

6.1 Overview

Under the Endangered Species Act (ESA), Habitat Conservation Plan (HCP) implementation begins when the Section 10(a)(1)(B) incidental take permit is issued. Primary responsibility for HCP implementation rests with the Michigan Department of Natural Resources (DNR), Minnesota DNR, and Wisconsin DNR (collectively referred to as State DNRs).

This chapter describes the implementation framework of the Lake States HCP, including the organizational structure, agencies' roles and responsibilities, and the assurances requested by the State DNRs through permit coverage.

6.2 Permit Structure

The State DNRs will apply for three separate permits that the U.S. Fish and Wildlife Service (USFWS) will issue individually based on the Lake States HCP. As described in Chapter 1, *Introduction*, Section 1.3.4, *Permittees*, the individual State DNRs are the permittees. For the purposes of the Lake States HCP, these State DNRs are jointly referred to as the permittees, although the text may specify an individual State DNR when necessary. This permit structure will allow for independent implementation of the covered activities and conservation and monitoring measures. These permits are severable, meaning that the revocation or suspension of one permit will not jeopardize the take authorization of the other permittees.

Additionally, each State DNR may extend its take authorization to other nonfederal landowners in its state that conduct covered activities that have the potential to result in take of covered bats. This authorization will be extended through participation in the Landowner Enrollment Program, described in detail in Appendix F, *Landowner Enrollment Program*.

6.3 Implementation Structure and Responsibilities

Each State DNR will oversee HCP implementation and will retain all program records. State DNR staff includes biologists, foresters, administrators, and other natural resource specialists who will carry out planning and design, monitoring, adaptive management programs, and periodic coordination with and reporting to USFWS. To form a functional unit for carrying out this program, each State DNR will assign HCP implementation responsibilities to specific individuals as described in Section 6.3.2, *DNR Implementation Structure*. The day-to-day implementation of the Lake States HCP will be managed by staff of each State DNR; however, the State DNRs will also coordinate with other resource agencies, foresters, biologists, science advisors, and the public, as needed, to ensure adequate and systematic implementation of their responsibilities under the HCP.

6.3.1 Lake States Advisory Committee

A Lake States Advisory Committee of representatives of the three state DNRs will provide for the distribution of information between the states during HCP implementation. The primary function of this committee will be to share new research, best practices, and coordinate the resolution of regional matters related to the HCP, as needed. The Lake States Advisory Committee will comprise key State DNR representatives (such as, but not limited to, HCP administrator, HCP Implementation team member, or other DNR staff), who will oversee implementing avoidance and minimization measures, mitigation, and monitoring associated with the Lake States HCP. This committee will meet semi-annually for the first 5 years of plan implementation. Meeting frequency may be reduced as necessary after the first 5 years of implementation but will continue to meet at least once a year throughout the permit term. Informal communication among members will take place, as needed, in between official meetings.

6.3.2 DNR Implementation Structure

Each DNR implementation structure is described below, but since there is some variation a high-level overview of is provided in Table 6-1 as a summary.

Table 6-1. General and State-Specific Implementation Titles and Key Tasks

General Title	Description	State Specific Titles
HCP Point of Contact	A coordinator who serves as the point of contact for the HCP for each state (includes maintaining budgets overseeing LEP, and coordinating: trainings, surveys, monitoring, and reporting).	MI = HCP Coordinator MN = HCP Administrator WI = HCP Coordinator
Implementation Support Team	If needed, additional dedicated staff that will support the HCP Point of Contact. This support team will include representatives of key divisions within each DNR as described in state-specific sections.	MN = Implementation Team WI = Implementation Committee
GIS technician	A GIS specialist that will compile, organize and track spatial data within the HCP (including location and extent of covered bat habitat and location of timber harvests).	MI = DNR GIS Technician MN = DNR GIS Technician WI = DNR GIS Technician
Biologists	DNR Wildlife Division biologist that will implement survey work and HCP activities as described in HCP state-specific sections.	MI = DNR Biologists MN = DNR Biologists WI = DNR Biologists
Forestry Staff	DNR foresters or other forestry staff that will implement forestry related conservation measures and other activities as described in the HCP state-specific sections.	MI = DNR Forestry Staff MN = DNR Forestry Staff WI = DNR Forestry Staff
Public Outreach Staff	As needed, communications and outreach staff associated with communications tasks within the HCP (such as a communication plan).	MI = Community Liaison MN = DNR Communications and Outreach Staff WI = DNR Biologists
Consultants and Contractors	Outside consultants and contractors that will assist with the implementation of the HCP, as needed.	MI = Consultants and Contractors MN = Consultants and Contractors WI = Consultants and Contractors

6.3.2.1 Michigan

HCP Coordinator

The Michigan DNR will assign HCP implementation responsibilities to a specific individual within the Forest Resources Division who will serve full-time as the Michigan HCP Coordinator. The HCP Coordinator will collaborate with staff from the Wildlife Division and Forest Resources Division, as needed, and will serve as a point of contact for HCP-related issues between other State DNRs and for USFWS. The HCP Coordinator will also provide support for and oversee the following tasks within the Michigan DNR.

- Answer internal HCP-related questions.
- Develop and maintain annual budgets and work plans.
- Coordinate any bat surveys with supervising biologists.
- Coordinate related training program(s) for Michigan DNR staff.

- Coordinate communication and decision-making between Wildlife Division and Forest Resources Division management staff, as needed.
- Coordinate monitoring activities for compliance with the Lake States HCP.
- Maintain effectiveness and compliance monitoring and survey data reports and archives, including monitoring results, and produce an annual report.
- Oversee enrollment in the Landowner Enrollment Program and compliance with program requirements.

Implementation of Conservation Program

As noted in Chapter 1, all activities covered under the Lake States HCP are ongoing activities conducted in accordance with the Michigan DNR's guidelines for sustainable forest management. Existing restrictions on timber harvest are communicated to staff through the Michigan DNR's Within-Stand Retention Guidance (Michigan Department of Natural Resources 2012) and regular staff trainings, including New Forester Orientation, Timber Sale Administration, Biodiversity Training, and In-Service Trainings. These same tools will be revised to reflect HCP commitments.

The Michigan DNR also uses consolidated, dynamic policies and procedures for State Forest lands, called Work Instructions, which will be updated to reflect HCP requirements. In addition, Timber Sale Contract Specifications will be updated upon permit issuance as part of the Michigan DNR annual Management Review Process.

Michigan DNR Staff Responsibilities

DNR Geographic Information System Technician

This technician will use a geographic information system (GIS) and other database systems to collect, store, and use spatial data necessary for HCP implementation. Data to be tracked in this manner will include the following.

- The location and extent of habitat for covered bats as assumed by the species habitat distribution models in this HCP (see Section 6.4.2: *Reporting*).
- The location, extent, and timing of implementation of conservation measures (e.g., creating potential hibernacula) (see Chapter 5, Table 5-8: *Biological Goals, Objectives, and Associated Monitoring Actions*).
- The location of timber harvest covered by the HCP on State DNR lands for sales completed during the reporting period.

