

Hiawatha National Forest

*2007 Monitoring &
Evaluation Report*



Hiawatha National Forest

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Table of Contents

	<u>Page</u>
➤ Introduction -----	1
➤ 3. Insects and Disease -----	2
➤ 4. Wildfire, Fire Ecology and Fuels -----	5
➤ 5. Recreation Motor Vehicles -----	7
➤ 6. Social and Economic Stability -----	11
➤ 7. Soils -----	13
➤ 8. Timber Regeneration -----	20
➤ 11. Wildlife Management Indicator Species -----	22
➤ 12. Treaty Rights -----	29
➤ 14. Wetlands -----	30
➤ 16. Non-native Invasive Species -----	34
➤ 17. Water Quality -----	36
➤ 21. Heritage Resources -----	40
➤ 25. Threatened and Endangered Species -----	42
➤ 28. Snowmobiles -----	67

Introduction

The Hiawatha National Forest Land and Resource Management Plan (Forest Plan) was approved for implementation in 2006. National Forest Management Act (NFMA) regulations require the forest to develop and implement a program of Monitoring and Evaluation to determine the effectiveness of active management on resources found on or near National Forest lands (36 CFR 219). Specifically, the monitoring and evaluation plan described in Chapter 4 of the 2006 Forest Plan is designed to answer the following questions:

- Did we do what we said we were going to do?
- Did our standards, guidelines, and objectives work as we expected them to?
- Is our understanding and science correct?

The purpose of monitoring and evaluation is to have the ability to respond to current conditions or to make appropriate changes based on new information or technology. Depending on the answers to the above questions, the Forest Plan may be amended or revised to adapt to new information or changed conditions.

Monitoring and Evaluation Strategy

Monitoring and evaluation are separate activities. Monitoring is the process of collecting data and information. Evaluation is the analysis and interpretation of the data collected from monitoring activities. A key requirement of the monitoring and evaluation process is for the forest staff to determine how closely Forest Plan standards and guidelines have been applied and how well the Forest Plan objectives are being met. This evaluation is presented in a Monitoring and Evaluation report to the Forest Supervisor, along with any recommended changes, revisions, or amendments to the forest plan deemed necessary (36 CFR 219.12(k)).

Budgetary constraints will affect the level of monitoring that can be done in a particular fiscal year. Generally, monitoring activity can be accomplished in resource areas with a low level of precision. If budget levels are adequate, the Forest may have the ability to conduct scientifically robust monitoring and evaluation activities.

Fiscal Year 2007 M&E Framework

There were fourteen key monitoring/evaluation activities selected from the 2006 Forest Plan included in this report. These activities require annual monitoring due to importance to the public (such as recreation) or a rapidly changing environment that requires expedited responses (outbreak of an insect pest). The following monitoring activity descriptions include the monitoring question to answer, a synopsis of the Forest Plan standards, guidelines, and objectives the question addresses, a brief summary of the data collected, and an evaluation of the activity. Finally, some activity descriptions conclude with a general statement about future monitoring activities.

3. Insects and Disease

Monitoring Questions:

- Are insect and disease populations compatible with objectives for restoring or maintaining healthy forest conditions?
- To what extent is Forest management managing undesirable occurrences of fire, insect and disease outbreaks?

Monitoring Activity Relationship to Forest Plan:

- Destructive insects and disease organisms do not increase to potentially damaging levels following management activities.
- 2400 Vegetation Management, Desired Condition
- 3400 Forest Pest Management, Desired Condition:
Reduce the impacts from invasive species by restoring the forest's health in order to be resilient to the effects of invasive insects, pathogens, plants, animals and other pests.
- 3400 Forest Pest Management, Guidelines 1 – 2:
 1. Integrated pest management methods should be used to minimize the effect or prevent the spread of insect and disease infestations.
 2. Promote spatial diversity of vegetation and age classes guided by the ecological characteristics of the landscape to reduce the risk of insect and disease damage.

Monitoring Activity and the Data Collected:

The Forest Health Protection division of the Northeastern Area of the Forest Service, State and Private Forestry conducted an aerial pest detection survey of the Hiawatha to identify areas with dead or stressed trees. Such areas indicate insect infestations or disease infections on the Forest. Where the cause of stress or mortality is unclear, areas are ground-checked to identify the cause. This pest detection survey looks for insect or disease problems in all tree species on the Forest.

Results of the aerial pest detection survey indicated that jack pine budworm was the primary pest causing damage on the west side of the Hiawatha in 2007, but the number of acres affected by jack pine budworm was less than in 2006. The survey showed several areas on the west side of the Forest that were infested with jack pine budworm at a level high enough to cause jack pine defoliation or mortality. The east side of the Forest also had some budworm-related mortality of jack pine. Jack pine budworm is a native species that is a normal part of the jack pine ecosystem, though usually at population levels that do not cause more than incidental damage in jack pine. Stands of overmature jack pine provide conditions that promote increases in jack pine budworm populations. Where there are concentrations of overmature jack pine, budworm

populations can become large enough to cause substantial jack pine defoliation or mortality in these overmature stands, as well as in nearby younger jack pine stands.

A separate detection effort was specific to emerald ash borer (EAB). Beginning in 2005, the Hiawatha has cooperated with the Michigan Department of Agriculture and Michigan Technological University, each of which maintains a system of detection trees across the Upper Peninsula to determine whether EAB might be present. EAB larvae feed on the inner bark of all native ash species (*Fraxinus*). Detection trees are cut down and peeled in the fall to look for evidence of EAB in the inner bark. Emerald ash borer detection trees examined in October and November of 2006 (Fiscal Year 2007) showed no evidence of EAB.

Beech bark disease is caused by the interaction of beech scale, a non-native insect, and one or more strains of *Nectria* fungus, of which one is non-native and others are native. It causes wide-spread mortality of beech, particularly of larger trees. The aerial pest detection survey indicated that beech mortality related to beech bark disease is of greater concern on the east side of the Hiawatha. The extent of beech bark disease infestation has increased from 2006 levels.

While beech bark disease-related mortality or defoliation does not yet occur on the west side of the Hiawatha, the pest detection survey indicates that such mortality is already occurring on the west side on non-NFS lands only a few miles outside the Forest boundary. The 2006 aerial detection survey had showed a small area of beech mortality on these non-NFS lands, but the affected area is much larger in the 2007 pest detection survey results, as well as much closer to the Hiawatha's boundary.

Additional detection efforts are directed to beech bark disease. Both Michigan State University and the University of Michigan have established a system of plots across the state, including plots on the Hiawatha. These plots will monitor the spread and progression of beech bark disease and will identify any resistant beech trees. The beech bark disease study plots were monitored in the summer of 2007 by researchers from Michigan State University and University of Michigan. Results from that monitoring will be provided to the Hiawatha in Fiscal Year 2008.

Evaluation of the activity:

In 2006, the Hiawatha completed an environmental analysis and signed a decision to treat most of the budworm-infested jack pine acres on the west side. Many acres had been treated by the time the 2007 pest detection survey was conducted. An additional environmental analysis was completed in 2007 to treat most of the remaining budworm-infested jack pine stands. These treatments are intended to replace the overmature jack pine stands with stands of young jack pine that do not provide the favorable conditions for large budworm populations. Soon after these treatments jack pine budworm population levels are expected to return to levels where they do not cause substantial jack pine defoliation or mortality.

The east side has also been treating infested jack pine stands, similar to the efforts on the west side. The infestation on the east side began a few years earlier than on the west, however, so most of the affected stands on the east have already been addressed

with environmental analysis and scheduled for treatment, though many stands had not yet been treated before the 2007 detection surveys took place. As on the west side, these treatments are intended to replace overmature stands of jack pine with stands of young jack pine that do not provide the favorable conditions for large budworm populations. After these treatments, jack pine budworm population levels are expected to return to levels where they do not cause substantial jack pine defoliation or mortality.

In 2007, the Hiawatha developed a set of recommendations to address beech bark disease, both in stands that are currently infected and in stands that are not yet infected. These recommendations were developed by the silviculture staff, after reviewing available peer-reviewed literature and applying information contained in the literature to conditions existing on the Hiawatha. Where stands containing beech were to be treated, Hiawatha staff began using these recommendations immediately in designing treatments.

Future Monitoring Activities:

The Forest will continue to obtain aerial forest pest surveys from the Northeastern Area of the Forest Service, State and Private Forestry to identify any areas with insect or disease outbreaks.

