USDA United States Department of Agriculture

Eastern Region

2018–2019 Biennial Monitoring & Evaluation Report

Forest Service Hiawatha National Forest September 2021

Alger, Delta, Schoolcraft, Luce, Mackinac, and Chippewa Counties

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Approval and Declaration of Intent

I have reviewed the biennial Forest Plan Monitoring and Evaluation Report for the Hiawatha National Forest for fiscal years 2018 and 2019. This report meets the intent of both the 2006 Hiawatha National Forest Plan (chapter 4) and 36 Code of Federal Regulations, Section 219.

This report is approved.

MARY MOORE Digitally signed by MARY MOORE Date: 2021.10.07 08:41:05 -04'00'

MARY MOORE
Forest Supervisor

Date

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Summary of Findings and Results

- Overall, monitoring does not indicate a need to revise any of the practices or guidelines prescribed in resource-specific protocols used by Hiawatha National Forest personnel. The management direction and mitigation measures described in the 2006 forest plan are effective in preventing undue resource damage due to authorized projects or activities. Areas of concern for additional monitoring and analysis are summarized in the following paragraphs.
- Budgetary constraints and reduced staffing have adversely affected the Forest's ability to respond consistently to prescribed monitoring elements. Monitoring intervals and parameters also vary due to changes in national or regional priorities, ongoing monitoring results, and other forest priorities. As a result, not all resources have data representative of each fiscal year evaluated in this report. However, when compared to previous reporting periods, trends observed in this report are believed to adequately represent conditions on the ground.
- It is anticipated that ongoing climate change vulnerability assessments and multi-stakeholder collaborations (36 CFR 219.12(c)(3)) will result in a suite of monitoring questions related to climate change. Questions may be adjusted over time as recommendations from this analysis indicate modification is necessary to effectively design project elements to manage on-the-ground practices
- Unauthorized (illegal) off-highway vehicle use is an ongoing problem for nearly all resources. Damage includes new or re-opened user-created trails, destabilization of sand dune slopes, channelization and erosion, invasive species introductions, and damage to wetlands and lakeshores. Monitoring is ongoing in cooperation with the Michigan Department of Natural Resources.
- Rising water levels in the Great Lakes are likely to be the biggest threat to populations of dwarf lake iris, lakeside daisy, piping plover and other species with waterside habitat on the Forest in the foreseeable future.
- Vehicular damage to the Brevort Road lakeside daisy and Houghton’s goldenrod site on July 22 2019 (see page 25) indicates that the site cannot be protected in the long term due to its proximity to the roadside and powerline right-of-way. Both plant populations are threatened by ongoing road maintenance, illegal OHV use, and non-native invasive species.
- The U.S. Fish and Wildlife Service delisted Kirtland’s warbler on October 9, 2019, after determining that the species no longer met the definition of an endangered or threatened species. The delisting rule re-iterated the need for continued management habitat among other activities, to maintain a Kirtland’s warbler population not at risk of extinction.

Table 1. Summary of findings

Monitoring Element	Do monitoring results indicate progress toward Plan targets?	Based on monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed?
(1) (36 CFR 219.12(a)(5)(i)). The status of select watershed conditions.	Yes	No	
(2) (36 CFR 219.12(a)(5)(ii)). The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.	Yes	No	
(3) (36 CFR 219.12(a)(5)(iii)). The status of focal species to assess the ecological conditions required under § 219.9.	Yes	No	
(4) (36 CFR 219.12(a)(5)(iv)). The status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.	Yes	No	
(5) (36 CFR 219.12(a)(5)(v)). The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.	Yes	No	
(6) (36 CFR 219.12(a)(5)(vi)). Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.	Uncertain	Uncertain	Unclear in this reporting cycle. To be revisited in the 2020-2021 report.
(7) (36 CFR 219.12(a)(5)(vii)). Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.	Yes	No	
(8) (36 CFR 219.12(a)(5)(viii)). The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land (16 U.S.C. 1604(g)(3)(C)).	Yes	No	

INTRODUCTION

The purpose of the 2018–2019 Hiawatha National Forest Biennial Monitoring and Evaluation Report is to help the Forest Service determine if project level change is needed for consistency with the 2006 Hiawatha National Forest Plan or if a change to the plan itself is required to ensure consistency with laws, regulations, and policies. Additionally, this report is designed to help the public, other Federal agencies, State, local, and Tribal governments observe ecological trends and anticipate critical steps in the overall monitoring program.

There are several objectives for this report, including:

- Assess the current condition and trend of selected forest resources
- Document changed conditions or status of key characteristics used to assess accomplishments and progress toward achieving the selected forest plan components
- Evaluate management effectiveness, and progress towards achieving the selected desired conditions, objectives, and goals described in the forest plan
- Assess the options for change based on previous monitoring & evaluation reports
- Document incomplete monitoring actions and the rationale for the delay
- Present any new information relevant to the evaluation of the selected monitoring questions
- Present recommended change opportunities to the responsible official

Consistency with Law, Regulation, and Policy

The 2006 Hiawatha National Forest Plan was updated in May 2016 for consistency monitoring requirements established in 2012 planning regulations [36 CFR 219.12 (c)(1)]. The monitoring report responds to the eight monitoring elements provided by the 2012 Planning Rule with corresponding monitoring questions and indicators for each resource, a synopsis of the forest plan direction, a summary of data collected, and an evaluation of the activity.

Public Participation

Our intent for public participation is to give the public access to all information developed through monitoring activities and "obtain public feedback on what the monitoring information suggests about the effectiveness of the forest plan" (Forest Service Handbook 1909.12_42.14c) (full transparency). Completed reports are published on the Hiawatha National Forest public webpage at https://www.fs.usda.gov/projects/hiawatha and an email notice is sent to those who signed up for updates on the Forest's electronic mailing list.

Roles and Responsibilities

The responsible official has the discretion to set the scope and scale of the plan monitoring program after considering information needs and the financial and technical capabilities of the agency (36 CFR 219.12 (a)(4)). The Responsible Official for the Hiawatha National Forest Plan is Mary Moore, Forest Supervisor for the Hiawatha National Forest.

Eastern Regional Office. The Regional Office (https://www.fs.usda.gov/r9) develops regional policies and directives (http://www.fs.fed.us/im/directives/) on monitoring and evaluation.

U.S. Forest Service, Eastern Region State and Private Forestry, Forest Health. (https://www.fs.usda.gov/naspf/) Forest Health Protection provides technical assistance on forest health-related matters, particularly those related to disturbance agents such as native and non-native insects, pathogens, and invasive plants.

U.S. Forest Service, Northern Research Station. (https://www.nrs.fs.fed.us) The Northern Research Station provides scientific and technical expertise to conduct effectiveness and validation monitoring and evaluation. Their responsibilities include advising and assisting the Forest in developing monitoring study plans, analyzing and interpreting data, reporting study results and conclusions, and publishing study results in regional publications.

U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service provides monitoring and reporting requirements for threatened and endangered species.

Michigan Department of Natural Resources, Forest Health Division. Michigan Department of Natural Resources works with the Forest to prevent, evaluate, and manage the occurrence and impacts of both native and exotic forest insects and diseases.

Michigan State University Extension Services. Michigan State University Extension's network of faculty and educators host classroom and outdoor workshops on forest health topics, such as identifying and managing invasive species, diseases, and pests.

How Our Plan Monitoring Program Works

The plan-monitoring program sets out the monitoring questions and associated indicators to respond to eight required monitoring elements provided in the 2012 Planning Rule [36 CFR 219.12(a)(5)(i-viii)]. This report is the vehicle for disseminating information to leadership to evaluate the need for change by comparing on-the-ground conditions to desired conditions outlined in the forest plan.

Monitoring questions and indicators provide the information to help guide management decisions for resources on the plan area, including testing relevant assumptions, tracking changes, and measuring effectiveness and progress toward meeting forest plan direction.

In the context of forest planning, there are three main monitoring goals

- *Are we implementing the forest plan properly? Are we meeting our management targets and project guidelines? (implementation monitoring)*
- *Are we achieving our forest plan management goals and desired outcomes? (effectiveness monitoring)*
- *Does our hypothesis testing indicate we may need to change the forest plan? (validation monitoring)*

When considering budgetary capacity and other factors, responding to these elements is the highest priority (forest plan, page 4-1). Prioritization of monitoring and analysis is described on page 4-2 of the forest plan. Measurement frequency is established by the potential for change, importance to the public, such as recreation, or changing conditions, such as fire or disease requiring expedited responses.

Variation in the reporting frequency does not significantly affect the overall monitoring program as trend analysis is more accurate when evaluated over an extended period, such as five or more years. If trends or other relevant information indicate a serious concern, the reporting frequency can be adjusted, and remedial action can be implemented.

Monitoring questions not addressed during the monitoring period for this report are discussed in Appendix A. This appendix contains available data for the monitoring question, a brief rationale for striking or deferring a question, or the lack of need for future monitoring.

MONITORING AND EVALUATION

Monitoring Element 1-Status of select watershed conditions

Monitoring Question 1.

To what extent is forest plan implementation affecting streams, lakes, ponds, wetlands, and their associated riparian ecosystems?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
By Project	2016	2–6 Years	2017

Forest Plan Direction

2500 Watershed Management, page 2-13

Goal 5. Water quality is maintained to the standards identified by the State of Michigan.

Indicators

(i). Implementation of Best Management Practices to ensure compliance with the Clean Water Act

The Forest used State and National Best Management Practices (BMPs) to monitor 12 sites (table 2) in 2018 and 2019. Eight of the 12 sites monitored had best management practices specified within implementation documents.

Table 2. Sites selected and monitored for best management practices during 2018 and 2019

Site	BMPs* Planned?	BMPs* Implemented?	BMPs* Effective?	Adverse Effects to Lakes, Streams, or Wetlands?
Trout Brook Pond Removal	Yes	Yes	Yes	Opens dam to return stream to natural channel and stabilizes site.
Chippewa County Telephone	No	No	N/A	Unauthorized off-highway vehicle use.
Rolling Barrel North Prescribed Fire	No	No	N/A	No adverse effects to interior wetland.
Trout Lake to Hulbert Snowmobile Trail	No	No	N/A	Local snowmobile club manages snowmobile trail. No BMP plans in USFS records.
Forest road 3131C, Sullivan Spur C	No	No	N/A	Old cross-drain culvert. Remove and reclaim site or replace to FS specifications.
Forest road 3330D, Koski Pond Spur D	Yes	Yes	Partially	Beaver dam damage to the road. Remove culvert and stabilize site or bring culvert up to standard.
Forest road S54A	Yes	Yes	Yes	BMPs planned, implemented, and fully effective.
Seven Wolf	Yes	Yes	Yes	BMPs planned, implemented, and fully effective.
Sure Bet	Yes	Yes	Yes	BMPs planned, implemented, and fully effective.
O Beech Wan Kenobo	Yes	Yes	Yes	BMPs planned, implemented, and fully effective.
Seven Wolf	Yes	Yes	Yes	BMPs planned, implemented, and fully effective.
Red Almost Done	Yes	Partially	Partially	Riparian Management Zone width inadequate and logging slash in woodland pond.

*Best Management Practices

Plan Consistency

Field monitoring supports the conclusion that water and soil resources are being protected by the proper implementation of State of Michigan best management practices.

Monitoring Question 2.

To what extent are we moving riparian corridors toward the desired condition?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	2 Years (Indicators i-iv)	2017

Forest Plan Direction

2600 Wildlife, Fish and Sensitive Plant Habitat Management, page 2-16.

Objective 1. In this planning period, annually restore or enhance 9 to 13 miles of riparian and in-channel stream habitat.

Indicators

(i). Miles of roads and trails obliterated, relocated, or improved in the riparian corridor.
(ii). Barriers removed for aquatic organism passage and to improve flow and sediment transport.
(iv). Acres of riparian vegetation improvements

During fiscal years 2018 and 2019, the Forest decommissioned about nine miles of roads found unnecessary for forest management and not maintained to standard (table 3). Additionally, the Forest corrected eight barriers to fish passage (table 4).

Table 3. Roads decommissioned in fiscal years 2018 and 2019

Activity	Miles
Fiscal Year 2018	
Forest Road 2152	0.88
Forest Road 2196	0.35
Forest Road 2212N	0.25
Forest Road 2422	0.21
Forest Road 2428CA	0.43
Forest Road 2683	0.28
Forest Road 2846	0.65
Forest Road A10C	0.61
Forest Road A56B	0.2
Forest Road A72C	0.86
Forest Road M84A	0.19
2018 Total Miles of Road Decommissioned	**4.9**
Fiscal Year 2019	
Forest Road 2058	0.36
Forest Road 2096	0.45
Forest Road 2212J	0.23
Forest Road 2245A	0.11
Forest Road 2247	0.78
Forest Road 2368B	0.35
Forest Road 2373 NR Hartney Lake	0.44
Forest Road 2388	0.12
Forest Road 2408A	0.2
Forest Road 2410D	0.37
Forest Road 2473C	0.2
Forest Road 2602A	0.24
Forest Road 2664	1.64
Forest Road 8105	0.18
Forest Road A10D	0.32
Forest Road A11C	0.08
Forest Road A22	0.34
Forest Road A90J	0.12
Forest Road A94O	0.04
Forest Road A95	0.49
Forest Road A96	0.87
Forest Road M64A	0.09
Forest Road M86B	0.72
Non-System Road NR A96F	0.14
Non-System Road off 2408A	0.23
Non-System Road NR 2602A	0.2
2019 Total Miles of Road Decommissioned	**9.3**

Table 4. Aquatic organism passage restoration projects

Fiscal Year 2018
Upper Farm Hill Creek at forest road 3119
East Lake Road and Flat Creek
Forest road 3119 Tributary to Bear Aquatic Organism Passage
Dam removal
Fiscal Year 2019
Pine River Tributary & forest road 3137 Aquatic Organism Passage Emergency Repair
Joel Creek at forest road 2481
Blind Biscuit Creek & Pine River Road (forest road 3137)
Sweiger Creek and forest road 3132

Riparian improvements in 2018 consisted of planting seedlings of long-lived conifers along cold-water streams to increase shade and provide large wood for in-stream, natural fish habitat in the future.

Table 5. Riparian planting 2018

Activity	Acres
Delias Run Riparian Planting	16
Indian River Riparian Planting	17
Indian River Riparian Planting	23
2018 Riparian Vegetation Improvement Acres	**56**

Plan Consistency

Aquatic organism passage, riparian vegetation management, and effective road management are all consistent with plan direction. The management direction described in the forest plan is effective in preventing undue resource damage due to authorized projects or activities.

Monitoring Element 2- Status of select ecological conditions.

Monitoring Question 5.

To what extent is the Forest maintaining or restoring conditions that result from or emulate natural ecological processes?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	2 Years	2017

Forest Plan Direction

5100 Fire Management, page 2-23

Objective 1. Prescribed Natural Fires. In this planning period, develop prescribed natural fire plans for all wildernesses and research natural areas.

Objective 1. Fuel Management. In this planning period, reduce wildfire risks by fuel management of an average of 1,000 acres per year.

Indicators

(i). Acres of prescribed burn to restore wetland and terrestrial habitat

Using prescription fire, the Forest treated 1,115 acres in 2018 and 2,877 acres in 2019. Post-fire monitoring includes the first-order[1] fire effects of all prescribed burns. Data such as ground cover consumed, surface color and ash depth, soil structure, root condition, and soil repellency are used to

[1] First-Order effects are those that concern the direct or immediate consequences of fire, such as biomass consumption, rate of fire spread, crown scorch, bole damage, burn severity, and smoke production.

develop strategies for managing secondary effects and restoration of ecological processes. Mechanical treatments for fuels management on the Forest included 6,885 acres in 2018 and 4,325 acres in 2019.

Figure 1. Prescribed Fire on the Hiawatha National Forest

Plan Consistency

The forest plan objective for prescribed fire is an average of 1,000 acres per year (forest plan p. 2-23). In 2018 and 2019, forest plan objectives for fuels management and prescribed natural fire were met.

Monitoring Question 6.