When electronic archiving is not available or is infeasible, the Michigan DNR will retain hard copy records, which, along with electronic records, will be available for inspection by USFWS.

DNR Biologists

The HCP Coordinator will work with staff in the Wildlife Division to train staff on HCP conservation measures and to produce any protocols needed to further HCP implementation. Wildlife Division biologists will implement survey work and oversee HCP activities related to bat research and monitoring, as described in Chapter 5, Section 5.5. Staff biologist(s) will also participate, as necessary (especially Objectives 4.1, 4.2, and 4.3), in the implementation of conservation measures focused on improving bat habitat.

DNR Forestry Staff

The HCP Coordinator will work with Forest Resources Division staff to train staff on HCP requirements within the first year of HCP implementation. Forestry staff will plan and implement forestry-related HCP conservation measures. Supervisory staff will ensure that field crews are trained in implementing the terms of the Lake States HCP and will assist in gathering the data needed to demonstrate compliance with the HCP (see Chapter 5 Table 5-8).

Consultants and Contractors

HCP requirements will become a part of standard contract specifications. Specifications are monitored by the Michigan DNR on-site contract administrator, and broader compliance is evaluated through annual auditing of forest operations.

6.3.2.2 Minnesota

HCP Administrator and Implementation Team

The Minnesota DNR will assign HCP implementation responsibilities to either a specific individual who will serve as the Minnesota HCP Administrator or to existing DNR staff whose job responsibilities include similar duties as described below. The HCP Administrator (or equivalent existing staff) will serve as a point of contact for HCP-related issues within the DNR, between other State DNRs, and for USFWS. The HCP Administrator will also provide support for and oversee the following tasks within the Minnesota DNR.

- Answer internal HCP-related questions.
- Develop and maintain annual budgets and work plans.
- Report and maintain results of any bat surveys
- Coordinate related training program(s) for Minnesota DNR staff.
- Coordinate monitoring activities for compliance with the Lake States HCP.
- Maintain monitoring and survey data reports and archives, including monitoring results, and produce an annual report.
- Coordinate communication and decision making between Minnesota DNR divisions, as needed.
- Coordinate the development of policy(ies) needed to communicate HCP expectations and requirements to staff.
- Coordinate updates to existing policies, guidelines, business practices, etc. to align with HCP requirements, as needed.
- Administer the Landowner Enrollment Program, including compiling annual reporting forms and ensuring compliance with program requirements.

The Minnesota DNR will establish an Implementation Team comprised of representatives from divisions within the Minnesota DNR, including the Division of Forestry and the Division of Ecological and Water Resources. The team will provide support to the HCP Administrator for the HCP-related tasks within their division. This team will meet as needed to coordinate tasks associated with HCP implementation. If policy direction is needed, existing committees that regularly work with the DNR policy system may be engaged.

Implementation of Conservation Program

As noted in Chapter 1, all activities covered under the Lake States HCP are ongoing activities conducted in accordance with the Minnesota DNR's policies for sustainable forest management. Existing direction on timber harvest are communicated to staff through guidance documents consistent with the DNR's policies and regular staff trainings. A stand-alone guidance document will be developed and used to communicate HCP expectations and requirements to staff. Initial communication (e.g., departmental memo) will occur to make staff aware of the policy and a training will be made available for staff. Existing policies, guidelines, and business practices will be updated as needed to comply with the incidental take permit terms.

Minnesota DNR Staff Responsibilities

DNR Geographic Information System Technician

This staff person will use GIS and other database systems to collect, store, and use spatial data necessary for HCP implementation. Data to be tracked in this manner will include the following.

- The location and extent of existing habitat for covered bats as assumed by the species habitat distribution models in this HCP.
- The location, extent, and timing of implementation of conservation measures.
- The location of timber harvest covered by the HCP on State DNR lands for sales completed during the reporting period.

When electronic archiving is not available or infeasible, the Minnesota DNR will retain hard copy records, which, along with electronic records, will be available for inspection by USFWS.

DNR Biologists

Minnesota DNR staff wildlife biologists will implement survey work and oversee HCP activities related to bat research and monitoring, as described in Chapter 5, Section 5.5. Staff biologists will participate, as necessary, in the implementation of conservation measures. Staff biologist(s) will also complete a white-nose syndrome (WNS) response plan by year 3 (see Chapter 5 Table 5-8) and other conservation measures focused on WNS.

DNR Forestry Staff

Forestry staff will plan and implement forestry-related HCP conservation measures and consult with other divisions as needed for forest management activities. Supervisory staff will ensure that field crews are trained in implementing the terms of the Lake States HCP and will assist in gathering the data needed to demonstrate compliance with the HCP.

DNR Communications and Outreach Staff

Communications and outreach staff will develop and implement a communications plan and associated communications products (such as a website, brochures, etc.) by year 2 (see Chapter 5 Table 5-8) for educating the public on bats, WNS, etc. Communications and outreach staff may also be tasked with assisting the HCP Administrator with the Landowner Enrollment Program website and communications.

Consultants and Contractors

The DNR will ensure that work done by consultants or contractors on DNR forestlands follows HCP requirements by incorporating such measures into contractual obligations (such as timber harvest permits with loggers).

6.3.2.3 Wisconsin

HCP Coordinator and Implementation Committee

The Wisconsin DNR will assign HCP implementation responsibilities to a specific individual within the Natural Heritage Conservation Program who will serve as the Wisconsin HCP Coordinator. The HCP coordinator will collaborate with staff from the Divisions of Forestry and Fish and Wildlife and Parks, as needed, and will serve as a point of contact for HCP-related issues between other State DNRs and for USFWS. The HCP coordinator will also provide support for and oversee the following tasks within the Wisconsin DNR.

- Answer internal HCP-related questions.
- Develop and maintain annual budgets and work plans.
- Report and maintain results of any bat surveys conducted by WDNR biologists.
- Chair DNR HCP-related committees, as needed.
- Coordinate related training program(s) for Wisconsin DNR staff.
- Compile and report on monitoring activities for compliance with the Lake States HCP (see Chapter 5, *Conservation Strategy*, Section 5.5, *Monitoring*).
- Maintain monitoring and survey data reports and archives, including monitoring results, and produce an annual report.
- Oversee landowner enrollment in the Landowner Enrollment Program and compliance with program requirements.

The Wisconsin DNR will set up a committee to oversee the first five years of HCP implementation. This Implementation Committee will be chaired by the HCP coordinator and will include representatives from the Divisions of Forestry (e.g., State Lands specialist, Managed Forest Law foresters, the Sustainable Forestry Certification coordinator, County Forest and Public Lands specialist) and Fish, Wildlife and Parks (e.g., Wildlife Management, Natural Heritage Conservation, Parks and Recreation Management, and Fisheries Management), as well as any key stakeholders identified during early implementation. This committee will collaborate to ensure that all training needs are met and that the HCP conservation measures are being applied consistently throughout the DNR. The Implementation Committee will meet quarterly during the first year of plan implementation and at least annually in years 2 through 5.