The Hiawatha will continue to cooperate with the Michigan Department of Agriculture and Michigan Technological University in efforts to detect emerald ash borer infestations. Detecting such an infestation while it is still small would improve the likelihood that control efforts might succeed.

The Hiawatha will also continue to cooperate with Michigan State University and with the University of Michigan in their efforts to monitor and study beech bark disease. The Forest anticipates receiving the 2007 study results in Fiscal Year 2008.

The monitoring strategy outlined in the Forest Plan will continue to be implemented.

4. Wildfire, Fire Ecology and Fuels

Monitoring Question:

- To what extent is Forest management managing undesirable occurrences of fire and insect and disease outbreaks?
- In this planning period, reduce wildfire risks by fuel management of an average of 1000 acres per year

Monitoring Activity Relationship to Forest Plan:

- Forest Plan, Table 4.3. Required Monitoring Items; Insect, Disease and Disturbance Process
- 5100 fire management Fuel Management Objective 1

Monitoring Activity and Data Collection:

The goal of this monitoring activity is to evaluate the fuels reduction, prevention, pre-suppression, and suppression of fire programs for the most efficient and effective use of human and capital resources.

Hazardous fuels reduction was accomplished on 2,889 of jack pine budworm infested timber. In addition, 2,968 acres of hazardous fuels were treated through other resource management projects including wildlife habitat improvement and timber sales. These projects have also served to help restore vegetation conditions closer to historic levels. There were 996 acres treated in the wildland – urban interface.

Three areas were treated with prescribed burns during 2007 for a total of 219 acres. These burns were primarily for wildlife habitat enhancement but also accomplished fuel reduction.

Prevention accomplishments in Fiscal Year 2007 included participating and distributing Smokey Bear material at state and local fairs, parades and schools

The Hiawatha experienced a late spring-summer drought resulting in more fire preparedness time than usually experienced. A total of 19 wildfires burned 692 acres in the summer of 2007.

Evaluation of Monitoring Activities:

The 2,889 acres of fuel treatment projects accomplished during 2007 is well above the forest plan objective of 1,000 per year. The forest has had no problems far exceeding the minimum goal. Intensive fuel treatments will occur in the foreseeable future. Currently 6,600 acres of future hazardous fuel reduction activities are available for implementation with all required NEPA analysis completed.

Fire Regime Condition Class (FRCC) rating can be used to evaluate how fuel treatments affect the vegetation condition of the landscape relative to a historic condition. A rating of 1 means the conditions are 0-33% different from historic condition, 2 means 33-66% different from historic conditions and 3 means greater than 66% different from historic condition. The fuel treatment activities in 2007 reduced the Fire Regime Condition Class from FRCC 2 to FRCC 1 on 2,337 acres and from FRCC 3 to FRCC 2 on 2,225 acres. The other treated acres did not improve the condition class a full increment. Movement between condition classes is considered a substantial achievement, and therefore the fuel treatments and other fuel reduction activities conducted in 2007 were effective in mitigating fire risk due to historically unnatural vegetation conditions.

The fuels program was economically efficient in 2007. All projects were accomplished in partnership with other resource management programs. When two or more programs contribute economic resources and achieve resource accomplishments with the same treatment, the treatment is efficient at meeting resource goals.

Fire preparedness was effective as well in 2007. Most fires were controlled during initial attack with minimal acres burned. In some fires that were not controlled early, past fuel treatments proved effective at preventing their spread. The Blueberry Blossom Fire (200 acres) burned an area treated in the late 1990's. That treatment proved effective in preventing a crown fire, and the total acres burned were less than what could have been. The Stockyard Fire (about 40 acres) burned in an area where fuel breaks had been established. These fuel breaks were successful in limiting acres burned and protecting structures.

Future Monitoring Activities:

Continued safety for fire personnel and the public must remain the number one priority of the fuels and wildfire program. Additional core values include fiscal integrity, and treating people with mutual respect.

Continued monitoring of fuel reduction, fire suppression and prescribed burning activities will be conducted, especially those related to improving the fire regime condition class.

The 1,000 acres per year fuel treatment objective should be consistently exceeded to reflect current management direction. The 1,000 acre figure was used to indicate a need to increase the fuels reduction program (previously limited to about 500 acres per year) but limited by historical budget restrictions. Due to the direction of the Healthy Forest Restoration Act and the willingness of Congress to fund fuels reduction projects, those budgetary concerns are no longer valid while the need for fuels management and condition class restoration continue to increase.

Recreation Motor Vehicles

Monitoring Question:

- To what extent is the Forest providing OHV opportunities?
- What are the effects of OHVs on the physical, biological, and social environment?
- How effective are Forest management practices in managing OHV use?

Monitoring Activity Relationship to Forest Plan:

- 2300 Recreation Management Motorized and Non-Motorized Trails

Goals:

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. The system includes loops and connections to access recreation facilities and local community services.
2. Trail and route development provide for multiple use, mitigate social conflicts and prevent natural resource damage.
3. Through coordination with adjacent public land/road management agencies complementing OHV and snowmobile policies and routes are provided.

Objectives:

1. In this planning period, provide off-highway vehicles trails, routes and areas indicated in Table 2300-5.

Monitoring Activity and Data Collection:

Monitoring Off-Highway Vehicle (OHV) use includes tracking total number of miles of roads, trails and areas open to OHV use and monitoring the effects of OHV use on the biological, physical and social environment. In 2007 the Forest completed its first Motor Vehicle Use Map. The map is a requirement of the Travel Management Rule of 2005. It identifies all roads, trails and areas open to wheeled motor vehicles as well as seasonal restrictions. Data was collected for this map from the Forest's INFRA roads and trails data base. Data was verified for accuracy prior to being incorporated into the Motor Vehicle Use Map. The Forest is required to update this map annually. Table RMV-1 displays the Forest Plan maximum miles of roads, trails and areas and the actual miles open based on the Motor Vehicle Use Map.

Table RMV-1. Off- Highway Vehicle Trails, Roads, and Areas

Type of Access	Forest Plan Maximum Miles Open	2007 MVUM Miles
OHV trails	75 miles	31 miles
ML 3-5 Forest Service roads	150 miles	155 miles
ML 2 Forest Service roads	2,100 miles	1,857 miles
Acres of OHV area	15 acres	15 acres

Based on the comparisons in the above table the Forest currently exceeds the Forest Plan objective of a maximum of 150 miles for Operation Maintenance Level (OML) 3-5 roads open to OHVs by five miles.

Forest Service staff continues to find areas where illegal OHV use has created resource damage. Damage includes channelization and erosion (Figure RMV-1), destabilization of sand dune slopes (Figure RMV-3), and damage to wetlands and lakeshores (Figure RMV-4). Damage to trail treads continues on snowmobile trails closed to OHV use and the North Country Scenic Trail (Figure RMV-2 and 5).



Figure RMV-1: User created trail around gate on the Rapid River-Manistique District



Figure RMV-2: Erosion caused by illegal OHV use on Snowmobile trail on the Rapid River-Manistique Ranger District



Figure RMV-3: User Created Hill Climb at Brevoort Dam Area on the Saint Ignace District



Figure RMV-4: Illegal OHV Use in Wetland



Figure RMV-5: Illegal OHV Use on the North Country National Scenic Trail – Saint Ignace District

In 2007 the Forest rehabilitated nine sites using grant funds distributed through the Michigan Department of Natural Resources (MDNR) OHV grant program. While this is a relatively small number of sites relative to the total areas of damage on the forest, it represents a positive trend toward managing illegal and damaging motor vehicle use.

The Forest is actively working with the local Sportsmen's Off-Road Vehicle Associations (SORVAs) to refine the OHV system and educate users on responsible riding on the Hiawatha.

In 2007 Forest Service law enforcement logged 21 incident reports and issued 1 violation notice for illegal OHV use on the Forest.

Evaluation of Monitoring Activities:

Based on the monitoring of OHV use on the Hiawatha National Forest, there is no need to revise any of the standards and guidelines at this time. The Forest has a system of roads and trails that provides loops and access to most local community services. The Forest's system is complemented with county roads that are also open to OHV use. Currently the Forest exceeds by 5 miles the maximum number of Operation Maintenance Level (OML) 3-5 roads open to OHVs. The Forest will look for opportunities to reduce the miles of OML 3-5 roads open to meet Forest Plan objectives. Total miles by trail and OML will continue to be monitored with annual updates to the Motor Vehicle Use Map. The Forest will work with the OHV clubs to refine this system in the future.