To what extent are insects and disease populations compatible with objectives for restoring or maintaining healthy forest conditions?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	2 Years	2017

Forest Plan Direction

3400 Forest Pest Management, page 2-22

Objective 1. In this planning period, identify and map areas of non-native invasive species concentration on the forest.

Indicators

(i). Acres, disturbance patterns, severity, and trends observed during annual flights for insect and disease damage

Table 6. Insect and disease flights in 2018 and 2019

Causal Agent	2018 acres within proclamation boundary	2018 acres within National Forest Lands	2018 timber sales	2019 acres within proclamation boundary	2019 acres within National Forest Lands	2019 timber sales
Beech Bark Disease	35,447	29,538	292	17,092	15,235	88
Forest Tent Caterpillar	30,557	25,018	1,692	26,538	17,219	99
Spruce Budworm	7,802	4,544	3	17,077	9,435	98
Jack Pine Budworm	256	244	15	181	169	0
Eastern Larch Beetle	279	244	0	701	701	0
Larch Casebearer	118	118	0	0	0	0
Unknown	183	63	0	0	0	0
Total Acres	**74,642**	**59,769**	**2,001**	**61,589**	**42,759**	**285**

The Forest Health Protection Division, State and Private Forestry conducted aerial pest detection surveys on the East Zone (figure 2) and West Zone (figure 3) of the Forest in 2018 and 2019 to identify areas with dead or stressed trees by species on the Forest (table 6).

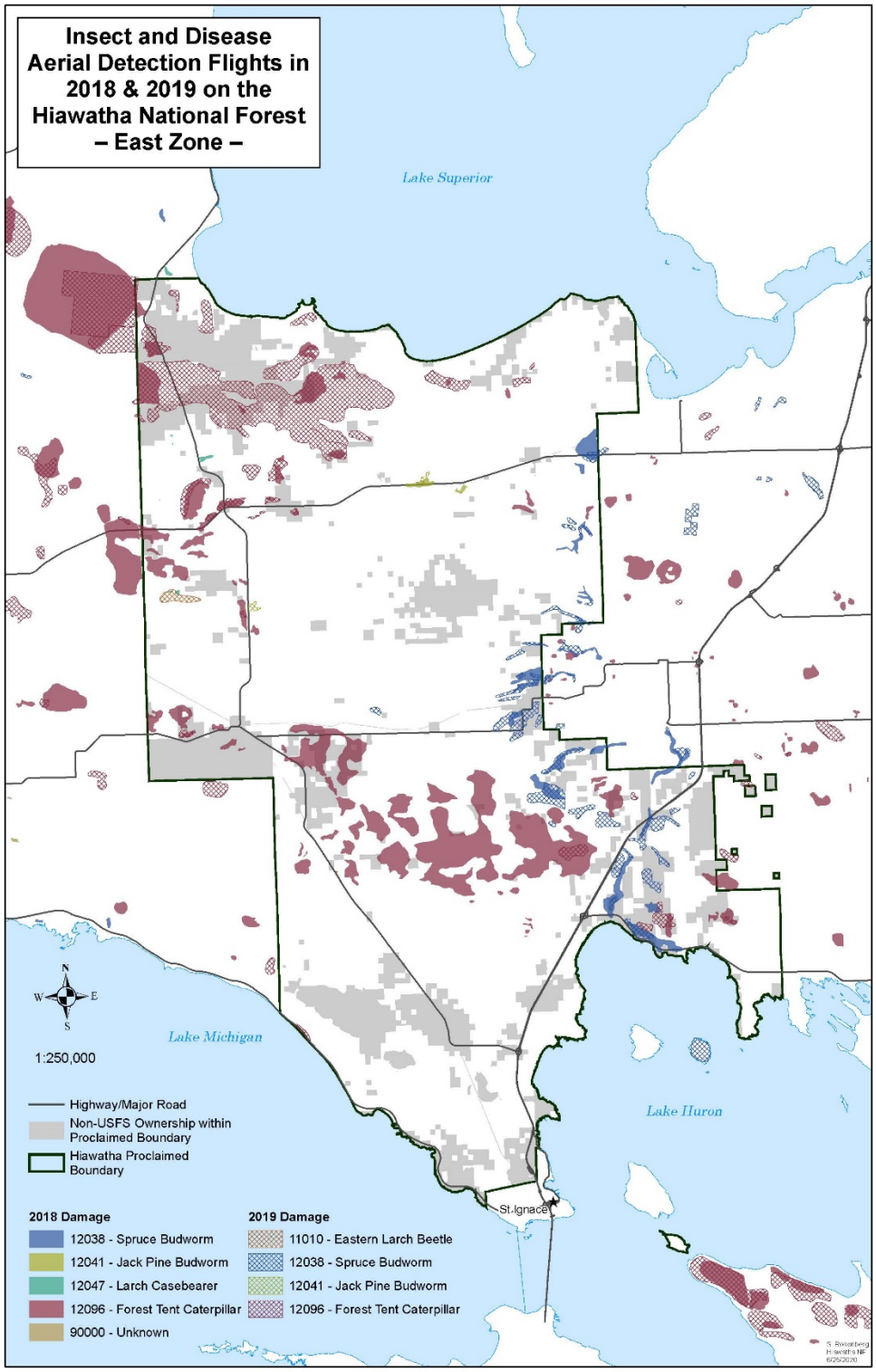


Figure 2. Insect and disease aerial detection results 2018 and 2019, East Zone

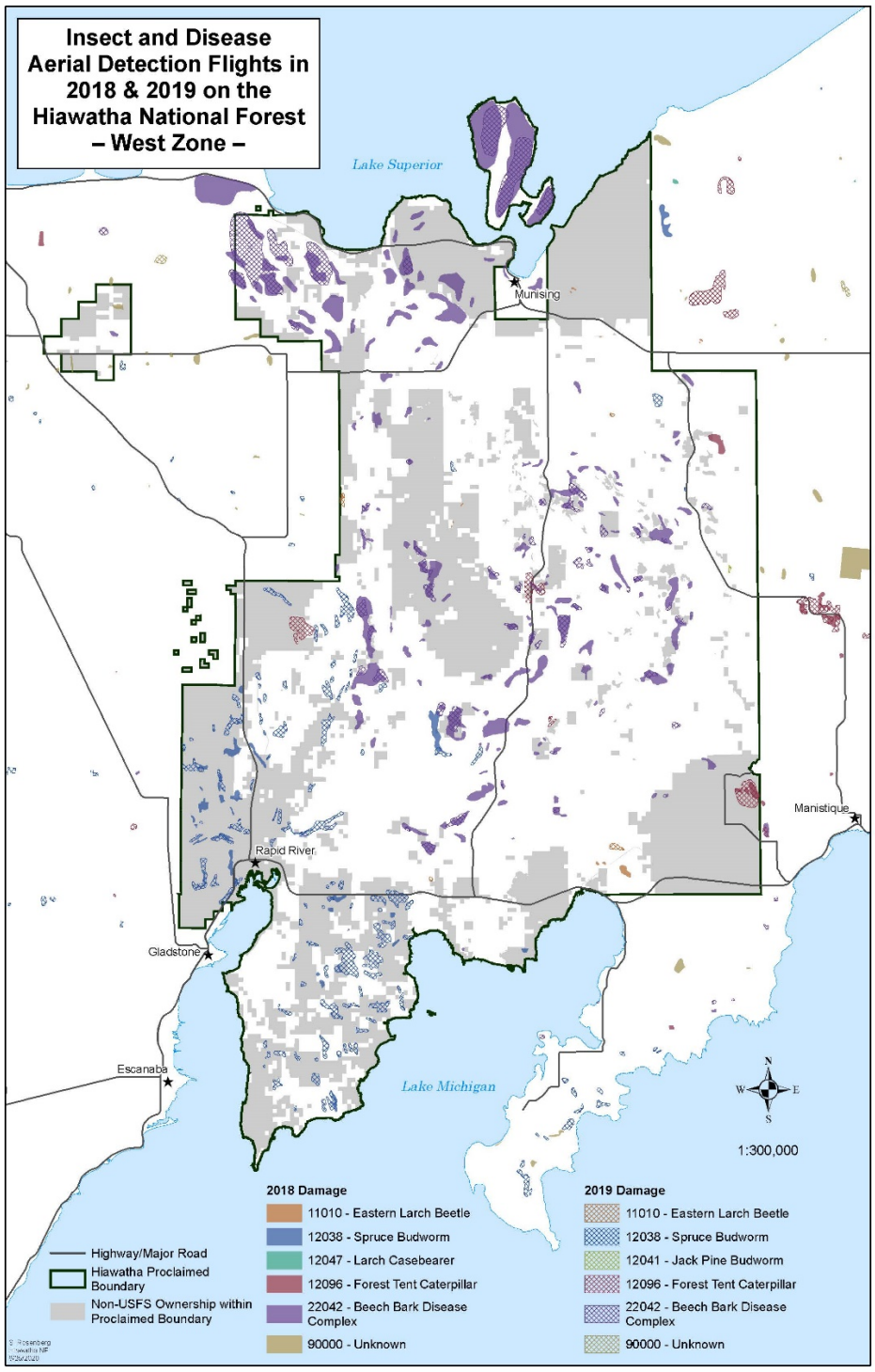


Figure 3. Insect and disease aerial detection results 2018 and 2019, West Zone

Beech Bark Disease

Beech bark disease occurs as a result of invasion by the beech scale insect, *Cryptococcus fagisuga.* The scale insect damages the bark, girdling, and killing the tree. Beech once covered a large portion of the forest; however, the rapid spread of the disease killed most of the trees in a relatively short period. It is believed that less than one percent of beech are resistant, and losses are expected to continue.

Figure 4. Aerial view of beech bark disease (photo by Michigan Department of Natural Resources)

Figure 5. A forester gathers scale from a tree infested with beech bark disease

During the 2018 aerial survey, about 30,000 acres were identified to have beech bark disease, dropping in 2019 to just over 15,000 acres (table 6). The Forest will continue to harvest beech with beech bark disease signs when prescriptions are written, and stands are harvested.

Forest Tent Caterpillar

Forest tent caterpillar infestations occur in 10 to 12-year cycles, with cycles lasting between two to six years. The caterpillars can completely defoliate trees, but trees usually regrow their leaves within a month. If defoliation occurs three or more years in a row, tree mortality can occur.

Figure 6. Forest tent caterpillar

During the aerial survey in 2018, just over 25,000 acres of the forest had been defoliated by forest tent caterpillars, decreasing in 2019 to just over 17,000 acres (table 6). Monitoring is ongoing to determine where large areas of trees are beginning to die from repeated defoliation.

Spruce Budworm

Spruce budworm is a native defoliator of spruce and fir. Severe outbreaks occur every 30 to 40 years lasting for ten or more years. A few (2 to 3) consecutive years of outbreaks typically won't affect the health of large areas of spruce and fir trees; however, extensive mortality may occur if an outbreak lasts more than five years.

Figure 7. Spruce budworm (left) and adult moth (right)

During the aerial survey in 2018, just over 4,500 acres were recorded as impacted by spruce budworm, and in 2019 over 9,400 acres were recorded as impacted (table 6). The spruce budworm population will continue to be monitored to determine the need for immediate harvest.

Figure 8. Examples of spruce budworm and crown dieback on the Hiawatha National Forest

Jack Pine Budworm

Jack pine budworm is a native defoliator impacting jack, red, white, and Scotch pine. Severe outbreaks occur every 10 to 12 years and can last for 3 to 4 years. A few consecutive years of outbreaks won't typically affect jack pine, but mortality may result when drought and other stressors, which increase a

trees vulnerability to infestation or disease are present. During the 2018 aerial survey, just over 200 acres had been impacted by jack pine budworm. In 2019 impacted acres decreased to 169 acres (table 6). Monitoring is ongoing for ecological stressors.

Figure 9. Jack pine budworm

Eastern Larch Beetle

Eastern larch beetle is a native bark beetle infesting tamarack (eastern larch) throughout its range in North America. During the aerial survey in 2018, just over 200 acres had been recorded as impacted by eastern larch beetle, increasing in 2019 to just over 700 acres (table 6). This insect will be monitored more closely to see if the population continues to grow.

Figure 10. Damage caused by the eastern larch beetle

Larch Casebearer

Larch casebearer is an invasive moth that feeds on tamarack needles from spring to fall. Larch casebearer larvae injure the tree by feeding on the inside. When populations are at high levels, the larch casebearer can defoliate 85 to 100 percent of the needles on tamarack. After four or more years of defoliation, the tamarack starts producing shorter needles, which stresses and can potentially kill the tree. During the aerial survey in 2018, just under 120 acres were reported to have been impacted by the larch casebearer, decreasing in 2019 to zero acres (table 6).

Figure 11. Larch casebearer

Plan Consistency

Aerial monitoring has been ongoing with monitoring data used in planning vegetative management activities. Monitoring has occurred in cooperation with state, local, and tribal governments (forest plan page 2-22).

Monitoring Question 7.

To what extent is Forest management managing undesirable occurrences of fire, insect, and disease outbreaks?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2017	2 Years	2017

Forest Plan Direction

2400 Vegetation Management, page 2-10

Standard 1. Maximum acre limits will not apply to salvage harvest resulting from catastrophic events such as fire, insect, and disease outbreaks or blowdown.

3400 Forest Pest Management, page 2-22

Objective 2. Annually treat 40 acres of identified non-native invasive species.

Indicator

(i). Acres harvested by salvage or sanitation; compare acres treated to acres identified in the previous monitoring question.

The Forest harvested about 12 acres as an intermediate salvage harvest due to insect infestation in 2018 and 2019. During the same period, the Forest did not harvest any acres for sanitation. The acres of forest impacted by wildfire did not kill a significant amount of the basal area to call for any amount of harvesting.

Figure 12. Examples of a salvage harvest (left) and diversity planting (right)

The harvest acreage is small compared to total impacted acreage because all causal agents except beech bark disease completely defoliate a majority of the trees in the stands for one or two years but do not kill the trees. The impacted acreage from causal agents is included in present and future timber sales shown in table 6 above. Following harvest, stands are planted or are naturally regenerated with white pine, hemlock, northern red oak, or a combination of species.

Plan Consistency

Aerial insect and disease surveys indicate that the management direction and mitigation measures described in the forest plan effectively prevent resource damage. There is no need to revise any practices or guidelines concerning protecting the forest from fire, insects, and disease.

Monitoring Element 3- Status of focal species.

Monitoring Question 10.

To what extent are key terrestrial habitat components (e.g., snags, woody material) being provided?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	10 Years	2017*

*Status of Focal Species reporting is on a ten-year interval. Past data has been retained here for continuity.

Forest Plan Direction

2600 Wildlife, Fish & Sensitive Plant Habitat, page 2-16.
Structural guidelines for habitat reserves include

- Two to four live trees greater than the average stand diameter per acre should be reserved.
- Variable size reserve islands/clumps up to a half-acre for every 10 acres should be reserved.
- For uneven-aged managed stands, up to five live den trees per acre should be reserved.
- In managed stands, reserve 2 to 10 snags, except where additional snags may benefit rare species.

Indicator

(i). Number of den and snag trees per acre in managed stands

Species richness and evenness are influenced by stand characteristics such as structural and vertical diversity and the availability of coarse woody debris. Amphibian and reptile species associated with conifer forest types are often closely associated with the large coarse woody debris.

The majority of the forest is mature with older-aged stand characteristics, such as snags naturally and downed woody debris. Project level mitigations include

- placing nest boxes for activities that reduce the number of snags or downed woody debris, such as thinning in red pine plantations and clear-cuts, to create wildlife openings.
- retaining variable-sized reserve islands of up to one-half acre for every ten acres to provide older-aged trees to serve as future snags.
- girdling live trees to accelerate tree mortality to create snags and downed woody debris.
- prescribed burning has increased in recent years to reduce fuel loading and bring fire back into the natural ecosystem.

Plan Consistency

Retention of den and snag trees is incorporated into project-level analysis and implementation. While not specifically recorded as a forest-wide metric, there is no indication that forest plan direction is not being implemented appropriately.