Implementation of Conservation Program

As noted in Chapter 1, all activities covered under the Lake States HCP are ongoing activities conducted in accordance with the Wisconsin DNR's guidelines for sustainable forest management. Existing guidelines on timber harvest are communicated to staff through the Wisconsin DNR's Silviculture Handbook (Wisconsin Department of Natural Resources 2012), program newsletters,

departmental memos, staff training, and internal guidance. These same tools will be revised to reflect HCP commitments.

Additional tools used to communicate HCP commitments will include briefings with administrators and program directors, and development of HCP focused training materials. These materials may be incorporated into existing DNR training programs to be delivered continuously throughout the permit term. Training materials will address all changes to agency practice that result from implementation of the HCP, all new conservation measures that must be implemented, how these activities must be tracked and reported, and which staff are responsible for implementing and tracking HCP metrics. It will also provide staff with the contact information for the HCP Coordinator for any questions related to HCP implementation.

Additionally, the Wisconsin DNR uses an Endangered Resources Review screening process to determine if any proposed activities that the DNR will conduct, fund, or approve comply with state and federal endangered species laws. The Wisconsin DNR will incorporate HCP requirements into this screening process; this will allow DNR staff to communicate with foresters and property managers when their proposed sale/project will be subject to HCP requirements due to the known presence of a listed species.

Wisconsin DNR Staff Responsibilities

DNR Geographic Information System Technician

This technician will use GIS and other database systems to collect, store, and use spatial data necessary for HCP implementation. Data to be tracked in this manner may include the following.

- The location and extent of habitat for covered bats as assumed by the species habitat distribution models in this HCP.
- The location, extent, and timing of implementation of conservation measures (e.g., creating potential hibernacula).
- The location of timber harvest covered by the HCP on State DNR lands for sales completed during the reporting period.

The Wisconsin DNR will retain records that will be available for inspection by USFWS.

DNR Biologists

The HCP Coordinator will work with staff in the Division of Fish, Wildlife and Parks to train staff on HCP conservation measures and to produce any protocols needed to further HCP implementation. Wisconsin DNR biologists will implement survey work and oversee HCP activities related to bat research and monitoring, as described in Chapter 5, Section 5.5. Biologist(s) will also participate, as necessary, in the implementation of conservation measures focused on improving bat habitat.

DNR Forestry Staff

The HCP Coordinator will work with DNR forestry staff to train staff on HCP conservation measures and to make any needed updates to the Silvicultural Handbook or other guidance within the first year of HCP implementation. Forestry staff will plan and implement forestry-related HCP conservation measures. Supervisors will ensure that field staff are trained in implementing the terms of the Lake States HCP and will assist in gathering the data needed to demonstrate compliance with the HCP.

Consultants and Contractors

The DNR will ensure that work done by consultants or contractors on DNR forestlands follows HCP requirements by incorporating such measures into contractual obligations (such as timber harvest contracts with loggers).

6.3.3 Role of U.S. Fish and Wildlife Service

The State DNRs will coordinate with USFWS and provide annual reports concerning HCP implementation. USFWS is the regulatory agency that issues the incidental take permit ensures that the permittees are in compliance with their incidental take permits and are implementing the HCP effectively and appropriately. USFWS will designate a lead for the Lake States HCP to be the State DNRs' primary point of contact during plan implementation. Successful execution of the conservation program by the State DNRs—including monitoring, reporting, and adaptive management actions that are part of the Lake States HCP—may at times require USFWS review and approval. Each State DNR provides USFWS with annual reports concerning HCP implementation in its state. The USFWS will review reports to ensure they contain the information required to ensure the permittee is complying with the HCP and terms and conditions of the permit, and to evaluate whether or not the HCP is meeting biological objectives.

Lake States Advisory Committee meetings (Section 6.3.1, *Lake States Advisory Committee*) may also help keep USFWS apprised of progress toward conservation goals and objectives, funding, monitoring, adaptive management, and other relevant topics. The meetings will serve as a means for the states to alert USFWS to key conservation actions, such as adaptive management, and monitoring prior to finalization of the final report. Meetings will also serve as a forum to troubleshoot potential issues before they affect permit compliance. USFWS will have the option to participate in these meetings only in a technical capacity and will not have voting rights. USFWS participation in these meetings will not be construed as its endorsement of any resulting decision the Advisory Committee recommends.

6.3.4 HCP Staff Training

Each State DNR will be responsible for training staff in the implementation of HCP requirements following permit issuance. Existing trainings will be updated to reflect HCP commitments and new trainings will be developed, as needed, to ensure that staff is aware of and equipped to implement the HCP. Each State DNR will ensure that HCP training materials are updated and deployed during Year 1 of the permit term.

6.3.5 Public Outreach

Each state will inform the public as part of implementation of the Lake States HCP. Each State DNR will maintain a publicly accessible communication tool (e.g., website), which will be maintained throughout implementation and used as the primary means of engaging the public in HCP implementation. This will include the application process for the Landowner Enrollment Program and related enrollment information, annual reports to USFWS, and contact information for each State DNR's HCP Administrator or Coordinator. The tool will also allow members of the public to register to receive communications on HCP implementation.

6.4 Administration

6.4.1 Data Tracking

Each State DNR will establish and maintain data from which HCP information will be managed, stored, and made available to staff, decision makers, USFWS, and others, as appropriate. The database will be used to track HCP compliance and effectiveness and may include the following elements.

- Progress toward achieving the biological goals and objectives by implementation of conservation measures (including avoidance, minimization, and mitigation) (see Chapter 5 Table 5-8 and Section 6.4.2: *Reporting* below).
- Implementation of covered activities, including extent of each activity.
- Results of all monitoring actions described in Table 5-8.

6.4.2 Reporting

Each State DNR will prepare and submit an annual report for the duration of the permit term including, among other things, compliance, impacts, conservation actions, management actions, and monitoring results. Annual reports will require synthesis of data and reporting on important trends (e.g. snag retention, status and trends of Covered Species, and outcome of enhancement actions). The annual reports will summarize the previous year's implementation activities (January 1 to December 31 for Michigan and Wisconsin and July 1 to June 30 for Minnesota) and will be provided to USFWS from the Michigan DNR by March 1, from the Minnesota DNR by October 31, and from the Wisconsin DNR by May 1 of the following reporting year. The first annual report will be due in year 2 of the permit term to allow time to assemble the first year of data and develop an appropriate template for the report. In addition to being submitted to USFWS, annual reports will be made available to the public.

The goals of the annual reports are as follows.

- Provide the information and data necessary for the State DNRs to demonstrate to USFWS and the public that the Lake States HCP is being implemented properly.
- Disclose any problems with HCP implementation and the corrective measures planned or implemented to address the problem.
- Identify administrative changes to the HCP, including those that will increase the success of conservation measures or adaptive management program.

