the Service issued a final rule (effective January 4, 2021) removing from the List of Endangered and Threatened Wildlife the gray wolf entities in the lower 48 United States and Mexico, except for the Mexican wolf (*C. l. baileyi*), that will remain listed (85 FR 69778). On February 10, 2022, a district court vacated and remanded the delisting rule, resulting in return to the List of Endangered and Threatened Wildlife.

For additional information on the gray wolf, please see the [species profile](#).

5.13 INDIANA BAT (*MYOTIS SODALIS*)

Indiana bats may summer in a wide range of habitats, from highly altered landscapes to intact forests. Roost trees vary considerably in size. Although trees used by Indiana bat maternity colonies are typically greater than 9 inches diameter at breast height (dbh), those used by males and non-reproductive females or as alternate roosts for maternity colonies may be as small as 5 inches dbh. Indiana bats typically roost beneath peeling bark but may also use cracks or crevices (Kurta et al 2002). As such, roost trees tend to be dead or dying trees with some bark remaining, or live trees with naturally exfoliating bark, such as shagbark hickory (*Carya ovata*); see Appendix B for more information. Rarely do Indiana bats roost in structures, such as barns, sheds, or bridges. During winter, the species hibernates in caves, abandoned mine portals or similar structures.

The Indiana bat was listed as endangered in 1967 due to episodes of people disturbing hibernating bats in caves during winter, which resulted in the death of substantial numbers of bats (USFWS 2019e). Indiana bats are vulnerable to disturbance because they hibernate in large numbers in only a few sites, with major hibernacula supporting 20,000 to 50,000 bats. Since its listing, the range-wide Indiana bat population has declined by nearly 60%. Several threats are believed to have contributed to the Indiana bat's decline, including the commercialization of caves, loss and degradation of forested habitat, pesticides and other contaminants, and most recently, the disease white-nose syndrome (WNS).

Indiana bats have been documented at many sites in Lower Michigan and are believed to range throughout the southern five county tiers, as well as parts of the thumb and the western coastal counties up to (and including) the Leelanau peninsula. Indiana bats that summer in Michigan roost in trees in riparian, bottomland, and upland forests from approximately April through

September. Michigan is home to a single known Indiana bat hibernaculum: a hydroelectric dam in Manistee County. Although the dam supports about 20,000 hibernating bats, Indiana bats comprise less than 1% of the winter population. Research suggests that the majority of the Indiana bats that summer in Michigan migrate to hibernacula in nearby states, including Indiana and Kentucky. See the Appendices for more information on suitable Indiana bat habitat in Michigan.

For additional information on the Indiana bat, please see the [species profile](#).

5.14 NORTHERN LONG-EARED BAT (*MYOTIS SEPTENTRIONALIS*)

Northern long-eared bats spend winter hibernating in caves, mines, or similar structures, preferring areas with constant temperatures, high humidity, and no air currents (Raesly and Gates 1987; Caceres and Pybus 1997; Brack 2007). During the summer, the species typically roosts underneath bark or in cavities, crevices, or hollows of both live and dead trees and/or snags (typically ≥ 3 inches dbh; see Appendix C) (Sasse and Pekins 1996; Foster and Kurta 1999; Owen et al. 2002; Carter and Feldhamer 2005; Perry and Thill 2007; Timpone et al. 2010). On occasion, northern long-eared bats roost in manmade structures, such as barns and sheds. These bats forage for insects in upland and lowland woodlots and tree-lined corridors.

The northern long-eared bat is one of the species most impacted by WNS. The northern long-eared bat was proposed for Federal listing as endangered on October 2, 2013. On April 2, 2015, the species was given a proposed listing of threatened with an interim 4(d) rule, which was finalized on January 14, 2016 (USFWS 2016a). No critical habitat has been proposed for the species. On March 22, 2022, the Service published a Species Status Assessment Report for the Northern Long-eared Bat (USFWS 2022a), and on the following day (March 23, 2022), published a proposal to reclassify the northern long-eared bat as endangered under the ESA. On November 29, 2022, the Service published a final rule reclassifying the northern long-eared bat from threatened to endangered. The final rule, effective March 31, 2023, addressed a court order requiring the Service to reconsider the previous listing decision for the northern long-eared bat within 18 months of completing a species status assessment, or by November 30, 2022 (Case 1:15-cv-00477, March 1, 2021), and removed its species-specific 4(d) rule.

To streamline the formal section 7 process for any projects completed by April 1, 2024 and consistent with the previous [4\(d\) rule](#), the Service developed an Interim Consultation Framework that provides take authorization for northern long-eared bat. The framework applies to a wide variety of ongoing projects with a Federal nexus (Federal permit or funding), such as timber harvest, prescribed fire, and infrastructure projects. During the Interim Consultation Period (originally March 31, 2023, to April 1, 2024), the Service has incorporated known northern long-eared bat locations into project reviews and IPaC Dkeys to help project proponents decide where take of northern long-eared bats is reasonably certain to occur. The Service released interim guidance and tools, originally scheduled to be in place until April 1, 2024, to help interested parties transition to the reclassification of the species, and subsequently extended the interim tools and guidance until summer 2024 (date TBD as of September 2024). The Service is also currently sharing drafts of new tools and guidance documents for interested parties to preview so they can familiarize themselves with changes from the interim guidance before the final tools

and guidance go into effect. These tools also support the conservation of the tricolored bat should the species be listed.

The northern long-eared bat's historic range encompassed the entire state of Michigan, and the species has been physically detected (i.e., mist net captures, hibernacula counts, museum collections, roosts) in 46 of Michigan's 83 counties. The species is present in the state year-round, migrating between summer and winter habitat during the spring and fall. The majority of known northern long-eared bat hibernacula are located in the western Upper Peninsula (UP), with only three of 77 known hibernacula located in the Lower Peninsula. Correspondingly, available Michigan data suggest that the species was historically most abundant in the UP (Kurta 1982, USFWS unpublished data). Although formerly widespread and common, the species' population has declined dramatically as result of WNS. Regular winter census data from 50 Michigan hibernacula demonstrated that the species' winter population has declined by at least 98.5% post-WNS (Kurta and Smith 2020), and recent summer surveys have failed to detect the species in several parts of the state where they were historically present (Kurta 2023, Kurta 2024, USFWS unpublished data). Although not nearly as common today, winter surveys document that the species continues to occur in Michigan in low numbers. See the Appendices [B–F](#) for more information on suitable northern long-eared bat habitat in Michigan. For additional information on the northern long-eared bat, including the previous 4(d) rule, Species Status Assessment, reclassification rule, and details on the Interim Consultation Framework, please see the Service's [species profile](#).

5.15 TRICOLORED BAT (*PERIMYOTIS SUBFLAVUS*)

The tricolored bat is one of the smallest bats in eastern North America and is distinguished by its unique tricolored fur that appears dark at the base, lighter in the middle, and dark at the tip (Barbour and Davis 1969). The once common species is wide-ranging across the eastern and central United States and portions of southern Canada, Mexico, and Central America. During winter, tricolored bats hibernate in caves, abandoned mines, and abandoned tunnels (Sandel et al. 2001, Katzenmeyer 2016, Limon et al. 2018, Lutsch 2019, Meierhofer et al. 2018). During the spring, summer and fall months, they roost primarily among leaf clusters of live or recently dead deciduous/hardwood trees (Perry and Thill 2007, Thames 2020).

The species faces extinction due to the impacts of WNS, which has led to 90 to 100% declines in tricolored bat winter colony abundance at sites impacted by the disease. Since WNS was first observed in New York in 2006, it has spread rapidly across the majority of the tricolored bat's historic range. A petition to list the tricolored bat as threatened was received by the Service on June 16, 2016. On December 20, 2017, the Service found that the petition presented substantial scientific or commercial information indicating that the petitioned actions may be warranted and commenced a review (as a 12-month finding) to determine if listing of the tricolored bat is warranted (82 C.F.R. 60362; December 20F, 2017). On September 14, 2022, the Service posted a completed Species Status Assessment (SSA) Report for the Tricolored Bat (USFWS 2021) and published a proposed rule to list the tricolored bat as endangered. A final listing decision is expected in summer 2024 (TBD as of September 2024).

Tricolored bats are speculated to be a relatively recent resident of the central Great Lakes Basin, most likely colonizing Michigan from the southwestern Lower Peninsula and/or northwestern

Upper Peninsula (UP) during the mid-twentieth century (Burt 1957, Kurta et al. 2007, Brown and Kurta 2013). The species was first observed in Michigan in 1965 and has been physically observed in 12 of the 83 Michigan counties, almost exclusively during the fall or winter (September through mid-March) in or near hibernation sites. Most known hibernacula are abandoned mines in the western UP, and all historically supported the northern long-eared bat and/or Indiana bat (e.g., Tippy Dam). Although the historic presence of both males and females and the species' typically short migration range suggests a breeding population may have occurred and may still occur year-round in parts of the state, the species was always relatively rare in Michigan (Brown and Kurta 2013, Kurta 2020). Hibernating populations have been small (i.e., <10 individuals per site) since before WNS, and Michigan's hibernating population has declined by nearly 94% as of 2020 (Kurta and Smith 2020). With very few exceptions, the species has not been observed in Michigan in the summer, and no maternity colonies have been documented, despite repeated and extensive mist netting and mortality monitoring at wind turbines across much of the southern Lower Peninsula.

If tricolored bats summer in Michigan, they most likely do so within close proximity of known hibernacula (which are largely clustered in the western UP). Notably, most of the current draft range of the species falls outside the range predicted by local bat expert Dr. Allen Kurta of Eastern Michigan University. In his book *Mammals of the Great Lakes* (2020, Third Edition), Kurta excludes the eastern UP from the predicted range of the species, whereas the Service's draft species range is largely restricted to the eastern UP. Despite the current draft range (which was developed using a range-wide modeling approach), the MIFO believes it is unlikely that tricolored bats occur in summer habitat outside of a 5-mi radius of known hibernacula and/or modeled summer habitat for the northern long-eared bat. For additional information on the tricolored bat, please see the Service's [species profile](#).

5.16 COPPERBELLY WATER SNAKE (*NERODIA ERYTHOGASTER NEGLECTA*)

Copperbelly water snakes require a mosaic of shallow wetlands or floodplain wetlands surrounded by forested uplands. Seasonally flooded wetlands without fish are favored foraging areas, and copperbellies frequently move from one wetland to another. The species feeds primarily on amphibians, mostly frogs and tadpoles, and requires shallow wetlands along the edges of larger wetlands complexes where they can hunt for frogs, as well as multiple wetland types and adjacent uplands (Mushinsky and Hebrard 1977, Diener 1957, Kofron 1978). Copperbellies hibernate, often in crayfish burrows, in forested wetlands and immediately adjacent forested uplands. They remain underground from late October until late April (Kingsbury 1996, Kingsbury et al. 2003).

The copperbelly water snake is found in two geographically separated areas. The northern distinct population segment (DPS) includes southern Michigan, northeastern Indiana and northwestern Ohio. This DPS was listed as threatened under the ESA in 1997. The southern DPS is not federally listed. Over the last 20 years, surveys have shown a continuing decline in the overall number of snakes in the northern DPS. At present, only five small sub-populations persist within the tri-state area, including Hillsdale County in Michigan. Threats to copperbelly watersnake include habitat fragmentation and loss, predation, persecution, and emerging stressors such as climate change and disease.

For additional information on the copperbelly watersnake, including a recent five-year status assessment, please see the [species profile](#).

5.17 EASTERN MASSASAUGA RATTLESNAKE (*SISTRURUS CATENATUS*)

The Eastern massasauga rattlesnake (EMR)'s habitat is typically associated with open to forested wetlands and adjacent uplands. During colder months (generally October through April), EMR hibernate below the frostline in crayfish or small mammal burrows, tree root networks or rock crevices in areas where the water table is near the surface (areas where the soil is saturated but not inundated) and with consistent hydrology to support overwinter survival (Reinert and Kodrich 1982). Hibernacula are typically near wetland edges, or slightly upland (typically within 500 meters of regulated wetland) (Reinert and Kodrich 1982; Seigel 1986; Weatherhead and Prior 1992; Johnson 1995; Bissell 2006). EMR stay in the area around their hibernacula until overnight temperatures warm up enough for them to move to their active season range.

The Service listed the EMR as a threatened species under the ESA on September 30, 2016. Once common across its range, the EMR has declined dramatically since the mid-1970s as a result of habitat loss and fragmentation, a lack of proper habitat management, and eradication by humans. The most prominent threats include habitat loss and fragmentation through development and vegetative succession, mortality of individuals as a result of roads, hydrologic alteration resulting in drought or flooding, persecution, collection, and post-emergent prescribed fire, mowing, and disking. Disease is a relatively recent threat with still unknown consequences. The effects of threats on extinction risk to EMR populations were included in model evaluations (Faust *et al.* 2011), while the Species Status Assessment (Szymanski *et al.* 2016) considered the total number of sites range wide where specific threats were reported.

Michigan currently supports more EMR populations than any other state or province, although the species has declined within the state. The range within Michigan includes most of the Lower Peninsula and Bois Blanc Island in Mackinac County (Lake Huron). The EMR is highly secretive and cryptic in nature, and can persist in low densities, which makes them difficult to detect. Further, there are extensive areas of the state that have never been surveyed for EMR. To assist project proponents in determining the likelihood of EMR presence in their project areas, the Service has identified occupied and likely occupied habitat using a tiered system in Michigan. Tiered habitat is based on the proximity to a known element occurrence and the suitability of the habitat according to available spatial data and population modeling. Tier 1 habitat are those areas known to be occupied or highly likely to be occupied by EMR. Tier 2 habitat includes areas with high potential habitat (and may be occupied by EMR). Projects can also be "within the known range" of EMR. Areas within the known range but outside of Tier 1 and Tier 2 are considered less likely to be occupied. However, it is likely that there are additional and yet-unknown occurrences throughout the Lower Peninsula of Michigan.

For additional information on the eastern massasauga, including a recent Species Status Assessment and draft recovery plan, please see the [species profile](#).

5.18 AMERICAN HART’S-TONGUE FERN (*ASPLENIUM SCOLOPENDRIUM* VAR. *AMERICANA*)

American hart’s-tongue fern is found in close association with outcrops of dolomitic limestone, in coulees, gorges and in cool limestone sinkholes in mature hardwood forests. It requires high humidity and deep shade provided by mature forest canopies or overhanging rock cliffs (Soper 1954). It prefers soils high in magnesium.

Although American hart’s-tongue is found over a very wide area, from Alabama to Canada, its populations tend to be very small and isolated due to its unique habitat. Because of its natural rarity, it is particularly vulnerable to disturbance. Many activities threaten the American hart's-tongue. Quarrying, recreation, and residential development have all destroyed these plants and their habitat (Stebbins 1935). Canadian populations are threatened by lumbering and the development of land for ski resorts and country estates, among other activities (COSEWIC 2016). By removing shade trees, logging raises light levels and lowers humidity, decimating any American hart's-tongue ferns in that area. The Service officially listed American hart’s-tongue on July 14, 1989.

In Michigan, all known American hart’s-tongue populations occur on prominent highlands of the Niagara escarpment in the eastern Upper Peninsula, typically in relatively young forest dominated by sugar maple. It is commonly found in association with northern holly fern (*Polystichum lonchitis*), common polypody (*P. virginianum*), maidenhair spleetwort (*Asplenium trichomanes*), fragile fern (*Cystopteris fragilis*), and herb-robert (*Geranium robertianum*).

For additional information on the Hart’s-tongue fern, including a recent Species Status Assessment, please see the [species profile](#).

5.19 DWARF LAKE IRIS (*IRIS LACUSTRIS*)

Occurring close to Great Lakes shorelines in cool, moist lakeshore air, dwarf lake iris is found on sand or in thin soil over limestone-rich gravel or bedrock. Habitat is along old beach ridges or behind open dunes. Changing water levels can open new habitat for the plants.

Dwarf lake iris was added to the U.S. List of Endangered and Threatened Wildlife and Plants in 1988. Dwarf lake iris only grows around the Great Lakes and occurs near the northern shores of Lakes Huron and Michigan in Michigan, Wisconsin, and Ontario, Canada (COSEWIC 2004). The lakeshore habitat of dwarf lake iris has been greatly reduced by shoreline development. Residential and vacation homes as well as associated road-widening, chemical spraying and salting, and off-road vehicle use have caused disturbance and destruction of habitat. The flowers bloom from mid-May until mid-August, then will burst open (Planisek 1983).

For additional information on the dwarf lake iris, including a recovery plan, please see the [species profile](#).

5.20 EASTERN PRAIRIE FRINGED ORCHID (*PLATANThERA LEUCOPHAEA*)

The eastern prairie fringed orchid occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, even bogs (Sheviak and Bowles 1981). It requires full sun for optimum growth and flowering and a grassy habitat with little or no woody encroachment. A symbiotic relationship between the seed and soil fungi, called mycorrhizae, is necessary for seedlings to become established. This fungi helps the seeds assimilate nutrients in the soil. This orchid is a perennial herb that grows from an underground tuber. Flowering begins from late June to early July, and lasts for 7 to 10 days (Bowles 1983). Blossoms often rise just above the height of the surrounding grasses and sedges. The more exposed flower clusters are more likely to be visited by the hawkmoth pollinators, though they are also at greater risk of being eaten by deer. Seed capsules mature over the growing season and are dispersed by the wind from late August through September.

Historically, eastern prairie fringed orchid was found in more than 20 Michigan counties, including the southern Lower Peninsula and Cheboygan County. Following extensive habitat loss, it now persists in fewer than 10 counties and is largely limited to the remnant lakeplain prairies of Saginaw Bay and western Lake Erie. Since the 1980s, inventories have demonstrated a continued decline of the orchid within known habitats, likely as a result of high lake levels and drought.

The eastern prairie fringed orchid was listed as threatened on September 28, 1989. Early decline was attributed to loss of habitat, mainly conversion of natural habitats to cropland and pasture. Habitat loss, including from the drainage and development of wetlands, is a continued threat to the species. Other current threats include succession to woody vegetation, competition from non-native species, and over-collection.

For additional information on the eastern prairie fringed orchid, please see the [species profile](#).

5.21 HOUGHTON'S GOLDENROD (*SOLIDAGO HOUGHTONII*)

Houghton's goldenrod typically grows on moist sandy beaches and shallow depressions between low sand ridges along the shoreline, called interdunal wetlands. Fluctuating water levels of the Great Lakes play a role in maintaining this unique goldenrod. During high water years, colonies of Houghton's goldenrod may be submerged. When water levels recede, some plants survive the inundation and new seedlings establish on the moist sand. Other plants that often grow with Houghton's goldenrod include Grass-of-Parnassus, Kalm's lobelia, shrubby cinquefoil, twigrush, and other goldenrods.

Houghton's goldenrod occurs almost exclusively on Great Lakes shoreline, growing primarily along the northern shores of Lakes Michigan and Huron in the Straits region. Most populations occur in Chippewa, western Mackinac, northern Emmet, Cheboygan, and northern Presque Isle counties. There are also interior populations in Mackinac County (a few miles from the Great Lakes shoreline). Interior populations in Kalkaska and Crawford Counties have been determined to be another species, *S. vossii* (Laureto and Pringle 2010) but are considered as part of the originally listed entity (also threatened status).

Houghton's goldenrod was listed as threatened on July 18, 1988 (53 FR 27134). High lake levels are a potential threat to some population that occur along Great Lakes shorelines, particularly in recent years. Residential development continues to be a threat, especially along the shores of Lake Huron in Cheboygan and Presque Isle Counties, Michigan. Invasive species, including *Phragmites australis* (common reed) and *Typha spp.* (cattails) threaten some populations (Leopold and Weber 2019).

For additional information on Houghton's goldenrod, including a recent five-year status review, please see the [species profile](#).

5.22 LAKESIDE DAISY (*HYMENOXYIS HERBACEA*)

Lakeside daisy is a long-lived perennial daisy that grows on alvars, a type of limestone with little plant cover, in full sunlight. All individuals within a given population tend to bloom about the same time, typically in late spring. After about a week, the double notched petals fade before falling. Seed dispersal takes place about a month later. Lakeside daisy also reproduces vegetatively by rhizomatous growth (USFWS 2021a).

Lakeside daisy is an endemic restricted to the Great Lakes area, within which it is one of the region's rarest plants, naturally occurring at only a handful of sites. In the U.S., it is known only from the Marblehead Peninsula area in northern Ohio, three restored populations in northern Illinois (where it was known historically from two sites), and a single, extremely small colony in Michigan's Upper Peninsula. In Ontario, Canada, where lakeside daisy is most abundant, it occurs along much of the southern coast of Manitoulin Island and in several restricted areas near the tip of the Bruce Peninsula.