Table 7. Habitat component projects with affected acres by fiscal year

Activity	Acres	Year
North Bishop Snag Creation	82	2016
Bluebird Box Installation	132	2016
Bat Structures West Zone	2,000	2016
Bat Structures East Zone	2,058	2016
East Zone Drumming Log Creation	10	2017
Mike White Bat House	200	2017
Stevens Pine Snag Creation	365	2017
Baldy Lake Bat House North	200	2017
Coalwood Bat House	200	2017
Birch Farm Bluebird Houses	30	2017

Monitoring Question 13.

Is the type and frequency of disturbance associated with dry-sand outwash plains (ecological land type 10/20) appropriate to maintain ecosystem integrity throughout the historical range of variation?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	10 Years	2017

Forest Plan Direction

2600 Wildlife, Fish & Sensitive Plant Habitat, page 2-16.

Objective 1. In this planning period, maintain permanent openings within vegetation goals for habitat suitable for sharp-tailed grouse.

Indicator

(i). Sharp-tailed grouse population trend

Sharp-tailed grouse *(Tympanuchus phasianellus)* and other avian species such as Kirtland's warbler *(Setophaga kirtlandii)* are adapted to open-land and early successional stages of jack pine ecosystems created by fire and other disturbances common to ecological land type 10/20. The Forest categorizes

vegetation using ecological land type[2] classifications (forest plan, page 3-7). Ecological land type 10/20 is characterized by sandy outwash plains typically supporting jack pine or red pine. Fire is the major disturbance factor.

Figure 13. Sharp Tailed Grouse

In 2018 and 2019, about 86,000 acres of insect, disease, and fire occurred on the Forest. These types of disturbances create short-term habitat for sharp-tailed grouse as the areas become reforested. Habitat improvement has continued through mechanical opening maintenance, prescribed burning, and indirectly through managing habitat for Kirtland's warbler.

Opening maintenance activities slow or set back succession to keep habitat in the open condition favored by sharp-tailed grouse. Prescribed burning helps to recycle nutrients and improves the diversity and vigor of native plants communities, which improves habitat for sharp-tailed grouse. Management of permanent openings is on track with the annual target for habitat improvement.

Plan Consistency

Forest plan direction for snag and timber harvest provides for retention of two to ten snags (den/roosting trees) per acre within harvest units. Through natural disturbance and project design criteria, ecosystem integrity has been maintained and exceeded in ecological land type 10/20.

Monitoring Element 4- Threatened and endangered species

Monitoring Question 14.

To what extent is forest management contributing to the conservation of threatened and endangered species?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually (Indicator i, ii, v)	2015	2 Years (Indicator i, v)	2017
10 Years (Indicator iii, iv)	2015	10 Years (Indicator iii, iv)	2017*

*Reporting for Indicators iii and iv are on a ten-year interval. Past data has been retained here for continuity.

Forest Plan Direction

2600 Wildlife, Fish & Sensitive Plant Habitat, page 2-17

[2] Ecological Land Types (ELTs) are groups of ecosystems with similar soils and productivity capability and are indicators of the potential vegetation on a given land area.

Objective 1. In this planning period, complete ten conservation assessments of Regional Forester Sensitive Species.

Indicators

(ii). Acres of habitat improved for threatened and endangered species
(iii).Acres of appropriately stocked jack pine for KW habitat

***Canada Lynx** (Lynx Canadensis)-Threatened*

Studies indicate that Canada lynx may not occur on the Forest or may be present in small numbers dispersing across the landscape and attributable to dispersals from Canada. Only a few reported observations exist, most recently on Sugar Island in 2010.

While there are no known Canada lynx on the Forest, their status as federally threatened and the potential for quality habitat on the Forest drives the need for preservation of habitat and ongoing monitoring for the species.

Canada lynx monitoring is conducted as part of the furbearer monitoring survey. The Forest conducts about 206 miles of furbearer surveys annually, including 86 miles of furbearer survey routes and surveys completed specifically for NEPA projects. In 2018 and 2019, three primary management activities were implemented in support of Canada lynx conservation.

- Track surveys to detect lynx presence
- Active management of habitat for prey species
- Protection of denning and seclusion habitat

Figure 14. Canada Lynx. USFWS Photo. © *Ted Swem*

The availability of habitat for Canada lynx on the Hiawatha is not a limiting factor (table 8). Habitat for prey species and characteristics for denning and seclusion are abundant.

Table 8. Habitat components for Canada Lynx

Habitat Component	Acres
Snowshoe hare habitat	465
Red squirrel habitat	349
Denning habitat	279
Habitat connectivity	682
Quality connectivity habitat	192

Plan Consistency

Forest plan goals for Canada lynx include vegetation management to retain, improve, or develop habitat characteristics suitable for snowshoe hare and other important alternate prey in sufficient amounts and distributions so that prey availability does not limit lynx recovery.

Gray Wolf *(Canis lupus)*

Hiawatha personnel conducted track surveys to detect gray wolves forest-wide. The survey provides a means to identify various mammals that are otherwise infrequently observed due to factors such as relative low abundance or secretive behavior. Survey routes were random and non-random. Observers are knowledgeable regarding the characteristics of wolf tracks and other field signs of the species.

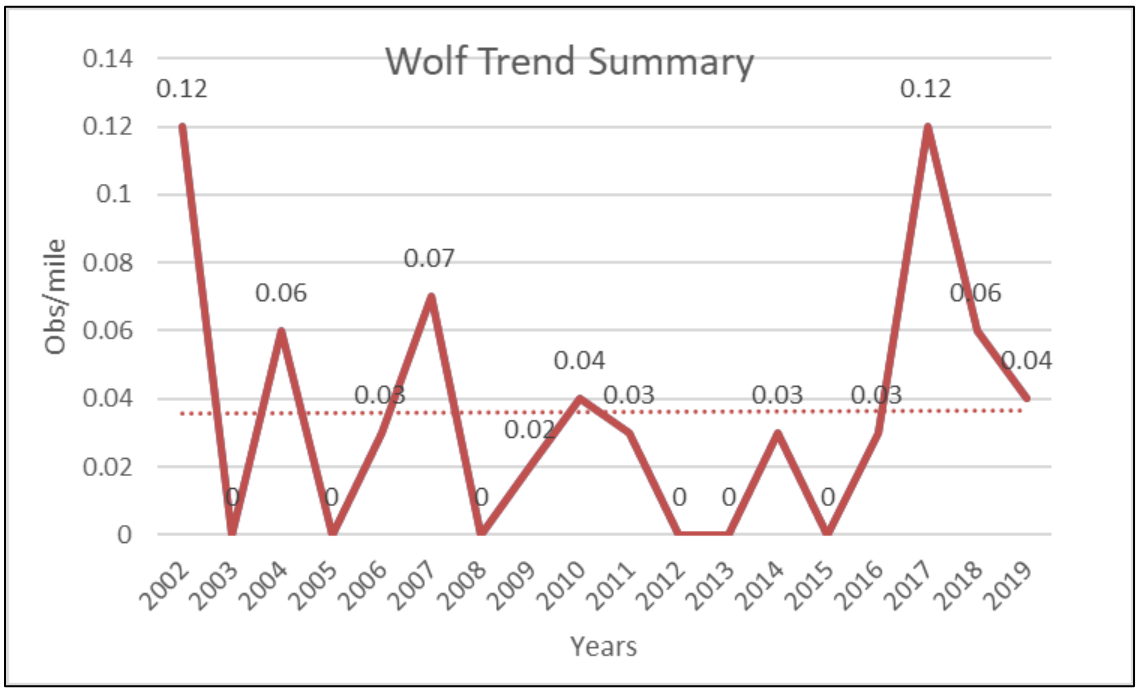


Figure 15. Wolf trend summary 2002–2019

The Forest conducted 125 miles of furbearer surveys in 2018 and 88 miles in 2019. Surveys were completed using snowmobiles in winter within a requisite length of time after snowfall. Fresh snow makes it easier to identify the species.

American marten, snowshoe hare, mink, weasel, gray wolf, coyote, fox, and bobcat tracks were among the furbearer tracks documented. On the East Zone, There were eight sets of wolf tracks observed in 2018 and four sets in 2019. No data were collected on the West Zone.

Figure 16. Gray wolf fitted with a tracking collar

Plan Consistency

The 17-year trend (figure 15) indicates that gray wolf numbers may be stable or increasing. Management activities on the Hiawatha are designed to benefit both wolves and prey species.

Hine's Emerald Dragonfly *(Somatochlora hineana) -Endangered*

There are 11 known locations for the Hine's emerald dragonfly on the Hiawatha, all in the East Zone and protected from disturbance through avoidance measures incorporated into project-level planning. Monitoring activity for Hine's emerald dragonfly aims to identify suitable habitat indicated by the presence of the species in an area.

Figure 17. Hine's emerald dragonfly. USFWS photo by Paul Burton

Based on surveys and consideration of habitat requirements, it is unlikely there are Hine's emerald dragonflies on the West Zone; however, the species may be present, with locations yet undiscovered. One adult was documented in Menominee County in 2008. Inventory of potential habitat continues on both zones.

Plan Consistency

The forest plan standard for Hine's emerald dragonfly is that breeding sites for the species will be protected. While no monitoring occurred during the current reporting period, protections were in place and managed through project-level analysis and design criteria.

Kirtland's Warbler *(Setophaga kirtlandii)-Endangered*

The Hiawatha National Forest implements management and monitoring activities in support of Kirtland's warbler conservation, including

- Breeding habitat monitoring.
  - Acres of suitable habitat are reported.
  - Acres sold and regenerated as suitable Kirtland's warbler habitat.
- Kirtland's warbler occurrences were monitored.
- The Forest collected data to compare stocking density, tree species, openings component and ground cover for occupied and unoccupied stands.
- Kirtland's warbler nests were protected by limiting project activities within and adjacent to occupied stands.
- The Forest coordinates with the U.S. Fish and Wildlife Service and Michigan Department of Natural Resources regarding species conservation measures.

Figure 18. Kirtland's Warbler

The Upper Peninsula population represents less than two percent of the total singing males in Michigan. Their range is distributed across the Forest, including stands in Eight-mile/Indian River, Wetmore and Whitefish Delta on the West Zone, and Raco Plains on the East Zone.

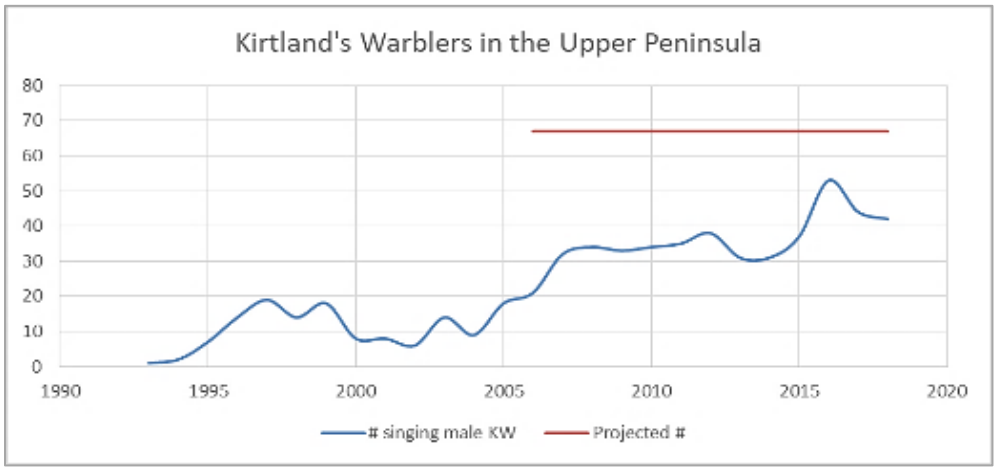


Figure 19. Kirtland's warbler singing males observed during the annual survey on Michigan's Upper Peninsula, 1994–2019

The Kirtland's warbler census is conducted annually over 15 days from June 6 to June 20 (figure 19). Only singing males are counted because they are easily recognoizable (by their song) and occupy distinct territories. The census enables the detection of differences in occupancy, duration of use, and density of singing males between management areas. It also allows managers to evaluate the success of habitat management activities. Current census results indicate a steady population increase over the last decade.

As a conservation-reliant species, an important consideration in the delisting process is agency commitments to continued management between the U.S. Fish and Wildlife Service, Michigan Department of Natural Resources, and the U.S. Forest Service. Agencies work together to develop breeding habitat development techniques based upon changing Kirtland's warbler habitat relationships and declining timber markets. Brood parasitism with brown-headed cowbird is also being assessed.

Table 9. Kirtland's warbler breeding habitat model

Agency /Forest	Average Acres /Pair	Duration (Years)	Average Acres /Goal	Predicted Pairs Traditional Management (100 percent)	Average Acres Available	Predicted Pairs Traditional Management (75 percent)	Predicted Pairs Traditional Management (25 percent)	Total Predicted Pairs
Hiawatha	100	10	670	6,700	67	50	8	59
Huron-Manistee	19	9	1,600	13,760	724	543	91	634
MDNR*	22	10	1,560	15,600	709	532	89	620
		Total	**3,830**	**36,060**	**1,500**	**1,125**	**188**	**1,313**

*Michigan Department of Natural Resources

Several factors contribute to the individual agency's habitat management goals, including Dedicated/Essential Habitat, bird-habitat relationships such as bird density and duration of use, and cost of habitat establishment. These factors and recent data were used to update the Kirtland's Warbler Breeding Habitat Model (table 9). The model is used to guide and support the agencies' Kirtland's warbler habitat management program and any modifications consistent with the goals and objectives as detailed in the 2015 Kirtland's Warbler Breeding Range Conservation Plan.

Figure 20. Aerial image of the opposing wave pattern used in Kirtland's warbler habitat

Agencies continue to evaluate non-traditional silvicultural techniques on up to 25 percent of the annual habitat goal to increase cost-effectiveness, improve the marketability of jack pine, and increase habitat biodiversity. Techniques implemented are primarily opposing-wave (figure 20) high-density

plantations in the northern Lower Peninsula of Michigan and anchor-chain scarification with openings creation in the eastern Upper Peninsula. Suitable habitat for Kirtland's warbler is jack pine stands with a minimum stem density of about 1,100 trees per acre in a similar age class with a contiguous area of 80 acres or more.

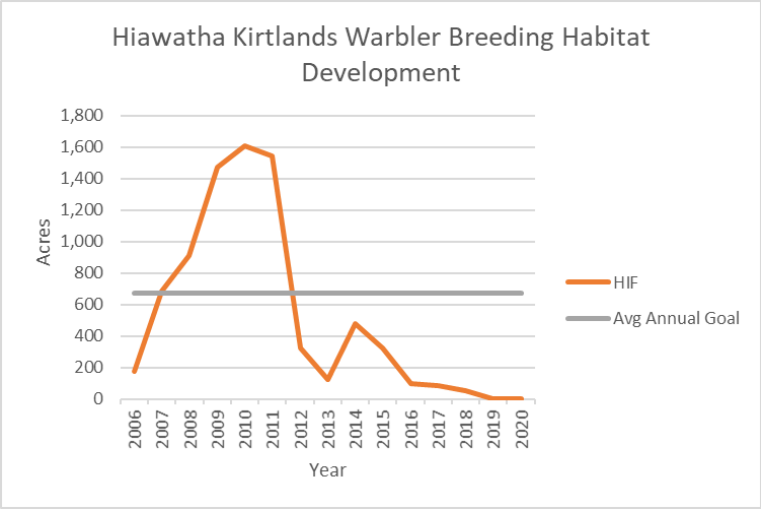


Figure 21. Jack pine reforestation in Management Areas 4.2 and 4.4 on Ecological Land Type 10/20

Implementation of conservation recommendations for Kirtland's warbler is ongoing. The Forest is reviewing jack pine harvest, supplemental seeding, site preparation, and slash treatment techniques to determine if additional efficiencies can be achieved for regenerating jack pine management for Kirtland's warbler breeding habitat. This adaptive management approach is intended to provide the best information for meeting the conservation needs of this species into the foreseeable future.

Population monitoring indicates that the species is stable in Michigan's Upper Peninsula. The number of males observed on the Forest accounts for over 93 percent of the Upper Peninsula population. The Forest Service and Michigan Department of Natural Resources remain committed to producing and maintaining habitat quantity and quality to support a minimum of 1,300 breeding pairs as identified in the 2015 Kirtland's Warbler Breeding Range Conservation Plan.