The minimum required content of the annual reports are as follows.

- Description of the covered activities implemented during the reporting period as well as cumulative total (i.e., from the start of the permit term). This will include the following.
 - Timber harvest—Total acreage of timber harvest completed on DNR lands, including the type of harvest, season in which the harvest occurred, and the amount of harvest on State DNR lands based on sales completed during the reporting period. If available in the future, location information for timber harvest on DNR lands will be overlaid on the bat species distribution models in GIS to identify assumed impacts. Currently, spatially explicit

- information on where timber harvest occurs is not be available. The assumptions used in the HCP regarding the seasonality and general distribution of harvest will be used to estimate impacts to occupied habitat. These assumptions will be revisited every five years to ascertain that they are still applicable (see Table 5.8). For private lands, the acres of forest enrolled in the HCP will be reported, and their location will be compared to bat species distribution models.
- Prescribed fire (burning and firebreaks)—Total acres of prescribed fire in forested lands¹. Prescribed fire (burning and firebreaks)—Total acres of prescribed fire in forested lands.
 - Documentation of any dead or injured Indiana, northern long-eared, little brown, or tricolored bats identified in the course of routine surveys (see Chapter 5 Sections 5.4.3, 5.4.4., and 5.5.2.3) conducted during the reporting year and resulting from covered activities.
 - A list of all State DNR directives or guidance updated to reflect HCP requirements during the reporting year.
 - A summary of changes to DNR lands resulting from land transfers or acquisitions that significantly affect the assumptions used to estimate impacts or develop the conservation program in the HCP, such as acquisition or sale of parcels with roost trees or hibernacula.
 - Documentation of actual HCP costs over the reporting year and description of any change in budget needs for the next reporting year (i.e., to account for inflation, changes to personnel).
 - Description of any changes in HCP implementation resulting from the adaptive management process during the reporting period, as applicable. This description will include the information that triggered the change, the rationale for the planned responses, and the results of any applicable monitoring actions.
 - Summary of surveys conducted through the monitoring program for the reporting period including description of surveys conducted, protocols used, and survey results.
 - Recommendations for changes to the monitoring program based on interpretation of results, if applicable.
 - As available, an assessment of the impact of WNS on covered species in the plan area (Section 6.5.1.2, *White-Nose Syndrome*). This might include reference to relevant reports or publications about WNS and covered bats released over the reporting year and the total number of hibernacula that may have been surveyed (including both known and potential habitat for covered species).
 - Documentation of any changed circumstances that were triggered during the year and any unforeseen circumstances, if applicable.
 - A summary of any administrative changes proposed or approved during the reporting year that affect the implementation of the HCP (Section 6.6, *Modifications to the Plan or Permit[s]*).

¹ The DNRs do not currently have spatially explicit data for prescribed fire; however, the estimates made in the Plan will be cross checked every five years to ensure accuracy (see Table 5-8).

6.5 Assurances Requested

This section discusses the No-Surprises Assurances requested by the State DNRs that are part of the ESA Section 10(a)(1)(B) permit issued by USFWS. These assurances require defining circumstances affecting the covered species that may change over the course of the permit term, as well as those that are unforeseen. Section 6.5.1, *Changed Circumstances*, and Section 6.5.2, *No Surprises Regulation*, describe these circumstances. While diseases, such as WNS, are commonly included in changed and unforeseen circumstances, changes to covered bat populations as a result of WNS are ongoing, so it is more appropriate for HCP actions to address WNS as a part of the conservation strategy than to address it as a post-hoc changed circumstance. For more information, see the discussion of WNS in Chapter 5, Section 5.4.1, White-Nose Syndrome. Similarly, climate change is addressed as part of adaptive management (Section 5.4.2) and is not addressed herein.

6.5.1 Changed Circumstances

Under ESA Section 10, an HCP must identify anticipated and possible circumstances that could change during implementation. Identifying strategies and protocols for addressing such anticipated changes allows for appropriate program adjustments.

The changed and unforeseen circumstances and their contingency actions, if applicable, are described below

6.5.1.1 Additional Species Listed

Over the course of the 50-year permit term, USFWS could list species as threatened or endangered under the ESA that are not covered under the Lake States HCP. Note that the reclassification of species covered by the HCP (such as the uplisting of a species from threatened to endangered or from unlisted to listed) requires no additional action: all covered species are fully addressed by the HCP. However, species not covered by the plan will trigger changed circumstances. When a new species has been proposed for listing and its habitat is associated with covered lands, USFWS will notify the State DNRs. Following such notification, the State DNRs will take the following measures.

- **Step 1: Determine the potential for State DNR covered activities to affect candidate species.** Within 1 year of listing as a candidate species, the State DNRs will determine to what extent the candidate species occurs or could occur on covered lands and, therefore, whether coordination with USFWS will be required. Species listed as candidates at the time of permitting have already been evaluated and require no further review.
- **Step 2: Coordinate with USFWS and avoid affecting newly listed species.** Once a new noncovered species is listed, the State DNRs will initiate coordination² with USFWS within two weeks of publication of the final listing rule. If the State DNRs and USFWS determine that the newly listed species occurs or could occur on covered lands and could be affected by activities covered under the Lake States HCP, they will identify and implement necessary measures to avoid the take of the newly listed species.

² Note the timing of coordination on newly listed species, is identified here as the latest coordination would occur. In reality the coordination would likely occur much earlier, such as during the USFWS' 90-day finding period or the public comment period on a proposed listing rule.

- **Step 3: Apply for permit amendment or alternative take coverage.** If the agencies wish to proceed with activities that will cause take of the newly listed species, they will begin the process to amend the Lake States HCP permit to include these species or, alternatively, the State DNRs can apply for a new and separate permit.

The agencies will implement the interim take avoidance guidelines identified under Step 2 for the species until the permit amendment is finalized or an alternate permit is issued to prevent being out of compliance with the ESA. Permit amendments to include additional covered species will require an amendment to the Lake States HCP and the permit, including the re-initiation of the internal Section 7 consultation and supplemental National Environmental Policy Act (NEPA) work.

6.5.1.2 Wildfire

Description

Wildfires, either ignited by natural (e.g., lightning) or human causes, can occur across the Lake States and are most frequent after snow cover recedes in the spring and after the growing season ends in the fall (Williams 2000). Wildfires usually occur under hot, dry conditions, which can lead to large, intense, and difficult-to-control wildfires (Kimmerer and Lake 2001). Uncontrolled and particularly intense wildfires can negatively affect covered bats through smoke exposure, by reducing roost availability, or by creating unsuitable conditions at existing roost sites. A stand-replacing fire that eliminates forest and favors shrub-scrub and grassland will reduce local roosting and foraging habitat for covered bats. Alternatively, wildfire also has the potential to provide additional roosting resources for bats through the creation of decaying trees and snags. Research in Appalachian forests have shown that these types of large-scale natural disturbance in hardwood forests can increase snag abundance several-fold over preexisting conditions (Johnson et al. 2010). In fact, targeted prescribed fire is an objective in the conservation strategy.