With the amount of illegal cross country OHV use observed, the Forest will need to continue to educate users on what roads, trails and areas are open to use. This will be accomplished through "courtesy patrols" in partnership with SORVAs, law enforcement contacts, brochures and posters, and other media releases.

The Forest will continue to rehabilitate areas where illegal OHV has occurred using MDNR OHV rehabilitation grant funds. Fourteen sites are funded for rehabilitation in Fiscal Year 2008.

Future Monitoring Activities:

The Forest will continue to update INFRA as changes are made in the number of roads trails and areas open to OHVs. Areas of illegal OHV use will continue to be monitored and mapped. We will also monitor areas that have been rehabilitated to assess the effectiveness of closures.

6. Social and Economic Stability

Monitoring Question:

- To what extent do output levels, location of timber harvest and mix of saw timber and pulpwood compare to the levels projected in the Forest Plan?

Monitoring Activity Relationship to Forest Plan:

- Projected timber output levels, location (by Ecological Land Type) and saw timber/pulpwood mix is described in Forest Plan Appendix A.

Monitoring Activity and Data Collection:

In 2007, the Hiawatha National Forest Timber Sale Program sold 40,721 million board feet (MBF) equal to 65,968 hundred cubic feet (CCF) of timber. The 2006 Forest Plan states an Allowable Sale Quantity (ASQ) of 100,009 MBF (162,014 CCF). Therefore the forest obtained 40.7% of the ASQ as stated in Appendix A of the 2006 Hiawatha National Forest Land Management Plan.

Two emphasis species groups identified in the forest plan are jack pine and aspen. Jack pine accounted for approximately 45% of forest sold target volume. Aspen accounted for approximately 9% of sold target volume. The remaining 54% of sold target volume consisted of Red/White Pine and mixed hardwood species. Sawtimber volume sold equaled 6,111 MBF (9,898 CCF). Pulpwood volume sold equaled 34,610 MBF (56,068 CCF). Value of timber sold \$2,184,456. The average price per MBF sold \$54.00. This was approximately a 50% reduction in sale receipts compared to FY 06 value sold. This drop in value was primarily due to the decrease in the housing market nation wide.

Harvesting activity occurred only on suitable lands as identified in the 2006 forest plan. In Fiscal Year 2007, 36,598 MBF (59,288 CCF) was harvested on the forest. This is approximately a 15% increase over the Fiscal Year 2006 harvest level. The total value of the harvested timber was \$2,894,781, an 8% drop from previous year. Approximately 50% of all harvesting occurred within jack pine stands. The remaining 50% of the harvests were located across all districts, land types and species groups (except cedar). Approximately 60% of harvest occurred in softwood species types and 40% in hardwood species types.

Sawtimber harvest accounted for approximately 10% of the timber harvested on the forest. Pulpwood accounted for approximately 90% of total forest timber harvest. The forest plan projected 52% of the decade 1 timber volume would be sawtimber and the remaining 48% would be pulpwood. The imbalance between projected outputs and what was actually harvested is due to an accelerated harvest level of budworm infested jack pine which was predominately sold as low value pulpwood. This imbalance should be corrected by end of fiscal year 2009.

Evaluation of Monitoring Activities:

The discrepancy between the forest plan projected sawtimber/pulpwood mix and what was harvested in 2007 can be attributed to a prolonged jack pine budworm infestation across the forest. The infestation has resulted in a jack pine removal emphasis sold primarily as pulpwood. Jack pine harvest is consistent with the forest plan which directs aggressive jack pine management in the first decade. Since this trend of intensive jack pine management is expected to decrease relatively quickly (1-2 years), there is need to change the current jack pine management strategy. It should be noted that approximately 30% of softwood pulp size timber is currently manufactured into dimensional lumber. This is due to demand, price and new technology.

Currently much of the sale program involves softwood species. Economically the forest has not balanced its species outputs in proportion to local industry demands. Economically, softwood pulp and softwood lumber mills have mostly benefited over the past 12-18 months. This trend is expected to continue during the 2008 and 2009 calendar years where the forest will produce 60% softwood. Yet this is only a short-term trend when compared to the projected decadal outputs in the forest plan. Starting in Fiscal Year 2010 the forest will strive for an output mix of 33% softwood, 33% hardwood and 33% aspen which is closer to historic levels.

Future Monitoring Activities:

Data will continue to be collected concerning the type, location and amount of timber sold.

Official timber sale harvesting data is maintained at the Regional level. It is stored in multiple data bases. The Automated Timber Sale Accounting system (ATSA) and the Timber Information Management system (TIM) are two of the more significant data bases which store this information. Quarterly accomplishments are reported upward. The forest receives an official year end report in late October or early November.

7. Soils

Monitoring Question:

- Are the effects of forest management, including prescriptions, resulting in significant changes to the productivity of the land?
- In this planning period, on a project level basis, identify soils that fail to meet Region 9 soil quality standards or where soil erosion or compaction is contributing to an overall decline in watershed condition or ecological function

Monitoring Activity Relationship to Forest Plan:

- 2500 Watershed Management, Soil Resources Goals 1 and 2; Objective 1
- LRMP, p. 4-5, Chapter IV, Table 4-3. Monitoring Items.

Monitoring Activity and Data Collection:

Monitoring activity occurred in several areas: soil disturbance (Phase 1 and Phase 2), soil compaction, and by participating in Environmental Assessment teams.

Soil Disturbance Phase 1 Monitoring:

A random selection of 27 payment units harvested in 2007 were selected for monitoring to make sure that the regional soil quality standards were being met. Each selected stand was evaluated using a meandering transect methodology. During the site visit, a qualitative estimate of the area in each of four disturbance classes was determined visually (Table 1). Note that only one bulleted attribute within a given class needs to be observed to establish the soil disturbance class and only Class 3 is considered detrimentally disturbed.

Table 1: Disturbance Class Categories

Class	Description
0	<ul style="list-style-type: none"> • No evidence of past equipment operation, • No depressions or old wheel tracks present, • Litter and duff layers present and intact, • No soil displacement evident
1	<ul style="list-style-type: none"> • Faint wheel tracks or slight depressions evident, • Litter and duff layers present and intact, • Surface soil has not been displaced and shows minimal mixing with subsoil
2	<ul style="list-style-type: none"> • Wheel tracks or depressions are evident but are not deep, • Litter and duff layers are partially intact or missing, • Surface soil is partially intact and may be mixed with subsoil
3	<ul style="list-style-type: none"> • Wheel tracks or depressions highly evident and deep, • Litter and duff layers are missing, • Evidence of topsoil removal, gouging, and piling, soil displacement has removed the majority of the surface soil • Surface soil may be mixed with subsoil, or subsoil totally exposed

Soil Disturbance Phase 2 Monitoring

For two payment units, area in each disturbance class was estimated quantitatively with one 100-foot transect per acre of the payment unit oriented along a random azimuth. The starting points for the random transects were established in the office before visiting the site. The disturbance class (Table 1) was determined at one foot intervals along each transect. Information collected along the transects was combined for the site and used to establish overall soil disturbance class percentages for the site.

Soil Compaction:

Between 2005 and 2007, soil compaction data (bulk density) was collected from 88 transects in 10 sale payment units. Compaction samples were collected at the 3-6 and 6-9 inch depths.

Bulk density sampling involved removing intact soil cores from soils at depths of 3-6 inches and 6-9 inches. The cores were dried to a constant weight at 105°C, sieved through a 2 mm screen to remove coarse fragments and weighed. Bulk density was calculated by dividing the dried weight soil sample with the coarse fragments removed by the volume of the core minus the volume of the coarse fragments.

To assess soil compaction in areas of heaviest use, bulk density samples were taken from skid trails. A random bulk density station (starting point) was selected for each transect prior to going to the field. The first skid trail past that station was sampled. If there were no skid trails encountered along the transect, then a background sample was taken at the random station. Each skid trail that intersected a sampling transect was assigned a condition class based on its apparent use as primary, secondary, tertiary, or decking area.

Environmental Assessment Teams

On every Environmental Assessment (EA), soils were evaluated. These EAs included Sprinkler, Niagra, Jack Pine Budworm 2007, and Dutch Mill. Soil input was also provided for two midscale assessments. These teams made an attempt on a project level basis to identify soils that fail to meet Region 9 soil quality standards or where soil erosion or compaction is contributing to an overall decline in watershed condition or ecological function.