Plan Consistency

The Forest has a goal of providing a minimum of 6,700 acres of breeding habitat for Kirtland's warbler. Since habitat can remain occupied for about ten years, the Forest needs to manage about 670 acres of jack pine annually to meet conservation needs for Kirtland's warbler. An outbreak of jack pine budworm in 2006 caused the Forest to exceed reforestation goals. Subsequently, the Forest reduced reforestation from 2012 to 2019. Over the last ten years, the reforestation averaged 696 acres per year, 26 acres over the acreage prescribed in the forest plan. As a result, current management is effective in guiding direction for Kirtland's warbler on the Hiawatha.

Northern Long-Eared Bat *(Myotis septentrionalis)*-Threatened

Acoustic bat survey monitors were set up at ten locations on the East Zone of the Hiawatha National Forest in 2018. Species were identified using computer software, and northern long-eared bats were not detected at a level that suggested a significant likelihood of presence at any of the ten sites. Acoustic bat survey monitors were set up at an additional 12 locations in 2019. Species were identified using computer software, and northern long-eared bats were detected at a level that suggested a significant likelihood of presence at two of the sites.

Figure 22. Northern long-eared bat

Only two percent of National Forest System lands receive any vegetation management in any given year. In addition, harvest activities on the Forest occur outside of the summer occupancy period, further reducing the risk bats could be injured or killed while in a roost (West, pers. comm. 2020).

In areas being treated, structural guidelines for habitat reserves (2600 Wildlife, Fish & Sensitive Plant Habitat, page 2-16) directs the retention of snags and den trees that could be roost trees for bats and snag creation activities improve roosting habitat. Thinning of hardwood and conifer stands would likely improve northern long-eared bat foraging habitat.

Plan Consistency

Leading scientists have indicated that forest management practices do not have a connective effect with white-nosed syndrome (Bat Conservation International 2008). Therefore, vegetation treatments on the Forest would have no indirect effects related to white-nosed syndrome and the population decline of these bats. This disease is having a significant impact to affected bat species and is expected to result in reduced breeding populations in the foreseeable future.

Piping Plover *(Charadrius melodus)-Endangered*

Monitoring for piping plover begins along the Lake Michigan shoreline in mid-April. Occupied habitat is monitored routinely until the plover begin their fall migration to wintering grounds in South Carolina and Florida.

Surveillance of approximately 13 miles of shoreline on 1,725 acres is made possible through partnerships with The Nature Conservancy, the U.S. Fish and Wildlife Service, the University of Minnesota, Lake Superior State University, and volunteers. Nests are protected and monitored until the eggs hatch and the young fledge.

The piping plover habitat improvement grant through Lake Superior State University and the Great Lakes Restoration Initiative has enabled the treatment of non-native invasive plants with the potential

to modify plover habitat along the Lake Michigan shoreline. The Three Lakes Cooperative Invasive Species Management Area treated mainly spotted knapweed, from the Pointe aux Chenes shoreline, dunes, trail, and parking area.

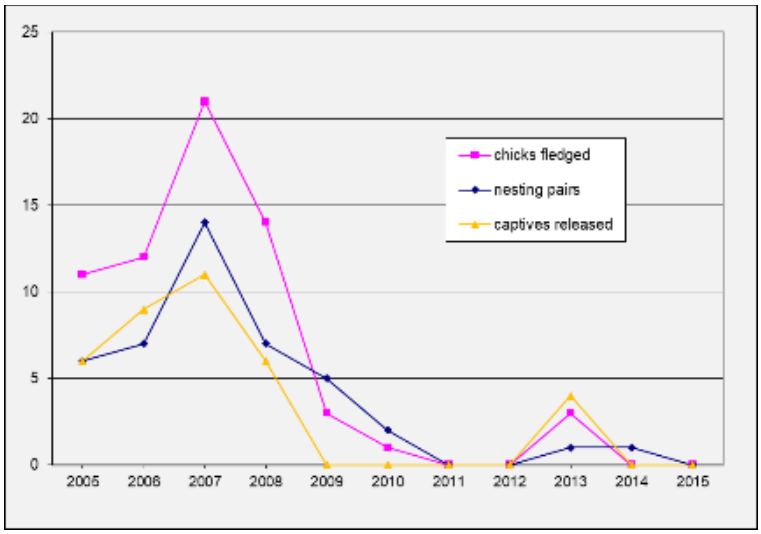


Figure 23. Piping plover nesting activity on the Hiawatha, 2005-2015

Since 2010, rising water levels have steadily reduced the availability of shorelines. The result is that nesting habitat, active nests and productivity have steadily declined (figure 23).

There have been no active nests on the Hiawatha since 2013. No piping plover were observed in 2018 or 2019.

Figure 24. Piping plover. USFWS photo

Plan Consistency

The current monitoring and survey practices are effective in assessing the management approach for piping plover on the Forest. We anticipate adequate personnel to continue monitoring and implement surveillance, nest protection, and habitat enhancement as appropriate into the foreseeable future. Still, the presence of piping plover on the Forest is unlikely unless water levels on the Great Lakes recede.

American Hart's-Tongue Fern *(Asplenium scolopendrium var. Americanum)-Threatened*

Two management activities contribute to the health and stability of American hart's-tongue fern on the Hiawatha National Forest.

- Selected occurrences are monitored to obtain status information, identify potential threats, and develop timely and appropriate responses to identified threats.
- Non-native invasive plants near known populations are identified and treated.

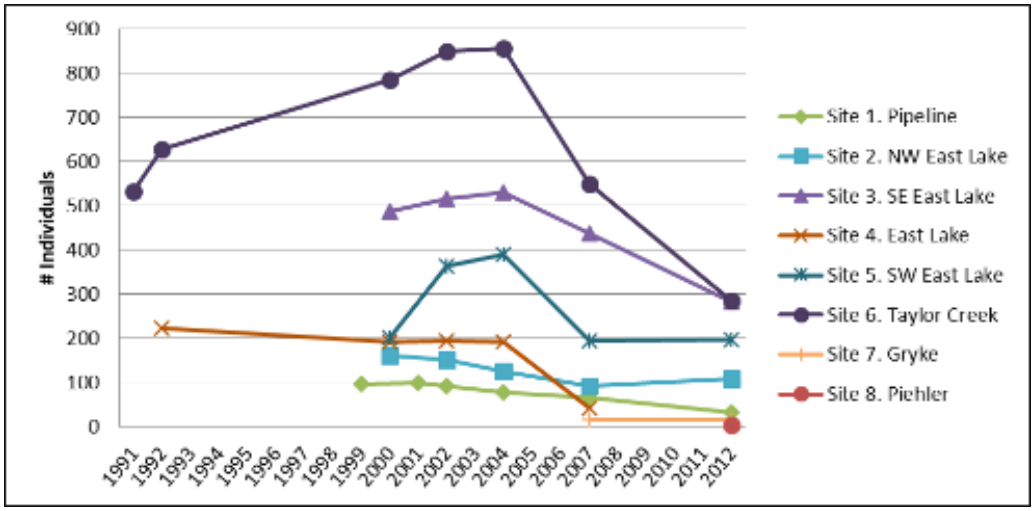


Figure 25. Summary of American hart's tongue fern on Hiawatha National Forest

American hart's tongue fern has been documented in 24 locations in the Great Lakes region. In Michigan's eastern Upper Peninsula, American hart's tongue fern occupies limestone boulders and outcrops of the Niagara Escarpment under rich hardwood forests. The Hiawatha National Forest supports eight separate occurrences, with 970 individuals documented (figure 25). The most recent discovery of American hart's tongue fern on the Hiawatha occurred in 2007 and 2012. Based on the periodic discovery of new populations since 1990, additional occurrences are likely in areas without recent botanical surveys. No monitoring of American hart's tongue fern occurred in 2018 and 2019.

Plan Consistency

Forest plan guidelines state that management within the Niagara escarpment community should be designed to protect American hart's tongue fern occurrences. While management of American hart's tongue fern is consistent with forest plan direction, the population of American hart's tongue fern has decreased since 1991. All known sites are protected and managed for invasive species to reduce inter-species competition. This indicates that current management may be only partly effective in protecting American hart's tongue fern on the Hiawatha.

Lakeside Daisy *(Hymenoxys herbacea)-Threatened*

Two management activities contribute to the health and stability of the lakeside daisy.

- Known sites are monitored to collect status information, identify potential threats and develop adequate responses to those threats.
- Monitoring for non-native invasive plants occurs near the known site. This helps ensure timely response before non-native invasive plants threaten established lakeside daisy occurrences.

Lakeside daisy is known at two locations in Michigan. The original site, first recorded around 1996, is located on both sides of Brevort Lake Road. The north side is within a Michigan Nature Association

preserve. Lakeside daisy plants on the south side of Brevort Lake Road grow in three clumps within a powerline corridor right-of-way adjacent to the road. A second population was recorded in 2014, near the St. Martin Peninsula.

Figure 26. Lakeside Daisy

Recovery activities for lakeside daisy include the installation of herbivore exclosures at the Brevort Lake Road site and flower monitoring and non-native invasive plant removal at the St. Martin site. Lakeside daisy was monitored at each location in both 2018 and 2019 and verified to still occur at each site. Both sites continue to be vulnerable to maintenance activities in the right-of-way and competition from non-native invasive plants along the roadside. Continued monitoring is needed to ensure quick response to threats and relocation to a more remote area is recommended in order for these populations to persist in the long term.

Figure 27. Location where the masticator was stuck causing impacts to soil and hydrology

On July 22, 2019, a utility sub-contractor was performing right-of-way maintenance when their masticator became stuck (figure 27) in the unstable tufa substrate on the south side of Brevoort Lake Road, within the Lakeside Daisy Brevort Township Site, which is occupied by both lakeside daisy and Houghton's goldenrod, and several Regional Forester's Sensitive Species plants. The machinery was extracted from the site. The resulting damage caused heavy rutting and impacted the hydrology of the site.

To ensure the long-term persistence of the population, the Hiawatha is pursuing a collaboration with the Fish and Wildlife Service and Michigan Nature Association to address establishing an additional population of lakeside daisy at a site that can be protected from these threats.

Figure 28. Lake Huron tansy at Pointe Aux Chenes (left). Volunteers pull spotted knapweed in the dunes overlooking the Brevort River and Lake Michigan (right). Photos by S. Blumer

Plan Consistency

Forest plan guidelines include protection of lakeside daisy in the Alvar community[3] of the Upper Peninsula of Michigan. Ongoing monitoring, management of non-native invasive species, and excluding herbivore access to lakeside daisy communities has proven effective for managing lakeside daisy on the Forest.

Pitcher's Thistle *(Cirsium pitcheri)-Threatened*

Two main management activities contribute to the health and stability of the Pitcher's thistle.

- Occurrences are monitored to collect status information, identify threats, and develop adequate responses in a timely fashion.
- Monitoring and hand pulling non-native invasive plants.

Figure 29. Pitchers Thistle

The Pitcher's thistle population on Forest is one of the largest, with over 10,000 individuals, in the species' entire distribution. The population extends almost continuously along approximately seven miles of the Lake Michigan shoreline from the Pointe aux Chenes Research Natural Area throughout the dune system adjacent to U.S. Highway 2. In 2015, 2016, and 2017 non-native invasive plants were

[3] In Michigan, alvar communities are commonly found near northern Great Lakes shores where flat bedrock is exposed.

removed from Pitcher's thistle sites. Both spotted knapweed and Scotch pine were removed. Spotted knapweed was hand-pulled. Scotch pine was treated through contractual cutting.

Plan Consistency

Forest plan guidelines include protecting Pitcher's thistle occurrences along shorelines, dunes, and sand beach communities and considering biological controls when treating non-native thistles. Current plan direction provides measures for protecting Pitcher's thistle along shorelines through project level mitigations and design criteria. Additionally, management of non-native thistle and other species includes hand-pulling of weeds.

Dwarf Lake Iris *(Iris lacustris)-Threatened*

Three main management activities contribute to the health and stability of dwarf lake iris.

- Occurrence surveys collect status information and identify threats used to develop adequate responses in a timely fashion.
- Occurrences in Round Island Wilderness were recorded.
- Monitoring and hand pulling non-native invasive plants are conducted near known occurrences.

On the East Zone, dwarf lake iris occurs on Round Island in five colonies and at one mainland site on the St. Martin peninsula. Comprehensive monitoring of Round Island populations occurred in 2008 and 2015. The St. Martin Peninsula population was first recorded in 2014. Dwarf lake iris was historically recorded at Pointe aux Chenes, but the population has not been observed since 1991.

Table 10. Summary of dwarf lake iris occurrences on the East Zone in 1981, 1993, 2008, and 2015

Site Name	1981	1993	2008	2015	Comments
Pointe aux Chenes	50	N/A	N/A	N/A	Several colonies distributed through open areas. Last observed 1991.
St. Martin Peninsula	N/A	N/A	N/A	>4,000	First observed September 2014.
Round Island West (IR1)	N/A	5,000	120	N/A	Threats include non-native *Lonicera* spp. and *Hieracium* spp.
Round Island Southeast (IR5)	N/A	>12	>1,000	N/A	Threats include non-native *Hieracium* spp.
Round Island Northeast (IR2)	N/A	20,000	70	N/A	Threats include non-native *Hieracium* spp.
Round Island Northeast (IR3)	N/A		100	N/A	Threats include non-native *Hieracium* spp.
Round Island Northeast (IR4)	N/A		>100	N/A	Threats include non-native *Hieracium* spp.

Table 10 summarizes dwarf lake iris occurrences on the East Zone of the Forest. Recovery activities for dwarf lake iris in 2018 and 2019 included monitoring at St. Martin Point and non-native invasive plant removal efforts at Round Island and St. Martin Point.

The objective of monitoring at the St. Martin Point dwarf lake iris site was to estimate population size and identify threats. Monitoring was conducted in early June, and at least 4,000 vegetative shoots were counted among all patches in this occurrence. The largest patch in the northeast corner supported at least 1,000 shoots. The primary threats to this population are rising Great Lakes water levels (some plants grow within 1 foot of the lake's high-water mark) and non-native invasive plants competition.

Houndstongue and spotted knapweed are expanding into some dwarf lake iris sites. In 2015 the Forest partnered with Superior Watershed Partnership to begin manual removal within the entire area of occupied and suitable unoccupied dwarf lake iris habitat. Because of Great Lakes Restoration Initiative Threatened and Endangered Species habitat funding, Superior Watershed Partnership removed non-native invasive plant species and mapped populations, non-native invasive plant removal continued in 2018 and 2019, respectively.

Off-highway vehicle user-created trails closed in 2012 were found re-opened in the historic population site on the west end of Weden's Bay with more damage located along the shoreline (rutted). A long-term solution is needed to stop unauthorized motorized activities from damaging this site. Off-highway vehicle damage was again documented in 2019.

Figure 30. Dwarf Lake Iris

Plan Consistency

Plan guidelines for management in Great Lakes shoreline and interdunal wetland communities are designed to protect dwarf lake iris. The current monitoring and survey practices are effective in assessing the management approach for dwarf lake iris on the Forest and will continue.

Eastern Region Sensitive Wildlife

Bald Eagle *(Haliaeetus leucocephalus)*

The Forest implemented management activities in support of bald eagle conservation. All management activities are consistent with guidance for sensitive species conservation specified in the forest plan. Based on past results, it is still believed that management activities on the Forest are not resulting in a lack of success at nest sites.

Nest Surveys

The Michigan Department of Natural Resources has not conducted an eagle monitoring flight since 2017. As the number of territories[4] increases across the State, competition among nesting pairs will likely result in a reduction in overall reproductive success. There have been between 8 and 27 active bald eagle territories recorded on the Forest over the last decade. Overall, 76 percent successfully fledged at least one young, which is equivalent to 1.5 young per nest. Five active territories did not fledge young.

Trail Closure Monitoring

On the West Zone, monitoring found that off-highway vehicles were still accessing trails near a bald eagle nest. Barrier posts blocked access to the nest tree, and interpretive signs were prominently displayed. Bald eagles were later observed at the nest. However, observations did not establish whether the nest was successful.