In the Lake States, wildfires are not anticipated to be distributed evenly across forest types (Cardille and Ventura 2001). The development and spread of wildfires is related to fuel abundance and connectivity, soil and vegetation moisture, and weather and climate patterns (Cardille et al. 2001). Soil moisture has been identified as a very important factor in wildfires in the Upper Midwest (Heinselman 1973; Vogl 1971), through its influence on available water capacity (i.e., volume of water available to plants [Cardille et al. 2001]). Large fires occur most often in the aspen parkland region of northwest Minnesota and in the sand plains of central Minnesota and northeast Lower Michigan. Fire conditions are exacerbated by drought and therefore are likely to worsen in the future if drought conditions become more prevalent due to climate change.

Conservation Measures and Monitoring

Prescribed fire is used throughout the Lake States as a management tool for the promotion of habitat and as means of reducing fuel load and preventing wide-scale wildfire. Objective 5.1 develops and implements prescribed burn plans in modeled bat habitat to minimize impacts of such burns. Objective 2.2 restricts the timing of prescribed burning in areas identified as known roost trees. While these objectives address prescribed burning, they are not specific to wildfires.

Thresholds

In order to set thresholds for changed circumstances, data on wildfire occurrence on state lands for each of the three states were examined. The analysis was limited to wildfire occurrence on state lands because differences in land management on public vs. private lands may result in different frequencies and intensities of wildfire.

Data were procured for wildfires on state lands for each of the three states. Michigan data were obtained from the 2016 Annual Report (Michigan Department of Natural Resources 2016), Minnesota data were provided by a contact in the Minnesota DNR (Verdegan pers. comm. 2020), and Wisconsin data were provided by a contact in the Wisconsin DNR (Barnier pers. comm. 2019). These data were compared to publicly available datasets for federal lands (U.S. Geological Survey 2018) to verify trends across land ownership such as size, number, and intensity of fires. In general, the overall trends across federal versus DNR datasets were similar.

Data on wildfire occurrence on state lands were available for all three states for the period of 2007 through 2016 (Table 6-2). Other periods were not consistently available across the three states. To substantiate the use of this most recent 10-year period, this dataset was compared to larger datasets from previous decades, and no statistically significant differences were found in terms of the frequency, size, and intensity of fires. States differed in the size and number of fires, with an observed tendency for Minnesota to experience more and larger fires consistent with wildfire hazard data compiled by the U.S. Forest Service (2018). There is a high degree of variability in the size and number of fires. In general fires affecting known roost trees and known hibernacula are considered foreseen and would be addressed as a changed circumstance. For each state, annual fire totals greater than the maximum annual acres burned plus one standard deviation are unforeseen.

Table 6-2. Maximum Annual Acreage of Wildfires on All State Lands, by State (2007–2016)

State	Maximum Acres Burned Annually (2007 - 2016)	Standard Deviation (SD)	Projected Maximum Acres Burned + SD
Michigan	23,813	8,656	32,469
Minnesota	28,975	881	29,856
Wisconsin	3,161	271	3,432

Sources: Michigan Department of Natural Resources 2016; Verdegan pers. comm. 2020; Barnier pers. comm. 2019.

Responsive Measures

Like prescribed fires low-intensity wildfires likely improve bat habitat (Boyles and Aubrey 2006; Ford et al. 2016), However, wildfires in areas where a known roost or hibernaculum is present could remove active roosts (Ford et al 2016) or kill/harm bats (Dickenson 2010). Catastrophic fire could remove all/most roosts in an area. To ensure that roost trees and hibernacula entrances addressed by the conservation strategy continue to provide habitat value in burned areas, fires in stands with known roosts or hibernacula will be analyzed within 1 year post fire. If a fire occurs in any area with a known roost or hibernaculum, a reasonable effort will be made to notify the USFWS within 90 days of the fire. Additionally a post-fire plan will be conducted. If this analysis indicates a degradation in habitat quality (e.g., known roost trees have been destroyed), the State DNRs will develop and implement a site-specific plan addressing rehabilitation needs. Short-term responsive measures will

include such measures as the use of bat boxes if viable roost trees have been destroyed. These actions will be included in the annual report.

6.5.2 No Surprises Regulation

This section describes the context of the federal No Surprises regulation as it relates to the Lake States HCP and the individual states' incidental take permits. The No Surprises regulation was established by the Secretary of the Interior on March 25, 1998, and is codified at 50 Code of Federal Regulations (CFR) § Section 17.22(b)(5) (endangered species) and Section 17.32(b)(5) (threatened species). As long as the permittees are properly implementing the HCP and the ITPs, the regulations provide assurances to Section 10 permit holders that no additional money, commitments, or restrictions of land or water will be required should unforeseen circumstances requiring additional mitigation arise once the permit is in place. The No Surprises regulation states that if the Lake States are properly implementing an HCP that has been approved by USFWS, no additional commitment of resources, beyond those already specified in the HCP will be required.

As stated at 50 CFR § 17.22(b)(5):

(5) Assurances provided to permittee in case of changed or unforeseen circumstances. The assurances in this paragraph (b)(5) apply only to incidental take permits issued in accordance with paragraph (b)(2) of this section where the conservation plan is being properly implemented, and apply only with respect to species adequately covered by the conservation plan. These assurances cannot be provided to Federal agencies. This rule does not apply to incidental take permits issued prior to March 25, 1998. The assurances provided in incidental take permits issued prior to March 25, 1998 remain in effect, and those permits will not be revised as a result of this rulemaking.

(i) Changed circumstances provided for in the plan. If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and were provided for in the plan's operating conservation program, the permittee will implement the measures specified in the plan.

(ii) Changed circumstances not provided for in the plan. If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and such measures were not provided for in the plan's operating conservation program, the Director will not require any conservation and mitigation measures in addition to those provided for in the plan without the consent of the permittee, provided the plan is being properly implemented.

(iii) Unforeseen circumstances.

(A) In negotiating unforeseen circumstances, the Director will not require the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the species covered by the conservation plan without the consent of the permittee.

(B) If additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, the Director may require additional measures of the permittee where the conservation plan is being properly implemented, but only if such measures are limited to modifications within conserved habitat areas, if any, or to the conservation plan's operating conservation program for the affected species, and maintain the original terms of the conservation plan to the maximum extent possible. Additional conservation and mitigation measures will not involve the commitment of additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources otherwise available

for development or use under the original terms of the conservation plan without the consent of the permittee.