Evaluation of Monitoring Activities:

Data collected from monitoring was used to assess the impacts from management activities. The Forest Plan requires the Hiawatha National Forest to meet the Regional Soil Quality Standards (FP Goal 1) and to ensure that soil productivity is restored, maintained or enhanced (FP Goal 2).

Soil Disturbance (Phase 1 and Phase 2):

The average level of no visual impact (Class 0) within the Payment Units was 70.3% (standard deviation of 23.7%). The average level of detrimental disturbance (Class 3) was 5.0% (standard deviation of 6.1%). This is well below the Region 9 Soil Quality Standard of 15% indicating that we are achieving our goal of minimizing soil impacts

during harvest operations. An average disturbance level this low across payment units, harvest types, and conditions seems to indicate a consistent effort at all levels (NEPA, stand layout, and sale administration) to minimize resource damage.

Because of the inherent variability and uncertainty associated with environmental data, confidence intervals for the mean were calculated. The 95% confidence interval for each of the disturbance classes is shown in Table 2. It should be noted that even assuming that the true mean is closer to the high end of the 95% confidence interval, this is still much less than the maximum 15% disturbance established in the Regional Soil Quality Standards.

Table 2: 95% Confidence Interval for Mean of Each Disturbance Class Based on the 2007 Sampling Data

Disturbance Class				
	0 (%)	1 (%)	2 (%)	3 (%)
95 % High	80.2	22.4	11.6	7.6
Mean	70.3	16.0	8.7	5.0
95% Low	60.4	9.6	5.7	2.5

Phase 2 assessments were completed on two randomly selected Payment Units. This data is presented in Table 3 below. Although there is not enough data for complete statistical analysis, a comparison of the data indicates a trend that Phase 1 sampling may actually be over-estimating the amount of detrimentally impacted area (Class 3).

Table 3: Comparison of Phase 1 and Phase 2 Monitoring on Two Payment Units

Payment Unit 1 (OW-21)				
	Class 0	Class 1	Class 2	Class 3
Phase 1 – Site	82.0	10.0	5.0	3.0
Phase 2 - Tran Avg	87.5 (± 10.4) ¹	10.2 (± 9.3) ¹	2.3 (± 8.3) ¹	0.0 (± 0.0) ¹

Payment Unit 2 (GS-2)				
	Class 0	Class 1	Class 2	Class 3
Phase 1 – Site	65.0	10.0	15.0	10.0
Phase 2 - Tran Avg	79.9 (± 13.5) ¹	11.0 (± 8.5) ¹	6.7 (± 8.1) ¹	2.4 (± 5.0) ¹

¹ Showing 1 standard deviation of the population for the Phase 2 sampling. Similar statistics are not available at the Payment Unit level for the Phase 1 sampling because there are no degrees of freedom associated with this type of sampling.

In general, the results from the 2007 soil monitoring indicate that the HNF is doing an excellent job of minimizing soil disturbance during harvest operations. Of the sites evaluated in the 2007 growing season, the average area per payment unit that was detrimentally impacted appears to be closer to 5% than the maximum 15% threshold stipulated by the Regional Soil Quality Standards. Coordination with the Timber Program will continue to minimize soil impacts during harvest operations.

Based on Phase 1 and Phase 2 Soil Disturbance Monitoring, the mitigation criteria used in Environmental Assessments to limit soil disturbance are effective.

Soil Compaction

The EIS identified that some areas of fine texture soil on the clay plains near Rudyard might be compacted and that there was limited sampling in this area. Further, these areas were identified as the most susceptible to negative impacts from compaction associated with skid trails. Additional monitoring was conducted on soils in this vicinity to further define this issue. Sampled units were winter harvested, a standard design criteria to minimize impacts in soils susceptible to compaction impacts.

The clay soils sampled were in the following soil mapping units (SMU) in county soil surveys, Soo Silty Clay Loam, Pickford Silty Clay Loam, and Rudyard Silty Clay Loam. Compacted soils were identified according to the Region 9 Soil Quality Standards (15% above the bulk density values published in the county soil surveys). Tables 4 through 7 show the results from this sampling.

Table 4: Bulk density exceedance on clay soils in the 3-6" depth samples by skid trail type.

Skid Trail Type	No. Samples	No. Exceed	% Exceed
Background	9	1	11.1%
Deck	1	0	0.0%
Secondary	16	2	12.5%
Tertiary	36	4	11.1%
<i>Overall</i>	<i>62</i>	<i>7</i>	<i>11.3%</i>

Table 5: Bulk density averages and exceedance by soil type for the 3-6" depth samples

Soil Field	Sample Avg (g/cm ³)	Soil Survey BD Range (g/cm ³)	15% Above Pub Lim (g/cm ³)	Std Dev	Min (g/cm ³)	Max (g/cm ³)	No of Samp	No Exceed
Soo Silty Clay Loam	1.15	1.10-1.50	1.73	0.21	0.75	1.49	13	0
Pickford Silty Clay Loam	1.24	1.10-1.35	1.55	0.28	0.70	1.70	38	7
Rudyard Silty Clay Loam	1.18	1.00-1.40	1.84	0.15	0.93	1.43	11	0

Table 6: Bulk density exceedance on clay soils in the 6-9” depth samples by skid trail type.

Skid Trail Type	No Samples	No Exceed	% Exceed
Background	9	0	0.0%
Deck	1	0	0.0%
Secondary	16	2	12.5%
Tertiary	36	5	13.9%
Overall	62	7	11.3%

Table 7: Bulk density averages and exceedance by soil type for the 6-9” depth samples.

Soil Field	Samp Avg (g/cm ³)	Soil Survey BD Range (g/cm ³)	15% Above Pub Lim (g/cm ³)	Std Dev	Min (g/cm ³)	Max (g/cm ³)	No of Samp	No Exceed
Soo Silty Clay Loam	1.54	1.40-1.70	1.96	0.17	1.18	1.74	13	0
Pickford Silty Clay Loam	1.57	1.40-1.65	1.89	0.17	1.17	1.91	38	2
Rudyard Silty Clay Loam	1.53	1.10-1.40	1.61	0.13	1.33	1.71	11	5

Based on this sampling, winter logging on clay soils does not appear to be causing overall compaction beyond the R9 SQS limit of a 15% increase in bulk density on 15% of the area of sale payment units. The Regional Soil Quality Standard was not exceeded on any individual payment unit.

As shown in Table 4, on average only 11.3% of the 3-6 inch profile samples exceed the density standard of 15% above published limits in our sampling of the most heavily impacted areas, skid trails. Based on this data, the Hiawatha National Forest is meeting the regional soil quality standards. Further, averages from within the skid trails are close to the midpoint of the published soil survey bulk density range, showing qualitatively that surface soils are not compacted even in areas of highest activity (skid trails).

Bulk densities for the 6-9’ profile are generally within the soil survey bulk density range. Only the Rudyard soils have an average bulk density that exceeds the bulk density published in the soil survey shown in Table 7. However, the Rudyard soil average bulk density is within 1 standard deviation of the soil survey average, and the high value may be a reflection of the limited number of samples collected. Since it is close to the published mean, we are not overly concerned, although additional sampling in Rudyard soils is recommended.

Concern has been raised elsewhere in the Region that soils may be compacted based on historic land management practices and that current management practices may be compounding this problem. One of the background samples exceeded the density limit

in the 3-6 inch layer. None of the background samples in the 6-9 inch depth range would have been classified as compacted. Although we found only limited compaction in the harvested stands, and we do not know recovery times, it appears that there is very limited evidence in this data to support the hypothesis that past land management has caused residual high density (above the standard) within the units sampled.

This data supports the conclusion that the samples can generally be trusted and the conclusions about the density values and extent of compaction in sale areas are sound. Further, winter harvesting on clays may cause some limited increases in soil density, but does not appear to detrimentally impact soil conditions.

Based on this sampling data, the effects discussed in the 2006 Hiawatha National Forest Management Plan Environmental Impact Statement are occurring as predicted. Winter logging in clay soils susceptible to compaction is not impacting soil conditions or decreasing site productivity.

Environmental Assessment Teams

Members of these teams have made recommendations on which stands (or portions of stands) should be avoided, and where winter harvesting should occur. Field monitoring has not yet occurred on these stands to assess whether the recommendations were effective when combined with other resource management recommendations and limitations. However, given the results from the soil disturbance and compaction monitoring as reported above, success is very probable.