The lakeside daisy was listed as threatened on June 23, 1988. The wide area encompassing known lakeside daisy sites suggests that the species was once widespread in prairie habitats throughout the Midwest and along Huron's northern shore. Fire suppression practices have eliminated the wildfires which once regularly cleared prairie grasslands of the encroaching woods. Now the expansion of shrubs and trees threatens the daisy, which needs full sun to survive. Limestone quarrying, which has increased in recent years, destroys the daisy's habitat. Finally, collectors may also pose a threat, since the daisy is now found in just a handful of sites.

For additional information on lakeside daisy, please see the [species profile](#).

5.23 MICHIGAN MONKEY-FLOWER (*MIMULUS MICHIGANENSIS*)

The Michigan monkey-flower (MMF) is a rare Michigan endemic plant with a range restricted to Great Lakes shorelines in the Mackinac Straits and Grand Traverse regions. It is semi-aquatic and forms mats over mucky soil and sand saturated or covered by cold, flowing spring water.

The MMF was listed as endangered on June 21, 1990 (55 FR 25596 25599). The greatest threat to MMF is direct destruction and modification of its habitat. The MMF's habitat has been developed for recreational and residential purposes, which has led to severe impacts to and, in some cases, extirpation of historical populations. Hydrological disruptions also constitute a

serious threat, as water diversion, warming of water sources, and other groundwater alterations lead to less-than-optimal habitat conditions.

Consequently, this species may be inadvertently impacted by offsite activities. Populations of MMF are particularly vulnerable to extirpation due to low numbers and limited capability for sexual reproduction. Additionally, periodic high-water levels of the Great Lakes and strong winter storms impact MMF habitat that occurs near the Great Lakes shoreline by redirecting seepage streams and opening the overstory by felling cedars. However, opening of the overstory may also benefit MMF by allowing for colonization.

Invasive species, including forget-me-not (*Myosotis scirpoides*), coltsfoot (*Tussilago farfara*), reed canary grass (*Phalaris arundinacea*), and Canada thistle (*Cirsium arvense*) represent an additional threat (Wiler and Skoglund 2022). Some of the MMF colonies at the Maple River site are in pockets of habitat with up to 99% invasive species (Canada thistle and forget-me-not), with only scattered MMF stems remaining. Coltsfoot and reed canary grass are known to occur at or in the vicinity of other MMF sites.

For additional information on the MMF, including a recent five-year status review, please see out the [species profile](#).

5.24 PITCHER’S THISTLE (*CIRSIUM PITCHERI*)

Pitcher’s thistle is a native thistle occurring on the open sand dunes and low open beach ridges of Great Lakes shoreline. It is most often found in near-shore plant communities but it can grow in all non-forested areas of a dune system. It is now found in Indiana, Michigan, Wisconsin, and Ontario, Canada. Pitcher’s thistle was extirpated from Illinois but has been reintroduced in Lake County.

Pitcher’s thistle was added to the List of Endangered and Threatened Wildlife and Plants on July 18, 1988 (53 FR 27137). The primary threats are invasive plants and recreational use of the dunes, but there is continued concern regarding the potential impact of seed-eating weevils. Surveys have been done in portions of the range, indicating increased abundance and potential stability in parts of the range (i.e., Upper Peninsula of Michigan) and decreased abundance or even extirpation of previously known populations in other parts of the range (i.e., southern Michigan).

Survey work by Michigan Natural Features Inventory in 2012-2016 has shown that the Pitcher’s thistle population in Michigan may be larger than previously believed and could exceed 1,000,000 individuals (Slaughter and Cuthrell 2017). Conversely, research on the invasive weevil species (*Larinus planus* and *Rhinocyllus conicus*) in recent years has shown cause for concern, with demonstrated declines in population growth rates that could lead to localized extinctions of some populations (Havens et al. 2012a). More information is needed in order to assess the magnitude and extent of this threat.

For additional information on Pitcher’s thistle, including a recent five-year status review, please see the [species profile](#).

6 COVERED ACTIVITY DESCRIPTION

The activities described herein include all activities addressed in this standing analysis. The activity description, conservation measures, and covered area inform the standing analysis and describe which specific activities are appropriate for NE or NLAA outcomes under this analysis. The description of activities and their inclusion in the standing analysis should not be construed to indicate that these activities will always result in effects to the species (or its critical habitat, if designated), nor is it meant to cover activities that fall outside of the analysis as described below. Action Agencies are not required to use this standing analysis; they continue to have the option to request individual consultation on a project; however, in most cases, we anticipate use of the standing analysis will substantially decrease consultation timeframes.

The proposed action is the compilation of many different types of projects that, depending on their size and specific location, often do not significantly affect any federally listed threatened or endangered species or critical habitats in Michigan. Common project types include, but are not limited to, the following:

- Vegetation management, including mowing, forestry activities, prescribed burning and harvest
- Construction, maintenance, operation, and/or removal of:
 - Roads and trails
 - Communication towers
 - Transmission and utility lines
 - Bridges and culverts
 - Oil and gas pipelines
 - Solar power facilities
 - Hydroelectric facilities/dams
 - Mines/quarries
 - Canals/levees/dikes
- Commercial, residential and recreational developments
- Agricultural activities
- Site/habitat restoration/enhancement
- Shoreline protection/beach nourishment
- Dredging and filling of wetlands/waterbodies
- Military operations

For additional details on these actions and their component subactivities, a deconstruction table can be found in Appendix D.

6.1 General Limits/Sideboards To assist Action Agencies/project proponents in determining whether their project meets the requirements of this standing analysis, the Service will provide a series of questions to assess whether the action is not likely to adversely affect listed species or critical habitat because the impacts are either unable to be 1) meaningfully measured, detected, or evaluated and, therefore, insignificant; 2) extremely unlikely to occur and, therefore, discountable; or 3) wholly beneficial. Any actions that are likely to adversely affect a listed

species or critical habitat do not qualify under this standing analysis and require separate individual project review and consultation by the local ESFO.

Actions that include certain activities, occur in certain geographic areas, or meet one or more context-dependent conditions will not be eligible to use the standing analysis. For projects requiring consultation (i.e., that “may affect” listed species or critical habitats) that do not qualify due to one or more of these exclusions, Action Agencies/project proponents must contact the appropriate ESFO directly to complete their consultation requirements.

Species-specific sideboards and conservation measures are discussed in section 7.

6.1.1 General Activity Based Limits/Sideboards

To receive the Service’s technical assistance acknowledgement of an Action Agency’s NE determination or the Service’s concurrence for a NLAA determination, based on this standing analysis, actions and activities may NOT include the following:

1. Long-term (i.e., greater than 10 years) permits, plans, or other actions (e.g., FERC licenses)
2. Construction or operation of wind turbines
3. Projects for which there are less than 30 days prior to the action occurring; or
4. Aerial or other broad application of chemicals (i.e., non-targeted applications)

To ensure compliance with the ESA, project-specific consultation (or other programmatic consultation, if applicable) with the Service may be necessary for projects including one or more of the general exclusions listed above. Those projects may not necessarily result in significant adverse effects to listed species or habitats but rather warrant individual review and consideration of project-specific conservation measures.

Additionally, to use this standing analysis and receive a conclusion from IPaC, projects must include the species/taxon-specific conservation measures detailed below, as appropriate (section 7). These include activity-based exclusions and conservation measures as well as location-based sideboards.

6.1.2 May 2024 Updates to General Exclusions:

In May 2024, we updated our Michigan Dkey to allow more communications tower projects to receive automated effects determinations. Listed migratory bird species at risk of tower collision will receive a “may affect” (MA) determination if the proposed tower is guyed and within certain known bird concentration areas. In addition, we provide language in IPaC-generated output letters regarding Migratory Bird Treaty Act considerations (Appendix A).

We also removed a qualifying question related to groundwater impacts (withdrawal of more than 10,000 gallons of water per day). This question was intended to address large-scale impacts to hydrology and groundwater tables. Answering “yes” to this question will now generate a MA determination for listed species dependent on wetlands and stable hydrology rather than

disqualifying the project (thus assisting the user in making effects determinations for other species on their species list and streamlining coordination with our office).

7 SPECIES-SPECIFIC AND TAXA-SPECIFIC SIDEBOARDS AND CONSERVATION MEASURES

This standing analysis applies conservation measures as design features to avoid adverse effects on an individual, population, or species. The Service has previously found that incorporation of certain conservation measures, while voluntarily adopted by Action Agencies, has reduced effects to the extent that the actions do not require formal consultation and the Service and the Action Agency have found that actions are not likely to adversely affect species and critical habitat. Projects using this standing analysis to support a determination of NE or NLAA must meet all the requirements of the standing analysis. The inability to voluntarily adopt certain conservation measures may result in a project not qualifying to use this standing analysis.

7.1 WHOOPING CRANE

Projects that intersect the whooping crane NEP AOI and may affect whooping crane must not occur within a National Wildlife Refuge or National Park. For Federal projects for which the Action Agency cannot conclude “no effect” to whooping crane within NWRs or NPs, Agencies must consult with the Service outside of the determination key. Outside of NWRs or NPs, Agencies must confirm that their project is not likely to jeopardize the continued existence of whooping crane. If they cannot confirm no jeopardy, they must conference to complete their section 7 requirement outside of the determination key.

7.2 PIPING PLOVER AND PIPING PLOVER CRITICAL HABITAT

Projects that intersect the piping plover AOI, occur within ¼ mile onshore and ¼ mile offshore of Great Lakes shoreline, and contain suitable piping plover habitat; or intersect piping plover critical habitat containing the primary constituent elements, must not result in:

1. Any changes to the quality, quantity, or availability⁴ of suitable piping plover habitat⁵ during the breeding season (April 15 through August 15) or to CH at any time of year
2. Any permanent changes to suitable piping plover habitat⁶ or CH
3. Increased activity⁷ within suitable piping plover habitat or CH
4. A new communications tower or changes to an existing tower resulting in a guyed tower in a bird concentration area (riparian and coastline areas, Audubon Society “important Bird Areas”, National Wildlife Refuges, State Game Areas, etc.)

⁴For example, beach grooming, boardwalk Actions, breakwaters, development, dredge deposition, etc.

⁵Piping plover habitat consists of Great Lakes islands and mainland shorelines that support, or have the potential to support, open, sparsely vegetated sandy habitats, such as sand spits or sand beaches that are associated with wide, non-forested systems of dunes and inter-dune wetlands.

⁶In this context, we define permanent to be effects lasting in duration more than 3 weeks

⁷For example, human disturbance, dog activity, or an increase in potential predators such as merlins, or mammalian predators.

If the project does not occur in suitable habitat along the Great Lakes shoreline, or if the critical habitat doesn't contain the physical and biological features essential to the conservation of piping plover (for details, refer to 66 FR 22938), piping plovers are not likely to be present in the Action Area. As such, adverse effects are discountable. Projects that increase human disturbance or potential for predation need further evaluation and will receive a "may affect" determination. Similarly, communications towers that have a higher risk of collision will receive a "may affect" determination for piping plover.

7.3 RUFA RED KNOT

Projects that intersect the rufa red knot AOI and occur within 0.25 mi of a Great Lakes shoreline or inland wetland buffer must not:

1. Permanently modify beaches, dunes, mudflats, peat banks, sandbars, shoals, or other red knot habitats⁸ during the red knot migration windows (May 15 through June 15 in the spring OR July 1 through September 30 in the fall)
2. Result in increased human disturbance or predation⁹ during the red knot migration windows (May 15 through June 15 in the spring OR July 1 through September 30 in the fall)
3. A new communications tower or changes to an existing tower resulting in a guyed tower in a bird concentration area (riparian and coastline areas, Audubon Society "important Bird Areas", National Wildlife Refuges, State Game Areas, etc.)

During migration, habitat loss, disturbance and increased predation could result in adverse effects and warrant additional evaluation separate from the DKey. If these actions occur outside of the migration window, adverse effects are discountable. Communications towers that have a higher risk of collision will receive a "may affect" determination for red knot.

7.4 FRESHWATER MUSSELS

Projects that intersect the AOI for rayed bean, northern riffleshell, snuffbox, round hickory nut, salamander mussel, or clubshell mussels must have no direct or indirect effects to mussel habitat. If any portion of the project area intersects a Group 3 stream or the 0.5-mi area upstream of a Group 3 stream, or an adjacent/connecting lake/reservoir for snuffbox, the project must not:

1. Have any direct impacts to a stream or river (e.g., stream/road crossings, new stormwater outfall discharge, dams, other in-stream work, etc.)
2. Have potential to indirectly impact the stream/river or the riparian zone (e.g., cut and fill, horizontal directional drilling, construction, vegetation removal, discharge, etc.)

⁸For example, the following Actions may modify red knot habitat: groins, jetties, sea walls, revetments, bulkheads, rip-rap, beach nourishment, nearshore dredging, dredge spoil disposal, sand mining/borrowing, beach bulldozing, sandbagging, sand fencing, vegetation planting/alteration/removal, deliberate or possible introduction of non-native vegetation, beach raking/mechanized grooming, boardwalks, aquaculture development.

⁹For example, the Action is likely to indirectly increase access or use of red knot habitats by humans and/or predators at times of year that the birds are typically present (e.g., commercial/residential development, beach access structures, boardwalks, pavilions, bridges/roads/ferries/trails, marinas, posts or other avian predator perches, structures or habitat features likely to encourage predator nesting/denning, trash cans or other predator attractants, feral cat colonies, policy changes likely to increase human use).

The AOI for mussels is currently a county-based list (clubshell, northern riffleshell) or watershed based (snuffbox, rayed bean, round hickory nut, salamander mussel). The Group 3 is a more specific list of stream segments within known counties that contain habitat likely to be occupied by listed mussels (see <https://www.fws.gov/media/michigan-freshwater-mussel-survey-protocols-and-relocation-procedures-rivers-and-streams> for additional information). Avoiding direct or indirect impacts to the stream, including changes to hydrology, will ensure adverse effects are insignificant and/or discountable.

In addition, some Michigan EGLE/Army Corps of Engineer joint permit application Minor Permit (MP) and General Permit (GP) categories (https://www.michigan.gov/documents/deq/wrd-general-permit-categories_555828_7.pdf) have been evaluated and determined to have discountable effects to listed mussels (USFWS 2019b), including:

- MP 3 - Boat Hoist;
- MP 5 - Boat Wells;
- MP 7 - Completed Enforcement Actions;
- MP 12 - Dock;
- MP 21 - Fish and Wildlife Habitat Structures;
- MP 22 - Ford Stream Crossings for Commercial Forestry Operations;
- MP 28 - Maintenance and Repair of Serviceable Structures;
- MP 45 - Temporary Recreational Structures;
- MP 48 - Wetland Habitat Restoration and Enhancement;
- GP A - Aids to Navigation;
- GP C - Clear Span Bridge;
- GP J - Dry Fire Hydrant;
- GP O - Minor Permit Revisions and Transfers;
- GP Q - Mooring Buoy;
- GP W - Scientific Measuring Devices;
- GP X - Snow Road Stream Crossings for Forestry Operations;
- GP Z - Spring Piles and Piling Clusters

Group 2 Streams are those that are likely to have state listed mussels. Note that if the project intersects a Group 2 stream, the output letter will include language notifying the applicant that state-listed mussels may occur in the area, and to contact the Michigan Department of Natural Resources to determine effects to state-listed mussels.

7.5 HINE’S EMERALD DRAGONFLY AND HINE’S EMERALD DRAGONFLY CH

Projects that intersect the Hine’s emerald dragonfly AOI or CH must not:

1. Disturb the ground or existing vegetation within 500 meters of a calcareous wetland, fen, sedge meadow, or marsh¹⁰
2. Affect local hydrology (permanently or temporarily)

¹⁰This includes any off-road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.

3. Include more than 10,000 gallons/day of water withdrawal
4. Include construction or modification of a road or trail within occupied or CH buffered habitat

The main threats to Hine's emerald dragonfly are habitat destruction, urban sprawl, off-road vehicles, road and pipeline construction – all of which result in ground disturbance. Avoiding ground disturbance will preclude direct effects to Hine's emerald dragonfly. Avoiding alterations to hydrology will preclude indirect effects.

7.6 HUNGERFORD'S CRAWLING WATER BEETLE

Projects that intersect the HCWB AOI must not intersect potentially suitable streams and:

1. Involve any road or stream actions (e.g., bridge or culvert actions) or in-stream disturbance within or adjacent to (i.e., within 100m of) a stream or river including loss of riparian vegetation
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal

Avoiding direct and indirect impacts to streams will avoid impacts to suitable HCWB habitat. Projects that involve work within or adjacent to streams within the HCWB's AOI do not qualify for this key.

7.7 KARNER BLUE BUTTERFLY

Projects that intersect the KBB AOI must avoid the following within suitable habitat¹¹:

1. Disturbance to any areas containing wild lupine
2. Chemical use
3. Any activities that may result in habitat loss

Avoiding areas containing wild lupine (the host plant for KBB) will ensure disturbance will have no adverse effects to KBB. Additional consultation (outside of the Dkey) is needed if loss of habitat will occur to ensure effects are insignificant or discountable.

7.8 MITCHELL'S SATYR

Projects that intersect the Mitchell's satyr AOI must not:

1. Include alteration or fill of more than 3 acres of wetland
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal
4. Disturb the ground or existing vegetation within 0.5 miles of a Mitchell's satyr occurrence in suitable habitat (prairie fen, shrub carr, tamarack swamp, tamarack savanna, wet meadow, or wet prairie habitat)

Projects must avoid disturbing the ground or existing vegetation, which includes any off road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment,

¹¹This includes a variety of habitats containing wild lupine, including oak savanna, oak or pine barrens, openings within oak forest (including rights-of-way), or old fields in association with oak forest.

grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc. Avoiding ground disturbance (defined to include use of chemicals) in suitable habitat will ensure direct effects are discountable. Avoiding changes to hydrology, including large volume water withdrawal, will avoid indirect effects to Mitchell's satyr within an occupied watershed.

7.9 MONARCH

Monarch is a candidate species. The Act does not establish protections or consultation requirements for candidate species. Some Federal and State agencies may have policy requirements to consider candidate species in planning. For example, it is Fish and Wildlife Service policy to consider candidate species as proposed (i.e., requiring conferencing as appropriate; the Federal Action may not jeopardize the continued existence of a proposed species). For all applicants (Federal and non-Federal), we encourage implementing conservation measures that will remove or reduce threats to these species and possibly make listing unnecessary.

In the Michigan Dkey, users can make a NE determination for monarch (i.e., if the project will not affect individuals or their habitat). If they do not make a NE determination, users are asked if the project is funded, authorized, or carried out by the Service to ensure policy is followed.

If users do not make a NE determination, the Dkey will provide a May Affect "submittable" determination (via a MA Verification letter). For projects that receive a MA submittable determination for candidate or experimental populations, no additional consultation is needed unless the project is ongoing when a final rule listing the species is published.

We included monarch in our Dkey to encourage voluntary conservation and so that all species on a project proponent's species list are considered (see section 3.2 above).

7.10 POWESHIEK SKIPPERLING AND POWESHIEK SKIPPERLING CRITICAL HABITAT

Projects that intersect the Poweshiek skipperling AOI or CH must not:

1. Include alteration or fill of more than 3 acres of wetland
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal
4. Disturb the ground or existing vegetation within 0.5 miles of a population that has been extant within the last 5 years in suitable habitat (prairie fen, sedge meadow, or tall grass prairie habitat)

Projects must avoid disturbing the ground or existing vegetation, which includes any off-road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc. Avoiding ground disturbance (defined to include use of chemicals) in suitable habitat will ensure direct

effects are discountable. Avoiding changes to hydrology, including large volume water withdrawal, will avoid indirect effects to Poweshiek skipperling within an occupied watershed.

7.11 CANADA LYNX

Projects that intersect the Canada lynx AOI must not include any actions that would harm the species directly (e.g., mammal trapping, poison bait, etc.).