(C) The Director will have the burden of demonstrating that unforeseen circumstances exist, using the best scientific and commercial data available. These findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of the affected species. The Director will consider, but not be limited to, the following factors:

- (1) Size of the current range of the affected species;
- (2) Percentage of range adversely affected by the conservation plan;
- (3) Percentage of range conserved by the conservation plan;
- (4) Ecological significance of that portion of the range affected by the conservation plan;
- (5) Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the conservation plan; and
- (6) Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

6.6 Modifications to the Plan or Permit(s)

The Lake States HCP and associated incidental take permit may be modified in accordance with the ESA, USFWS implementing regulations, and the provisions outlined in this chapter. Regular HCP and permit modifications are not anticipated; however, modifications to the HCP or permit may be requested by either the State DNRs or USFWS. USFWS also may amend the permit at any time for just cause, and upon a written finding of necessity, during the permit term in accordance with 50 CFR § 13.23(b). The categories of modifications are administrative changes and amendments.

Any administrative changes arising during a reporting year will be submitted to USFWS as addendums to the next annual report. Amendments will be documented by providing USFWS with a redline version of the Lake States HCP containing the relevant text change(s). Upon request from USFWS, the State DNRs will provide a complete revised version of the Lake States HCP, including the revisions resulting from all administrative changes and amendments to date, every 5 years during the permit term.

6.6.1 Administrative Changes

Administrative changes are internal changes or corrections to the Lake States HCP that may be made by the State DNRs, at their own initiative, or approved by the State DNRs in response to a written request submitted by USFWS. Requests from USFWS will include an explanation of the reason for the change as well as any supporting documentation.

Each revision of the Lake States HCP will not necessarily result in amending the incidental take permit. The need to amend the permit depends on how the HCP has changed, how those changes need to be reflected in the permit, and whether the changes would trigger additional Section 7 or NEPA review. Administrative changes to the HCP must be consistent with the scope of the analysis already in the HCP and presented to the public as part of the NEPA process. Administrative

changes will address small errors, omissions, or language that may be too general or too specific for practical application.

Examples of administrative changes to the Lake States HCP are listed as follows.

- Corrections of typographical, grammatical, and similar editing errors that do not change the intended meaning or obligations.
- Corrections of any minor errors in maps or exhibits.
- Corrections of any maps, tables, or appendices in the HCP to reflect approved amendments (Section 6.6.2, *Amendments*) to the HCP or incidental take permit.
- Changes to the State DNR staff or changes to membership of the HCP Advisory Committee without changing the representation of the State DNRs.

In addition, the threshold for participation in the Landowner Enrollment Program may change over time as densities of bats diminish on the landscape. Details on how these thresholds are established are provided in Appendix F, *Landowner Enrollment Program*.

6.6.2 Amendments

The Lake States HCP, incidental take permit, and implementing document amendments are not anticipated on a regular basis; however, these modifications may be requested by either the Lake States or USFWS. Once an amendment is requested, it is up to USFWS to decide the level of review needed to satisfy ESA and regulatory requirements. USFWS also may amend the incidental take permit at any time for just cause, and upon a written finding of necessity, during the permit term in accordance with 50 CFR § 13.23(b).

Amendments to the HCP can be approved through an exchange of formal correspondence, addenda to the HCP, revisions to the HCP, or permit amendments. Modifications to the projects and activities described in the HCP that meet the following criteria must comply with applicable permitting requirements, including the compliance with NEPA, the National Historic Preservation Act, and Section 7 of the ESA.

- Modifications that significantly affect the impact analysis or conservation strategy of the HCP.
- Modifications that significantly affect other environmental resources or other aspects of the human environment in a manner not already analyzed.
- Modifications that result in a change for which public review is required, such as revising the Permit Area or adding covered species (see list below).

The specific document requirements for the application may vary, however, based on the substance of the amendment. For instance, if the amendment involves an action that was not addressed in the original HCP or NEPA analysis, the documents may need to be revised or new versions prepared to address the proposed amendment. If circumstances necessitating the amendment were adequately addressed in the original documents, an amendment of the incidental take permit might be sufficient. Upon submission of complete amendment documentation, USFWS will publish a notice of the receipt of the application in the Federal Register, initiating the NEPA and HCP public comment process. After the close of the public comment period, USFWS may approve or deny the proposed amendment application. Examples of changes that would require an amendment include the following actions.

- Addition of covered species to the HCP.
- Increase in the allowable take limit of existing covered activities or addition of new covered activities to the HCP.
- Modifications of any important action or component of the conservation strategy under the HCP, including funding, that may substantially affect levels of authorized take, effects of the covered activities, or the nature or scope of the conservation strategy.
- A major change in the biological goals and objectives or conservation actions if monitoring or research indicates that they are not attainable because technologies to attain them are either unavailable or infeasible.

From time to time the USFWS may propose an amendment. Any Lake States' permittee³ may, at their sole discretion, reject any amendment proposed by USFWS. If the USFWS proposes an amendment in order to ensure issuance criteria continue to be met and the Lake States reject the proposed amendment, the USFWS may exercise its authority to suspend or revoke the Permit, in whole or in part, for cause in accordance with 50 Code of Federal Regulations section 13.27, 13.28-13.29, 17.22(b)(8) and 17.32 (b)(8) and other applicable laws and regulations in force at the time of such suspension or revocation. Except where USFWS determines that emergency action is necessary to avoid irreparable harm to a Covered Species, it will not suspend the federal permit without first (1) attempting to resolve any disagreements regarding the implementation or interpretation of the HCP, (2) requesting the Lake States DNRs to take appropriate remedial actions, and (3) providing the Lake States DNRs with written notice of the facts or conduct which may warrant the suspension and an adequate and reasonable opportunity for the Permittees to demonstrate why suspension is not warranted.

³ The Lake States HCP is designed to accommodate three individual and severable permits (one for each State). As a result, action or inaction taken by one State does not impact the other two State's permits. For example, if USFWS proposes an amendment in order to ensure issuance criteria continue to be met, and two States accept the amendment and one State rejects the amendment, the USFWS may exercise its authority to suspend or revoke the one State permit while the other two State permits remain unaffected.