[4] A territory is an area protected by a pair of bald eagles

Plan Consistency

Current management has been effective in guiding direction for bald eagles on the Forest. Monitoring efforts should continue to survey for active nests and document nesting success noting any disturbance activities from Forest management or other human use, such as off-highway vehicle trails. As long as reproduction remains near 1.5 young per active nest, eagle populations should remain stable. Based on the results of monitoring, no changes in bald eagle management are recommended.

Northern Goshawk *(Accipiter gentilis) and* ***Red-Shouldered Hawk*** *(Buteo lineatus)- Regional Forester's Sensitive Species*

The Forest implements management activities in support of red-shouldered hawk and northern goshawk conservation. The management activities are consistent with guidance for sensitive species conservation specified in the forest plan. There were six major activities conducted over the last decade.

- Historic nests were surveyed for the presence of nesting pairs
- Historic nests were surveyed for evidence of successful nesting and productivity
- Raptor activity was monitored near timber sales
- Active nest trees in timber sales were protected with buffers and seasonal restrictions.
- Habitat analysis was completed for projects conducted on the Hiawatha National Forest
- Results of habitat analyses were applied to project design, to lessen species impacts

Productivity Surveys

Northern goshawk and red-shouldered hawk are Regional Forester's sensitive species and are monitored by the Forest and the Michigan Natural Features Inventory. Since the entire Forest is not surveyed in any year, only known nest sites are monitored, with priority given to nests occurring in active timber sales.

Productivity surveys for active nests are conducted each year in June and July (figure 31). The nests' contents are determined using direct observations or a 50-foot fiberglass telescopic pole with a wireless video camera attached at the top. Observers on the ground used a hand-held monitor to see directly into the nest. Nests having adults or young present are termed "Active-Breeding" and are assumed successful. Successful nests are those having live young at the time surveys were conducted.

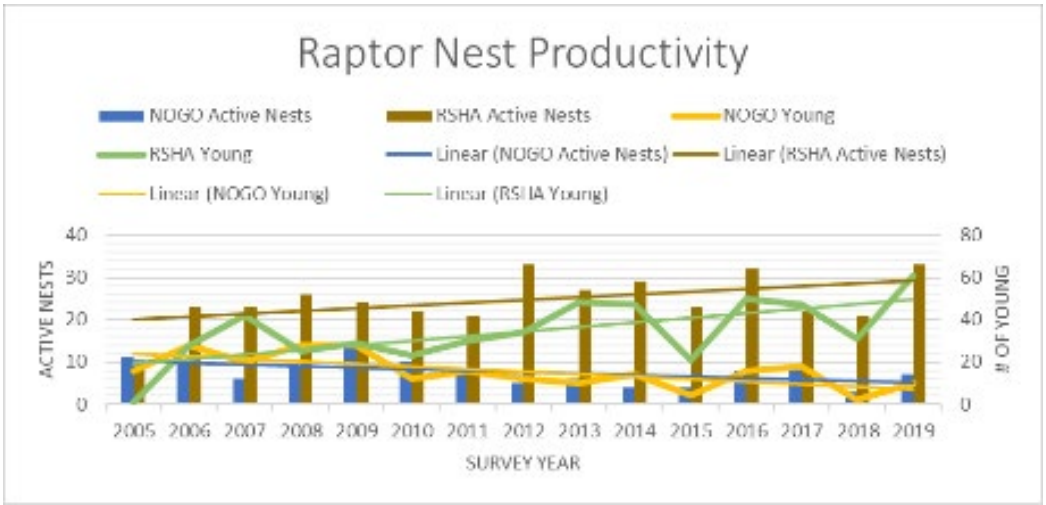


Figure 31. Raptor nest monitoring results for the Hiawatha National Forest

Based on the monitoring conducted over the past several years, the red-shouldered hawk appears in greater numbers and is likely more secure than the northern goshawk populations. Even though our current monitoring constitutes a small sample of the two species' total population, that data indicates that management appears to be effective in assessing broad trends of the species on the Forest.

Nests should be monitored annually during the breeding period and results documented in the U.S. Forest Service Natural Resource Management Wildlife database to foster adaptive management. Active nests in the vicinity of timber sales should be the highest priority for monitoring. If the previous year's nest is no longer active, a survey should be conducted across the pair territory to locate the new active nest.

Raptor Use Within Timber Sale Areas

Several nests checked were within timber sale project areas. Avoidance measures were applied to active nests, including limiting activities and timing when near a nest and fledging location. Annual nest monitoring is used to evaluate the effectiveness of these measures.

Plan Consistency

Plan guidelines include the protection of active and historic breeding territories, nesting areas and post-fledging habitat. Survey data in figure 31 shows annual fluctuation, with an upward trend in the red-shouldered hawk productivity and decreasing productivity in northern goshawk productivity over the twelve-year monitoring period. Both recorded and anecdotal data indicate that current management is effective in guiding direction for northern goshawk and red-shouldered hawk. Additional data is needed before changing management direction in the forest plan for northern goshawk and red-shouldered hawk.

Sharp-tailed Grouse *(Tympanuchus phasianellus) - Regional Forester's Sensitive Species*

Sharp-tailed grouse is a sensitive species on the Hiawatha National Forest. All management activities are consistent with guidance for sensitive species conservation specified in the forest plan. Three major activities are conducted

- Sharp-tailed grouse leks (dancing grounds) were surveyed
- Active leks are protected
- Openland habitat were treated mechanically or with prescribed fire to maintain or enhance habitat for sharp-tailed grouse and associated species

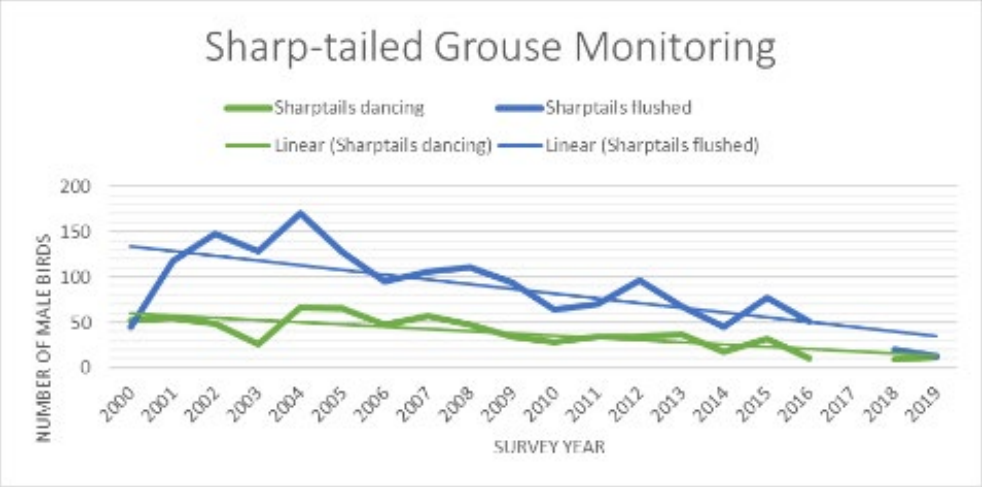


Figure 32. Sharp-tailed grouse counts of males on the Forest, 2000–2019

Approximately 9,450 acres of open land managed as barrens and young pine regeneration were surveyed for sharp-tailed grouse. Monitoring was conducted at 31 leks across the Forest. The number of dancing males and the number of flushed individuals were counted annually at each of the lek sites from approximately March 21 through May 15. Based on the population monitoring data, the sharp-tailed grouse population on the Hiawatha appears to be decreasing. Survey results from 2000 to 2019 show a decline in the number of dancing males across the forest (figure 32).

Heavy snows make detection of sharp-tailed grouse difficult, as snow-covered leks may not be used during survey periods. Grouse may also move from traditional lek sites to habitat that isn't surveyed. These factors may be contributing to lower detectability of sharp-tailed grouse so the downward trend may not be as severe as data imply.

Plan Consistency

Plan objectives for sharp-tailed grouse state: In this planning period, maintain permanent openings within vegetation goals for habitat suitable for sharp-tailed grouse. The decline in sharp-tailed grouse over the last decade warrants increased attention. Recent severe winters have reduced detectability in the field, and other factors including a short-term reduction in habitat maintenance.

Monitoring Element 5- Status of visitor use and visitor satisfaction.

Monitoring Question 17.

What are the effects of off-highway vehicles on the physical, biological, and social environment?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2017	2 Years	2017

Forest Plan Direction

2300 Recreation Management, page 2-6

Goal 1. A safe and cost-effective road and trail system provides a variety of recreation experiences, responds to changing social needs and minimizes user conflicts.

Goal 2. Trail and route development provide for multiple use, mitigate social conflicts and prevent natural resource damage.

Indicators

(ii). Acres of soil compacted, rutted or eroded by off-highway vehicle use
(iii).Number of water quality erosion sites caused by off-highway vehicles

Figure 33. Resource damage to trails (left) and dune destabilization (right)

Monitoring and restoration are ongoing in cooperation with Michigan Department of Natural Resources staff to rehabilitate degraded areas where illegal off-highway vehicle use has occurred. Common damage includes soil erosion, dune destabilization, invasive species introductions, and damage to wetlands and lakeshores.

Monitoring Question 21.

To what extent is Wilderness being managed to protect the biological and physical resources and wilderness values while accommodating recreational uses?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2015	10 Years	2015

*Wilderness reporting is on a ten-year interval. Past (2016-2017) data has been retained here for continuity.

Forest Plan Direction

2300 Recreation Management-Wilderness. Page 2-8

Objective 1. During this planning period, evaluate the need for management plans for Round Island, Mackinac and Delirium Wildernesses.

Indicator

(i). The number of Wilderness Performance Elements met.

Annual performance scores for Wilderness areas rose between 2016-2017 as a result of continued improvement in the management of our wilderness areas for recreational uses. Management of non-native invasive species is ongoing and generally concurrent with management planned for adjacent project and management areas. While in Wilderness, only hand pulling and non-motorized control methods are used. Five colonies of federally threatened dwarf lake iris are managed and monitored on the Round Island Wilderness.

Plan Consistency

Forest plan goals for Wilderness include protecting Wilderness values while accommodating recreation use. Performance scores for recreation in wilderness areas have increased while management has protected biological and physical resources. This indicates that plan direction has been effective in managing wilderness values, recreation, and visitor satisfaction.

Monitoring Question 23

What is the status of visitor use and visitor satisfaction?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
5 Years	2016	6 Years	2017*

*Visitor Use and Satisfaction reporting is on a six-year interval. Past data has been retained here for continuity.

Forest Plan Direction

2300 Recreation Management

Goal 1. A variety of recreation facilities, settings and opportunities which minimize user conflicts.

Goal 2. Complimentary recreation opportunities for forest visitors are developed in coordination with other regional recreation providers.

Indicator

(i). National Visitor Use Monitoring metrics.

Results from the 2016 National Visitor Use Monitoring suggest that Forest visitation rates remain high with greater than 96 percent of respondents reporting “Somewhat Satisfied” (19 percent) or “Highly Satisfied” (77 percent) across all survey categories.

Plan Consistency

The satisfaction rating provided by the National Visitor Use Monitoring program indicates that visitors are happy with their experiences on the Forest. While new interests and trends may drive a shift in forest recreation, at this time, there is no need to revise plan direction concerning recreation. The forest plan's management direction is effective in preventing undue resource damage.

Monitoring Element 6- Climate change and other stressors.

Climate change indicators were developed to identify key impacts to the Great Lakes region and track how changing climate is affecting Forest resources. Many activities depend on the winter season. As a result, the Forest chose to monitor winter severity and duration to assess how climate change is affecting activities guided by the forest plan. The National Oceanographic and Atmospheric Administration divides States into climate divisions. The Forest is located within Climate Division MI02 (figure 34).

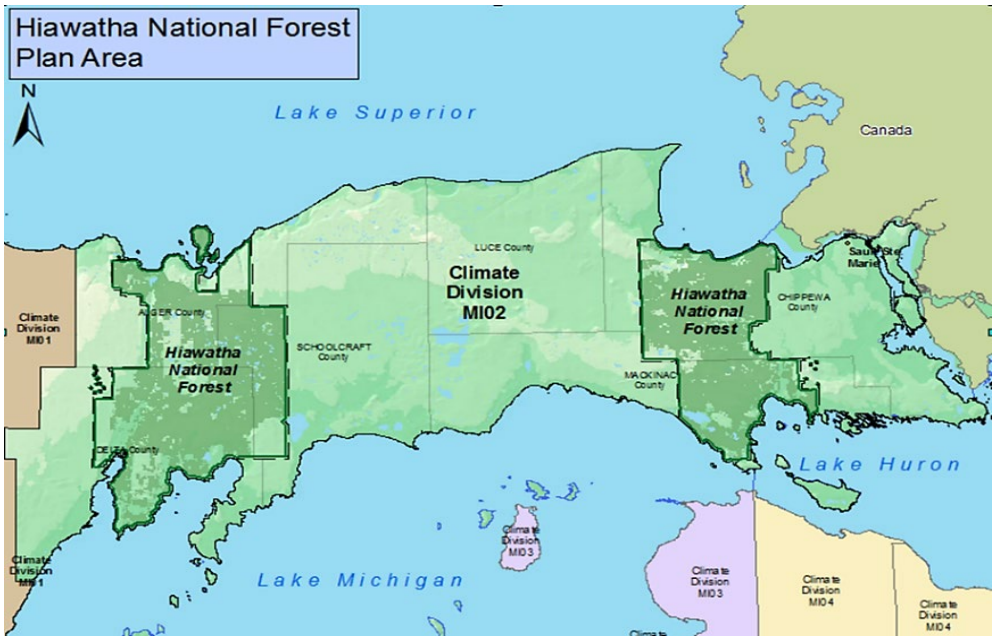


Figure 34. Climate Division MI02 and the relationship to the Hiawatha National Forest

Forest Plan Direction

The monitoring element for climate change was added in 2016 as an administrative change to the 2006 Hiawatha National Forest Plan. While the forest plan does not directly address the effects of climate change, it includes indicators and activities directly connected to changing climate.

Specifically, the plan provides forest-wide management direction for resources such as wildlife, fish, and sensitive plant habitat management (page 2-16), forest pest management (page 2-22), and fire management (page 2-23). Adaptations to mitigate climate change are included in the discussions for environmental management (page 2-2), vegetation management (page 2-10), and watershed management (page 2-13).

Monitoring Question 24.

How are the timing and duration of winter weather conditions changing across the plan area on an annual basis?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Daily	2017	2 Years	2017

Indicator

(i). Accumulated Winter Season Severity Index. The index is based on data measured daily for maximum temperature, minimum temperature, snowfall, snow depth

Changing Temperature Regimes

The duration of the annual freezing cycle varies considerably between the east and west sides of the plan area (figure 35) with the East Zone seeing an overall decrease in the annual freezing season of about 20 days and the West Zone experiencing a reduction of about two days between 1950 and 2019.