7.12 GRAY WOLF

Projects that intersect the gray wolf AOI must not:

1. Overlap with a known gray wolf denning or rendezvous area (users are directed to contact the lead gray wolf biologist with the Michigan Department of Natural Resources for assistance in determining whether their project area may overlap known denning or rendezvous areas)
2. Have any potential for the action to harm wolves directly (e.g., mammal trapping, poison bait), or indirectly (e.g., increasing vehicle use that may result in vehicle strikes, exposure to potential human persecution)

7.13 INDIANA BAT

Projects that intersect the Indiana bat AOI must not:

1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area
2. Remove/modify a human structure (barn, house or other building) known to contain roosting Indiana bats

Additionally, projects that contain known or potential Indiana bat habitat¹² and include tree cutting/trimming, prescribed fire, and/or pesticide (including insecticide and rodenticide) application must not:

1. Clear >10 contiguous acres of forest habitat within 5 miles of a known Indiana bat hibernaculum (Tippy Dam)
2. Clear >10 contiguous acres of modeled summer habitat (see Appendix E, F)

¹²Suitable summer habitat for Indiana bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats, such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 5 inches dbh that have exfoliating bark or cracks/crevices), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. Southern Michigan maternity roost trees are typically dead or dying trees in open areas exposed to solar radiation. Infrequently, Indiana bats are observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes. The Michigan Field Office has modeled suitable Indiana bat habitat across the species' expected range in Michigan based on available data. See Appendix II for details on how the habitat suitability model was developed and incorporated into the Dkey.

3. Fragment a connective corridor (e.g., tree line) between 2 or more forest patches of at least 5 acres (see Appendix F)
4. Cut or trim any potential Indiana bat roost trees (trees ≥ 5 inches in diameter [at breast height] with cracks, crevices and/or exfoliating bark; see Appendix B), conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific time periods:
 - a. Within 5 miles of a known hibernaculum (Tippy Dam): April 1 through October 31 (i.e., activities limited to November 1 through March 31)
 - b. In modeled summer habitat and >5 mi from Tippy Dam: April 15 through September 30 (i.e., activities limited to October 1 through April 14)
 - c. Outside modeled summer habitat and >5 miles from Tippy Dam: June 1 through July 31 (i.e., activities limited to August 1 through May 31)

Projects that contain known or potential Indiana bat habitat and include herbicide application must follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants

Projects that include removal/modification of an existing bridge or culvert suitable for day-roosting Indiana bats¹³ must not:

1. Result in the permanent loss of known or potential roosting spaces
 - a. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

1. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation Agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of “uplight” of 0 and “backlight” as low as practicable.
2. Direct temporary lighting away from suitable habitat when bats may be present

7.14 NORTHERN LONG-EARED BAT

Following the reclassification of the northern long-eared bat from threatened to endangered, the Service released Interim Consultation Period guidance and tools, originally scheduled to be in place until April 1, 2024, to help interested parties transition to the status change. Subsequently, the Interim Consultation Period was extended until summer 2024 (date TBD as of September 2024). In addition to the interim tools and guidance, the Service is also currently sharing drafts of new tools and guidance documents for interested parties to preview so they can familiarize

¹³ Suitable bridges and culverts include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices). Suitable culverts are limited to those at least 4 feet (1.2 meters) high and 50 feet (15 meters) long. If the bridge/culvert been inspected for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) during the summer roosting season (May 15 through August 15) and no bats or signs of bats were observed, work on the bridge/structure can proceed at any time of year.

themselves with changes from the interim guidance before the final tools and guidance go into effect. These tools also support the conservation of the tricolored bat should the species be listed.

Interim Consultation Period Conservation Measures

During Interim Consultation Period (March 31, 2023 – TBD summer 2024), projects within known northern long-eared bat occurrence buffers (including 5 miles of a known hibernaculum, 3 miles of a post WNS mist net capture or verified, post-WNS acoustic detection, and/or 1.5 miles of a post-WNS roost tree) must not:

1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area
2. Remove/modify a human structure (barn, house or other building) known to contain roosting northern long-eared bats

Additionally, projects within the Interim Consultation Period occurrence buffers that contain potential northern long-eared bat habitat¹⁴ and include tree cutting/trimming, prescribed fire, and/or pesticide (including insecticide and rodenticide) application must not:

1. Clear >10 acres of forest habitat within 5 miles of a known northern long-eared bat hibernaculum
2. Clear >10 acres of modeled summer habitat within the Indiana bat range/AOI (see Appendix I, II)
3. Clear >20 acres of modeled habitat outside the Indiana bat range/AOI (see Appendix I, I)
4. Fragment a connective corridor between 2 or more forest patches of at least 5 acres (see Appendix II)
5. Cut or trim any potential northern long-eared bat roost trees (trees ≥ 3 inches in diameter [at breast height] with cracks, crevices, cavities/hollows and/or exfoliating bark; see Appendix IV), conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific periods:
 - a. Within 5 miles of a known hibernaculum in the Upper Peninsula: April 15 through October 14 (i.e., activities limited to October 15 through April 14)
 - b. Within 5 miles of a known hibernaculum in the Lower Peninsula: April 1 through October 31 (i.e., activities limited to November 1 through March 31)

¹⁴ Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats, such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 3 inches dbh that have exfoliating bark, cracks/crevices, and/or cavities/hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. Infrequently, northern long-eared bats are observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes. The Michigan Field Office has modeled suitable northern long-eared bat habitat across the species' expected range in Michigan based on available data. See Appendix I for details on how the habitat suitability model was developed and incorporated into the Dkey.

- c. In modeled summer habitat and >5 mi from known hibernacula in the Upper Peninsula: May 15 through August 31 (i.e., activities limited to September 1 through May 14)
- d. In modeled summer habitat and >5 mi from known hibernacula in the Lower Peninsula within the Indiana bat range/AOI: April 15 through September 30 (i.e., activities limited to October 1 through April 14)
- e. In modeled summer habitat and >5 mi from known hibernacula in the Lower Peninsula outside of the Indiana bat range/AOI: May 1 through August 31 (i.e., activities limited to September 1 through April 30)
- f. Outside modeled summer habitat and >5 miles from known hibernacula: June 1 through July 31 (i.e., activities limited to August 1 through May 31)

Projects within the Interim Consultation Period occurrence buffers that contain potential northern long-eared bat habitat and include herbicide application must follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants.

Projects within the Interim Consultation Period occurrence buffers that include removal/modification of an existing bridge or culvert suitable for day-roosting northern long-eared bats¹⁵ must not:

- 1. Result in the permanent loss of known or potential roosting spaces
- 2. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects within the Interim Consultation Period occurrence buffers that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

- 1. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable
- 2. Direct temporary lighting away from suitable habitat when bats may be present

Post-Interim Consultation Period Conservation Measures

After the Interim Consultation Period, projects that intersect the northern long-eared bat AOI must not:

- 1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area

¹⁵ Suitable bridges and culverts include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices). Suitable culverts are limited to those at least 4 feet (1.2 meters) high and 50 feet (15 meters) long. If the bridge/culvert been inspected for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) during the summer roosting season (May 15 through August 15) and no bats or signs of bats were observed, work on the bridge/structure can proceed at any time of year.

2. Remove/modify a human structure (barn, house or other building) known to contain roosting northern long-eared bats

Additionally, projects within the Interim Consultation Period occurrence buffers that contain potential northern long-eared bat habitat¹⁶ and include tree cutting/trimming, prescribed fire, and/or pesticide (including insecticide and rodenticide) application must not:

6. Clear >10 acres of forest habitat within 5 miles of a known northern long-eared bat hibernaculum
7. Clear >10 acres of modeled summer habitat within the Indiana bat range/AOI (see Appendix I, II)
8. Clear >20 acres of modeled habitat outside the Indiana bat range/AOI (see Appendix I, I)
9. Fragment a connective corridor between 2 or more forest patches of at least 5 acres (see Appendix II)
10. Cut or trim any potential northern long-eared bat roost trees (trees ≥ 3 inches in diameter [at breast height] with cracks, crevices, cavities/hollows and/or exfoliating bark; see Appendix IV), conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific periods:
 - a. Within 5 miles of a known hibernaculum in the Upper Peninsula: April 15 through October 14 (i.e., activities limited to October 15 through April 14)
 - b. Within 5 miles of a known hibernaculum in the Lower Peninsula: April 1 through October 31 (i.e., activities limited to November 1 through March 31)
 - c. In modeled summer habitat and >5 mi from known hibernacula in the Upper Peninsula: May 15 through August 31 (i.e., activities limited to September 1 through May 14)
 - d. In modeled summer habitat and >5 mi from known hibernacula in the Lower Peninsula within the Indiana bat range/AOI: April 15 through September 30 (i.e., activities limited to October 1 through April 14)
 - e. In modeled summer habitat and >5 mi from known hibernacula in the Lower Peninsula outside of the Indiana bat range/AOI: May 1 through August 31 (i.e., activities limited to September 1 through April 30)
 - f. Outside modeled summer habitat and >5 miles from known hibernacula: June 1 through July 31 (i.e., activities limited to August 1 through May 31)

¹⁶ Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats, such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 3 inches dbh that have exfoliating bark, cracks/crevices, and/or cavities/hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. Infrequently, northern long-eared bats are observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes. The Michigan Field Office has modeled suitable northern long-eared bat habitat across the species' expected range in Michigan based on available data. See Appendix I for details on how the habitat suitability model was developed and incorporated into the Dkey.

Projects within the Interim Consultation Period occurrence buffers that contain potential northern long-eared bat habitat and include herbicide application must follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants.

Projects within the Interim Consultation Period occurrence buffers that include removal/modification of an existing bridge or culvert suitable for day-roosting northern long-eared bats¹⁷ must not:

1. Result in the permanent loss of known or potential roosting spaces
2. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects within the Interim Consultation Period occurrence buffers that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

1. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable
2. Direct temporary lighting away from suitable habitat when bats may be present

7.15 TRICOLORED BAT

As described in Section 5.15, if tricolored bats do summer in Michigan, they likely do so within close proximity of known hibernacula and/or modeled summer habitat for Indiana bat and/or northern long-eared bat. Therefore, we expect our existing Dkey conservation measures for Indiana bat and northern long-eared bat to be fully protective of tricolored bats in Michigan, with the exception of effects to potential tricolored bat roost trees¹⁸ within 5 miles of known hibernacula.

As of September 2024, the tricolored bat is a proposed species. Section 7(a)(4) requires Federal agencies to confer with the Service on actions that are likely to jeopardize the continued existence of a proposed species. Jeopardize the continued existence of means to engage in an

¹⁷ Suitable bridges and culverts include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices). Suitable culverts are limited to those at least 4 feet (1.2 meters) high and 50 feet (15 meters) long. If the bridge/culvert been inspected for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) during the summer roosting season (May 15 through August 15) and no bats or signs of bats were observed, work on the bridge/structure can proceed at any time of year.

¹⁸ Unlike Indiana and northern long-eared bats, which roost beneath exfoliating bark or within cracks/crevices or cavities of trees, tricolored bats most often roost in live or dead foliage. Potential tricolored bat roosts include leaf clusters of live and recently dead deciduous trees, Spanish moss [*Tillandsia usneoides*], and beard lichen [*Usnea trichodea*]. Tricolored bats roost in a variety of tree species, especially oaks (*Quercus spp.*), and often select roosts in tall, large diameter trees, but will roost in trees as small as 4 inches in diameter when potential roost substrate is present. Tricolored bats commonly roost in the mid to upper canopy of trees, although males will occasionally roost in dead leaves at lower heights (e.g., < 16 feet from the ground).

action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).

Dkey users can make a NE determination for the tricolored bat (i.e., if the project will not affect individuals or their habitats). If they do not make a NE determination, federally funded or authorized projects that intersect the tricolored bat AOI and occur within 5 miles of a known hibernaculum will receive a May Affect “submittable” determination (via a MA Verification letter). These projects must ensure that project activities will not jeopardize the continued existence of the tricolored bat. As long as a non-jeopardy determination is supported, no additional consultation is needed unless the project is ongoing when a final rule listing the species is published.

7.16 COPPERBELLY WATER SNAKE

Projects that intersect the copperbelly water snake AOI and buffered habitat must not:

1. Involve construction or maintenance of a road or other barrier (e.g., paved trail)
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal
4. Disturb the ground or existing vegetation¹⁹ within 0.5 miles of a copperbelly occurrence

Projects that fragment habitat, affect hydrology, or result in ground disturbance need project-specific review in areas where copperbelly occur.

7.17 EASTERN MASSASAUGA RATTLESNAKE

The following projects are not covered by the Dkey in Tier 1 or Tier 2 habitat²⁰:

1. Prescribed fire
2. New roads, widening existing roads, and other types of projects that create a permanent barrier to snake movement
3. Projects that permanently alter hydrology
4. Include more than 10,000 gallons/day of water withdrawal
5. Projects that temporarily alter hydrology during the inactive season
6. In Tier 1, projects that impact more than 0.5 acres of EMR habitat, or in Tier 2, greater than 1 acre of EMR habitat (size limit here is to ensure extent of project is small enough that BMPs can be effective without project-level review)
7. Projects that include mowing vegetation (non-turf grass) during the active season

In addition, in order to reach a not likely to adversely affect determination:

8. In Tier 1, projects cannot result in ground disturbance in areas where potential hibernacula occur. (If present in Tier 1, projects must avoid ground disturbance any time

¹⁹This includes any off-road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.

²⁰In Tier 1 habitat, contact the Service regarding the potential applicability of surveys to determine EMR absence in suitable habitat.

- of year). In Tier 2, projects cannot result in ground disturbance to potential hibernacula during the inactive season (if present in Tier 2, ground disturbance must be well within the active season to avoid when snakes are present underground).
9. If conducting ground disturbing work in Tier 1 or Tier 2 habitat, the following best management practices (BMPs) must be implemented (if applicable):
 - a. Use existing roads and minimize speeds at facilities and access roads (e.g., <15 mph on two track roads), during the active season.
 - b. Use low impact equipment such as lightweight track mounted vehicles with low ground pressure OR limit vehicle use to the inactive season, when the ground is completely frozen.
 - c. Revegetate all disturbed areas with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance). Monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions.
 - d. Avoid the spread of invasive species into suitable EMR habitat by following best practices such as inspecting and cleaning equipment and vehicles for invasive plant materials and seeds before entering EMR habitat areas.
 - e. Ensure fill is clean and free of contaminants/invasive species.
 10. For projects during the active season, in Tier 1 and Tier 2, projects must include the following BMPs (if applicable):
 - a. In Tier 1, for projects involving earth work, properly install exclusionary fencing, clear the area before work begins using a qualified person, and remove all fencing following project completion.
 - b. Keep turf grass short (<6 inches) throughout the active season. In non-turf grass, mow tall (>6 inches) vegetation during the inactive season (for Tier 1), or raise the deck height to greater than 8 inches (for Tier 2).
 11. For projects using chemical treatments (e.g., herbicides), they must agree to follow all appropriate label instructions regarding which herbicide formulation and proper use in potential EMR habitat AND avoid spray drift beyond the target species/area (observing label instructions regarding optimal wind speed and direction, boom height, droplet size calibration, precipitation forecast, etc.).

For all Projects within the range, including Tier 1 and Tier 2, projects must include all General BMPs:

- a. Use wildlife-safe materials for erosion control and site restoration throughout the project area. Do not use erosion control products containing plastic mesh netting or other similar material that could entangle eastern massasauga rattlesnake (EMR). Several products for soil erosion and control exist that do not contain plastic netting including net-less erosion control blankets (for example, made of excelsior), loose mulch, hydraulic mulch, soil binders, unreinforced silt fences, and straw bales. Others are made from natural fibers (such as jute) and loosely woven together (often referred to as "leno weave") in a manner that allows wildlife to wiggle free.
- b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/~PFnXe_e02w), review the EMR

factsheet (available at <https://www.fws.gov/media/eastern-massasauga-rattlesnake-fact-sheet>), or call (517) 351-2555.

- c. During project implementation, require reporting of any federally listed species, including EMR, to the Service within 24 hours.

Based on implementation of the recommended BMPs, and avoidance of the excluded actions, adverse effects to eastern massasauga are expected to be discountable.

7.18 PLANTS

In Michigan, threatened plants include American hart's tongue fern, dwarf lake iris, eastern prairie fringed orchid, Houghton's goldenrod, lakeside daisy, and Pitcher's thistle. Michigan monkey flower is Michigan's only endangered plant species. Plants in Michigan are protected by state law in addition to the Federal ESA.

Projects that are funded, authorized, or carried out by a Federal agency, intersect the AOI and/or buffered habitat of a federally listed plant, and have either determined presence through a survey or have not conducted a survey and are assuming presence must not:

1. Indirectly alter the habitat or resources of the listed plant(s)²¹
2. Directly harm the listed plant(s)²²
3. Include more than 10,000 gallons/day of water withdrawal (for wetland dependent species to include Michigan monkey flower, Houghton's goldenrod, eastern prairie fringed orchid)

If the project does not have a Federal nexus but has the potential to affect a listed plant, the user will receive output language advising them to contact the Michigan Department of Natural Resources regarding compliance with state law and to determine whether a state permit is needed. We also encourage landowners to maintain habitat for listed plant species and avoid disturbing listed plants to the extent possible.

For projects with a Federal nexus, avoiding direct and indirect effects to plants will ensure effects are insignificant or discountable.

7.19 BALD EAGLE

Although no longer listed under the ESA, bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d). The Dkey provides the user with information on the BGEPA and directs users to contact the MIFO for more information on the BGEPA if their action may impact bald or golden eagles.

²¹For example, actions that cause a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.

²²For example, through prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduction to possession, etc.

8 EFFECTS ANALYSIS

This section covers the effects of the anticipated activities covered in this standing analysis to the covered species and critical habitat (above). Where appropriate in our analysis, we make note of which activities are expected to have no effect on a species and critical habitat. This information is provided as helpful technical assistance to those Agencies and project proponents who may be unfamiliar with the species and activities and can be incorporated by reference by action Agencies when they make a NE determination.

The effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

A project's Action Area must include all areas affected (i.e., modifications to land, air, or water) by the proposed action, and not merely the immediate area involved in the action. If the activities satisfy the two-part test for causation ("but for" and "reasonably certain to occur"), they should be considered as part of the action. To qualify for use of this standing analysis, a project's Action Area must be wholly encompassed by the coverage area for this standing analysis as described above and all activities within the proposed action must fit within the scope of the standing analysis.

Qualifying actions typically involve one or more of the stressors addressed below.

Insignificant Habitat Loss/Degradation

Some projects that qualify for use of this Dkey may result in minor loss/fragmentation or temporary degradation of available habitat for one or more federally listed species. However, we believe that adherence to the specific conservation measures will ensure that any reduction or modification of available habitat will result in only insignificant effects to listed species and critical habitats. Conservation measures that control for significant loss/degradation of habitat include restrictions on the extent and timing of certain activities (e.g., acreage thresholds for tree clearing projects within the Indiana bat AOI, seasonal restrictions on temporary surface- and groundwater elevation changes in potential eastern massasauga hibernation habitat), restrictions on stream/hydrology-impacting or vegetation/ground-disturbing activities within the AOIs/buffered habitat of several species (e.g., copperbelly water snake, listed insects), and restrictions on Actions that may fragment habitat or create barriers to movement/dispersal within the AOIs of several species (e.g., dams within Group 3 streams, roads/trails/fences within listed snake habitats).

Noise and Vibration

Noise and/or vibration resulting from some projects are typically produced temporarily during the construction phase (e.g., construction vehicles and equipment, blasting) and may be permanently produced during the operation phase (e.g., roads/trails/bridges, commercial/recreational facilities, military operations, etc.). However, we believe that adherence to the specific conservation measures will ensure that any disturbance related to an increase in noise and/or vibration will result in only insignificant effects to listed species and critical habitats. Conservation measures that limit exposure to these stressors and control for significant disturbance include restrictions on the timing of certain activities (e.g., tree cutting during the Indiana bat active season, modifications to beaches, dunes, mudflats or other potential habitats during the red knot migration windows), restrictions on ground-disturbing activities within the AOIs of several species (e.g., listed snakes, insects), and restrictions on in-stream disturbance within the AOIs of Hungerford's crawling water beetle and listed mussels).

Smoke, Dust, Chemicals, and Odor

Smoke, dust, chemicals, and/or odor resulting from some project activities are typically produced temporarily during the construction phase (e.g., construction vehicles and equipment, blasting, invasives treatment/pesticide application, prescribed burning) and may be permanently produced during the operation phase (e.g., mines/quarries, commercial/residential developments, military operations, etc.). However, we believe that adherence to the specific conservation measures will ensure that any disturbance related to an increase in smoke, dust, chemicals, and/or odor will result in only insignificant effects to listed species and critical habitats. Conservation measures that limit exposure to these stressors and control for significant disturbance include restrictions on the timing of certain activities (e.g., prescribed burning and pesticide use in potential habitat during the Indiana bat and eastern massasauga active seasons), restrictions on chemical use and vegetation-disturbing activities within the AOI of listed insects, restrictions on direct and indirect river/stream impacts in Group 3 streams, and disturbance buffers around sensitive areas (e.g., known gray wolf denning or rendezvous sites).