Future Monitoring Activities:

Soil Disturbance Monitoring

- 2007 was the first year using this monitoring technique, and it provided a good overall picture of soil disturbance on the HNF.
- Other environmental factors such as soil type, time of harvest, Ecological Landtype Phase, Environmental Assessment for harvest area, and mitigation measures used during the harvest activity may be relevant for analysis. Sample stratification is possible when payment units are selected so harvest activities and specific conditions can be evaluated. In 2007, there was not enough data associated with any particular factor to make definitive statements for specialized conditions. We may be able to combine 2007 information with data to be collected in the future to make more definitive statements.
- Additional coordination is needed with the Timber Program to determine stand and harvest history. This is particularly important for stands that may have been partially harvested over several winters or have had limited access.
- Additional coordination is needed with the Silviculture Program, particularly to ensure that units are visited prior to site preparation activities so that a differentiation can be made between soil disturbance from harvest operations and site preparation for regeneration.

Soil Compaction:

- Paired sampling is recommended (on and off skid trails) to more clearly document changes on the skid trails and to collect additional background data.

8. Timber Regeneration

Monitoring Question:

- Are harvested lands adequately restocked after five years?

Monitoring Activity Relationship to Forest Plan:

- Lands are adequately restocked as specified in the Forest Plan. LRMP, p. 4-4, Chapter IV, Table 4-3. Monitoring Items.

Monitoring Activity and the Data Collected:

Stands treated with regeneration harvests, such as clearcuts, seed tree cuts, shelterwood cuts, or selection cuts, must be reforested within five years of harvest under the National Forest Management Act (NFMA). Reforestation may be through natural regeneration with or without site preparation, or through artificial means such as planting seedlings or applying seed. Reforestation activities are scheduled as soon as possible after harvest. Any needed site preparation is usually done in the first field season following harvest. If seeding is planned, that activity usually takes place on snow in late winter following site preparation. If planting is planned, that activity is usually scheduled for the spring following site preparation.

Stands are surveyed at least twice following reforestation activities to monitor reforestation success and ensure that reforested stands are restocked with an adequate number of young trees to meet management goals. Stocking surveys are usually conducted in the first and third years following reforestation activities; additional surveys may be scheduled in some stands.

A minimum of five sample plots are taken in each stand surveyed, with the number of plots increasing as stand size increases. Plot locations are distributed throughout the stand to ensure that all areas of the stand are surveyed. While walking between plots, the surveyor also notes whether overall regeneration stocking is similar to the results in the plots. Stands where regeneration stocking is lower than desired for that stand's management goals will be scheduled for additional reforestation activities, usually supplemental planting.

Evaluation of Monitoring Activities:

Approximately 5,600 acres were scheduled for third-year or later stocking surveys in 2007. All of the acres requiring stocking surveys were evaluated. Of these, about 5,300 were certified as regenerated with sufficient stocking.

There were approximately 300 acres that were not certified as regenerated with sufficient stocking based on results of third-year or later surveys in 2007. These stands were scheduled either for supplemental planting in 2008 or for additional surveys to determine whether supplemental reforestation activities would be needed.

It is likely that there will always be a relatively small percentage of stands where the initial reforestation activity will need to be supplemented to some degree. The Forest has experienced several years with extended periods of dry weather during the growing season, which often results in some seedling mortality. Even when weather conditions are favorable, other factors such as deer browsing, insects, or disease may sometimes result in a need for additional reforestation efforts. Current reforestation methods and activities are adequate to fulfill the NFMA reforestation requirements and no changes are needed.

Future Monitoring Activities:

Reforestation success will continue to be monitored through stocking surveys for all stands now in the process of regeneration, as well as for stands harvested and reforested in the future, to ensure that harvested stands are adequately reforested within five years. Where needed, supplemental reforestation activities will be carried out to ensure this goal is met within the required time period.

11. Wildlife Management Indicator Species

Monitoring Question:

- Are habitat trends of Management Indicator Species consistent with Forest Plan expectations?

Monitoring Activity Relationship to Forest Plan:

- 2600 Wildlife, Fish and Sensitive Plant Habitat Management Goals:
 1. Diverse, healthy, productive and resilient habitats for aquatic and terrestrial wildlife are provided

Brook Trout (*Salvelinus fontinalis*)

Monitoring Activity and Data Collection:

The quantity and quality of habitat for brook trout, a coldwater species, is influenced by in-stream and riparian habitat improvement projects that address important requirements such as spawning gravel, low sediment loads and woody debris (Forest Plan Environmental Impact Statement pp.3-220-221). During 2007, the following management activities were completed and will benefit over 10 miles of brook trout habitat:

- Sand bedload was reduced by maintaining in-channel sediment basins in Haymeadow Creek, Eighteenmile Creek, Johnson Creek, Camp 83 Creek, Buckeye Run, Big Murphy Creek, Carp River, West Branch Pine River and the North Branch Pine River.
- Construction of log bank covers in portions of Bear Creek (East Unit) and Little Murphy Creek provided large wood structure and pools.
- Stabilization of 320 ft of eroding sand bank on the Indian River reduced sediment input, provided large wood structure, will improve spawning habitat and, through planting, will reestablish native conifer species that provide shade and woody debris (Figures 1A and 1B).
- Reconstruction of road-stream crossings on the West Branch Pine River, Johnson Creek and Big Murphy Creek (Figure 2) improved fish passage and reduced sediment inputs. Mitigation included maintenance of sediment basins listed above.

Brook trout habitat also is influenced by watershed-scale changes in riparian and upland conditions that affect stream flows, sediment loads, water temperatures, large wood loading and other habitat features. These changes may result from natural processes such as succession of vegetation and climate change or from changes in human land uses including forest management activities.



Figure 1. Stabilization of an eroding bank on the Indian River. **A**-Pre-treatment view. **B**- One month post-treatment.



Figure 2. Reconstructed stream crossing on Big Murphy Creek at CR-437.

The effects of habitat improvement projects and watershed-scale changes are monitored by periodic system-wide inventories at fixed sites in rivers and by effectiveness monitoring at sites where management prescriptions have been (or will be) implemented. Habitat assessments are done at multiple transects within sampled sites so that changes in habitat features such as channel width, depth, substrate composition and woody debris can be quantified. Observed changes in habitat features are often subtle and may be inconclusive regarding potential effects on brook trout habitat. Brook trout populations reflect habitat, therefore, temporal changes in the abundance and size distribution of populations, combined with habitat data, provide a good indication of trends in habitat suitability.

Population data are collected according to state-approved protocols that include single-run electrofishing (catch per unit of effort) at inventory stations and two-run depletion electrofishing (population estimates) for intensive monitoring in treatment areas and untreated control areas. Habitat assessments are done at multiple transects within

sampled sites. Spawning nests (redds) are counted annually on most sites where spawning gravel has been installed. Redd counts are compared to observed changes in numbers of juvenile trout to assess effectiveness of spawning habitat enhancement projects. Time-series photography documents habitat responses. Changes in the amount of beaver activity (especially the number of beaver dams), are noted during inventories as this affects water temperature and a wide variety of habitat components required by brook trout.

Evaluation of Monitoring Activities:

Brook trout monitoring is split into two distinct categories. Habitat improvement monitoring focuses on those activities done to improve brook trout habitat in distinct geographic areas. Watershed-scale monitoring is done to assess overall trends due to changes in the overall watershed condition that results from such activities as road construction, beaver dams, and forest management. Each of these categories is discussed in more detail.

Evaluation of Habitat Improvement Projects

During 2007, effectiveness monitoring for habitat improvement projects occurred in Bear Creek (pre-treatment), the Little Indian River (post-treatment) and several streams where spawning gravel has been installed.

Pre-treatment monitoring

Pre-treatment monitoring of habitat and the brook trout population occurred in a habitat enhancement area (“Treatment Area”) and untreated control (“Control Area”) on Bear Creek (East Unit) in 2007 (Tables 1 and 2). These data serve as basis to evaluate the effectiveness of enhancement projects and can be compared with results of future monitoring efforts. Log bank covers were installed in the treatment area shortly after assessments were completed

Table 1. Pre-treatment habitat conditions in Bear Creek on July 19, 2007. Station length is 500 ft

Habitat Parameter	Treatment Area	Control Area
Average width(ft)	12.7	12.2
Average depth (ft)	0.6	0.6
Percent pools	24	19
Percent gravel	0	38
Large wood count	9	34

Table 2. Pre-treatment population estimates for brook trout in Bear Creek on July 19, 2007. Log bank covers were installed in the treatment area shortly after population assessments were completed.