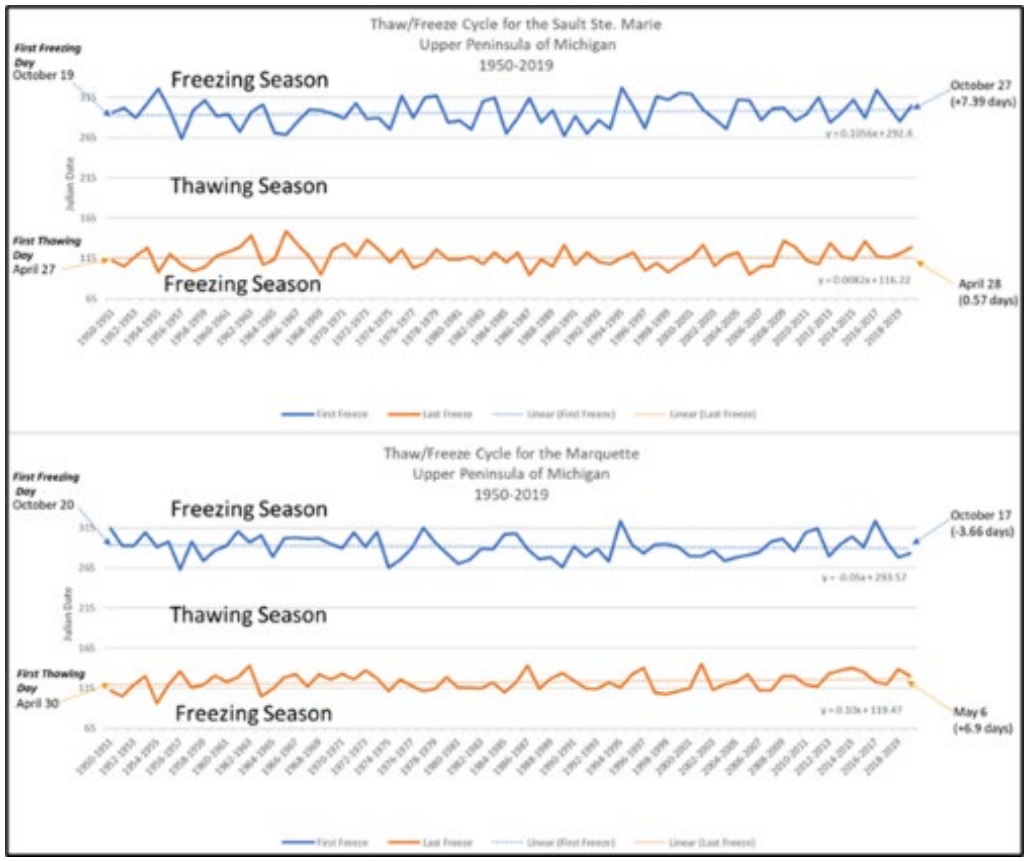


Figure 35. Freeze/thaw cycles between 1950 and 2019 Sault Ste. Marie and Marquette, Michigan

Records for the Upper Peninsula of Michigan indicate that between 1895 and 2017, the average maximum temperature has increased by 2.3 °F, and the average minimum temperature has increased by 2.6 °F. There was an overall increase in mean annual temperature of 2.4 °F over the 122-year data collection period (figure 36).

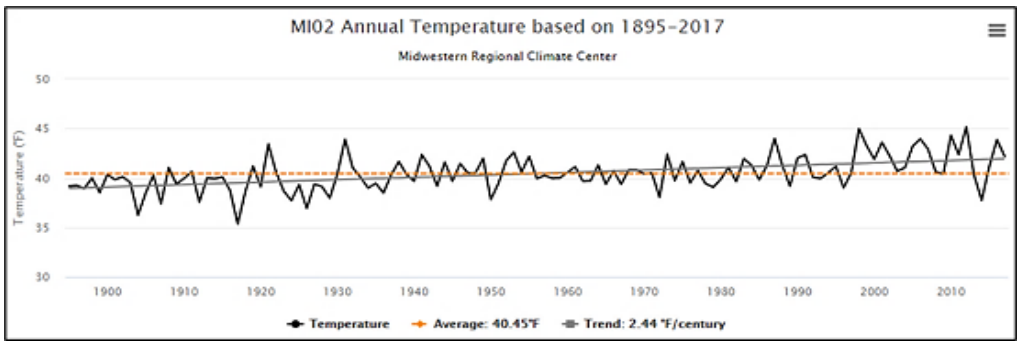


Figure 36. Average temperature changes across Climate Division MI02 from 1895–2017

Data from the Midwest Regional Climate Center show an overall increase in the average minimum temperature from December through February (figure 37). The increase in temperature has been more pronounced in the southeast moving northwest in the plan area over the past 120 years.

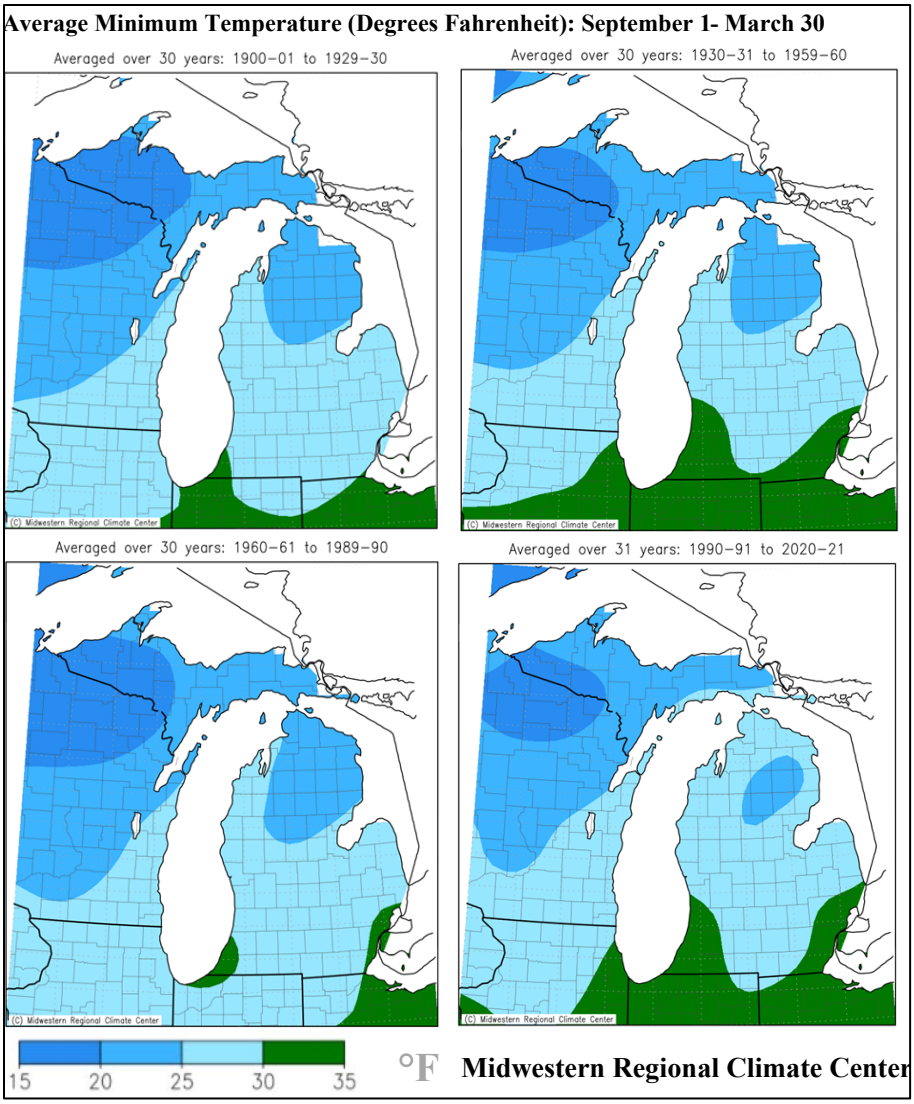


Figure 37. Average minimum temperature (°F) September 1 through March 30, 1900–2021

Changes to a variety of uses could occur depending on temperatures and duration. Winter recreation is popular on the Forest. As temperatures increase, winter recreation such as ice fishing, snowmobiling, and skiing would decrease; however, winter uses may be offset by an increase in warm-weather activities. Some vegetation management projects are designed to occur only during the winter to allow heavy equipment to be used while saturated soils are frozen. Shorter or warmer winters could result in increased surface disturbance as semi-frozen soils are displaced, decreases in work windows near seasonal margins, or consideration of other mitigations.

Snowpack

In the winter months, cold winds typically prevail from the northwest in the Great Lakes region, producing dramatic lake-effect snowfall on the northern edge of the plan area. As a result, there is commonly a striking difference between the snowfall experienced by areas along the shores of Lake Superior, the interior of the Upper Peninsula, and southern edge of the plan area along Lake Michigan.

Data provided by the Midwest Regional Climate Center (figure 38), in 20-year intervals, indicates the progression of increased snowfall southward across the Upper Peninsula over the last 120 years. Overall, snowfall has increased in areas affected by lake-effect snow in the Great Lakes basin even as snowfall totals in Illinois, Indiana, and Ohio have declined with rising temperatures.

Warmer surface water temperatures and declining ice cover on Lake Superior have likely driven the observed increases in lake-effect snow. As global temperatures continue to rise and further warm the Great Lakes, areas in lake-effect zones will continue to see increasing snowfall, but the change in temperature is expected to result in decreased snow depth and a shorter duration of annual snow cover.

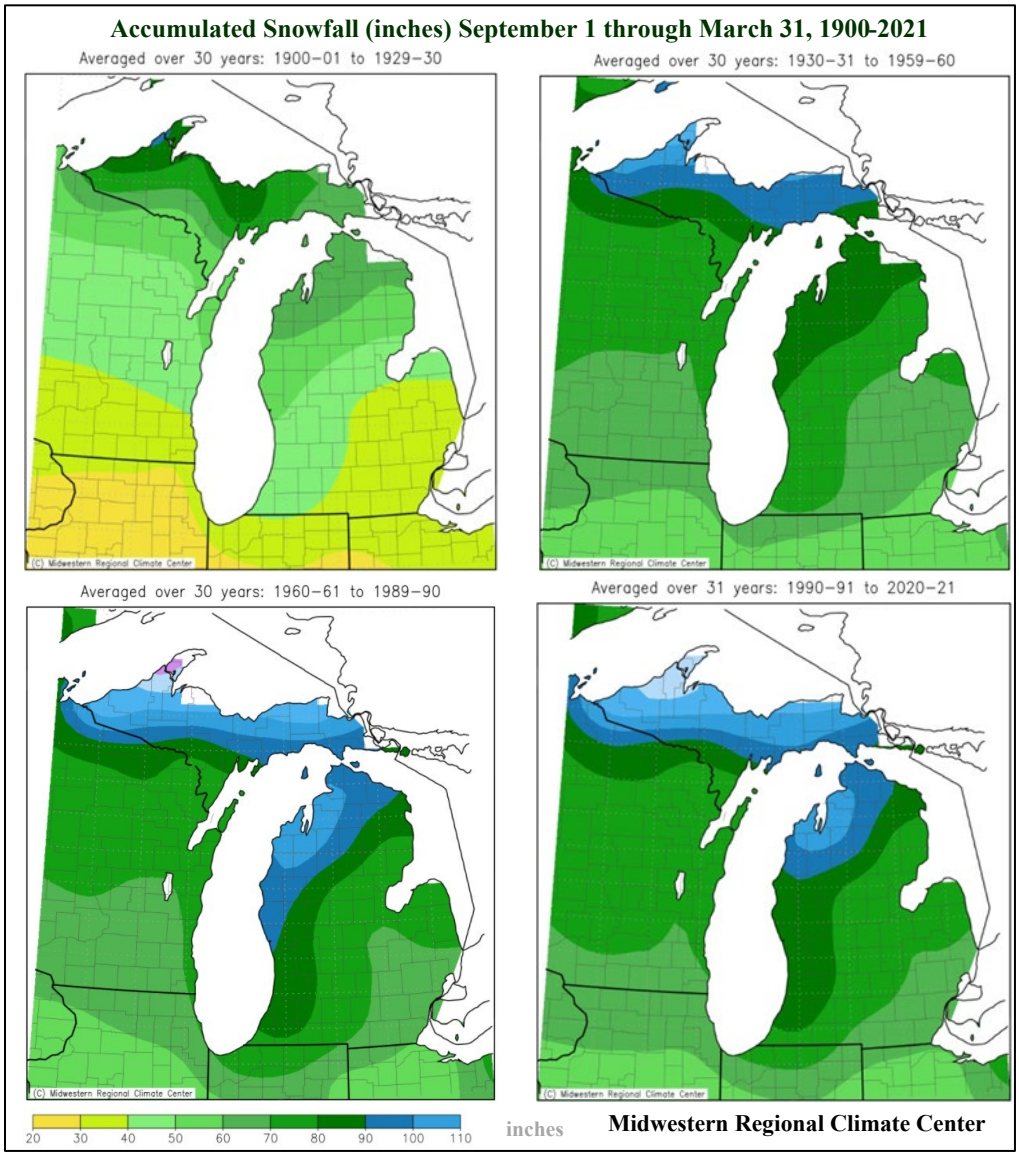


Figure 38. Accumulated snowfall (inches) September 1 through March 31, 1900–2021

Accumulated Winter Season Severity Index

The cumulative effects of winter are difficult to gauge when relying on a limited number of input variables. To help consider multiple factors contributing to winter severity, the Midwest Regional Climate Center developed an index for tracking winter severity known as the Accumulated Winter Season Severity Index.

Accumulated Winter Season Severity Index scores for the most recent 10 years	Accumulated Winter Season Severity Index scores for the years nearest the planning year

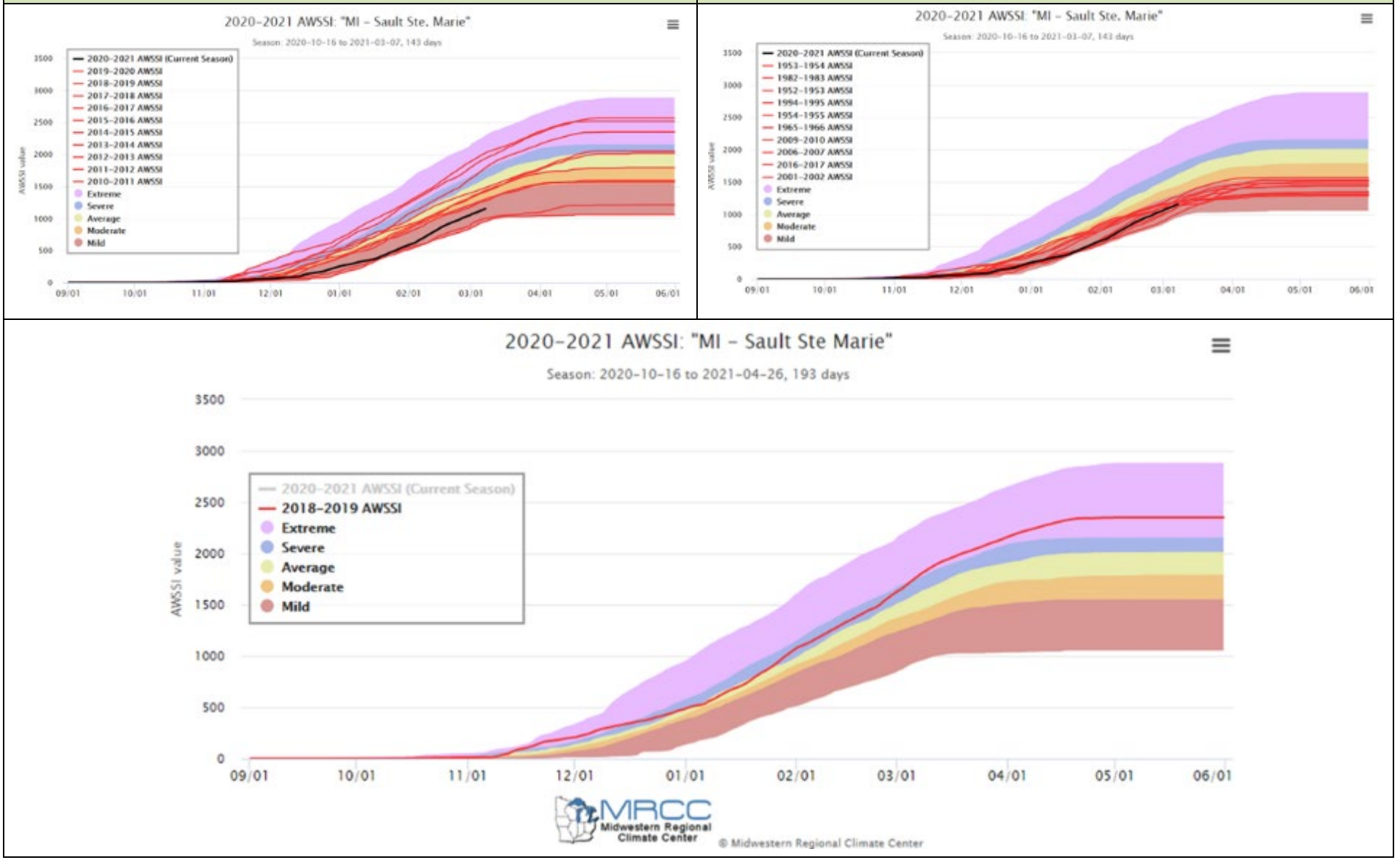
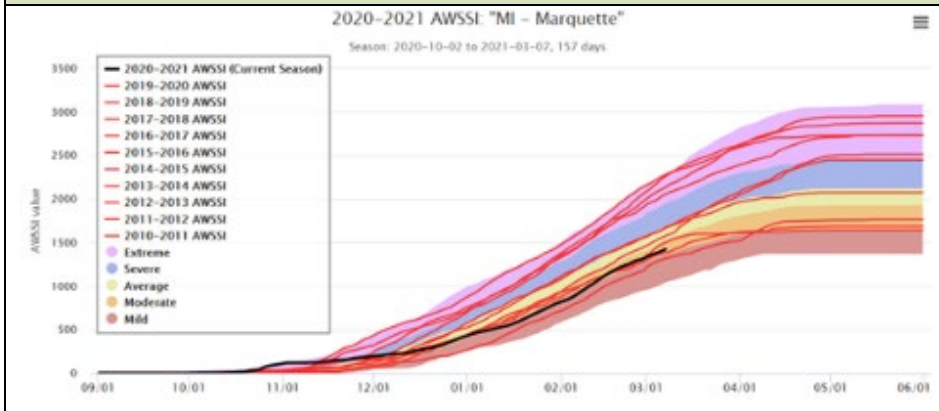
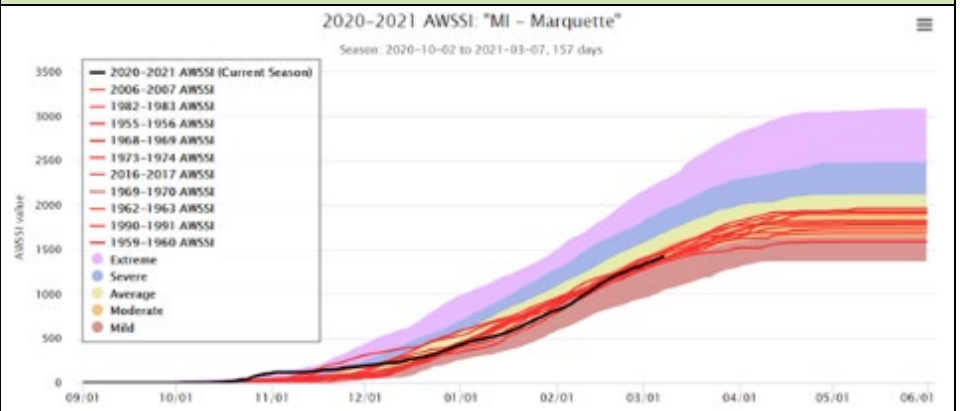