Night Lighting

Night lighting produced by some projects may occur temporarily during the construction phase (e.g., equipment lighting) and/or permanently during the operation phase (e.g., road/trail and facility lighting). However, we believe that application of the specific conservation measures will ensure that any disturbance related to night lighting will result in only insignificant effects to listed species and critical habitats. Most federally listed species are not expected to be affected by night lighting; however, certain species that are active at night (e.g., listed mammals, snakes, migrating birds) may be sensitive to an increase in lighting at night. Conservation measures that limit exposure to this stressor and control for significant disturbance include the general exclusion for communications towers more than 200 feet in height (which require night lighting), the timing of certain activities (e.g., Actions that may increase human activity in potential habitat during the red knot migration windows), and disturbance buffers around sensitive areas (e.g., known gray wolf denning or rendezvous sites).

Changes to Hydrology

Several Michigan species are dependent on wetland habitats and stable water levels. Major alteration of habitat through changes to hydrology could change habitat conditions such that they are no longer suitable, either through drying or inundation. For species that overwinter or shelter in crayfish burrows (listed snakes, Hine’s emerald dragonfly larvae), stable hydrology is necessary for successful overwintering. Examples of projects that may significantly alter hydrology include those with large amounts of fill, large water withdrawals, and changes to structures (culverts or dams) within rivers and streams. Conservation measures that address potential changes to hydrology include limits on water withdrawal, amount of fill (butterflies), extent of water table elevation changes (including drawdown and inundation), and extent of project scale (e.g., less than 0.5 acres for Tier 1 habitat for EMR).

Conclusion

If a project is not consistent with the general and species/taxon-specific conservation measures and/or exclusions detailed above, the DKey will provide a response indicating that it cannot generate a conclusion (i.e., NE or NLAA determinations) for all species and will recommend project-specific coordination with the MIFO. In other words, for any species for which the user gets a MA determination, further consideration is required and their endangered species review cannot be completed using the Dkey. On the other hand, if the user provides project-specific information consistent with the conservation measures, IPaC will generate a consistency letter (for non- Federal project proponents) or a concurrence letter (for Action Agencies) concluding that the project is consistent with NE and/or NLAA determinations for all listed species. We base these conclusions on the effects analysis above, which are summarized in Table 2.

Table 2. A summary of the effects of the stressors from qualifying projects on federally listed species in Michigan.

Stressor	Effect
Habitat Loss/Degradation	None or insignificant
Noise and Vibration	None or insignificant

Smoke, Dust, Chemicals, and Odor	None or insignificant
Night Lighting	None or insignificant
Changes to Hydrology	Insignificant or discountable
Conclusion	“May affect – not likely to adversely affect”

For additional analysis, see [Appendix D](#).

9 SUMMARY AND CONCLUSION

After considering the relevant information pertaining to the species and critical habitat, reviewing the covered activities and associated required conservation measures, and evaluating their anticipated effects), we conclude that Federal and non-Federal actions subject to this standing analysis will support a determination of “No Effect” or “may affect, not likely to adversely affect” (NLAA), as appropriate, for the subject species and critical habitat as described above. This standing analysis is based on the consultation provisions of section 7(a)(2) of the Act, our approach to technical assistance, and the information cited and will undergo review and revision, as needed, if any of the following conditions have been met: 1) If new information reveals the effects of the covered action(s) to the covered species or critical habitat are occurring in a manner or to an extent not considered in this standing analysis based on applied use; or 2) If the species or critical habitat covered by the standing analysis has a change in status.

This standing analysis will be provided on our website and through IPaC via a link within the Dkey. For a list of all possible questions, see Appendix G (note that no project will receive all of these questions; which questions a user gets depends on 1) where they draw the project and 2) how they answer previous questions).

LITERATURE CITED

- Abbas, H. 2011. Prairie Fen Hydrology. Ph.D. Dissertation. Michigan State University, East Lansing, Michigan. 212 pp.
- Barbour, R.W. and W.H. Davis. 1969. Bats of America. The University Press of Kentucky, Lexington, Kentucky.
- Bissell, KM 2006. Modeling habitat ecology and population viability of the eastern massasauga rattlesnake in southwestern lower Michigan. MS Thesis, Michigan State University, East Lansing.
- Bouseman, J.K. and J.G. Sternburg. 2001. Field guide to butterflies of Illinois. Illinois Natural History Survey. Champaign, IL.
- Bowles, M.L. 1983. The tallgrass prairie orchids *Platanthera leucophaea* (Nutt.) Lindl. and *Cypripedium candidum* Muhl. ex Willd.: Some aspects of their status, biology, and ecology, and implications toward management. *Natural Areas Journal* 3(4):14-37
- Brack V. Jr. 2007. Temperatures and Locations Used by Hibernating Bats, Including *Myotis sodalis* (Indiana Bat), in a Limestone Mine: Implications for Conservation and Management. *Journal of Environmental Management*, 40:739–746.
- Brown, H. and A. Kurta. 2013. Has the eastern pipistrelle conquered the Lower Peninsula? *Michigan Birds and Natural History* 20:111-113.
- Burt, W.H. 1957. Mammals of the Great Lakes Region. University of Michigan Press, Ann Arbor, Michigan.
- Caceres, M.C., and M.J. Pybus. 1997. Status of the northern long-eared bat (*Myotis septentrionalis*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 3, Edmonton, AB, 19 pp.
- Cashatt, E. D., and T. E. Vogt. 1996. Population and habitat monitoring of Hine's emerald dragonfly (*Somatochlora hineana Williamson*) in northeastern Illinois in 1995. Report to U.S. Fish and Wildlife Service. Illinois State Museum, Springfield, Illinois. 77 pp.
- [CEC] Secretariat of the Commission for Environmental Cooperation. 2008. North American monarch conservation plan. Communications Department of the Center for Environmental Cooperation Secretariat.
- Christian, A.D., B.N. Smith, D.J. Berg, J.C. Smoot, and R.H. Findlay. 2004. Trophic position and potential food sources of 2 species of unionid bivalves (Mollusca: Unionidae) in 2 small Ohio streams. *Journal of the North American Benthological Society* 23(1):101-113.

Cleveland, A.G. and J.G. Jackson 2013. Environmental factors influencing the status and management of bats under Georgia (USA) bridges. *Proceedings of the 2013 International Conference on Ecology and Transportation (ICOET 2013)* 9 pp.

Cockrell BJ, Malcolm SB, Brower LP. 1993. Time, temperature, and latitudinal constraints on the annual recolonization of eastern North America by the monarch butterfly. Pp. 233-251 in Malcolm SB, Zalucki MP, eds. *Biology and Conservation of the Monarch Butterfly*. Natural History Museum of Los Angeles County, Science Series 38.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2004. COSEWIC assessment and status report on the dwarf lake iris *Iris lacustris* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vi + 18 pp.

COSEWIC. 2016. Assessment and status report on the American Hart's-tongue Fern, *Asplenium scolopendrium* var. *americanum* in Canada: Committee on the Status of Endangered Wildlife in Canada, Ottawa, Canada. xii + 43 pp.

Cummings, K.S. and C.A. Mayer. 1992. Field guide to freshwater mussels of the Midwest. Illinois Natural History Survey Manual No. 5. 194 pp

Cuthrell, D.L. and B.S. Slaughter. 2012. Special animal abstract for *Oarisma poweshiek* (Poweshiek skipperling). Michigan Natural Features Inventory, Lansing, MI. 4 pp.

Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>.

Diener, R. A. 1957. An ecological study of the plain-bellied water snake. *Herpetologica* 13:203-211.

Faust, L., J. Szymanski, and M. Redmer. 2011. Range wide extinction risk modeling for the eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*). Unpublished report, Lincoln Park Zoo and U.S. Fish and Wildlife Service. 66p.

Feldhemer, G.A., T.C. Carter, A.T. Morzillo, and E.H. Nicholson. 2003. Use of Bridges as Day Roosts by Bats in Southern Illinois. Publications, Paper 45.

Foster, R.W., and A. Kurta. 1999. Roosting ecology of the Northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). *Journal of Mammalogy* 80(2):659–672.

Fuller, T.K., L.D. Mech, and J.F. Cochrane. 2003. Wolf population dynamics. Pp. 161–191 in L.D. Mech and L. Boitani, editors. *Wolves: Behavior, Ecology, and Conservation*. University of Chicago Press, Chicago, Illinois.

- Gibson, T., J. Cecil, and G.T. Watters. 2011. New or confirmed potential host/mussel associations in Ellipsaria, September 2011, Vol.13, No.3, pp 7-8.
- Gore, I.A. and K.R. Studenroth, Jr. 2005. Status and Management of Bats Roosting in Bridges in Florida. Florida Department of Transportation Research Project #BD433 Final Report. 62 pp.
- Grabarkiewicz, J. 2023. A Bat Survey of Selected Culverts in Southern Michigan. Report to the U.S. Fish and Wildlife Service, 11/17/2023. 37 pp.
- Grant, M. and R. Vande Kopple. 2003. Preliminary report of the feeding habits of Hungerford's crawling water beetle. Report to the U.S. Fish and Wildlife Service. 4 pp.
- Grant, M. and R. Vande Kopple. 2009. A stable isotope investigation into the feeding behavior of *Brychius hungerfordi* Spangler (Coleoptera: Haliplidae), a federally endangered crawling water beetle. *The Coleopterist Bulletin* 63(1): 71-83.
- Grant, M., R. Vande Kopple, and B. Ebbers. 2011. Hungerford's crawling water beetle survey, Northern Lower Michigan, 2011 Field Season. Report to the U.S. Fish and Wildlife Service. 10 pp.
- Grizzle, J.M., and C.J. Brunner. 2007. Assessment of current information available for detection, sampling, necropsy, and diagnosis of diseased mussels. Auburn University, Auburn, Alabama. 84 pp.
- Haag, W. R. and M.L. Warren. 1998. The role of ecological factors and reproductive strategies in structuring freshwater mussel communities. *Canadian Journal of Fisheries and Aquatic Sciences* 55:297-306.
- Herman WS, Tatar M. 2001. Juvenile hormone regulation of longevity in the migratory monarch butterfly. *Proceedings of the Royal Society B-Biological Sciences* 268:2509-2514.
- ICF. 2023. Lake States Forest Management Bat Habitat Conservation Plan. January. (ICF 103717.0.002.) Fairfax, VA. Prepared for Michigan Department of Natural Resources, Traverse City, MI.
- Interagency Lynx Biology Team (ILBT). 2013. Canada lynx conservation assessment and strategy. 3rd edition. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-13-19, Missoula, MT. 128 pp.
- Johnson, G. 1995. Spatial ecology, habitat preferences, and habitat management of the eastern massasauga, *Sistrurus c. catenatus*, in a New York transition peatland. Ph.D. Dissertation, State University of New York, Syracuse, New York. xvii + 140p.

- Johnson, J.B., J.E. Gates, and W.M. Ford. 2008. Distribution and activity of bats at local and landscape scales within a rural-urban gradient. *Urban Ecosystems* 11(2):227-242.
- Jones, J.A. 2015. Recovery strategy for the Houghton's goldenrod (*Solidago houghtonii*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vi + 31pp
- Katzenmeyer, J.B. 2016. Use of highway culverts, box bridges, and caves by winter-roosting bats in Mississippi. Master of Science in Wildlife and Fisheries Science, Mississippi State University, Mississippi. 70 pp.
- Keeley, B.W. and M.D. Tuttle. 1999. Bats in American bridges. Resource Publication 4, Bat Conservation International. 6 pp.
- Kingsbury, B. A. 1996. Ecology of the endangered copperbelly water snake, *Nerodia erythrogaster neglecta*, in Fish Creek, Indiana. Report submitted to Indiana Department of Natural Resources.
- 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 Indiana and Ohio Departments of Natural Resources and the U.S. Fish and Wildlife Service. 186 pp.
- Kofron, C. P. 1978. Food and habits of aquatic snakes (Reptilia, Serpentes) in a Louisiana swamp. *Journal of Herpetology* 12(4):543-554.
- Kost, M.A. and D.A. Hyde. 2009. Exploring the Prairie Fen Wetlands of Michigan. Extension Bulletin E-3045. East Lansing, Michigan: Michigan Natural Features Inventory, Michigan State University Extension.
- Kurta, A. and J. Kennedy (eds.). 2002. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.
- Kurta, A., L. Winhold, J.O. Whitaker, and R. Foster. 2007. Range expansion and changing abundance of the eastern pipistrelle (Chiroptera: Vespertilionidae) in the central Great Lakes region. *American Midland Naturalist* 157:404–411.
- Kurta, A. and .M. Smith. 2020. Changes in Population Size and Clustering Behavior of Hibernating Bats in the Upper Peninsula of Michigan After Arrival of White-Nose Syndrome. *Northeastern Naturalist* 27(4):763-772. Available at <https://doi.org/10.1656/045.027.0415>
- Laureto, P.J. and J. S. Pringle. 2010. *Solidago vossii* (Asteraceae), a new species of goldenrod from northern Michigan. *The Michigan Botanist* 49:105-117.

Leong KLH, Sakai WH, Bremer W, Feuerstein D, Yoshimura G. 2004. Analysis of the pattern of distribution and abundance of monarch overwintering sites along the California coastline. Pp. 177-185 in Oberhauser KS, Solensky MJ, eds. *The Monarch Butterfly: Biology and Conservation*. Ithaca, NY: Cornell University Press.

Leopold, D.J. and Weber, J. 2019. Range wide status assessment of Houghton's goldenrod (*Oligoneuron [=Solidago] houghtonii*) with a special emphasis on niche limits, demographic transitions, and population stability. Final Report to U.S. Fish and Wildlife Service.

Limon, D.A., C.J. Garcia, B.B. Gregory, R.D. Stevens, and M.A. Barnes. 2018. The status of *Pseudogymnoascus destructans* in Louisiana. *The Southwestern Naturalist* 63(4):216-219.

Lutsch, K. 2019. Assessment of culverts and bridges as roosting habitat for *Perimyotis subflavus* (tri-colored bat) and disease transmission corridors for *Pseudogymnoascus destructans*. Master of Science in Integrative Biology, Kennesaw State University, Georgia. 44 pp.

Malcolm, S.B., B.J. Cockrell, and L.P. Brower. 1993. Spring recolonization of eastern North America by the monarch butterfly: Successive brood or single sweep migration? Pp. 253-267 in Malcolm SB, Zalucki MP, eds. *Biology and Conservation of the Monarch Butterfly*. Natural History Museum of Los Angeles County, Science Series 38.

McKelvey, K. S., S. W. Buskirk, and C. J. Krebs. 2000b. Theoretical insights into the population viability of lynx. Pages 21-37 in Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires, (eds.). *Ecology and conservation of lynx in the contiguous United States*. University Press of Colorado, Boulder, Colorado.

Mech, L.D. 1970. *The Wolf: The Ecology and Behavior of an Endangered Species*. Thirteenth Printing (2007). University of Minnesota Press, Minneapolis, Minnesota. 384 pp.

Mech, L. D. and L. Boitani. 2003. Wolf social ecology. Pp. 1–34 in L.D. Mech and L. Boitani, editors. *Wolves: Behavior, Ecology, and Conservation*. University of Chicago Press, Chicago, Illinois.

Meierhofer, M.B., J.S. Johnson, K.A. Field, S.S. Lumadue, A. Kurta, J.A. Kath, and D.M. Reeder. 2018. Bats recovering from white-nose syndrome elevate metabolic rate during wing-healing in spring. *Journal of Wildlife Diseases* 54(3):480-490.

Mousseau, T. 2004. Taxonomy, classification, reconstructed phylogeny, biogeography, and natural history of nearctic species of *Brychius* Thomson (Coleoptera: Haliplidae). Master's Thesis, University of Manitoba, Winnipeg. 155 pp+ appendices.

Murray, H.D., and A.B. Leonard. 1962. *Handbook of the unionid mussels of Kansas*. University of Kansas Museum of Natural History Miscellaneous Publication No. 28.

- Mushinsky, H. R. and J. J. Hebrard. 1977. Food partitioning by five species of water snakes in Louisiana. *Herpetologica* 33:162-166.
- Nichols, S.J., and D. Garling. 2000. Food-web dynamics and trophic-level interactions in a multispecies community of freshwater unionids. *Canadian Journal of Zoology* 78:871-882.
- Parmalee, P.W., and A.E. Bogan. 1998. The freshwater mussels of Tennessee. The University of Tennessee Press, Knoxville, Tennessee.
- Opler, P. A. and G. O. Krizek. 1984. Butterflies East of the Great Plains. The John Hopkins University Press.
- Owen, S.F., M.A. Menzel, W.M. Ford, J.W. Edwards, B.R. Chapman, K.V. Miller, and P.B. Wood. 2002. Roost tree selection by maternal colonies of Northern long-eared Myotis in an intensively managed forest. USDA Forest Service. Newtown Square, Pennsylvania. 10 pp.
- Parsons JA. 1965. A digitalis-like toxin in monarch butterfly *Danaus plexippus* L. *Journal of Physiology-London* 178:290-304.
- Peers M. J. L., D. H. Thornton, and D. L. Murray. 2012. Reconsidering the specialist-generalist paradigm in niche breadth dynamics: Resource gradient selection by Canada lynx and bobcat. *PLoS ONE* 7(12): e51488. doi:10.1371/journal.pone.0051488.
- Perry, R.W.,- and R.E. Thill. 2007. Roost selection by male and female northern long-eared bats in a pine-dominated landscape. *Forest Ecology and Management* 247:220–226.
- Planisek, S.L. 1983. The Breeding System, Fecundity, and Dispersal of *Iris lacustris*. The Michigan Botanist 22:93-102.
- Raesly, R.L. and J.E. Gates. 1987. Winter habitat selection by north temperate cave bats. *American Midland Naturalist* 118(1):15-31.
- Reinert, H.K. and W.R. Kodrich. 1982. Movements and Habitat Utilization by the Massasauga, *Sistrurus catenatus catenatus*. *Journal of Herpetology* 16:162-171.
- Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires. 2000b. The scientific basis for lynx conservation: qualified insights. Pages 443-454 in Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires, (eds.). Ecology and conservation of lynx in the contiguous United States. University Press of Colorado, Boulder, Colorado
- Sandel, J.K., G.R. Benatar, K.M. Burke, C.W. Walker, T.E. Lacher, and R.L. Honeycutt. 2001. Use and selection of winter hibernacula by the eastern pipistrelle (*Pipistrellus subflavus*) in Texas. *Journal of Mammalogy* 82(1):173-178.

- Sasse, D.B., and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats (*Myotis septentrionalis*) in the white mountain national forest. Bats and Forests Symposium October 1995, Victoria, British Columbia, Canada, pp. 91-101.
- Saunders, S. P., T.W. Arnold, E.A. Roche, and F.J. Cuthbert. 2014. Age-specific survival and recruitment of piping plovers *Charadrius melodus* in the Great Lakes region. *Journal of Avian Biology* 45(5):437-449.
- Scott, J. A. Lycaenidae. In *The Butterflies of North America*. Stanford University Press, Stanford. 1986. pp. 347-414.
- Seigel, R. A. 1986. Ecology and conservation of an endangered rattlesnake, *Sistrurus catenatus*, in Missouri, USA. *Biological Conservation* 35:333–346.
- Sells, S., M. Mitchell, K. Podruzny, J. Gude, A. Keever, D. Boyd, T. Smucker, A. Nelson, T. Parks, N. Lance, M. Ross, and R. Inman. 2021. Evidence of economical territory selection in a cooperative carnivore. *Proceedings of the Royal Society B* 288:20210108.
- Sheviak, C.J. and M.L. Bowles. 1981. Rare Plants of New York State. New York State Museum Bulletin No. 445.
- Silverman, H., S.J. Nichols, J.S. Cherry, E. Achberger, J.W. Lynn, and T.H. Dietz. 1997. Clearance of laboratory-cultured bacteria by freshwater bivalves: differences between lentic and lotic unionids. *Canadian Journal of Zoology* 75:1857-1866.
- Silvis, A., W.M. Ford, E.R. Britzke, and J.B. Johnson. 2014. Association, roost use and simulated disruption of *Myotis septentrionalis* maternity colonies. *Behavioural Processes* 103:283-290.
- Silvis, A., W.M. Ford, and E.R. Britzke. 2015. Effects of Hierarchical Roost Removal on Northern Long-Eared Bat (*Myotis septentrionalis*) Maternity Colonies. *PLoS ONE* 10(1):e0116356.
- Slaughter, B.S. and D.L. Cuthrell. 2017. Status Assessment of Pitcher’s Thistle and Hart’s-tongue Fern: Acquiring Contemporary Information for Recovery Planning and Five-year Reviews. Michigan Natural Features Inventory, Report No. 2017-02, Lansing, MI.
- Smith, P. 2019. Research Scientist. Red knot breeding webinar, October 15, 2019. Wildlife Research Division, Environment and Climate Change Canada, Ottawa, Ontario, Canada.
- Soper, J.H. 1954. The hart’s-tongue fern in Ontario *American Fern Journal* 44(4):129–147.
- Stahler, D.R., D.W. Smith, K.A. Cassidy, E.E. Stahler, M.C. Metz, R. McIntyre, and D.R. MacNulty. 2020. Ecology of family dynamic in Yellowstone wolf packs. Pp. 42–60 in D.W.