Brook Trout Size Class (inches)	Numbers of Brook Trout (95% CI) per 500ft	
	Treatment Area	Control Area
2	0	9(9-12)
4-6	11(11-12)	13(13-19)
7-10	4(4-5)	4(4-5)

Post-treatment monitoring

Post-treatment effectiveness monitoring for a log bank cover project on the Little Indian River consisted of population estimates in the treatment area and untreated control area. Pre-treatment (2003, 2004) and post-treatment (2006, 2007) population estimates for brook trout indicate that populations fluctuate from year to year and there has been no consistent response to installation of bank covers to date (Figure 3). The amount of cover installed was minor in relation to the size of the stream and was only about 50% of the prescribed amount. The prescribed cover installation will be completed in the future. Habitat and populations will be reevaluated following completion of all prescribed activities to assess their effectiveness.

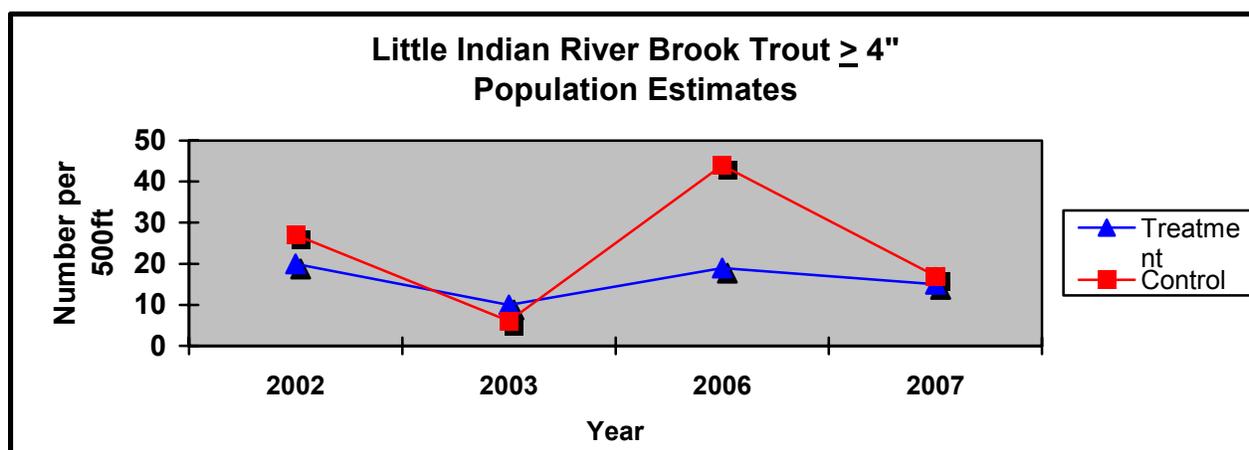


Figure 3. Population estimates for brook trout before (2002, 2003) and after (2006, 2007) installation of log bank covers in the Little Indian River.

Spawning gravel monitoring

Brook trout spawning redds were counted on installed gravel in several streams. Ocular estimates of spawning use relative to the area of gravel were made to assess the effectiveness of the gravel installation (Table 3). Spawning areas on 5 of 9 streams are well used and past population monitoring has found good to excellent production of juvenile brook trout on these streams.

Table 3. Counts of brook trout redds on streams where spawning habitat has been installed by the Forest Service. Counts are the highest number of redds observed on dates near the end of the spawning season (late October-November).

Stream	Number of Redds	Use Relative to Gravel Area
<u>West Unit</u>		
Bear Creek	1	Very light
Camp 12 Creek	47	Very heavy
Camp 83 Creek	10	Moderate
Fishdam River	39	Moderate
Gully Run	2	Light
Little Murphy Creek	28	Moderate
Johnson Creek	5	Light
Little Black Creek	3	Light
<u>East Unit</u>		
Biscuit Creek	40	Heavy

Those areas that had light or very light gravel bed use were further assessed. Trout access to gravel was impeded by beaver damming activity on Little Black Creek and by very low flows on Gully Run. The spawning area on Johnson Creek has reached its effective life-span and is scheduled for maintenance in 2008. Reasons for low use on Bear Creek are not clear but will be investigated further in Fiscal Year 2008.

Evaluation of watershed-level monitoring:

Inventories were conducted in the Whitefish River and tributaries to the North Branch Pine River to assess the overall watershed condition relative to brook trout habitat. Habitat and brook trout populations were assessed at 17 inventory stations in these two watersheds and compared to findings of inventories completed during the 1990s. Additionally, long-term annual monitoring of trout population trends continued in the Indian River.

Whitefish River

In the Whitefish River system the only substantial change from the previous inventory was that stream flows were much lower in 2007 due to drought conditions. This reduced average channel widths and depths 6% and 22%, respectively, and probably increased maximum stream temperatures, though this parameter was not monitored. Amounts of large woody debris and spawning gravel changed 2% or less. Low flows this year had little effect on brook trout abundance as numbers changed very little or not at all in 7 of the 8 stations sampled in the Whitefish River (Figure 4).

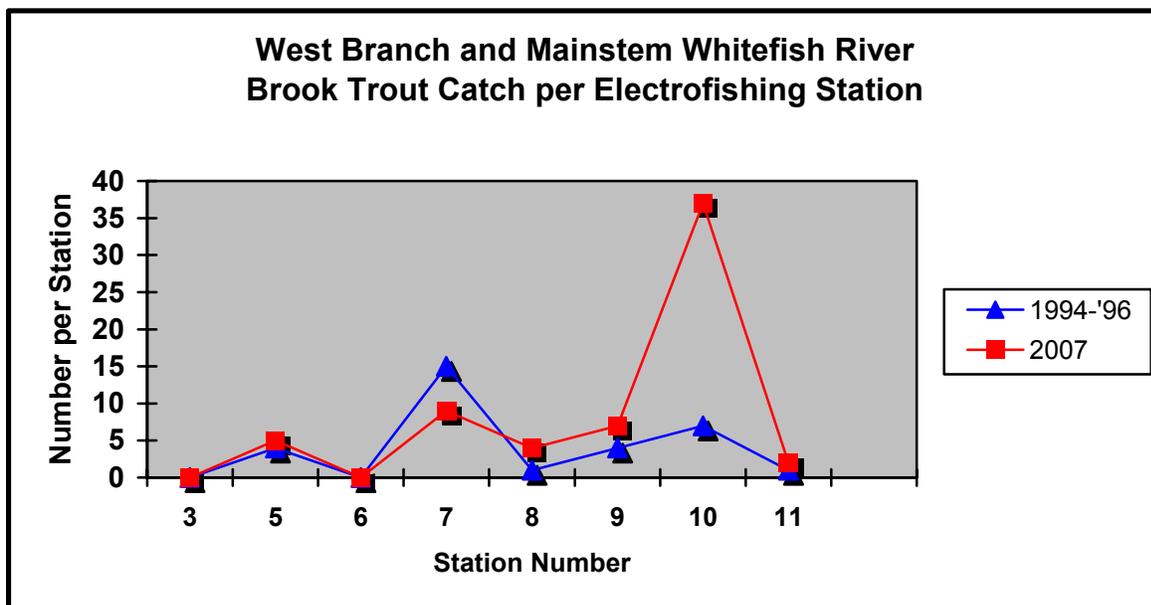


Figure 4. Catch of brook trout at inventory stations in the Whitefish River system.

North Branch Pine River

On tributaries to the North Branch Pine River, stream flows were very similar to the previous inventory. Amounts of large woody debris and spawning gravel changed very little except at station 9 where gravel increased from <1% to 25% of substrate due to a

habitat improvement project. Brook trout abundance increased in 5 of 9 stations (Figure 5) but new beaver dams are impeding dispersal of juveniles from headwater spawning areas (stations 5,6,13, 14 and 17) to suitable adult habitat downstream in stations 4, 10 and 12.