Figure 39. Winter season severity for Sault Ste Marie Michigan. Upper left represents Accumulated Winter Season Severity Index scores for the most recent 10 years. The upper right scores are those closest to the current year

Accumulated Winter Season Severity Index scores for the most recent 10 years	Accumulated Winter Season Severity Index scores for the years nearest the current year





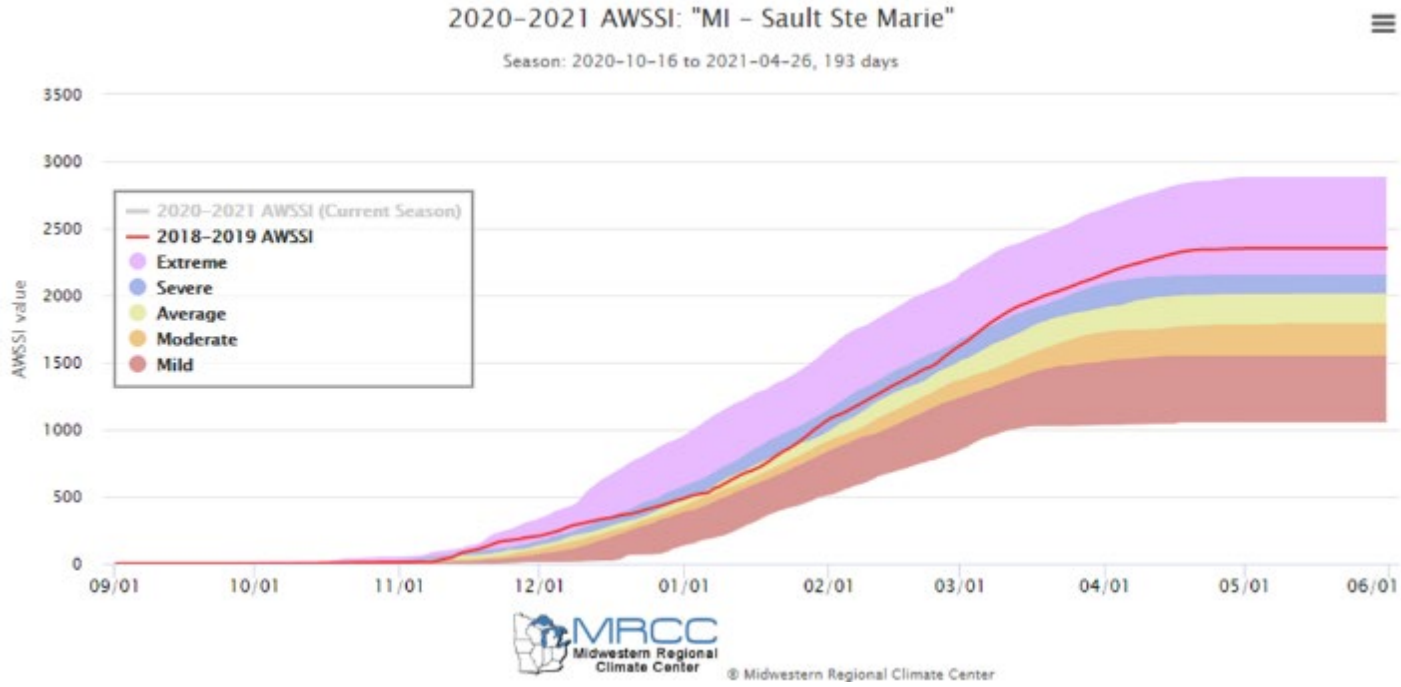


Figure 40. Winter season severity for Marquette, Michigan. The upper left represents Accumulated Winter Season Severity Index scores for the most recent 10 years. The upper right scores are those closest to the current year

The accumulated winter season severity index (AWSSI) tool provides an objective measure of annual and historic winter conditions dating back to 1951. The data incorporate maximum and minimum temperature, seasonal duration, snowfall, and snow depth, which are used to calculate an overall rating system from which winter severity can be quantified and compared from year to year.

Weather station data from Sault Ste. Marie (figure 39) and Marquette (figure 40) Michigan were used to calculate the average scores for the planning area. Data indicate that 2018 and 2019 were moderate to mild during mid-winter when compared to other years with severity increasing early and late in the season. However, data recorded over the most recent 10 years indicate a broad array of seasonal conditions ranging from extreme to mild over a relatively brief period, which is consistent with measured data in temperature and snowfall.

Long-term shifts in temperatures, timing, and duration of climatic seasons can directly affect resource management—similarly, ecological conditions for habitat and species living at the margins of their survivable range. Conditions may develop that lead to widespread damaging insect disease outbreaks. Severe weather resulting from climate change could also result in an increased number of large-scale disturbances such as wind, ice storms, floods, and wildfire events.

Plan Consistency

Climate change was added as a monitoring element into the forest plan in 2016. Management direction and mitigation measures designed around forest health, by extension, include management for the effects of climate change. Based on monitoring for forest health, there is no current need to revise practices or guidelines concerning climate change. However, the Forest recognizes climate change as an evolving science. It is anticipated that ongoing climate change vulnerability assessments and multi-stakeholder collaborations will result in an updated suite of monitoring questions and indicators related to climate change.

Monitoring Element 7- Desired conditions and multiple-use opportunities.

Monitoring Question 25.

How close are projected outputs and services to actual?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Variable depending on resource	2017	2–10 Years	2017

Forest Plan Direction

Appendix A, page A-1

> Appendix A of the forest plan prescribes projected timber output levels, location (by ecological land type), and saw timber/pulpwood mix. Appendix A also provides an allowable sale quantity of 108.5 million board feet per year used as a reference to annual outputs.

Indicator

(i). A quantitative and qualitative estimate of performance, comparing outputs and services with those projected by the forest plan.

The timber industry calculates volume using the board foot[5] as the base metric. Because of the wide range of uses volumes can be quantified in thousand board feet or millions of board feet to provide a manageable set of integers to describe the quantity of wood being discussed. Table 11 summarizes volume sold and percentage by fiscal year.

[5] One board foot equals: 1 ft × 1 ft × 1 in. or 30.48 cm × 30.48 cm × 2.54 cm.

Table 11. Timber sold and percent of allowable sale quantity in 2018 and 2019

Fiscal Year	Timber Sold (million board feet)	Percent of Allowable Sale Quantity
2018	36.3	34 percent
2019	43.9	41 percent

Plan Consistency

Management direction and mitigation measures described in the forest plan are generally effective in providing an appropriate mix of harvestable timber to meet society and industry's needs. The discrepancy between Forest Plan projected sawtimber/pulpwood mix and actual output can be attributed to a suppressed vegetative sale program over time. Removal of jack pine, which is sold for both pulpwood and dimensional lumber, was suppressed due to other species emphasis such as beech bark disease/hardwood stand management.

Monitoring Question 26.

How close are projected costs with actual costs?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Depends on resource	2017	2–10 Years	2017

Forest Plan Direction

Appendix A, page A-1

Indicator

(i). Documentation of costs associated with carrying out the planned management prescriptions compared with costs estimated in the forest plan.

Cost data is available from sources such as contract bids, Knutson-Vandenburg cost narratives and in-house cost calculations.

Table 12. Timber sold and associated costs for 2018–2019

Fiscal Year	Timber Sold (million board feet)	Predicted Cost	Actual Cost	Difference
2018	36.3	$1,633,500	$1,923,351	($289,851)
2019	43.9	$1,975,500	$2,544,223	($568,723)

Plan Consistency

The forest plan assumes a sale prep cost of $45/thousand board feet produced. Sale prep costs include everything from planning through implementation of timber sales. In general, funds for planning, inventory, and monitoring are decreasing. In fiscal year 2018, the cost of a project was 18 percent underfunded by predicted project-generated funds. In 2019, the difference was 28 percent underfunded. If funding continues to decrease, decisions on what inventory and monitoring are the most important to forest management will need to be made.

Monitoring Question 28.

Has public demand for commodity uses and non-commodity opportunities changed?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2015	2 Years	2017

Forest Plan Direction

2400 Vegetation Management, page 2-10

Appendix A, page A-1

Indicator

(i). By resource, situations that generate resource damage or demand exceeds Forest capacity to provide

Public demand for timber can be measured by the timber target assigned to the forest by the region. Units are reported in hundred cubic feet. The timber target assigned to the Forest was 71,412 hundred cubic feet in 2018 and 73,035 hundred cubic feet in 2019. These assigned targets are well below the forest allowable sale quantity of 176,095 hundred cubic feet. The reduction is partially due to personnel turnover (new to their jobs) or vacant positions, which reduced the capacity of the Forest.

Monitoring Question 29.

To what extent is the Forest meeting its transportation system objectives?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	2 Years	2017

Forest Plan Direction

7700 Transportation System, page 2-25

Objective 1. In this planning period, reconstruct an average of 10 miles of arterial/collector roads per year.

Objective 2. In this planning period, construct and/or reconstruct an average of one bridge per year.

Objective 3. In this planning period, replace an average of two major culverts per year.

Indicator

(i). Miles of roads reconstructed, and bridges constructed or reconstructed
(ii). Number of culverts replaced

The Forest maintains its Operational Maintenance Level 3,4,5 roads annually through routine maintenance activities such as grading, spot surfacing, brushing, and culvert cleaning.

Roads reconstructed in fiscal years 2018 and 2019 were for timber sale purposes and consisted of Operational Maintenance Level 1 & 2 roads. A total of 14 miles of road were decommissioned and removed from the Forest's road system in fiscal years 2018 and 2019. In fiscal years 2018–2019, eight culverts were replaced (table 4).

Plan Consistency

While no new or reconstructed bridges were reported, other elements such as road re-construction, effective road closures, and culvert replacements exceeded forest plan direction. As a result, no change in management is required.

Monitoring Question 31.

To what extent do output levels, location of timber harvest, and mix of saw timber & pulpwood compare to those levels?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2017	2 Years	2017

Forest Plan Direction

2400 Vegetation Management, page 2-10
Appendix A, page A-1

Indicator

(i). The difference between actual output of saw timber and pulpwood and projected output.

The forest plan estimates a split of 63 percent saw timber and 37 percent pulpwood in the yearly timber offerings on the forest (forest plan Appendix A, table A-1). Actual offerings for fiscal years 2018 and 2019 saw more pulpwood than saw timber, as summarized in table 13.

Table 13. Actual sawtimber and pulp offerings for 2016 and 2017

Fiscal Year	Actual Sold Percent Saw	Actual Sold Percent Pulp	Predicted Sold Percent Saw	Predicted Sold Percent Pulp	Difference Percent Saw	Difference Percent Pulp
2018	34	66	63	37	-26	-29
2019	32	68	63	37	-28	+31

Plan Consistency

The discrepancies between projected sawtimber and pulpwood mix and actual output can be attributed to a suppressed vegetative sale program. Other factors are likely a combination of local growing conditions and tree cover types that produce more pulp than sawtimber at the time of harvest and a locally strong pulp market. The result is a lower overall value of timber purchased from the forest than predicted by the forest plan, as pulpwood brings in a lower value to the government than sawtimber.

Monitoring Question 32.

Are harvested lands adequately restocked after five years?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	2 Years	2017

Forest Plan Direction

2400 Vegetation Management, page 2-10
Appendix A, page A-1

Indicators

(i). Acres meeting required minimum percentages through first-, third- and fifth-year stocking surveys

Stands are surveyed at least twice during the first five years after harvest during reforestation activities to monitor regeneration success and to ensure that reforested stands are stocked with an adequate number and distribution of young trees to meet management goals.

In planted stands, stocking surveys are usually done in the first and third years after planting and are usually certified as regenerated after the third-year survey. Stands that are planted (initial or replant) also receive survival surveys. A random line or a cluster of 10 seedlings is staked immediately after planting. These plots are surveyed one year and then three years afterward to estimate the survival of the planted trees.

In naturally regenerated or artificially seeded stands, stocking surveys occur in the third and fifth years following the regeneration harvest. These stands are usually certified as regenerated following the fifth-year survey.

2018

Approximately 1,314 acres were harvested in 2014. Of these acres, 1,272 were certified as regenerated in 2018. Only 42 acres (two stands) were not certified as regenerated.

2019

Approximately 931 acres were harvested in 2015. Out of these acres, all 931 were certified in 2019.

Plan Consistency

Stands treated with regeneration harvests, such as clear-cut, seed tree removal, shelterwood removal or two-aged removals, must be reforested within five years of harvest under the National Forest Management Act. Based on monitoring, there is no need to revise any practices or guidelines designed to meet the plan's 70 percent desired stocking condition and objectives.

Monitoring Element 8- Substantial and permanent impairment of the productivity of the land.

Monitoring Question 33.

Are the effects of Forest management, including prescriptions, resulting in changes to the productivity of the land?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2016	Annually	2017

Forest Plan Direction

- 2400 Vegetation Management, page 2-10

Indicator

(i). Acres of whole-tree harvesting on xeric sands

There were zero acres of whole-tree harvest on the forest in fiscal years 2018 and 2019.

Plan Consistency

There is no need to revise any practices or guidelines concerning changes to the productivity of the land.

Additional Monitoring Questions

Monitoring Question 35. Heritage Properties

How are Heritage properties being protected from damage or disturbance?

Measurement frequency	Date last measured	Reporting frequency	Date last reported
Annually	2019	2–10 Years	2017

Indicators

(i). Number of heritage structures and sites protected

Since 2013 the Forest Service has implemented the new Heritage Program Managed to Standard target system to meet forest plan goals while maintaining compliance with Section 106 of the 1966 National Historic Preservation Act and 36 CFR 800. The system involves seven individual performance indicators, each worth up to 10 points each for a total maximum score of 70 points.