- Smith, D. R. Stahler, and D.R. MacNulty, editors. *Yellowstone Wolves: Science and discovery in the World's first National Park*. University of Chicago Press, Chicago, Illinois, U.S.A.
- Strayer, D.L., J.A. Downing, W.R. Haag, T.L. King, J.B. Layzer, T.J. Newton, and S.J. Nichols. 2004. Changing perspectives on pearly mussels, North America's most imperiled animals. *BioScience* 54(5):429-439
- Stebbins, G.L. 1935. Further notes on the hart's tongue American Fern Journal. 25(3):105.
- Steffens, W.P. 1997. 1997 Hine's emerald (*Somatochlora hineana Williamson*) surveys in Michigan's Upper Peninsula. Report to the U.S. Fish and Wildlife Service.
- Szymanski, J., C. Pollack, L. Ragan, M. Redmer, L. Clemency, K. Voorhies, and J. Jaka. 2016. Species Status Assessment for the Eastern Massasauga Rattlesnake (*Sistrurus catenatus*) July 2016 (v2).
- Tesauro, J. and D. Ehrenfeld. 2007. The effects of livestock grazing on bog turtle. *Herpetologica* 63(3):293-300.
- Thames, D.B. 2020. Summer Foraging Range and Diurnal Roost Selection of Tri-colored bats, *Perimyotis subflavus*. Master's Thesis University of Tennessee Knoxville.
- Timpone, J.C., J.G. Boyles, K.L. Murray, D.P. Aubrey, and L.W. Robbins. 2010. Overlap in roosting habits of Indiana Bats (*Myotis sodalis*) and northern bats (*Myotis septentrionalis*). *American Midland Naturalist* 163:115–123.
- Urquhart FA, Urquhart NR. 1978. Autumnal migration routes of the eastern population of monarch butterfly (*Danaus p. plexippus* L.; Danaidae; Lepidoptera) in North America to the overwintering site in the Neovolcanic Plateau of Mexico. *Canadian Journal of Zoology* 56:1759-1764.
- U.S. Fish and Wildlife Service (USFWS). 2001. Hine's Emerald Dragonfly (*Somatochlora hineana*) Recovery Plan. Fort Snelling, MN.
- U.S. Fish and Wildlife Service (USFWS). 2012a. Whooping Crane (*Grus americana*) 5-Year review: Summary and Evaluation. Corpus Christi Ecological Service Field Office and Aransas National Wildlife Refuge.
- U.S. Fish and Wildlife Service (USFWS). 2018a. Rayed Bean (*Vilosa fabalis*) 5-Year review: Summary and Evaluation. Midwest Region Ecological Services Field Office Columbus, Ohio.
- U.S. Fish and Wildlife Service (USFWS). 2018b. Snuffbox (*Epioblasma triquetra*) 5-Year review: Summary and Evaluation. Midwest Region Ecological Services Field Office Columbus, Ohio.

U.S. Fish and Wildlife Service (USFWS). 2019a. Northern Riffleshell (*Epioblasma torulosa rangiana*) 5-Year review: Summary and Evaluation. Pennsylvania Field Office. State College, PA.

U.S. Fish and Wildlife Service (USFWS). 2019b. Letter to Melanie Burdick, U.S. Environmental Protection Agency, with Enclosure “Project Review for State and federally Listed Freshwater Mussels.”

U.S. Fish and Wildlife Service (USFWS). 2019c. Clubshell (*Pleurobema clava*) 5-Year review: Summary and Evaluation. Pennsylvania Field Office. State College, PA.

U.S. Fish and Wildlife Service (USFWS). 2019d. Karner Blue Butterfly (*Lycaeides melissa samuelis*) 5-Year review: Summary and Evaluation. Minnesota- Wisconsin Field Office. Bloomington, Minnesota.

U.S. Fish and Wildlife Service (USFWS). 2019e. Indiana Bat (*Myotis sodalis*) 5-Year review: Summary and Evaluation. Indiana Ecological Services Field Office. Bloomington, Indiana.

U.S. Fish and Wildlife Service (USFWS). 2020a. Rufa Red Knot (*Calidris cantus rufa*) 5-Year review: Summary and Evaluation. New Jersey Field Office. Galloway, New Jersey.

U.S. Fish and Wildlife Service (USFWS). 2020b. Piping Plover (*Charadrius melodus*) 5-Year review: Summary and Evaluation. Michigan Field Office. East Lansing, Michigan.

U.S. Fish and Wildlife Service (USFWS). 2021a. Lakeside daisy (*Hymenoxys herbacea*) 5-Year review: Summary and Evaluation. Ohio Field Office. Columbus, Ohio.

U.S. Fish and Wildlife Service (USFWS). 2022a. Species status assessment report for the snuffbox. May 2022 (Version 1.0). Ohio Ecological Services Field Office, Columbus, Ohio.

U.S. Fish and Wildlife Service (USFWS). 2022b. Species status assessment report for the rayed bean. May 2022 (Version 1.0). Ohio Ecological Services Field Office, Columbus, Ohio.

U.S. Fish and Wildlife Service (USFWS). 2023. Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service’s approval of a Habitat Conservation Plan and the issuance of associated Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan). 94 pp.

Van Hook, T. 1996. Monarch butterfly mating ecology at a Mexican overwintering site: Proximate causes of non-random mating. Dissertation. University of Florida. 259 pp.

Watters, G.T. 1990. 1990 Survey of the unionids of the Big Darby Creek system. Final Report to The Nature Conservancy. 229 pp.

Watters, G.T. 1992). Unionids, fishes, and the species-area curve. *Journal of Biogeography* 19:481-490.

Watters, G.T. 1996. Hosts for the northern riffle shell (*Epioblasma torulosa rangiana*). Triannual Unionid Report 10:14.

Watson, E.T., J.L. Metcalfe-Smith, and J. Di Maio. 2001. COSEWIC status report on the mudpuppy mussel *Simpsonaias ambigua* in Canada. Committee on the Status of Endangered Wildlife in Canada.

Weatherhead, P.J., and K.A. Prior. 1992. Preliminary observations of habitat use and movements of the eastern massasauga rattlesnake (*Sistrurus c. catenatus*). *Journal of Herpetology* 26:447-452.

West, E.L., J.L. Metcalfe-Smith, and S.K. Staton. 2000. Status of the rayed bean, *Villosa fabalis* (Bivalvia: Unionidae), in Ontario and Canada. *Canadian Field-Naturalist* 114:248-258.

Wiler, M.E. and D.G. Skoglund. 2022. Michigan monkey-flower (*Erythranthe michiganensis*) Annual Report – 2022. Technical Report. Sleeping Bear Dunes National Lakeshore, Natural Resource Division, Empire, Michigan. 22 pp.

Zalucki, M.P. 1982. Temperature and rate of development in *Danaus-plexippus L* and *D. chrysippus L* (Lepidoptera, Nymphalidae). *Journal of the Australian Entomological Society* 21:241-246.

Appendix A: Michigan Communication Towers Flow Chart and MBTA language

Michigan Dkey Communication Towers Flow Chart



Migratory Bird Treaty Act language:

*Paragraph A: Your communications tower, as proposed, may have significant impacts to migratory birds. We strongly recommend that all communications towers are either unlit or use flashing-only LED lights at the minimum configuration allowed by the FAA to reduce the tower's nighttime attraction to birds. Additionally, to further reduce your project's attraction to birds, we strongly recommend that all on-ground facilities, equipment, and infrastructure use motion- or heat-sensitive, down-shielded, and minimum intensity security lighting (as applicable). Guyed towers may have increased risk to migratory birds, especially when over 450 feet tall and/or when constructed near areas that may have large concentrations of birds (e.g., riparian and coastline areas, Audubon Society "Important Bird Areas", National Wildlife Refuges, State Game Areas, etc.). Towers built with these configurations may necessitate the development of an Environmental Assessment and be subject to additional environmental review. You can avoid this by adopting recommended lighting specifications to reduce nighttime attraction to birds and eliminating guy wires.

**Paragraph B: The Michigan Field Office is concerned with the impact that communication towers have on migratory birds. Your project is designed to reduce nighttime bird attraction as the tower is either not lit or will use flashing-only LED lights at the minimum configuration allowed by the FAA. Additionally, your project will use motion- or heat-sensitive, down-shielded, and minimum intensity security lighting on all on-ground facilities, equipment, and infrastructure (as applicable). However, your project may still have negative impacts to migratory birds due to the use of guy wires and the project's proposed location near areas that may have large concentrations of birds (e.g., riparian and coastline areas, Audubon Society "Important Bird Areas", National Wildlife Refuges, State Game Areas, etc.). We therefore recommend you review the USFWS's Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning (updated March 2021 available at <https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation>), and incorporate additional avoidance and minimization measures, as practicable.

Appendix B: Potential Indiana Bat Roost Trees

The Service defines suitable Indiana bat roost tree as any tree ≥ 5 inches in diameter (at breast height) with cracks, crevices and/or exfoliating bark that is within 1,000 feet of forested/wooded habitat.

Although live trees may be used, Indiana bat roosts are most typically snags in early to mid-decay stages. When healthy live trees are used, they tend to be species with naturally sloughing bark, such as shagbark hickory (*Carya ovata*). While over 40 Indiana bat roost tree species have been documented, including coniferous species, deciduous trees are most frequently used, and all the Indiana bat roosts reported in Michigan have been deciduous species. Generally, roost quality improves with tree height, diameter, amount of peeling bark, and solar exposure. Maternity roosts (roost trees used by reproductive female bats and their young) are typically high-quality roosts (i.e., large, tall trees with peeling bark and/or large cracks/crevices that receive a high degree of solar radiation).

Examples of Indiana bat roost trees:



Appendix C: Potential Northern Long-eared Bat Roost Trees

The Service defines suitable northern long-eared bat roost tree as any tree ≥ 3 inches in diameter (at breast height) with cracks, crevices, exfoliating bark, and/or cavities/hollows that is within 1,000 feet of forested/wooded habitat.

Although northern long-eared bat roosts are often dead or dying trees, live trees with defects are also commonly used. Northern long-eared bats have been reported to use over 35 roost tree species, but deciduous species are most frequently selected. Maternity roosts (roost trees used by reproductive female bats and their young) are typically higher-quality roosts (i.e., large-diameter, tall trees with peeling bark and/or notable defects and adequate solar exposure); however, compared to sympatric Indiana bat roosts, northern long-eared bat roosts (even maternity roosts) are often smaller, shorter trees with a higher degree of canopy cover and are more likely to be living.

Examples of northern long-eared bat roost trees:



Appendix D. Deconstruction of potential actions

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Mowing	Snakes	Tires and moving blades	adults, neonates, gravid females	crushing, injuring, mortality	Mow during inactive season when snakes are hibernating and under ground. Keep grass short (less than 6 inches) to make less suitable. Raise mower deck (>8 inches) to reduce risks during active season. In terms of scope, Dkey limits size of project to less than 0.5 acre in Tier 1 habitat.	discountable or insignificant
Mowing	Butterflies	Tires and moving blades	early life stages (eggs, larvae, pupae)	crushing, injuring, mortality; loss of nectaring resources or host plants	Avoid working in suitable habitat	discountable if working outside of areas with host plants and nectar resources for adults
Mowing	Plants	Tires and moving blades	vegetative and flowering tissue	crushing, injuring, mortality	Avoid working in suitable habitat	discountable if working outside of suitable habitat; if working within suitable habitat and they are mowing, dkey gives MA
Tree cutting that is not part of forest management (e.g., conversion)	Bats	Felling of trees/limbs, permanent removal or fragmentation of roosting/foraging habitat	Adults, pups	Crushing, injury, mortality (if roosting bats are present); increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are flushed or forced to seek alternate roosts), severing flight corridors	Avoid cutting when bats may be roosting in trees; avoid cutting within 0.25 mi of known hibernacula; limit extent of tree clearing and ensure adequate habitat will remain in surrounding areas, avoid fragmenting connective forested corridors (e.g., tree lines); alternatively, perform summer presence/absence survey to determine occupancy	Insignificant or discountable
Tree cutting for forest management (e.g., timber harvest, forest stand improvements)	Bats	Felling of trees/limbs, minor or temporary removal of suitable roosting/foraging habitat; enhancement of suitable roosting/foraging habitat	Adults, pups	Crushing, injury, mortality (when bats present); colony fragmentation, increased metabolic costs/physiological stress/reproductive effects (when bats not present); increased flight space, thermal benefits to roost trees, increased insect activity/abundance (enhancement of roosting and foraging habitat)	Retain high-quality potential roosts (e.g., standing snags, hollow trees); avoid cutting potential roosts during non-volant pup season; avoid cutting within 0.25 mi of known hibernacula; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant, discountable, or wholly beneficial
Prescribed fire	Snakes	Heat and smoke; fire breaks (see mowing and ground disturbance)	adults, neonates, gravid females	harm or mortality	Avoid in Tier 1 or Tier 2 habitat. If can't avoid Tier 1 or 2, BMPs can include timing restrictions, slow rate of spread, lower intensity, etc but would want a project-level review (outside of dkey) so dkey gives MA determination.	Discountable if outside of EMR tiered habitat.

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Prescribed fire	Butterflies	Heat and smoke; fire breaks (see mowing and ground disturbance)	all life stages	harm or mortality	Avoid in suitable habitat where species may be present.	Discountable if outside of suitable habitat.
Prescribed fire	Plants	Heat and smoke; fire breaks (see mowing and ground disturbance)	all	harm or mortality	Avoid in suitable habitat where species may be present.	Discountable if outside of suitable habitat.
Prescribed fire	Bats	Smoke, heat/flames, CO and other gases, alteration or temporary loss of roosting/foraging habitat (e.g., scorching or felling of roost trees)	Adults, pups	Scorching/thermal injury/mortality, increases in blood carboxyhemoglobin (if roosting bats present); increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are flushed); temporary loss of roost trees and/or foraging habitat; increased flight space, thermal benefits to roost trees, increased insect activity/abundance (enhancement of roosting and foraging habitat)	Avoid burning in/near suitable forested habitat during the non-volant pup season or when temperatures are <40 degrees F; avoid burning within 0.25 mi of known hibernacula; if bats may be present, keep average flame length ≤8 feet and smoke to a minimum, avoid felling potential roost trees during site prep; during the burn, leave visibly burning trees standing unless they present a safety threat; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant, discountable, or wholly beneficial
Ground disturbance, earth movement, excavation	Snakes	heavy equipment (crushing/injury risk), loss of hibernacula	adults, neonates, gravid females	injury or mortality of individuals if present, loss of hibernacula could result in indirect mortality if other suitable hibernacula are not present and able to be located by EMR or CWS	Conduct work outside of the active season when snakes are not above ground. Avoid work in areas where hibernacula could occur. Alternatibely, during the active season, exclude snakes from work area using exclusionary fencing. Dkey limits size of project to less than 0.5 acre in Tier 1 habitat.	Insignificant or discountable
Ground disturbance, earth movement, excavation	Butterflies	heavy equipment (crushing/injury risk), loss of host plant, nectar resources, loss of suitable hydrology, spread of invasive species (see separate action)	all life stages	Injury or mortality of individuals if present, loss of host or nectar plants could result in indirect mortality.	Avoid working in suitable habitat	Insignificant or discountable
Ground disturbance, earth movement, excavation	Plants	heavy equipment (crushing/injury risk), loss of suitable hydrology (see separate action), spread of invasive species (see separate action)	all	Injury or mortality of individuals if present	Avoid working in suitable habitat	Insignificant or discountable

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Hydrological Changes	Insects (HED, MISA, POSK, HCWB)	loss of suitable habitat for feeding, breeding, and sheltering	all	lowered fitness	Project must not have permanent or temporary impacts to hydrology within occupied watershed or result in water withdrawal of more than 10,000 gallons/day.	Insignificant or discountable
Hydrological Changes	Snakes	loss of suitable habitat for feeding, breeding, and sheltering (including hibernation)	all	lowered fitness; freezing or desiccation (mortality) during winter if water levels are not stable	Project must not result in changes to water table of more than 6 inches or result in inundation lasting more than 2 weeks. Within the watershed, water withdrawals can not be more than 10,000 gallons/day.	Insignificant or discountable
Hydrological Changes	Plants	loss of suitable habitat and resources	all	lowered fitness	If within suitable habitat, project can not directly or indirectly effect resources including hydrology. Within the watershed, water withdrawals can not be more than 10,000 gallons/day.	Insignificant or discountable
Spread of invasive species	Insects (HED, MISA, POSK, HCWB, KBB)	loss of suitable habitat and resources for feeding, breeding, and sheltering	all	lowered fitness	Avoid working in suitable habitat	Insignificant or discountable
Spread of invasive species	Snakes (EMR and CWS)	loss of suitable habitat and resources for feeding, breeding, and sheltering	all	lowered fitness	At the conclusion of the action, revegetate all disturbed areas with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance); monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions	Insignificant or discountable
Spread of invasive species	Plants	loss of suitable habitat and resources for feeding, breeding, and sheltering	all	lowered fitness	Avoid working in suitable habitat	Insignificant or discountable
Planting, cultivation	Bats	Increased forest and/or insect habitat	Adults, pups	Enhanced roosting, foraging, and/or commuting habitat	N/A	Wholly beneficial

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Herbicide/fungicide use	Bats	Chemical exposure, vegetation changes	Adults, pups	Chemical toxicity, modification of suitable habitat (including potential enhancement of roosting/foraging habitat)	Follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants; avoid application within 0.25 mi of known hibernacula; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant, discountable, or wholly beneficial
Pesticide (insecticide/rodenticide) application	Bats	Exposure to chemicals targeting mammals and/or prey sources (bioaccumulation)	Adults, pups	Chemical toxicity	Avoid application within 0.25 mi of known hibernacula and within suitable habitat when bats may be present; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant or discountable
Pesticide (insecticide/rodenticide) application; herbicide application	All	Exposure to chemicals directly affecting species (lethal or sublethal) and/or prey sources (bioaccumulation) or host plants/nectar sources	All	chemical toxicity; loss of prey; loss of host plant or nectar source	No broad application of chemicals; only targeted can get through our dkey. No application in suitable habitat for sensitive species.	Insignificant or discountable
Placement of fill or rip rap, dredging	Freshwater mussels	crushing, suffocation, loss of suitable substrate	adults, juveniles	lowered fitness, mortality	Avoid direct and indirect impacts to streams within group 3 streams	Discountable
Construction of structures	Birds (PIPL and REKN)	collision risk for certain buildings and towers	adults	mortality or injury	For communication towers, structure must be unlit or will use flashing-only LED lights at the minimum configuration allowed by the FAA; use motion- or heat-sensitive, down-shielded, and minimum intensity security lighting on all on-ground facilities, equipment, and infrastructure; avoid bird concentration areas if using guy wires	Discountable
Construction of structures	Bats	Aleration of suitable day roosting habitat	Adults, pups	Crushing, injury, mortality (if roosting bats are present); increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are flushed or forced to seek alternate roosts)	Avoid removal/modification of suitable bridges when bats may be present, avoid permanent loss of known or potential day-roosting spaces; alternatively, perform a bridge assessment or summer presence/absence survey to determine occupancy	Insignificant or discountable

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Human activity	Birds (PIPL and REKN)	Increase in dogs off leashes, increase in predators (avian and mammalian)	Adults, chicks, eggs	mortality or injury, decreased fitness	Avoid actions that increase risk of dogs off leash, avian and mammalian predators in suitable habitat -- any time of year for permanent changes; during breeding season for temporary changes.	discountable or insignificant
Roads and trails	Snakes	Barrier to movement, fragmentation	All	decreased fitness, road mortality	No new roads or trails; no significant widening (>10 ft) of an existing road footprint, converting the surface of an existing road or trail from a non-paved to a paved surface, widening of a paved or gravel trail, or adding new linear features such as fences, canals, or other permanent barriers have the potential to fragment habitat and alter movement and dispersal.	discountable or insignificant
Temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s)	Bats	Light pollution, changes in insect activity	Adults	Avoidance of lit areas; increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are forced to seek alternate habitats); enhanced foraging opportunities	When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable; direct temporary lighting away from suitable habitat when bats may be present	Insignificant, discountable, or wholly beneficial

Appendix E: Development of a Habitat Suitability Model for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*M. septentrionalis*) in Michigan

In 2018, the Michigan Ecological Services Field Office (MIFO) contracted with Dr. Eric McCluskey of Grand Valley State University to develop a habitat model for the Indiana bat in Michigan. In 2021, MIFO again contracted with Dr. McCluskey to develop a habitat model for the northern long-eared bat in Michigan, which we combined with the Indiana bat model. A shapefile of the combined habitat model is available here: [Michigan Listed Bat Habitat Model](#)

Indiana Bat Model

To develop the model, we compiled all available Indiana bat summer capture (foraging) and roost occurrence data for Michigan and applied a 500-m spatial filter as a minimum distance between occurrence records to minimize overemphasis of habitat importance based on clusters of individuals. After filtering the occurrence data, 44 locations remained (20 capture and 24 roost locations). We developed models using capture and roost occurrences separately as well as with all occurrences combined to determine which model was best suited for identifying foraging and roost habitat.