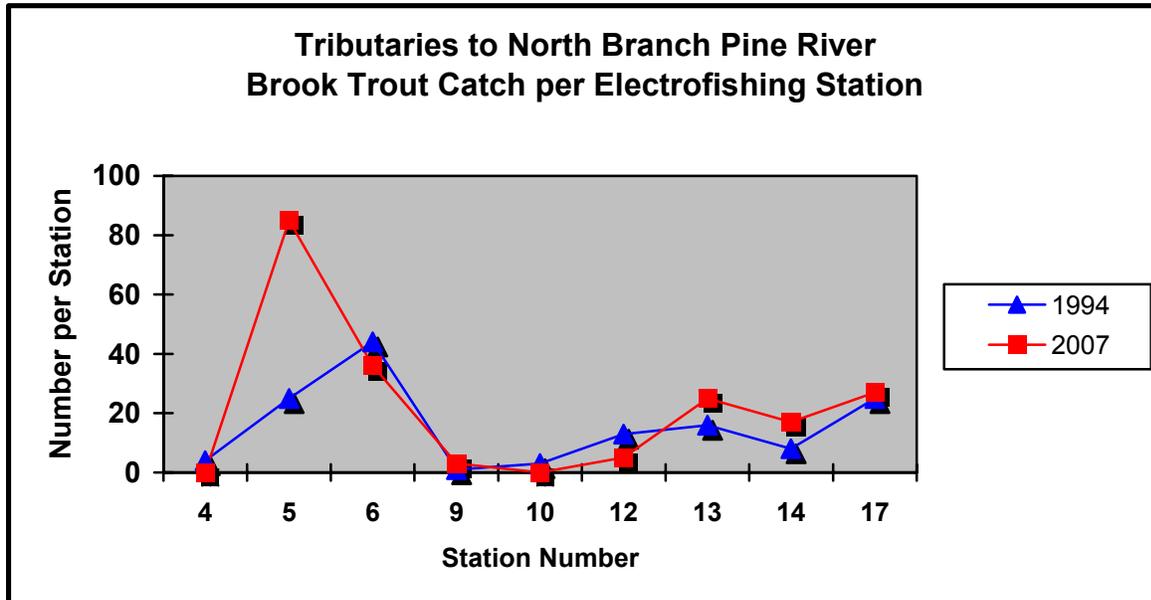


Figure 5. Catch of brook trout at inventory stations in the North Branch Pine River system.

Indian River population monitoring

Population estimates in long-term monitoring stations on the Indian River in 2007 showed that numbers of age 0 (young-of-the-year) brook trout were 32% lower than the long-term average but numbers of age 1-2 brook trout were 21% above average (Figure 6). Although there have been large fluctuations in age 0 numbers from year to year the general trend has been slightly upward for all ages of brook trout since the mid 1990's. This suggests that habitat conditions are slowly improving as riparian timber stands age and habitat improvement projects begin to have an effect.

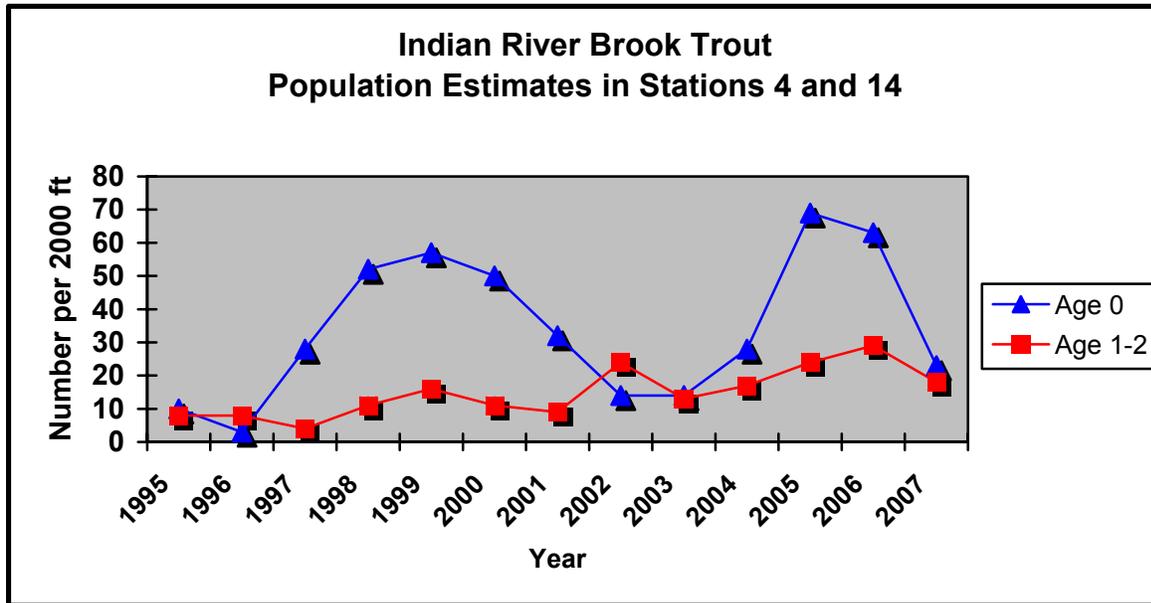


Figure 6. Population estimates for brook trout in Stations 4 and 14 on the Indian River.

Overall evaluation of monitoring activity

These monitoring activities across the Forest indicate that brook trout populations fluctuate widely from year to year but are stable or increasing in the long-term.

Future Monitoring Activities:

Brook trout habitat and population responses will be monitored during 2008-2012 at a representative sample of habitat improvement sites to determine effectiveness. Trends in brook trout habitat and populations will also be monitored with inventories conducted on 2 or 3 river systems annually. This inventory schedule will be coordinated with the Michigan Department of Natural Resources.

12. Treaty Rights

Monitoring Question:

- How are the MOU's between the Forest and Native American Tribes being implemented?

Monitoring Activity and Data Collection:

The Forest Service shares in the United States' trust responsibility and treaty obligations to work with federally-recognized Tribes on a government-to-government basis to protect the Tribes' ceded territories on lands administered by the Forest Service. As such, the policies of the Forest Service toward federally recognized tribes are intended to strengthen relationships and further tribal sovereignty through fulfilling mandated responsibilities. The Hiawatha National Forest outlines its policies and responsibilities on tribal relations in two Memoranda of Understanding (MOU): 1) The 1999 Memorandum of Understanding Regarding Tribal – USDA Forest Service relations on National Forest Lands within the territories ceded in treaties of 1836, 1837, and 1842, and 2) 2006 Memorandum of Understanding Regarding Tribal - USDA Forest Service Relations on National Forest lands within the territory ceded in the Washington Treaty of 1836 and any National Forest lands located within the exterior boundaries of the reservation of any signatory tribe.

Forest Service leadership meets annually with the MOU tribal signatories of each MOU to discuss MOU implementation, facilitate ongoing communication, and to discuss issues arising under the MOUs. In addition to the annual MOU meetings, Hiawatha National Forest deciding officials lead consultation efforts on all of the Forest's project level decisions. The deciding officials along with interdisciplinary team members made themselves available to tribal elected officials, tribal natural resource staff and Tribal Historic Preservation Officers to discuss project proposals, solicit tribal concerns, and encourage further input on projects. In 2007, these meetings were met with varied degrees of interest and input from the tribes.

Evaluation of Monitoring Activities:

The 1999 MOU has been in place for over five years and is running smoothly. Through provisions laid out in the MOU, projects and processes have been implemented without notable complications. Some activities conducted under this MOU include notification of birch bark gathering opportunities, implementation of camping fee and length of stay waivers for tribal members exercising treaty rights, and implementation of an off-reservation National Forest gathering code. The 2006 MOU has been in place for about a year and implementation has been successful thus far.

14. Wetlands

Monitoring Question:

- To what extent are wetlands being protected and wetland functions being restored?

Monitoring Activity Relationship to Forest Plan:

- Plan objectives to restore soil-hydrologic functions.
- 2500 Watershed Management Desired Condition, Goals 1, 2, and 3, Objectives 2 and 3; Riparian Ecosystem Standards 1, Guideline 1 and 6.
- LRMP, p. 4-6, Chapter IV, Table 4-3. Monitoring Items
- Clean Water Act

Monitoring Activity and Data Collection:

The Hiawatha National Forest took a multi-factor approach to monitoring wetlands during 2007. Assessing wetland protection was a component of both the Best Management Practices (BMP) monitoring and the soil disturbance monitoring. We also arranged a multidisciplinary BMP meeting, and participated in environmental assessment teams.

Best Management Practices (BMP) Monitoring

During 2007, monitoring was conducted on the implementation of Michigan's Best Management Practices (BMPs), along with applicable Forest Plan Standards and Guidelines for riparian management on 22 randomly selected harvest units. Numerous factors were qualitatively evaluated in the field. Some of the primary considerations included:

- Identifying and avoiding wetlands/water bodies
- Applying appropriate buffer widths
- Identifying and designing road/water crossings
- Location of landings, roads, and equipment maintenance areas
- Complete removal of temporary roads and/or crossings
- Installation of erosion control structures in the unit and along access road(s)
- Slash disposal
- Presence of long-lived trees along cold water streams.