1. A Heritage Program Plan: 10 points for the plan or 2 points for each plan element.
2. Section 110 Field Survey of National Forest System Lands where cultural resources are most likely to occur: Minimum of 200 acres of survey per year for 10 pts.
3. Legacy cultural resources are evaluated for eligibility to the National Register of Historic Places (NHRP): 1 site listed or 20 sites determined not eligible = 10 pts.
4. Annual condition assessment of Priority Heritage Assets (PHA): Each PHA must receive a condition assessment once every five years for 10 pts each fiscal year.

5. Cultural resource stewardship to protect and maintain PHAs: Each undertaking = 2.5 pts.
6. Opportunities for scientific study or public education and outreach: Every project is worth 2 pts.
7. Volunteer hours: Minimum number of 400 hours to achieve 10 pts.

Forest Service Heritage Programs that earn a minimum score of 45 out of 70 possible Heritage Program Managed to Standard points are considered to be managed to standard.

Heritage resources are classified as either Priority Heritage Assets (PHAs) or Other Heritage Assets. Heritage assets are "property, plant, and equipment that are unique for one or more of the following reasons: historical or natural significance; cultural, educational, or artistic (for example, aesthetic) importance; or significant architectural characteristics" (FSM 2360.5). Priority Heritage Assets are historic properties requiring more intensive management. The condition of each PHA is assessed every five years. The ability of heritage personnel to complete annual PHA site condition assessments is captured in table 14 and table 15.

Table 14. 2018 managed to standard target points by indicator (columns 1-7) and heritage event

Heritage Event	Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5	Indicator 6	Indicator 7
Cultural Resource Overview	2	N/A	N/A	N/A	N/A	N/A	N/A
Predictive Model (Grand Island)	2	N/A	N/A	N/A	N/A	N/A	N/A
Priority Heritage Assets site condition assessments	N/A	N/A	N/A	5	N/A	N/A	N/A
National Register of Historic Places Determination of Eligibility (n=31)	N/A	N/A	15.5	N/A	N/A	N/A	N/A
Sandtown stabilization/planting	N/A	N/A	N/A	N/A	2.5	N/A	N/A
Peninsula Point Lighthouse	N/A	N/A	N/A	N/A	2.5	2	16
Youth Archaeology Workshop	N/A	N/A	N/A	N/A	N/A	2	0.6
Sugar Camp article	N/A	N/A	N/A	N/A	N/A	2	N/A
Society for Historical Archaeology paper presentation	N/A	N/A	N/A	N/A	N/A	2	N/A
Rock Koln interp. Sign replacement	N/A	N/A	N/A	N/A	N/A	2	N/A
Trout Bay boat relocation	N/A	N/A	N/A	N/A	2.5	N/A	N/A
Total =	**4**	**0**	**15.5**	**5**	**7.5**	**10**	**16.6**
Scores =	**4**	**0**	**10**	**5**	**7.5**	**10**	**10**

Table 15. 2019 managed to standard target points by indicator (columns 1-7) and heritage event

Heritage Event	Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5	Indicator 6	Indicator 7
Cultural Resource Overview	2	N/A	N/A	N/A	N/A	N/A	N/A
Predictive Model (Grand Island)	2	N/A	N/A	N/A	N/A	N/A	N/A
Priority Heritage Assets site condition assessments	N/A	N/A	N/A	10	N/A	N/A	N/A
Section 110 Survey (80 acres)	N/A	2	N/A	N/A	N/A	N/A	N/A
Sandtown stabilization/planting	N/A	N/A	N/A	N/A	2.5	N/A	N/A
Camp Au Train Passport in Time	N/A	N/A	N/A	2.5	N/A	2	840
Youth Archaeology Workshop	N/A	N/A	N/A	N/A	N/A	2	320
Mather-Klauer Lodge Restoration	N/A	N/A	N/A	N/A	2.5	2	N/A
Munising Warehouse Chimney Restoration	N/A	N/A	N/A	N/A	2.5	N/A	N/A
Soldier's Lake Pavilion Insect Treatment	N/A	N/A	N/A	N/A	2.5	N/A	N/A
Grand Island Pavilion Roof	N/A	N/A	N/A	N/A	N/A	2	N/A
Michigan History Presentation	N/A	N/A	N/A	N/A	N/A	2	N/A
Total =	**4**	**2**	**0**	**10**	**10**	**10**	**1160**
Scores =	**4**	**2**	**0**	**10**	**10**	**10**	**10**

Other Heritage Assets are considered non-priority assets that may have important historical or cultural significance but currently lack the need for intensive management. The condition of non-priority heritage assets is recorded in the course of conducting heritage resource inventory surveys and implementing heritage resource protection measures (e.g., site avoidance, stabilization, maintenance, and evaluation).

During the 2018 and 2019 field seasons, 64 new heritage resources were recorded bringing the total number of heritage resources to around 3,460. A total of 43,735 acres of suitable lands were also inventoried for heritage resources per the Secretary of the Interior Standards, Section 106 of the National Historic Preservation Act, and 36CFR800.4. This brings the total number of acres of suitable Forest lands inventoried for heritage resources up to approximately 70 percent.

Previous annual monitoring has demonstrated that the most significant sources of impacts to heritage resources appear to be damage caused by relic hunters, recreational use, and natural erosion or deterioration. Existing guidelines provide ample direction for addressing these impacts, but implementing this direction depends on funding. Two PHAs were found to be moderately to heavily damaged because of erosion and insect infiltration. Both issues will be addressed in fiscal year 2020.

Forest Service activities rarely result in adverse effects to heritage assets. This is due in large part to the successful implementation of site protection and avoidance measures, followed by post-implementation monitoring of projects.

Plan Consistency

Pursuit of the Heritage Program Managed to Standard target system corresponds directly with the Heritage programmatic goals and objectives outlined in the 2006 forest plan (pages 2-7 and 2-8) for the Hiawatha National Forest. The forest plan goals and objectives are defined as the Identification (FSM2363.1), Evaluation (FSM2363.2), and the Allocation of Cultural Resources to Management Categories (i.e., Preservation, Enhancement, Scientific Investigation, and Release from management under the National Historic Preservation Act [FSM2363.3]).

Based on monitoring, there is no need to revise any practices or guidelines concerning heritage resource protection. The management direction and mitigation measures described in the forest plan effectively prevent undue resource damage due to authorized projects or activities.

APPENDIX A

Monitoring Questions Not Evaluated in Detail

Monitoring Question 3. Best Management Practices

How is the Forest complying with the Clean Water Act requirements?

Stricken-Relocated. Added as an indicator under question 1

Monitoring Question 4. Ecosystem Restoration

To what extent are ecologically healthy and productive aquatic ecosystems being restored?

Stricken-Redundant. Discussion on ecosystems is found repeatedly through the monitoring report within the context of affected resources.

Monitoring Question 8. Native and Desired Non-native Species habitat

To what extent is forest management providing ecological conditions to maintain habitat for native and desired non-native species?

Stricken-Redundant. Discussion on habitat for native and desired non-native species is found repeatedly throughout the monitoring report within the context of affected resources.

Monitoring Question 9. Research Natural Areas-candidate Research Natural Areas

To what extent are Research Natural Areas and candidate Research Natural Areas being managed to protect their unique values and how are they contributing to research?

Stricken-Unnecessary. Research Natural Areas are by their very nature protected areas. The Northern Research Station manages approvals for scientific study, project-level activities, and monitoring. Existing Research Natural Areas were considered and managed as such in relation to projects proposed within or near Research Natural Area boundaries.

Monitoring Question 11. Old-growth management

To what extent are existing and potential old growth forest stands being managed or unmanaged to develop into or accelerate toward old growth?

Deferred. Management to accelerate stands to old growth are occurring at the project level, however, personnel changes and funding have limited the capacity of the Forest to accurately respond to this question in this reporting cycle.

Monitoring Question 12. Even Aged Management

How much even-aged management should be used? In what forest types should it be used?

Deferred. Silviculture practices for regenerating various species would indicate the primary method that should be used. It's not based on "how much". To accomplish the vegetative goals of the forest plan, this method and others are used. Personnel changes and funding have limited the capacity of the Forest to accurately respond to this question in this reporting cycle.

Monitoring Question 15. Canada Lynx

To what extent is the Forest maintaining the amount and juxtaposition of Canada lynx foraging and denning habitats?

Stricken-Redundant. Canada Lynx discussed under Monitoring Element 4 Question 14

Monitoring Question 16. Interagency Cooperation for TES

To what extent is the Forest working cooperatively with the U.S. Fish and Wildlife Service, State and Federal agencies to update and implement recovery plans and conservation assessments for TES?

Stricken-Redundant. Interagency cooperation for Threatened, Endangered and special status species is included in the discussion for Monitoring Element 4, Question 14

Monitoring Question 18. Effects of Snowmobiles

What are the effects of snowmobiles on the physical, biological, and social environment?

Stricken-Unnecessary. No resource damage has been noted because of snowmobile use. There has been no change to the number of unplowed Forest roads or other areas open to snowmobiles.

Monitoring Question 19. Snowmobile Opportunities

To what extent is the Forest providing snowmobile opportunities?

Stricken-Unnecessary. There have been no changes to the number of unplowed National Forest System roads or other areas open to snowmobile use. The current system of trails continues to provide access to services in local communities.

Monitoring Question 20. Inland Lake Watercraft Access

To what extent is the Forest providing and maintaining a variety of inland lake watercraft accesses in motorized and non-motorized settings?

Stricken-Unnecessary. The Forest provides adequate watercraft access opportunities to our inland lakes, many of which are natural, year-round, and require minimal maintenance.

Monitoring Question 22. Wild and Scenic River

To what extent are Wild and Scenic River values being managed to protect the biological and physical resources while accommodating recreational uses?

Stricken-Unnecessary. Wild and Scenic River values, when present, are considered in project-level analysis and design elements incorporated for consistency with the forest plan and laws regulations and policies.

Monitoring Question 27. Vegetative Composition

To what extent is the Forest meeting the vegetative composition objectives?

Stricken-Redundant. Vegetative composition objectives are discussed in detail throughout the monitoring report within the context of affected resources.

Monitoring Question 30. Timber Management on Suitable Lands

To what extent is timber management occurring on lands suitable for such production?

Stricken-Redundant. Discussion found repeatedly through monitoring report within the context of affected resources.

Monitoring Question 34. Federal Indian Trust

To what extent is the Forest meeting its Federal Indian trust responsibility, including, but not limited to, meeting the requirements of memoranda of understanding, consulting with tribes on Forest management and actively seeking collaborative opportunities?

Stricken- This question simply asks whether or not the Forest is following rules rather than conducting monitoring, it is a simple accounting of interactions already required by law.

APPENDIX B: Listing of Supporting Plan Monitoring Program Documents

USDA Forest Service. 2002. Conservation assessment for red-shouldered hawk (*Buteo lineatus*). Eastern Region.

USDA Forest Service. 2005. Biological Assessment for the 2006 Hiawatha National Forest Plan. August 2005.

USDA Forest Service. 2006. Hiawatha National Forest 2006 forest plan, U.S. Forest Service. Escanaba MI. Available online in portable document format (PDF): http://www.fs.fed.us/r9/hiawatha/revision/rev_welcome.html

USDA Forest Service. 2009. Conservation Assessment for Northern Goshawk (*Accipiter gentilis*) in the Western Great Lakes Region. Milwaukee, Wisconsin.

USDA Forest Service. 2012a. 2012 Botany Monitoring and Inventory Report. East Unit Hiawatha National Forest, Edited by *S. Blumer.* October 24, 2012.

USDA Forest Service. 2012a. 2012 Wildlife and Fish Monitoring Report. East Unit Hiawatha National Forest, Edited by *S. Sjogren, D. Huebner, and J. Reattoir*. January 27, 2012.

USDA Forest Service. 2012b. 2012 Wildlife, Fish, Plant and NNIS Monitoring Report. West Unit Hiawatha National Forest, Edited by *L. Langstaff, J. Ekstrum, M. Cole, M. Ammerman, and D. LeBlanc,* October 30, 2012.

USDA Forest Service. 2013b. 2013 Wildlife and Fish Monitoring Report. East Unit Hiawatha National Forest, Edited by *S. Sjogren, D. Huebner, and J. Reattoir*. January 27, 2012.

USDA Forest Service. 2013c. 2013 Wildlife, Fish, Plant and NNIS Monitoring Report. West Unit Hiawatha National Forest, Edited by *J. Ekstrum, L. Langstaff, D. LeBlanc, M. Cole, M. Ammerman,* January 30, 2014.

USDA. 2001. FSM 2600 – WILDLIFE, FISH, AND RARE PLANT HABITAT MANAGEMENT**.** chapter 2670 - THREATENED, ENDANGERED, AND SENSITIVE PLANTS AND ANIMALS**.** Supplement No.: 2600-2001-1**.** Effective Date: February 23, 2001

USFWS. 2006. Biological Opinion for the Hiawatha National Forest Plan, March 2006. U.S. Department of Interior, Fish and Wildlife Service East Lansing Office, MI.

USDI Fish and Wildlife Service (USDI FWS). 2009. Gray Wolf, *Canis lupus*. Reinstatement of Protections for the Gray Wolf in the Western Great Lakes. http://www.fws.gov/midwest/wolf/delisting/FRsept2009reinstatementofESAstatus.html.

USDI Fish and Wildlife Service (USDI FWS). 2011a. Status of Gray Wolf *Canis lupus* in the Western Great Lakes. http://www.fws.gov/midwest/wolf/aboutwolves/index.htm#population

USDI Fish and Wildlife Service (USDI FWS). 2011a. Gray Wolf *Canis lupus*. Region 3 Biologue Fact Sheet. http://www.fws.gov/midwest/wolf/aboutwolves/pdf/biologueMarch2011.pdf.

USDI Fish and Wildlife Service (USDI FWS). 2011b. Gray Wolf *Canis lupus* in the Western Great Lakes Population Tables, 2009-2010 and 1976-2010. http://www.fws.gov/midwest/wolf/aboutwolves/mi_wi_nos.htm

USDI Fish and Wildlife Service (USDI FWS). 2011b. Gray Wolf Recovery in Minnesota, Wisconsin, and Michigan. March 2011. Region 3. http://midwest.fws.gov/wolf/. Accessed April 2011

USFWS and The International Association of Fish and Wildlife Agencies. 2003. How to avoid incidental take of lynx while trapping or hunting furbearers.

USFWS. 1998. Endangered Species Act (ESA) Section 7 Consultation Handbook.

USFWS. 2001. Hine's Emerald Dragonfly (*Somatochlora hineana*) Recovery Plan. Fort Snelling, MN.

MNFI. 2014. Surveys and Monitoring for the Hiawatha National Forest: FY 2013 Progress Report. Report Number 2014-01. January 27, 2014.

MSU. 2013. Modeling Northern Fen Hydrology to Inform Endangered Species Recovery. Sampath, P.V., Liao, H. and Li, S., Department of Civil & Environmental Engineering, Michigan State University, East Lansing, MI 48824.

Other Supporting Documents

Hunter, M.L., Jr. 1990. Wildlife, forests, and forestry. Principles of managing forests for biological diversity. Englewood Cliffs, New Jersey. Prentice Hall publisher.

American hart's-tongue fern references

- Email communication from Brian Olsen (8 July 2015) regarding field marking and visit
- Proposed East Lake Road design plan (NEPA project file)
- Interdisciplinary Team meeting notes (November 2014, April 2015, available in project file)
- MNFI Rare Species Survey Report (2013, available in NEPA project file)
- Monitoring data forms (2012) in species files
- Final Report for 5-Year Monitoring Study of Six Occurrences of AHTF (Mar 2004)

Lakeside daisy references

- Element occurrence record: 091005_LAKESIDEDAISY_M134, 6/6/14 (NRIS TESP/IS database)
- Draft scoping letter for Establishment of New Lakeside Daisy Population Project (2013)
- MNFI Annual Agreement Progress Reports (2012, 2014) including Floristic Quality Assessments for St. Martin Point and Pontchartrain Point (2014)
- HNF Survey Report for Introduction of Lakeside Daisy (Davis 2009)