6.7 References

6.7.1 Written References

- Baerwald, E. F. and R. M. R. Barclay. 2009. Geographic Variation in Activity and Fatality of Migratory Bats at Wind Energy Facilities. *Journal of Mammalogy* 90(6):1341–1349.
- Barclay, M. R., and A. Kurta. 2007. Ecology and Behavior of Bats Roosting in Tree Cavities and Under Bark. In M. J. Lacki, J. P. Hayes, and A. Kurta, eds.: *Bats in Forests: Conservation and Management*. Johns Hopkins University Press, Baltimore, MD. Pp. 17–59.
- Bernazzani, P., B. A. Bradley, J. J. Offerman. 2012. Integrating Climate Change into Habitat Conservation Plans Under the U.S. Endangered Species Act. *Environmental Management* 49:1103–1114.
- Boyles, J. G., and D. P. Aubrey. 2006. Managing forests with prescribed fire: implications for a cavity-dwelling bat species. *Forest Ecology and Management* 221:108–115.
- Cardille, J. A., and S. J. Ventura. 2001. Occurrence of wildfire in the northern Great Lakes region: Effects of land cover and land ownership assessed at multiple scales. *International Journal of Wildland Fire* 10:145–154.
- Cardille, J. A., S. J. Ventura, and M. G. Turner. 2001. Environmental and social factors influencing wildfires in the Upper Midwest, United States. *Ecological Applications* 11:111–12.
- Cook et al. 2016. Consensus on consensus: a synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters*. 11 048002.
- Dale, V. H., L. A. Joyce, S. McNulty, R. P. Neilson, M. P. Ayres, M. D. Flannigan, P. J. Hanson, L. C. Irland, A. E. Lugo, and C. J. Peterson. 2001. Climate change and forest disturbances: climate change can affect forests by altering the frequency, intensity, duration, and timing of fire, drought, introduced species, insect and pathogen outbreaks, hurricanes, windstorms, ice storms, or landslides. *Bioscience* 51:723–734.
- Dukes, J. S., et al. 2009. Responses of insect pests, pathogens, and invasive plant species to climate change in the forests of northeastern North America: What can we predict? *Canadian Journal of Forest Research* 39:231–248.
- Erickson, J. L. and S. D. West. 2002. The influence of regional climate and nightly weather conditions on activity patterns of insectivorous bats. *Acta Chiropterologica* 4(1):17–24.
- Ford, W. M., A. Silvis, J. B. Johnson, J. W. Edwards, and M. Karp. 2016. Northern long-eared bat day-roosting and prescribed fire in the central Appalachians, USA. *Fire Ecology* 12:13–27.
- Frelich, L. E., and P.B. Reich. 2010. Will environmental changes reinforce the impact of global warming on the prairie–forest border of central North America? *Frontiers in Ecology and the Environment* 8:371–378.
- Frick, W.F., D.S. Reynolds, and T.H. Kunz. 2010. Influence of climate and reproductive timing on demography of little brown myotis *lucifugus*. *Journal of Animal Ecology* 79(1):128–136.

- Frick, W. F., T. L. Cheng, K. E. Langwig, J. R. Hoyt, A. F. Janicki, K. L. Parise, J. T. Foster, and A. M. Kilpatrick. 2017. Pathogen dynamics during invasion and establishment of white-nose syndrome explain mechanisms of host persistence. *Ecology* 98:624–631.
- Frick, W. F., S. Puechmaille, J. R. Hoyt, B. A. Nickel, K. E. Langwig, J. T. Foster, K. E. Barlow, T. Bartonicka, D. Feller, A. Haarsma, C. Herzog, I. Horacek, J. Van der Kooij, B. Mulken, B. Petrov, R. Reynolds, L. Rodrigues, C. W. Stihler, G. G. Turner, and A. M. Kilpatrick. 2015. Disease alters macroecological patterns of North American bats. *Global Ecology and Biogeography* 24:74–749.
- Great Lakes Integrated Sciences + Assessments (GLISA). 2018. Great Lakes Integrated Sciences + Assessments, GLISA- A NOAA RISA Team. University of Michigan and Michigan State University. University of Michigan School of Environment and Sustainability, Ann Arbor, MI. <http://glisa.umich.edu/climate>. Accessed: April 18, 2018.
- Hayhoe, K., J. VanDorn, T. Croley II, N. Schlegal, and D. Wuebbles. 2010. Regional climate change projections for Chicago and the Great Lakes. *Journal of Great Lakes Research* 36(2): 7–21.
- Heffernan, L. M., and G. G. Turner. 2016. The Spread of White-nose Syndrome in North America and Pennsylvania, Chapter 8. In: C.M. Butchkoski, D.M. Reeder, G.G. Turner, and H.P. Whidden, eds. *Conservation and Ecology of Pennsylvania's Bats*. East Stroudsburg, PA: Pennsylvania Academy of Science.
- Heinselman, M. L. 1973. Fire in the virgin forests of the Boundary Waters Canoe Area, Minnesota. *Journal of Quaternary Research* 3:329–382.
- Hellmann J. J., J. E. Byers, B. G. Bierwagen, and J. S. Dukes. 2008. Five potential consequences of climate change for invasive species. *Conservation Biology* 22:534–43.
- Humphries, M. M., J. Umbanhowar, and K. S. McCann. 2004. Bioenergetic prediction of climate change impacts on northern mammals. *Integrative and Comparative Biology* 44:152–162
- Intergovernmental Panel on Climate Change (IPCC). 2014. *Climate Change 2014: Synthesis Report*. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
- Johnson, J. B., W. M. Ford, J. L. Rodrigue, J. W. Edwards, and C. M. Johnson. 2010. Roost selection by male Indiana myotis following forest fires in Central Appalachian Hardwoods Forests. *Journal of Fish and Wildlife Management* 1:111–121.
- Kimmerer, R. W., and F. K. Lake. 2001. The role of indigenous burning in land management. *Journal of Forestry* 99:36–41.
- Kling, G. W., K. Hayhoe, L. B. Johnson, J. J. Magnuson, S. Polasky, S. K. Robinson, B. J. Shuter, M. M. Wander, D. J. Wuebbles, D. R. Zak, R. L. Lindroth, S. C. Moser, and M. L. Wilson. 2003. *Confronting Climate Change in the Great Lakes Region: Impacts on our Communities and Ecosystems*. Union of Concerned Scientists, Cambridge, Massachusetts, and Ecological Society of America, Washington, D.C.
- Kurta, A., and S. M. Smith. 2017. *Exploration of Bat Hibernacula, Population Monitoring, and Surveillance for White-Nose Syndrome*. Report to the Michigan Department of Natural Resources.