Due to the small number of occurrences, we used an ensemble of small models (ESM) approach that permits more predictor variables to be used by running each pairwise combination of variables and then weighting these final models in an ensemble. The ESMs were run in the R package *ecospat*. Presence only modeling requires the selection of background area from which background points will be randomly sampled to compare to the occurrence data. The background area should represent parts of the landscape that are accessible to the focal organism. We created a convex hull around our occurrence data using ArcMap, a polygon formed by connecting straight lines between points. We then buffered this convex hull by 25 km to include areas beyond the known core distribution of Indiana Bat in southern Michigan that should be physically accessible and may have undetected presences. We set background point selection for this entire buffered area except for within 5 km of Indiana Bat occurrences where background points are most likely to unintentionally represent true presences.

We selected predictor variables by removing the worse performing variable from highly correlated pairs (>0.75) using the ‘corSelect’ function from the *fuzzySim* R package. Then we then used Maxent’s internal variable importance (permutation importance) and jackknife measures to determine which of the remaining variables were important to retain for separate capture and roost models. We selected two model types, Artificial neural network (ANN) and Maxent, for the ESMs. We compared five runs for each model type with the capture, roost, and combined datasets using area under the ROC curve (AUC) and true skill statistic (TSS). We then calculated the Boyce Index value using *ecospat* to compare the ANN and Maxent models from each dataset in their ability to identify capture and roost locations. We used Boyce Index as the primary assessment metric as it allowed for comparisons across all three model types for capture and roost data.

Based on the Boyce Index assessment, we selected the Maxent presence-only roost model as the strongest fit model. Using the 10th percentile threshold, we converted the model output to a binary raster. The binary raster was then converted to a shapefile using non-simplified shapes. Because considerable portions of the modeled habitat contained clearly non-suitable cover types, particularly near highly developed urban areas, we further refined the model by clipping the binary shapefile by the most recent available National Land Cover Database (NLCD 2019) data. Land cover categories excluded (“Clipped”) from modeled habitat included open water, perennial ice/snow, developed (low, medium, and high intensity), and barren land (sand, rock, clay).

Northern Long-eared Bat Model

To develop the model, we compiled all available northern long-eared bat summer capture (foraging) and roost occurrence data for Michigan’s Lower Peninsula and applied a 1-km spatial filter as a minimum distance between occurrence records to reduce the potential for biased results from over-represented sites. After filtering the occurrence data, 56 locations remained.

We screened a diverse set of candidate variables (30 m resolution) representing different habitat elements, including land cover, hydrology, and elevation. First, we identified and removed highly correlated variables (>0.75) with the ‘corSelect’ function in the fuzzySim R package, keeping the better performing variable from each correlated pair. We further evaluated the remaining variables using the jackknife of variable importance and training gain output in Maxent. The final northern long-eared bat variables were mean canopy at 100 m, canopy range at 500 m, percentage of emergent wetland at 50 ha, percentage of forested wetland at 5 ha, wetland diversity index at 25 ha, and wetland diversity index at 1,000 ha.

Once the occurrence data were thinned, we used a buffered region to clip the selected variable rasters to serve as the area for background point selection by ecospat. We used a 25-km buffer for background point selection (10,000 random points). The sample size was low enough ($n=56$) that we opted to use the R package ecospat, that was developed for datasets with few occurrences. Ecospat uses an ESM approach where separate models are produced with each pair of variables before an ensemble is created under a weighting scheme. We used Maxent and ANN for the ecospat ESMs. The ecospat models used five-fold cross validation (80% training partitions). We used Boyce Index implemented in ecospat as the primary model selection metric using the ‘ecospat.boyce’ function for the ESMs. Finally, we converted the continuous habitat suitability values from each species SDM to a binary raster of habitat and non-habitat to represent the distribution of habitat patches. We used the maximum sum of sensitivity and specificity (MSSS) threshold for the ecospat ESM models (equivalent to the maximum true skill statistic (TSS)).

Combined Listed Bat Model

To combine and further refine the habitat models, we created a grid of five-acre hexagons for Michigan using the “Generate Tessellation” tool in ArcPro 2.9. Five acres was selected as the patch size based on available literature and data suggesting that Indiana and northern long-eared bats are unlikely to occupy an isolated forest stand of less than five acres. The total acres

of modeled habitat were summarized by hexagon using the “Summarize Within” tool. Hexagons with less than one acre of either bat’s habitat were then removed. These small model fragments were typically isolated from other modeled hexagons, likely artifacts of imprecise raster data, and were considered unlikely to provide sufficient habitat to support roosting listed bats. Hexagons containing more than one acre of modeled habitat of either species were retained, helping to fill gaps and buffer edges among smaller but closely connected modeled patches and increasing the overall acreage of modeled habitat across the state.

The remaining hexagons were then aggregated using the “Dissolve” tool allowing for multipart features. The “Summarize Within” tool was run again to obtain acres of modeled habitat within each hexagon cluster. We then ran a “Near Neighbor” analysis to identify forest patches that were greater than 1,000 feet from forested areas to remove isolated patches unlikely to be used by roosting listed bats. We removed hexagons that were more than 1,000 feet from their nearest neighbor and that contained less than five acres of modeled habitat. These isolated forest patches are considered unlikely to support roosting listed bats due to their insufficient size and distance from other suitable, modeled areas. The final layer was then checked against known listed bat roosting areas and detections. An additional three hexagons were added to the model to capture locations that fell outside of the modeled habitat.

Appendix F: Projects that may Cause Indirect Adverse Effects/Harm to ESA-listed Bats

Indiana bat (*Myotis sodalis*), northern long-eared (*M. septentrionalis*), and tricolored bat (*Perimyotis subflavus*) are forest dependent and require a network of forested tracts for roosting, commuting, and foraging. The U.S. Fish and Wildlife Service (Service) defines suitable roosting habitat for Indiana bats as forest patches containing trees of 5 inches diameter at breast height (DBH) or larger, and suitable roosting habitat for the northern long-eared bat as forest patches containing trees of 3 inches DBH or larger. Roosting habitat for tricolored bats is characterized as forests, woodlots, and linear features (e.g., fencerows and riparian corridors) containing live or recently dead trees with live or dead leaf clusters, Spanish moss [*Tillandsia usneoides*], or beard lichen [*Usnea trichodea*]). Additional forest types, including early successional habitat with small diameter trees, may also be used as important foraging and/or commuting habitat by listed bats.

Indiana, northern long-eared, and tricolored bats exhibit high interannual site fidelity, with maternity colonies roosting together in the same area over multiple years (USFWS 2007, Foster and Kurta 1999, Johnson et al. 2009, Silvis et al. 2015). Because tree roosts are naturally ephemeral, listed bats are expected to be adapted to some amount of roost loss. However, largescale loss or degradation of occupied habitat could lead to maternity colony fragmentation and/or reproductive failure if a substantial number of roost trees (particularly primary maternity roosts) are removed or if a sufficient amount of suitable roosting, foraging, swarming/staging, and/or commuting habitat will no longer be available, even if the clearing takes place during times of the year when bats are not present on the landscape (inactive season).

Although project specifics (e.g., timing, availability of nearby habitat, quality of remaining habitat, etc.) can modify a risk assessment, the Michigan Ecological Services Field Office generally views the following project activities as having potential to cause adverse effects and/or harm to federally listed bats if they are present (or when assuming potential presence without survey data²³) without further considerations. In other words, projects involving the following activities are not eligible to receive automated concurrence through our All-Species Michigan Dkey:

1. Clearing >10 contiguous²⁴ acres of modeled habitat within 5 miles of a known listed bat hibernaculum;
2. Clearing >10 contiguous²⁵ acres of modeled bat habitat in the Indiana bat range;
3. Clearing >20 contiguous²⁶ acres of modeled bat habitat outside the Indiana bat range;
4. Fragmenting²⁷ a connective corridor (e.g., tree line) between two or more forest patches of at least 5 acres

²³Surveys conducted in accordance with the Service's Range-wide Indiana bat and Northern Long-eared Bat Survey Guidelines may be used to demonstrate presence or probable absence of listed bats within a project area. Lacking presence/absence survey data, presence is assumed in suitable habitat.

²⁴Connected by 1,000 feet or less

²⁵Connected by 1,000 feet or less

²⁶Connected by 1,000 feet or less

²⁷Creating a gap of 1,000 feet or more between previously connected forest

Acreege Thresholds

To better characterize potential habitat and focus conservation efforts, the Michigan Ecological Services Field Office developed a [habitat suitability model](#) for the Indiana and northern long-eared bat in Michigan (see Appendix E). Potentially suitable habitat for these species and tricolored bat may occur outside of modeled areas, but occupancy of such areas is expected to be less likely (including for tricolored bat, since the final variables selected for the Indiana and northern long-eared bat models, including canopy cover and wetland variables, are also ecologically relevant to tricolored bat²⁸).

As listed bat maternity home ranges contain multiple primary and secondary roost trees and Michigan provides abundant suitable habitat for listed bats, it is extremely unlikely that loss of up to 10 contiguous acres of habitat would eliminate all primary roost trees within a maternity roosting area anywhere in Michigan. Based on NLCD 2021 USFS Tree Canopy Cover data for the CONUS (Dewitz 2023), median tree canopy cover by county in Michigan is 41% across the state and 62% across the Upper Peninsula, where northern long-eared and tricolored bats are most likely to occur; moreover, most of the forestland across Michigan [18.9 of approximately 19.3 million forested acres] is modeled as suitable for Indiana and/or northern long-eared bat. Available literature suggests that northern long-eared bat maternity colonies can tolerate loss of a single primary roost or up to 20% of available secondary roosts in the inactive season before abandoning roosting areas or substantially altering roosting behaviors (Silvis et al. 2014, 2015), and Indiana and tricolored bats are expected to respond similarly. Loss of up to 10 contiguous acres of habitat is also unlikely to noticeably degrade the quality of an occupied roosting or foraging area or render a travel corridor unsuitable anywhere in Michigan. For these reasons, the Michigan Ecological Services Field Office believes it is extremely unlikely that loss of up to 10 contiguous acres during the inactive season would lead to detectable adverse effects/harm, even where listed bats are most likely present (e.g., within 5 miles of known hibernacula) and forest habitat is most limited/fragmented (e.g., modeled habitat within the Indiana bat range, where median tree canopy cover by county is 25% [average: 26%; range: 12-52%]).

Based on the abundance of forested habitat outside the Indiana bat's range (i.e., northern Lower Peninsula and Upper Peninsula, where median tree canopy cover by county is 53%), we believe a higher threshold is warranted. We have been using a threshold of up to 20 contiguous acres of modeled habitat during the inactive season to screen projects outside of the Indiana bat's range and hibernacula buffers in our Dkey. While in many cases, a higher threshold may be justified (e.g., up to 100 acres), a 20-acre threshold has been working well in Michigan for initial project screening. We prefer to manually review projects that are larger in scale to ensure other listed species and other Federal wildlife laws are adequately considered. Many projects that cannot receive automated concurrence through our statewide Dkey due to this threshold will be able to receive concurrence outside the Dkey.

Michigan projects that will clear >10 contiguous acres within 5 mi of a known listed bat hibernaculum, >10 acres of modeled habitat in the Indiana bat range, and/or >20 contiguous acres of modeled habitat outside the Indiana bat range or that will fragment a connective corridor

²⁸ It is not possible to develop a habitat suitability model for the tricolored bat in Michigan since no summer data exist for the species. However, given their rarity in Michigan and ecological similarities to the other listed bats, tricolored bats are not expected to occur outside modeled habitat for Indiana and northern long-eared bat.

between two or more forest patches of at least 5 acres may warrant further project-specific consideration or coordination with the Service in order to evaluate and minimize potential impacts.

Minimum Patch Size

Based on life history information and available literature for Indiana bats (e.g., average foraging distances and occupied forest patch sizes), the Service believes that it is unlikely that an isolated forest stand of 10 acres or less would provide sufficient resources for an Indiana bat. However, available data indicate that Indiana bats may infrequently use isolated forest patches as small as 5.6 acres (Keith Lott, personal communication). The Michigan Ecological Services Field Office believes a conservative minimum patch size of 5 acres is appropriate for both Indiana and northern long-eared bats. Although listed bats rarely traverse non-forested areas of 1,000 feet or more, they are frequently observed using vegetated corridors, such as tree lines, to travel among suitable forest patches. Because they may connect important foraging and roosting habitats, removal of forested corridors (regardless of size/area of corridor) could severely fragment available habitat and result in adverse effects or indirect take of listed bats. Therefore, projects that remove connective corridors between forest patches warrant project-specific consideration and coordination with the Service.

Northern Long-eared Bat Interim Consultation Period (March 31, 2023 – TBD Summer 2024)

During the Interim Consultation Period, the Service does not consider take of northern long-eared bats to be reasonably certain except within the specified distance buffers of known occurrences. During the Interim Consultation Period, projects outside of these buffers may conclude that take of northern long-eared bats is not reasonably certain and that adverse effects are unlikely. During the Interim Consultation Period, this framework has been integrated into the Michigan All Species Determination Key. Additionally, to assist private landowners and stakeholders with non-Federal actions, the Service has published range-wide [Interim Voluntary Guidance](#) for [Forest Habitat Modification](#) and [Wind Energy Operation](#).

However, please note that the [Interim Consultation Framework](#) and associated [Standing Analysis](#) only consider and address the effects of Covered Actions that are expected to occur from March 31, 2023, until April 1, 2024. In other words, the Standing Analysis and Interim Consultation Framework do not consider any effects or incidental take resulting from the Covered Actions that may occur after April 1, 2024. Additionally, they do not consider effects to or take of Indiana bats or other federally listed bats. After April 1, 2024, any Action Agency that was issued an individual BO that relied on the Interim Consultation Framework will need to reinitiate consultation if its continuing, discretionary Action is expected to affect the northern long-eared bat (i.e., cause incidental take). If the Action Agency fails to reinitiate consultation on or before April 1, 2024, its individual BO will no longer be based on the best available information, which means the Action Agency's section 7 compliance and incidental take exemptions provided by section 7(o)(2) may lapse. Please see the [USFWS northern long-eared bat page](#) for more information.

Supporting Documents

The following Service web pages provide further information and background on the potential for indirect adverse effects via habitat loss or fragmentation.

- [Section 7 Technical Assistance, Summary of Indiana Bat Ecology](#)
- [Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects](#)
- [Range-wide Indiana bat and Northern Long-eared Bat Survey Guidelines](#)
- [Standing Analysis and Implementation Plan for the Range-wide Northern Long-eared Bat and Tricolored Bat Assisted Determination Key](#)

Literature Cited

Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>.

Foster, R.W. and A. Kurta. 1999. Roosting ecology of the northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). *Journal of Mammalogy* 80: 659-672.

Johnson, J.B., J.W. Edwards, W.M. Ford, and J.E. Gates. 2009. Roost tree selection by northern myotis (*Myotis septentrionalis*) maternity colonies following prescribed fire in a Central Appalachian Mountains hardwood forest. *Forest Ecology and Management* 258:233-242.

Silvis, A., W.M. Ford, E.R. Britzke, and J.B. Johnson. 2014. Association, roost use and simulated disruption of *Myotis septentrionalis* maternity colonies. *Behavioural Processes* 103:283-290.

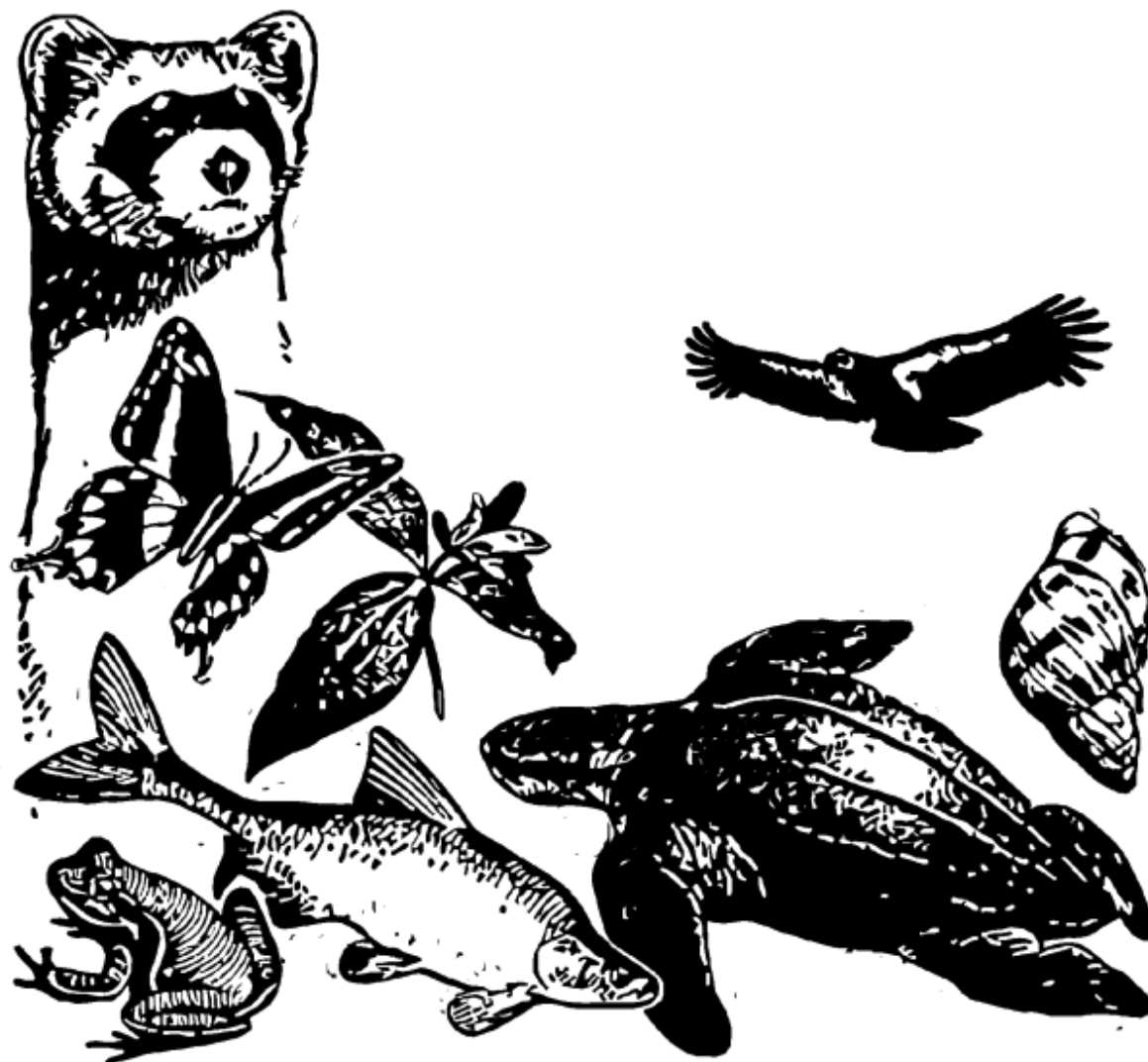
Silvis, A., W.M. Ford, and E.R. Britzke. 2015. Effects of Hierarchical Roost Removal on Northern Long-Eared Bat (*Myotis septentrionalis*) Maternity Colonies. *PLoS ONE* 10(1):e0116356.