- Langwig, K. E., W. F. Frick, J. T. Bried, A. C. Hicks, T. H. Kunz, and A. M. Kilpatrick. 2012. Sociality, density-dependence and microclimates determine the persistence of populations suffering from a novel fungal disease, white-nose syndrome. *Ecology Letters* 15(9):1050–7.
- Langwig, K. E., W. F. Frick, R. Reynolds, K. L. Parise, K. P. Drees, J. R. Hoyt, T. L. Cheng, T. H. Kunz, J. T. Foster, and A. M. Kilpatrick. 2014. Host and pathogen ecology drive the seasonal dynamics of a fungal disease, white-nose syndrome. Pages 20142335 in *Proceedings of The Royal Society of London B: Biological Sciences* 282:20142335.
- Langwig, K. E., W. F. Frick, J. R. Hoyt, K. L. Parise, K. P. Drees, T. H. Kunz, J. T. Foster, and A. M. Kilpatrick. 2016. Drivers of variation in species impacts for a multi-host fungal disease of bats. *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 371:1–9.
- Lawton, J. H. 1994. Population dynamic principles. *Philosophical Transactions of the Royal Society of London B* 344:61–68.
- Lookingbill, T.R., Elmore, A.J., Engelhardt, K.A.M., Churchill, J.B., Edward Gates, J., Johnson, J.B., 2010. Influence of wetland networks on bat activity in mixed-use landscapes. *Biol. Conserv.* 143:974–983.
- Maher, S. P., A. M. Kramer, J. T. Pulliam, M. A. Zokan, S. E. Bowden, H. D. Barton, K. Magori, and J. M. Drake. 2012. Spread of white-nose syndrome on a network regulated by geography and climate. *Nature Communications* 3:1306.
- Menzel, M. A., Menzel, J. M., Carter, T. C., Ford, W. M., Edwards, J. W., 2001. Review of forest habitat relationships of the Indiana bat (*Myotis sodalis*). General Technical Report NE-284. U.S. Forest Service, Northeastern Research Station, pp. 1–21.
- Michigan Department of Natural Resources. 2014. White-nose syndrome confirmed in bats in Michigan. In: *Serious Bat Disease found in Alpena, Dickinson and Mackinac Counties*. Available: <https://content.govdelivery.com/accounts/MIDNR/bulletins/b052e9>.
- Michigan Department of Natural Resources. 2016. *Wildfires Tracked by Minnesota DNR*. Available: https://gisdata.mn.gov/fa_IR/dataset/env-wildfires-tracked-by-mndnr.
- Michigan Department of Natural Resources. 2012. *Within-Stand Retention Guidance*. Accessed July 5, 2019. Available: https://www.michigan.gov/documents/dnr/WithinStandRetentionGuidelines-IC4110_175766_7.pdf.
- Miller-Butterworth, C. M., M. J. Vonhof, J. Rosenstern, G. G. Turner, and A. L. Russell. 2014. Genetic structure of little brown bats (*Myotis lucifugus*) corresponds with spread of white-nose syndrome among hibernacula. *Journal of Heredity* 105:354.
- Minnesota Department of Natural Resources. 2013. *Fungus Dangerous to Bats Detected at 2 Minnesota State Parks*. Available: <http://news.dnr.state.mn.us/2013/08/09/fungus-dangerous-to-bats-detected-at-2-minnesota-state-parks/#more-12787>.
- Minnesota Department of Natural Resources. 2019. Climate of Minnesota Website. Available: <https://www.dnr.state.mn.us/climate/index.html>. Accessed: January 2020.

- Minnesota Forest Resources Council. 2013. Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers and Resource Managers. Minnesota Forest Resources Council, St. Paul, Minnesota. Available: <https://www.minnesotaforests.com/forest-management>. Accessed: July 2019.
- Minnis, A. M. and D. L. Lindner. 2013. Phylogenetic evaluation of *Geomyces* and allies reveals no close relatives of *Pseudogymnoascus destructans*, comb. nov., in bat hibernacula of eastern North America. *Fungal Biology* 117:638–649.
- Michigan State University and Northern Institute of Applied Climate Science. 2014. Forest management in a changing climate: how the climate affects forests. Extension Bulletin E-3221. Michigan State University Extension, East Lansing, Michigan and Northern Institute of Applied Climate Science, Houghton, Michigan. 2 pp.
- Perkins, J. M. 1996. Does competition for roosts influence bat distribution in a managed forest, p. 164–174. In: Barclay, R. M. R. and R. M. Brigham (eds.). *Bats and forests*. Ministry of Forests, Victoria, British Columbia.
- Root, T. L. et al. 2003. Fingerprints of global warming on wild animals and plants. *Nature* 421:57–60.
- Sherwin, H.A., Montgomery, W.I. & Lundy, M.G. 2012. The impact and implications of climate change for bats. *Mamm. Rev.* doi: 10.1111/j.1365-2907.2012.00214.x.
- 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.
- U.S. Fish and Wildlife Service. 2012. *News Release: North American bat death toll exceeds 5.5 million from white-nose syndrome*. Office of Communications. Arlington, VA.
- U.S. Fish and Wildlife Service. 2018. *White-Nose Syndrome Information*. Pages in federal white-nose syndrome website "a coordinated response to the devastating bat disease" in U. S. F. a. W. Service, editor.
- U.S. Fish and Wildlife Service. 2019. White-nose Syndrome occurrence map - by year (2019). Version: 2.1.4. Data Last Updated: 10/2/2018. Available: <https://www.whitenosesyndrome.org/resources/map>. Accessed: February 2019.
- U.S. Forest Service. 2014a. Michigan forest ecosystem vulnerability assessment and synthesis: a report from the Northwoods Climate Change Response Framework project. General Technical Report NRS-129. U.S. Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, Pennsylvania. 229 pp.
- U.S. Forest Service. 2014b. Minnesota forest ecosystem vulnerability assessment and synthesis: a report from the Northwoods Climate Change Response Framework project. General Technical Report NRS-133. U.S. Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, Pennsylvania. 228 pp.
- U.S. Geological Survey. 2018. Federal Fire Occurrence Website. Available: <https://wildfire.cr.usgs.gov/firehistory/index.html>. Accessed: July 2018.

- U.S. Global Change Research Program (USGCRP). 2017. Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6.
- Vogl, R. J. 1971. Fire and the northern Wisconsin pine barrens. Pages 175–209 in Proceedings of the tall timbers fire ecology conference, August 20–21, 1970, New Brunswick, Canada. Tall Timbers Research Station, Florida State University, Tallahassee, Florida, USA.
- Weed, A. S., M. P. Ayres, and J. A. Hicke. 2013. Consequences of climate change for biotic disturbances in North American forests. *Ecological Monographs* 83:441–470.
- Williams, G. W. 2000. Introduction to aboriginal fire use in North America. *Fire Management Today* 60:8–11.
- Wisconsin Department of Natural Resources. 2012. Silviculture Handbook, 24315.24, Chapter 24 (dated November 2012). Accessed June 26, 2019. Available: <https://dnr.wi.gov/topic/ForestManagement/silviculture.html>.
- Wisconsin Department of Natural Resources. 2014. Deadly bat disease detected in single Wisconsin site. In C. Office (ed). *State joins 23 others in confirming white-nose syndrome*. Available: http://www.suamico.org/document_center/AnimalControl/Deadly_bat_disease_detected_in_single_Wisconsin_site.pdf.
- Wisconsin Initiative on Climate Change Impacts. 2011. Wildlife working group report. Madison, Wisconsin. 52 pp.
- Wisconsin Initiative on Climate Change Impacts. 2016. Climate Wisconsin 2050 - scenarios of a state of change: forestry. Madison, Wisconsin. 8 pp.
- Wisconsin Initiative on Climate Change Impacts. 2019. Home Website. Available: <https://www.wicci.wisc.edu/index.php>. Accessed: January 2020.
- Wuebbles D. J. and Hayhoe K. 2004. Climate change projections for the United States Midwest. *Mitigation and Adaptation Strategies for Global Change* 9:335–63.

6.7.1 Personal Communications

- Barnier, James. Forest Fire Protection Section Chief, Wisconsin Department of Natural Resources. 2019.
- Verdegan, Travis. Forestry Predictive Services Coordinator, Minnesota Department of Natural Resources. 2020.