U.S. Fish and Wildlife Service (USFWS). 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife FWS, Fort Snelling, MN. 258 pp.

All Species Michigan Determination Key

Determination Key overview

Generated July 23, 2024 05:29 PM UTC, IPaC v6.112.0-rc2



This [key](#) is intended to streamline review of projects for potential effects to Federally listed threatened and endangered (TE) species and designated critical habitat (CH).

This key is designed as a tool to help Federal agencies and other project proponents decide if their proposed action has the potential to adversely affect TE species and CH and covers certain routine and predictable projects for all species in Michigan.

Some projects may be outside the scope of this key. The key does not cover wind energy development; aerial or other large-scale application of any chemical (such as insecticide or herbicide); projects for which there are less than 30 days prior to action occurring; and approval of long-term permits or plans (e.g., FERC licenses). Activities that fall outside the scope of this key will require additional evaluation and/or consultation outside of the IPaC application; please contact the Michigan Ecological Service Field Office if you have questions.

If your project qualifies for use of this Dkey, you will be prompted to answer questions about your project to help you evaluate the effects of your action on Federally listed species and designated CH. If your completed TE review indicates a "No Effect" (NE) determination for all listed species, print your IPaC output letter for your files to document your compliance with the Endangered Species Act. For Federal projects with a "Not Likely to Adversely Affect" determination, our concurrence becomes valid if you do not hear otherwise after a 30-day review period, as indicated in your letter. If your output letter indicates additional coordination with the Michigan Ecological Services Field Office is necessary (i.e., you get a May Affect Consistency letter), you will be provided additional guidance on contacting the Service to continue ESA coordination outside of this key; ESA compliance cannot be concluded using the key for "May Affect" determinations unless otherwise indicated in your output letter.

Please note that only one assisted determination key may be completed per species for each project. Please carefully review the descriptions of all available determination keys to select the most appropriate key for your project. For instance, federal transportation projects with potential effects to listed bats may be advised to complete the determination key entitled, [FHWA, FRA, FTA Programmatic Consultation for Transportation Projects affecting NLEB or Indiana Bat](#), although the Michigan Determination Key does cover Federal and non-Federal transportation activities. The Rangewide determination key for northern long-eared bat is included in the All-Species Michigan Determination key as an option (effective March 2023).

Finally, be advised that this determination key is intended to assist the user in the evaluating the effects of their actions on Federally listed species in Michigan. It does not authorize any activities that are otherwise prohibited by the Endangered Species Act (e.g., for wildlife: import/

export, Interstate or foreign commerce, possession of illegally taken wildlife, etc.; for plants: import/export, reduce to possession, malicious destruction on Federal lands, commercial sale, etc.) or other Federal or state statutes.

For a video demonstration of this DKey, click the link below.

[Demo: All Species Michigan Determination Key Video](#)

Species covered by this key

This key covers the following species, and critical habitat for these species, expected to occur in this project area:

None

The following species, also covered by this key, are not expected to occur in this project area:

American Hart's-tongue Fern *Asplenium scolopendrium* var. *americanum*

Canada Lynx *Lynx canadensis*

Clubshell *Pleurobema clava*

Copperbelly Water Snake *Nerodia erythrogaster neglecta*

Dwarf Lake Iris *Iris lacustris*

Eastern Massasauga (=rattlesnake) *Sistrurus catenatus*

Eastern Prairie Fringed Orchid *Platanthera leucophaea*

Gray Wolf *Canis lupus*

Hine's Emerald Dragonfly *Somatochlora hineana*

Houghton's Goldenrod *Solidago houghtonii*

Hungerford's Crawling Water Beetle *Brychius hungerfordi*

Indiana Bat *Myotis sodalis*

Karner Blue Butterfly *Lycaeides melissa samuelis*

Lakeside Daisy *Hymenoxys herbacea*

Michigan Monkey-flower *Mimulus michiganensis*

Mitchell's Satyr Butterfly *Neonympha mitchellii mitchellii*

Monarch Butterfly *Danaus plexippus*

Northern Long-eared Bat *Myotis septentrionalis*

Northern Riffleshell *Epioblasma rangiana*

Piping Plover *Charadrius melodus*

Pitcher's Thistle *Cirsium pitcheri*

Poweshiek Skipperling *Oarisma poweshiek*

Rayed Bean *Villosa fabalis*

Round Hickorynut *Obovaria subrotunda*
Rufa Red Knot *Calidris canutus rufa*
Salamander Mussel *Simpsonia ambigua*
Snuffbox Mussel *Epioblasma triquetra*
Tricolored Bat *Perimyotis subflavus*
Whooping Crane *Grus americana*

Geographic extent where this key is valid

This key is valid for qualifying projects anywhere within the following geographic extent:



Potential questions in this key

The following is a comprehensive list of all questions that are part of this determination key.

Based on the answers you provide, only appropriate follow-up questions will be asked.

1. Are there any possible effects to any listed species or to designated critical habitat from your project or effects from any other actions or projects subsequently made possible by your project?

Select "Yes" even if the expected effects to the species or critical habitat are expected to be 1) extremely unlikely (discountable), 2) can't meaningfully be measured, detected, or evaluated (insignificant), or 3) wholly beneficial.

Select "No" to confirm that the project details and supporting information allow you to conclude that listed species and their habitats will not be exposed to any effects (including discountable, insignificant, or beneficial effects) and therefore, you have made a "no effect" determination for all species. If you are unsure, select YES to answer additional questions about your project.

2. This determination key is intended to assist the user in the evaluating the effects of their actions on Federally listed species in Michigan. It does not cover other prohibited activities under the Endangered Species Act (e.g., for wildlife: import/export, Interstate or foreign commerce, possession of illegally taken wildlife, purposeful take for scientific purposes or to enhance the survival of a species, etc.; for plants: import/export, reduce to possession, malicious destruction on Federal lands, commercial sale, etc.) or other statutes. Click yes to acknowledge that you must consider other prohibitions of the ESA or other statutes outside of this determination key.
3. Is the action the approval of a long-term (i.e., in effect greater than 10 years) permit, plan, or other action? (e.g., a new or re-issued hydropower license, a large-scale land management plan, or other kinds of documents that provide direction for projects or actions that may be conducted over a long term (>10 years) without the need for additional section 7 consultation).
4. Is the action being funded, authorized, or carried out by a Federal agency?
5. Does the project intersect a NWR?
This question will be answered automatically based on your project location.
6. Does the action involve the installation or operation of wind turbines?
7. Are there at least 30 days prior to your action occurring? Endangered species consultation must be completed before taking any action that may have effects to listed species. The Service also needs 30 days to review projects before we can verify conclusions in some dkey output letters. For example, if you have already started some components of the project on the ground (e.g., removed vegetation) before completing this key, answer "no" to this question. The only exception is if you have a Michigan Field Office pre-approved emergence survey (i.e., if you have conducted pre-approved emergence surveys for listed bats before tree removal, you can still answer yes to this question).

8. Does the action involve constructing a new communications tower or modifying an existing communications tower?
9. Is your tower unlit?
10. Will you use flashing only LED lights at the minimum configuration allowed by the FAA (i.e. no pulsing or steady-burning lights)?
11. Will your project utilize motion- or heat-sensitive, down-shielded, and minimum intensity security lighting on all on-ground facilities, equipment, and infrastructure to reduce nighttime bird attraction? (If no ground lighting, select "N/A")
 - _N/A
 - Yes
 - No
12. Is your communications tower self-supported (i.e., without guy wires)?
13. Is your tower over 450 feet?
14. Does the activity involve aerial or other large-scale application of any chemical (including insecticide, herbicide, etc.)?
15. Does your project include water withdrawal (ground or surface water) greater than 10,000 gallons/day?
16. Will your action permanently affect hydrology?
17. Will your action temporarily affect hydrology?
18. Will your project have any direct impacts to a stream or river (e.g., Horizontal Directional Drilling (HDD), hydrostatic testing, stream/road crossings, new storm-water outfall discharge, dams, other in-stream work, changes to water quality or hydrology, etc.)?
19. Does your project have the potential to indirectly impact the stream/river or the riparian zone (e.g., cut and fill, horizontal directional drilling, hydrostatic testing, construction, vegetation removal, discharge, changes to water quality or hydrology, etc.)?
20. Are you applying for one of the following Michigan EGLE/Army Corps of Engineers joint permit application Minor Permit (MP) Categories:

MP 3 - Boat Hoist; MP 5 - Boal Wells; MP 7 - Completed Enforcement Actions; MP 13 - Dock;
MP 22 - Fish and Wildlife Habitat Structures;
MP 25 - Ford Stream Crossings for Commercial Forestry Operations;
MP 31 - Maintenance and Repair of Serviceable Structures;
MP 52 - Temporary Recreational Structures;
MP 54 - Wetland Habitat Restoration and Enhancement?

Verify the MP category number and associated description matches your project/application (https://www.michigan.gov/documents/egle/WRD-Minor-Project-Categories_733320_7.pdf). If you don't know what category applies for your project, answer no to this question.

21. Are you applying for one of the following Michigan EGLE/Army Corps of Engineers joint permit application General Permit (GP) Categories:

GP A - Aids to Navigation;
GP C - Clear Span Bridge;
GP J - Dry Fire Hydrant;
GP O - Minor Permit Revisions and Transfers;
GP Q - Mooring Buoy;
GP W - Scientific Measuring Devices;
GP X - Snow Road Stream Crossings for Forestry Operations;
GP Z - Spring Piles and Piling Clusters?

Verify the GP category number and associated description matches your project/application (https://www.michigan.gov/documents/deq/wrd-general-permit-categories_555828_7.pdf). If you don't know what category applies for your project, answer no to this question.

22. Will your action disturb the ground or existing vegetation? This includes any off road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.

23. Is the action a utility-scale solar development project?

Note: Solar projects are considered utility scale if they will be 1 megawatt or larger.

24. [Hidden semantic] Does the action intersect the MOBU AOI?

This question will be answered automatically based on previous questions.

25. Under the ESA, monarchs remain warranted but precluded by listing actions of higher priority. The monarch is a candidate for listing at this time. The Endangered Species Act does not establish protections or consultation requirements for candidate species. Some Federal and State agencies may have policy requirements to consider candidate species in planning. We encourage implementing measures that will remove or reduce threats to these species and possibly make listing unnecessary. If your project will have no effect on monarch butterflies (for example, if your project won't affect their habitat or individuals), then you can make a "no effect" determination for this project. Are you making a "no effect" determination for monarch?

26. Is this project funded, authorized, or carried out by the U.S. Fish and Wildlife Service?

27. By policy, the U.S. Fish and Wildlife Service treats candidate species as proposed for listing for purposes of conducting internal FWS section 7. Conferences are required for USFWS actions that are likely to jeopardize the continued existence of the monarch. Jeopardize the continued existence of means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Is your project likely to jeopardize the continued existence of the monarch?

28. [Hidden Semantic] Does the action intersect the Eastern massasauga rattlesnake area of influence?

This question will be answered automatically based on previous questions.

29. Will your action impact less than 0.5 acres of [suitable Eastern massasauga rattlesnake habitat](#)?

30. Will your action impact less than 1 acre of [suitable Eastern massasauga rattlesnake habitat](#)?

31. In a previous answer in this key, you indicated your project will have permanent effects to hydrology. Will the hydrological impacts result in a significant change in the elevation of

surface water upstream or downstream, or in the local groundwater elevations?

A significant change is one where the elevations are expected to change more than 6 inches or result in inundation.

32. Does your action involve prescribed fire?
33. Will this action occur entirely in the Eastern massasauga rattlesnake inactive season (October 16 through April 14)?
34. Will this action occur entirely in the Eastern massasauga rattlesnake inactive season (October 2 through April 30)?
35. Will this action occur entirely in the Eastern massasauga rattlesnake active season (April 15 through October 15)?
36. Will this action occur entirely in the Eastern massasauga rattlesnake active season (May 1 through October 1)?
37. Will the action result in permanent loss of more than one acre of wetland or conversion of more than 10 acres of uplands of potential Eastern massasauga rattlesnake habitat (uplands associated with high quality wetland habitat) to other land uses?
38. Will you use [wildlife safe materials](#) for erosion control and site restoration and eliminate the use of erosion control products containing plastic mesh netting or other similar material that could ensnare Eastern massasauga rattlesnake?
 - N/A
 - Yes
 - No
39. Will you watch MDNR's "[60-Second Snakes: The Eastern Massasauga Rattlesnake \(EMR\)](#)" video, review the [EMR factsheet](#) or call 517-351-2555 to increase human safety and awareness of EMR?
40. Will all action personnel report any Eastern massasauga rattlesnake observations, or observation of any other listed threatened or endangered species, during action implementation to the Service within 24 hours?

41. Will your action create a new road or trail or alter the horizontal alignment of an existing road or trail?
42. Will your action result in a new or increased permanent barrier to snake movement?

For example, significant widening (>10 ft) of an existing road footprint, converting the surface of an existing road or trail from a non-paved to a paved surface, widening of a paved or gravel trail, or adding new linear features such as fences, canals, or other permanent barriers have the potential to fragment habitat and alter movement and dispersal.

43. In a previous answer in this key, you indicated your project will have temporary effects to hydrology. Will the hydrological impacts result in a significant change in the elevation of surface water upstream or downstream, or in the local groundwater elevations?

A significant change is one where the elevations are expected to change more than 6 inches or result in inundation.

44. It is important to understand where potential [hibernation habitat](#) for eastern massasauga occurs at the project site. Has a qualified herpetologist conducted a habitat assessment of the site, including assessing whether potential EMR hibernacula are present on the action site? Or have you otherwise delineated potential [hibernation habitat](#) on the site?
45. Does the action area contain suitable [hibernation habitat](#), such as small mammal burrows, crayfish burrows, or tree root networks that could provide hibernation habitat? If known hibernacula are present, select YES. If unsure, select YES.
46. Will you avoid disturbing areas containing suitable Eastern massasauga rattlesnake [hibernation habitat](#)?
47. Does the action area contain suitable [hibernation habitat](#), such as small mammal burrows, crayfish burrows, or tree root networks that could provide hibernation habitat? If known hibernacula are present, select YES. If unsure, select YES.
48. Will you avoid disturbing areas containing suitable Eastern massasauga rattlesnake [hibernation habitat](#)?
49. Can disturbance to potential hibernation habitat occur well within the active season (June through August) to avoid when snakes are present underground? During this time, they are

most likely to be able to move out of the way of disturbance and have greater chances of finding alternative hibernation habitat in the fall. Destroying potential hibernacula may still impact snakes indirectly. Potential hibernation sites should be avoided to the extent possible.

50. For site access, will you minimize vehicle speeds on roads through suitable eastern massassauga rattlesnake habitat? To do this, can you follow posted speed limits, and minimize speeds at facilities and access roads (e.g., less than 15mph on two-track roads), when possible, during the active season?

If no vehicle activity will occur in eastern massassauga rattlesnake habitat, select YES.

51. Will vehicles or equipment be used off of existing access roads?
52. Will you use low-impact equipment such as light-weight track mounted vehicles with low ground pressure?
53. For vehicle and equipment access, will you limit operating vehicle/equipment in Eastern massassauga rattlesnake (EMR) habitat to the inactive season when the ground is frozen? During this time, under these conditions, EMR are most likely underground and will not be impacted by these activities.
54. At the conclusion of the action, will you revegetate all disturbed areas with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance), as appropriate?
55. Will you monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions?
56. Will you avoid the spread of invasive species into suitable Eastern massassauga rattlesnake (EMR) habitat by following best practices such as inspecting and cleaning equipment and vehicles for invasive plant materials and seeds before entering EMR habitat areas?
57. Does the action involve grading, fill, digging, trenching, or other earth moving activity?
58. Will you properly install and maintain [exclusionary fencing](#) to exclude Eastern massassauga rattlesnake from the area of disturbance during the active season?

59. Will you clear the project area, using a qualified person, prior to beginning work?
60. At conclusion of work, will you promptly remove all fencing material?
61. If placing fill, can you ensure all fill material is free from contaminants or invasive species? (If no fill will be placed, select YES).
62. Are you removing or maintaining vegetation (e.g., cutting brush, mowing, applying herbicides, etc)?
63. Will mowing occur as part of the proposed action?

64. Will you mow tall vegetation (> 6 inches) during the inactive season?

Note: In areas with turf grass or areas where trying to discourage EMR (e.g., in areas around buildings), we recommend that you mow regularly and keep grass relatively short (less than 4-6 inches) to reduce its suitability for EMR. If starting with longer grass (greater than 6 inches), mow during the inactive season initially, and then maintenance mowing can occur during the active season (as long as it is regularly maintained and kept shorter than 4-6 inches, so that EMR is unlikely to use those areas). Unmaintained/longer grass may be used by snakes and make them vulnerable to mortality during the next mowing event. We consider turf grass to be manicured/regularly maintained lawn in areas adjacent to human structures.

65. Will you ensure mower decks are raised above 8 inches for non-turf grass?

Note: In areas with turf grass or areas where trying to discourage EMR (e.g., in areas around buildings), we recommend that you mow regularly and keep grass relatively short (less than 4-6 inches) to reduce its suitability for EMR. If starting with longer grass (greater than 6 inches), mow during the inactive season initially, and then maintenance mowing can occur during the active season (as long as it is regularly maintained and kept shorter than 4-6 inches, so that EMR is unlikely to use those areas). Unmaintained/longer grass may be used by snakes and make them vulnerable to mortality during the next mowing event. We consider turf grass to be manicured/regularly maintained lawn in areas adjacent to human structures.

66. Will you maintain turf grass less than 6 inches throughout the active season? (We consider turf grass to be manicured/regularly maintained lawn in areas adjacent to human structures)?
67. If removing brush or trees, will you do so during the inactive season when the ground is completely frozen? During this time, under these conditions, EMR are most likely underground and will not be impacted by these activities.

68. Will you hand cut or use low impact harvest methods in areas of suitable habitat? This includes using low-impact equipment such as light weight track mounted vehicles with low ground pressure.

Note that if working near potential hibernacula, use hand tools and access site on foot. Do not burn brush piles on site (remove brush off site or leave in place without burning)

69. Does your project involve pesticide application?
70. Will you follow all appropriate label instructions regarding the appropriate herbicide or other pesticide formulation and its proper use in potential EMR habitat?
71. Will you avoid spray drift beyond the target species/area (observing label instructions regarding optimal wind speed and direction, boom height, droplet size calibration, precipitation forecast, etc.)? We recommend avoiding broadcast applications of herbicides in occupied EMR habitat. Spot spraying or wicking can be used to control invasive plants in occupied habitat.
72. [Semantic] Does the action area intersect the rayed bean area of influence?
This question will be answered automatically based on previous questions.
73. [Semantic] Does the action area intersect the northern riffelshell area of influence?
This question will be answered automatically based on previous questions.
74. [Semantic] Does the action area intersect the snuffbox area of influence?
This question will be answered automatically based on previous questions.
75. Will your project result in a direct (e.g., drawdown, chemical application, substrate disturbance, water withdrawal, etc.) or indirect (e.g., increase in sedimentation, changes to water quality) effect to a lake or reservoir?
76. [Semantic] Does the action area intersect the clubshell area of influence?
This question will be answered automatically based on previous questions.
77. [Semantic] Does the action area intersect the Round Hickorynut AOI?
This question will be answered automatically based on previous questions.
78. [Semantic] Does the action area intersect the Salamander mussel AOI?
This question will be answered automatically based on previous questions.

79. Section 7 conferences are required if a federal action is likely to jeopardize the continued existence of a proposed species. Jeopardize the continued existence of means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Is your project likely to jeopardize the continued existence of the salamander mussel?
80. Semantic Does the action area intersect Salamander mussel CH?
This question will be answered automatically based on previous questions.
81. Section 7 conferences are required if a federal action is likely to result in the destruction or adverse modification of critical habitat proposed to be designated. Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical (50 CFR §402.02). Is your project likely to adversely modify critical habitat proposed to be designated for the salamander mussel?
82. [Hidden Semantic] Does the action area intersect the Mitchell's satyr area of influence?
This question will be answered automatically based on previous questions.
83. Does your project include alteration or fill of 3 or more acres of wetland?
84. Does any portion of the action occur in prairie fen, shrub carr, tamarack swamp, tamarack savanna, wet meadow, or wet prairie? For more information on suitable [Mitchell's satyr habitat](#).
85. [Hidden Semantic] Does the action intersect the Karner blue butterfly area of influence?
This question will be answered automatically based on previous questions.
86. Will the action occur in oak savanna, oak or pine barrens, openings within oak forest, old fields in association with oak forest, or openings or rights-of-way with abundant native grasses and wildflowers?
87. Is the larval host plant, wild lupine, present on site? If unsure, select YES.
88. Can you avoid disturbance to areas with lupine?

89. Will the action use chemicals (pesticide, herbicide, etc.), result in disturbance of surrounding oak savanna habitat, or otherwise affect Karner blue butterfly or its habitat?

90. [Hidden Semantic] Does the action area intersect the Poweshiek skipperling area of influence?

This question will be answered automatically based on previous questions.

91. Does your project include alteration or fill of 3 or more acres of wetland?

92. Does any portion of the action occur in prairie fen, fen, sedge meadow, or tall grass prairie habitat? For more information on suitable [poweshiek skipperling habitat](#).

93. [Hidden Semantic] Does the action area intersect the Poweshiek skipperling critical habitat?

This question will be answered automatically based on previous questions.

94. Does any portion of the action occur in prairie fen, fen, sedge meadow, or tall grass prairie habitat? For more information on suitable [poweshiek skipperling habitat](#).

95. [Hidden Semantic] Does the action area intersect the piping plover area of influence?

This question will be answered automatically based on previous questions.

96. Will the action occur in suitable piping plover habitat?

Note: Piping plover habitat consists of Great Lakes islands and mainland shorelines that support, or have the potential to support, open, sparsely vegetated sandy habitats, such as sand spits or sand beaches, that are associated with wide, unforested systems of dunes and inter-dune wetlands.

97. Will the action occur during the piping plover migration season (April 1 through May 1 in spring OR August 15 through September 15 in the fall)?

98. Will the action result in changes to piping plover habitat quality, quantity, or availability? For example, beach grooming, boardwalk actions, breakwaters, development, dredge deposition, etc.

99. Will the action overlap with the piping plover breeding season (April 15 through August 15th)?

100. Are the changes to piping plover habitat permanent? (In this context, we define permanent to be effects lasting in duration more than 3 weeks).

101. Will the action result in increased activity (human disturbance, dog activity, or increased potential predators such as merlins, mammalian predators) (i.e., permanent changes OR temporary changes during the breeding season)?
102. [Hidden Semantic] Does the action area intersect piping plover critical habitat?
This question will be answered automatically based on previous questions.
103. Are the [physical and biological features](#) essential to the conservation of the piping plover present in the action area?
104. Will the action result in changes to piping plover habitat quality, quantity, or availability? For example, beach grooming, boardwalk actions, breakwaters, development, dredge deposition, etc.
105. Will the action result in increased activity (human disturbance, dog activity, or increased potential predators such as merlins, mammalian predators)?
106. [Hidden Semantic] Does the action area intersect the rufa red knot area of influence?
This question will be answered automatically based on previous questions.
107. Will the action occur during the red knot migration windows (May 15-June 15 or July 1-September 30?)
108. Will the action modify beaches, dunes, mudflats, peat banks, sandbars, shoals, or other red knot habitats? For example, the following actions may modify red knot habitat: groins, jetties, sea walls, revetments, bulkheads, rip-rap, beach nourishment, nearshore dredging, dredge spoil disposal, sand mining/borrowing, beach bulldozing, sandbagging, sand fencing, vegetation planting/alteration/removal, deliberate or possible introduction of non-native vegetation, beach raking/mechanized grooming, boardwalks, aquaculture development.
109. Will the action result in permanent habitat change to red knot habitat?
110. Will the action result in increased human disturbance or predation? For example, is the action likely to indirectly increase access or use of red knot habitats by humans and/or predators at times of year that the birds are typically present (e.g., commercial/residential development, beach access structures, boardwalks, pavilions, bridges/roads/ferries/trails, marinas, posts or other avian predator perches, structures or habitat features likely to

encourage predator nesting/denning, trash cans or other predator attractants, feral cat colonies, policy changes likely to increase human use).

111. Will the action modify beaches, dunes, mudflats, peat banks, sandbars, shoals, or other red knot habitats? For example, the following actions may modify red knot habitat: groins, jetties, sea walls, revetments, bulkheads, rip-rap, beach nourishment, nearshore dredging, dredge spoil disposal, sand mining/borrowing, beach bulldozing, sandbagging, sand fencing, vegetation planting/alteration/removal, deliberate or possible introduction of non-native vegetation, beach raking/mechanized grooming, boardwalks, aquaculture development.
112. Will the action result in permanent habitat change to red knot habitat?
113. Will the action result in increased human disturbance or predation? For example, is the action likely to indirectly increase access or use of red knot habitats by humans and/or predators at times of year that the birds are typically present (e.g., commercial/residential development, beach access structures, boardwalks, pavilions, bridges/roads/ferries/trails, marinas, posts or other avian predator perches, structures or habitat features likely to encourage predator nesting/denning, trash cans or other predator attractants, feral cat colonies, policy changes likely to increase human use).
114. [Hidden Semantic] Does the action area intersect the whooping crane (ex. Pop) area of influence?
This question will be answered automatically based on previous questions.
115. Have you determined that the action will have no effect on individuals within the whooping crane nonessential experimental population (NEP)?
116. Does the action occur within a National Wildlife Refuge or National Park?
117. For Federal projects outside a National Wildlife Refuge or National Park, we treat the nonessential experimental population of whooping crane as proposed for listing and only two provisions of section 7 would apply: section 7(a)(1) and section 7(a)(4). Section 7(a)(4) requires Federal agencies to confer with the Service on actions that are likely to jeopardize the continued existence of a proposed species. Is your project likely to jeopardize the continued existence of whooping crane?
118. [Hidden Semantic] Does the action area intersect copperbelly water snake area of influence?

This question will be answered automatically based on previous questions.

119. Does the action include construction or maintenance of a road or other barrier (e.g., paved trail)?

120. In a previous answer in this key, you indicated your project will have effects to hydrology.

Will the hydrological impacts result in a significant change in the elevation of surface water upstream or downstream or in the local groundwater? A significant change is one where the elevations are expected to change more than 6 inches or result in inundation.

121. [Hidden Semantic] Does the action area intersect the gray wolf area of influence?

This question will be answered automatically based on previous questions.

122. Does the action area intersect with a known gray wolf denning or rendezvous area?

123. Is there any potential for the action to harm wolves directly (e.g., mammal trapping, poison bait), or indirectly (e.g., increasing vehicle use that may result in vehicle strikes, exposure to potential human persecution)?

124. [Hidden Semantic] Does the action area intersect the lynx area of influence?

This question will be answered automatically based on previous questions.

125. Is there any potential for this action to harm Canada lynx directly (e.g., mammal trapping, poison bait)?

126. [Hidden Semantic] Does the action area intersect the area of influence for American hart's-tongue fern?

This question will be answered automatically based on previous questions.

127. Did you conduct a survey to determine if American hart's-tongue fern occurs in the action area? If YES, email your survey report to MIFO_Dkey@fws.gov with "Survey Report" in subject line before continuing with the next step of this key.

128. Does American hart's tongue fern occur in the action area?

129. Will the action indirectly alter the habitat or resources of American hart's-tongue fern? For example, could your action result in a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.? If unsure, select yes.

130. Could the action directly harm American hart's-tongue fern? For example, prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduce to possession, etc.
131. [Hidden Semantic] Does the action area intersect the area of influence for dwarf lake iris?
This question will be answered automatically based on previous questions.
132. Did you conduct a survey to determine if dwarf lake iris occurs in the action area? If YES, email your survey report to MIFO_Dkey@fws.gov with "Survey Report" in subject line before continuing with the next step of this key.
133. Does dwarf lake iris occur in the action area?
134. Will the action indirectly alter the habitat or resources of dwarf lake iris? For example, could your action result in a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.? If unsure, select yes.
135. Could the action directly harm dwarf lake iris? For example, prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduce to possession, etc.
136. [Hidden Semantic] Does the action area intersect the area of influence for Eastern prairie fringed orchid?
This question will be answered automatically based on previous questions.
137. Did you conduct a survey to determine if Eastern prairie fringed orchid occurs in the action area?
138. Does eastern prairie fringed orchid occur in the action area? If YES, email your survey report to MIFO_Dkey@fws.gov with "Survey Report" in subject line before continuing with the next step of this key.
139. Will the action indirectly alter the habitat or resources of eastern prairie fringed orchid? For example, could your action result in a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.? If unsure, select yes.
140. Could the action directly harm eastern prairie fringed orchid? For example, prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduce to possession, etc.

141. [Hidden Semantic] Does the action area intersect the area of influence for Houghton's goldenrod?
This question will be answered automatically based on previous questions.
142. Did you conduct a survey to determine if Houghton's goldenrod occurs in the action area? If YES, email your survey report to MIFO_Dkey@fws.gov with “Survey Report” in subject line before continuing with the next step of this key.
143. Does Houghton's goldenrod occur in the action area?
144. Will the action indirectly alter the habitat or resources of Houghton's goldenrod? For example, could your action result in a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.? If unsure, select yes.
145. Could the action directly harm Houghton's goldenrod? For example, prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduce to possession, etc.
146. [Hidden Semantic] Does the action intersect the area of influence for lakeside daisy?
This question will be answered automatically based on previous questions.
147. Did you conduct a survey to determine if lakeside daisy occurs in the action area? If YES, email your survey report to MIFO_Dkey@fws.gov with “Survey Report” in subject line before continuing with the next step of this key.
148. Does lakeside daisy occur in the action area?
149. Will the action indirectly alter the habitat or resources of lakeside daisy? For example, could your action result in a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.? If unsure, select yes.
150. Could the action directly harm lakeside daisy? For example, prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduce to possession, etc.
151. [Hidden Semantic] Does the action intersect the area of influence for Michigan monkey-flower?
This question will be answered automatically based on previous questions.

152. Does the action area include cold calcareous springs, seeps or streams, emergent marsh, Great Lakes marsh, Hardwood-conifer swamp, northern wet meadow, rich conifer swamp, sand/gravel beach, or headwater streams (1st/2nd order)?
153. Did you conduct a survey to determine if Michigan monkey-flower occurs in the action area? If YES, email your survey report to MIFO_Dkey@fws.gov with “Survey Report” in subject line before continuing with the next step of this key.
154. Does Michigan monkey-flower occur in the action area?
155. Does your action indirectly alter the habitat or resources of Michigan monkey-flower? For example, could your action result in an increase in invasive species, water temperature, water pH, water quality, impacts to hydrology (e.g., change in surface or ground water elevation), potential reduction in pollinators? If unsure, select yes.
156. Could your action directly harm a listed plant species? For example, prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduce to possession, etc.
157. [Hidden Semantic] Does the action area intersect the area of influence for Pitcher's thistle? This question will be answered automatically based on previous questions.
158. Does the action area include Great Lakes shoreline sand dunes?
159. Did you conduct a survey to determine if Pitcher's thistle occurs in the action area? If YES, email your survey report to MIFO_Dkey@fws.gov with “Survey Report” in subject line before continuing with the next step of this key.
160. Does Pitcher's thistle occur in the action area?
161. Will the action indirectly alter the habitat or resources of Pitcher's thistle? For example, could your action result in a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.? If unsure, select yes.
162. Could the action directly harm Pitcher's thistle? For example, prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduce to possession, etc.

163. [Hidden Semantic] Does the action area intersect the Hine's emerald dragonfly area of influence?

This question will be answered automatically based on previous questions.

164. Does the action occur in or within 500 meters of a calcareous wetland, fen, sedge meadow, or marsh suitable for Hine's emerald dragonfly? For more information on Hine's emerald dragonfly habitat, see this [link](#).

165. [Hidden Semantic] Does this action intersect Hine's emerald dragonfly critical habitat?

This question will be answered automatically based on previous questions.

166. Does the action include construction or modification of a road or trail?

167. Does the action occur in or within 500 meters of a calcareous wetland, fen, sedge meadow, or marsh suitable for Hine's emerald dragonfly? For more information on Hine's emerald dragonfly habitat, see this [link](#).

168. [Hidden Semantic] Does the action intersect Hungerford's crawling water beetle area of influence?

This question will be answered automatically based on previous questions.

169. Have you conducted a Hungerford's crawling water beetle habitat assessment following the [Service's survey protocol](#)?

170. Does the action area contain potential Hungerford's crawling water beetle habitat? Please answer yes if you are unsure if habitat criteria occurs in your project's action area.

171. Have you conducted a Hungerford's crawling water beetle appraisal or survey following the [Service's survey protocol](#)?

172. Were Hungerford's crawling water beetle detected?

173. The project has the potential to affect federally listed bats. Does the action area contain any known or potential bat hibernacula (natural caves, abandoned mines, or underground quarries)?

174. Has a presence/absence bat survey or field-based habitat assessment following the Service's Range-wide [Indiana Bat and Northern Long-eared Bat Summer Survey Guidelines](#) been conducted within the action area?

175. Did you coordinate with the Michigan Field Office in advance of your survey effort and receive authorization for the study proposal and approval of the results?

If NO, please contact the Michigan Field Office (MIFO_Dkey@fws.gov) before completing this DKey.

176. Did survey results demonstrate the probable absence of Indiana bats and northern long-eared bats?

177. Does the action involve removal/modification of a human structure (barn, house or other building) known to contain roosting bats?

178. Does the action include removal/modification of an existing bridge or culvert?

179. [Hidden Semantic] Does the action area intersect the third county tier?

This question will be answered automatically based on your project location.

180. Is the bridge/culvert within 1000 feet of forested habitat?

181. Does the bridge/culvert work include modification/removal of (1) an existing bridge and/or (2) a culvert at least 4 feet (1.2 meters) high and 50 feet (15 meters) long?

182. Has the bridge/culvert been **inspected** for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) during the summer roosting season (May 15 through August 15)?

Note: Note:A blank bridge/structure assessment form can be found [here](#).

183. Upload a completed bridge/structure assessment **form**. A blank bridge/structure assessment form can be at <https://www.fws.gov/media/appendix-d-bridgestructure-assessment-form>

- No

This answer requires upload of a supporting document.

- Yes

This answer requires upload of a supporting document.

184. Were signs of bats observed?

185. Does the bridge/culvert contain suitable roosting spaces (i.e., expansion joints, cracks/crevices) for day-roosting bats?

186. Will construction activities be performed during the inactive season for Indiana and northern long-eared bats (October 1 through April 14)?
187. Will construction activities permanently alter potential roosting spaces (existing joints/cracks/crevices)?
188. Does the action include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s)?
189. Will you apply the following Avoidance and Minimization Measures for bats?
1. When installing new or replacing existing permanent lights, use [downward-facing, full cut-off lens lights](#) (with same intensity or less for replacement lighting); or for those transportation agencies using the [BUG system developed by the Illuminating Engineering Society](#), the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable.
 2. Direct temporary lighting away from suitable habitat during the active season.
190. Does the action include one or more of the following: (1) tree cutting/trimming, (2) prescribed fire, (3) pesticide (including insecticide and/or rodenticide), and/or (4) herbicide/fungicide application?
191. Does the action include herbicide application?
192. Will herbicide application follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants?
193. Will the action clear >10 acres of contiguous forest (i.e., connected by 1,000 feet or less) or fragment a riparian or other connective forested corridor (e.g., tree line) between 2 or more forest patches of at least 5 acres? For more information, see [Appendix II](#).
194. Will the action clear > 20 acres of forest or fragment a connective corridor between 2 or more forest patches of at least 5 acres? For more information, see [Appendix II](#).
195. Does the action area contain potential NLEB bat roost trees (trees ≥ 3 inches in diameter [at breast height] with cracks, crevices, cavities and/or exfoliating bark)? For more information, see [Appendix IV](#).

196. Does the action area contain potential Indiana bat roost trees (trees ≥ 5 inches in diameter [at breast height] with cracks, crevices and/or exfoliating bark)? For more information, see [Appendix III](#).

197. Does the action include emergency cutting/trimming of hazard trees in order to prevent imminent loss of human life and/or property?

198. [Semantic] Is any portion of the action area within 5 miles of a known Indiana or northern long-eared bat hibernaculum?

This question will be answered automatically based on previous questions.

199. [Hidden Semantic] Does the action area intersect the eastern UP Michigan Modeled Bat Habitat?

This question will be answered automatically based on your project location.

200. [Hidden Semantic] Does the action area intersect the NE Michigan Modeled Bat Habitat?

This question will be answered automatically based on your project location.

201. [Hidden Semantic] Does the action area intersect the SE_LP_N_half Michigan Modeled Bat Habitat?

This question will be answered automatically based on your project location.

202. [Hidden Semantic] Does the action area intersect the SE_LP_S Michigan Modeled Bat Habitat?

This question will be answered automatically based on your project location.

203. Will all tree cutting/trimming, prescribed fire, and/or insecticide/rodenticide application occur OUTSIDE the non-volant ("pup") season for listed bats (that is, no cutting/trimming, prescribed fire, or pesticide application during June 1 through July 31)? Select N/A if the project does not include at least one of these activities.

Note: that based on the project's location, conducting these activities outside the months of June and July may be sufficient to avoid adverse effects to/take of listed bats.

- Yes
- No
- _NA

204. Your project intersected modeled bat habitat.

Will all tree cutting/trimming, prescribed fire, and/or insecticide/rodenticide application be restricted to the inactive (hibernation) season for listed bats (that is, conducted during October 1 through April 14)?

Select N/A if the project does not include at least one of these activities.

- _NA
- Yes
- No

205. Will all tree cutting/trimming, prescribed fire, and/or insecticide/rodenticide application be restricted to the inactive (hibernation) season for listed bats (that is, conducted during October 15 through April 14)?

Select N/A if the project does not include at least one of these activities.

- _NA
- Yes
- No

206. Will all tree cutting/trimming, prescribed fire, and/or insecticide/rodenticide application be restricted to the inactive (hibernation) season for listed bats (that is, conducted during November 1 through March 31)?

Select N/A if the project does not include at least one of these activities.

- Yes
- No
- _NA

207. Will the action clear >10 acres of modeled bat habitat?

To determine whether it is >10 acres, you can download the shapefile or kmz here: [Indiana bat model](#). For more information on the development of the Indiana bat habitat suitability model, see [Appendix I](#).

208. [Hidden Semantic] Does the action area intersect the Indiana bat AOI?

This question will be answered automatically based on previous questions.

209. [Hidden Semantic] Does this project intersect the northern long-eared bat area of influence?

This question will be answered automatically based on previous questions.

210. Will all tree cutting/trimming, prescribed fire, and/or pesticide application be conducted outside the northern long-eared bat summer roosting period of May 15 through August 31 (that is, limited to September 1 through May 14)?

- Yes
- N/A
- No

211. Will all tree cutting/trimming, prescribed fire, and/or insecticide/rodenticide application be conducted outside the northern long-eared bat non-volant ("pup") season of June 1 through July 31(that is, limited to August 1 through May 31)? Select N/A if the project does not include at least one of these activities.

- _N/A
- Yes
- No

212. Will all tree cutting/trimming, prescribed fire, and/or insecticide/rodenticide application be conducted outside the northern long-eared bat summer roosting period of May 1 through August 31 (that is, limited to September 1 through April 30)? Select N/A if the project does not include at least one of these activities.

- N/A
- Yes
- No

213. [Hidden semantic] Does the action intersect the Tricolored bat AOI/SLA/range?

This question will be answered automatically based on previous questions.

214. The tricolored bat was proposed for listing as endangered on September 13, 2022. In Michigan, the tricolored bat was rare pre-white nose syndrome (WNS) and is exceedingly rare post-WNS. The species has been observed in 12 Michigan counties to date, largely during the fall or winter. With very few exceptions, the species has not been observed in Michigan in the summer months, and no maternity colonies have been found. During winter, tricolored bats hibernate in caves, abandoned mines, and abandoned tunnels ranging from small to large in size. During spring, summer and fall months, they roost primarily among leaf clusters of live or recently dead deciduous/hardwood trees.

Are you making a no effect determination on this project for the tricolored bat?

215. Section 7 conferences are required if a federal action is likely to jeopardize the continued existence of a proposed species. Jeopardize the continued existence of means to engage in

an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Is your project likely to jeopardize the continued existence of the tricolored bat?