Soil Disturbance Monitoring

During the 2007 growing season, 27 sites were qualitatively evaluated to monitor compliance with the Regional Soil Quality Standards in accordance with the HNF 2006 Forest Plan. Among the factors evaluated included rutting in wet areas and other wetland impacts. For a more detailed description of the soil disturbance monitoring methodology and results see the Soils Section of this report.

Multidisciplinary BMP Meeting

A multidisciplinary BMP meeting was held after evaluating the 22 sites for appropriate BMP use. Results from the monitoring activity were discussed with other groups within the Hiawatha (Timber, Silviculture, Wildlife, Rangers). Further, a field trip was taken to evaluate a site in the field that typified many of the issues surrounding upland and lowland harvesting. During the meeting, a discussion was held regarding what was done right and what areas needed improvement.

Environmental Assessment Teams

The Soil and Watershed group was involved with all major Environmental Assessments that occurred in 2007, including Sprinkler, Niagara, Jack Pine Budworm 2007, and Dutch Mill. Wetland input was also provided two midscale assessments. The group attempted to identify wetland areas that were in need of protection or had reduced functionality due to past land use. Furthermore, the group made recommendations to protect wetland functions and avoid and/or minimize impacts.

Evaluation of Monitoring Activities:

BMP Monitoring

Based on the 2007 monitoring, wetland resources were protected in situations where the payment unit was an upland site near a wetland area. Protection was accomplished by adjusting stand boundaries and establishing appropriate buffers to prevent wetland disturbance.

Some detrimental soil rutting occurred in stands that contained small wetland inclusions, especially in hemlock dominated stands. While rutting did not occur on 15% of the entire stand in most instances, a high percentage of the wetland inclusions within the stands were impacted by rutting. Rutting has impacted the values of wetland aesthetics and recreational use, but has not significantly changed the wetland functions of flood attenuation, erosion control, water purification, sediment trapping, or nutrient removal.

The methodology used during the Fiscal Year 2007 monitoring cycle to evaluate BMPs in sale units within 100 feet of wetlands did not work well since it was easy to miss wetland disturbances within the stands. However it was determined that documentation already being collected for the Phase I Soil Monitoring being performed simultaneously was adequately recording effects to wetlands.

Soil Disturbance Monitoring

The soil disturbance monitoring was not explicitly designed to assess how wetlands were being protected or restored as part of our management activities. However, it was observed that efforts to restore or protect wetlands are being made by limiting harvest seasons, carefully selecting sites, timing of harvest activities, and applying appropriate buffers to sensitive areas.

In general, large easily identifiable wetland areas are avoided during site selection and sale preparation stages by either eliminating the stands from further consideration and/or providing large limited-management buffers to protect the resources.

The monitoring did note that there are some problems with our harvest operations in wetlands. Of the sites that were considered detrimentally disturbed, two had high levels of rutting in hydric soils unable to support the harvest equipment. With the data currently available, it is not possible to determine the exact cause of the rutting, but some likely factors include warmer winters with thinner snowpack/frozen soils and small inclusions of vulnerable soils not identified prior to harvest operations. Per discussions with sale administrators, it is also possible that much of the damage occurs in the first and last week of operation as the purchaser attempts to put in roads and complete the job before spring break-up. It was also noted that the sale administrator diaries usually warned purchasers of these issues and/or stopped harvest operations when damage was noted. On several of the other sites, it was noted that much of the soil disturbance occurred in small wetland inclusions.

Multidisciplinary BMP Meeting

The multidisciplinary meeting was a great success. It allowed a free and open exchange of ideas on how to protect wetlands as well as other soil and water resources. Some of the ideas that came out of that meeting included:

- Protection of wetlands and other resources can not be completely accomplished at any single phase of the projects. Rather, it will require consistent effort at all phases of timber sales: planning, marking, implementation, administration. This will be particularly important for small wetland inclusions that are within stands and are frequently unmapped on published sources because of their size.
- Conduct similar multidisciplinary reviews of projects annually
- Although it is best to identify issues early, timber markers and sale administrators have the ability to limit impacts as a last resort.
- Minor modification of data collection forms and increased help from the timber program could help gather information before visiting the field.

Environmental Assessment Teams

An attempt is made during every environmental review to minimize impacts to wetlands. Members of these teams have made recommendations on which stands or portions of stands should be avoided, and where winter harvesting should occur. Monitoring has not yet occurred on these stands and we can not therefore know if the recommendations were effective when combined with other management recommendations and limitations. However, given the results from the monitoring that was conducted based on past recommendations, it appears that in general we are doing a good job of minimizing impact.

Future Monitoring Activities:

- The BMP and Soil Disturbance monitoring will continue. This monitoring helps assess wetland protection as required in the Forest Plan.

- Future multidisciplinary BMP trips will be conducted to review progress towards minimizing wetland impacts.
- Additional work needs to be completed to assess the protection of wetland functions.

16. Non-native Invasive Species

Monitoring Question:

How effective is the Forest at treating and controlling the spread of non-native invasive species?

Monitoring Activity Relationship to Forest Plan:

- 2500 Watershed Desired Conditions: “Exotic species are not spreading or adversely affecting native flora and fauna in riparian and aquatic areas”
- 3400 Pest Management Goals:
 1. Work with state, local, tribal, other agencies and organizations to discourage the spread of undesirable non-native species
 3. The spread of existing non-native invasive species is controlled using permissible mechanical, biological and chemical controls
 4. Educational materials about controlling and/or reducing the spread of non-native invasive species are developed and distributed at appropriate locations including boat launches, trailheads, etc.
- 3400 Pest Management Objectives:
 1. In this planning period, identify and map areas of non-native invasive species concentration on the forest
 2. Annually treat 40 acres of identified non-native invasive species
- 3400 Pest Management Guidelines:
 1. Integrated pest management methods should be used to minimize the effect or prevent the spread of insect and disease infestations
 2. Promote spatial diversity of vegetation and age classes guided by the ecological characteristics of the landscape to reduce the risk of insect and disease damage
 4. Gravel and topsoil should be from a source where weed reduction practices are being used

Monitoring Activity and Data Collection:

Non-native invasive species (NNIS) monitoring for 2007 consisted of recording treatment effectiveness on 50% of all acres of NNIS treatments from the same year. Treatment effectiveness is measured with ocular estimates of the percentage plants killed with the treatment. This data is entered into a form on the Natural Resources Information Systems (NRIS) database. Additionally, we continued to count the number of the same size garbage bags of hand-pulled plants removed at each documented site.

Garbage bag counting is a method used to determine how effective NNIS treatments are at given sites. At approximately the same time each year, sites are treated with 100% hand-pulled removal. Pulled plants are placed in 55-gallon garbage bags and counted when they are removed from the site. The number of bags can then be used to estimate the amount of weed biomass removed at a given site every year. Between-year trends

can be used to indicate the long-term effectiveness of the treatments. Bag data will be examined for trends on a five year basis.

The Hiawatha National Forest participates in a weed cooperative with several other agencies including The Nature Conservancy Upper Peninsula chapter, Upper Peninsula Resource Conservation and Development Council, Marquette Conservation District, Pictured Rocks National Lakeshore and Moosewood Nature Center. Some sites were monitored with the help of The Nature Conservancy. Additionally, volunteers were present and contributed to treatment and monitoring of approximately 136 and 76 acres respectively.

In 2007, 58 sites (169.8 acres) were treated with hand-pulling control measures. Twenty seven weed treatments were monitored, totaling 77.6 acres. Treatment effectiveness was determined after a waiting period. Evaluating sites by returning to the site after treatment enables the Hiawatha to get a better feel for how much of an area was not controlled due to missed plants or late germinating individuals. The average treatment control was 77%. Treatment focused on the following invasive species: *Allaria petiolata* (garlic mustard); *Arctium minus* (burdock); *Centaurea biebersteinii* (spotted knapweed); *Cirsium arvense*, *C. palustre*, *C. vulgare* (Canada, marsh and bull thistle); *Cynoglossum officinale* (houndstongue); *Euphorbia esula* (leafy spurge); *Hypericum perforatum* (St. Johnswort); *Lythrum salicaria* (purple loosestrife); *Melilotus alba* (white sweet clover); *Phalaris arundinacea* (reed canary grass); *Pinus sylvestris* (Scotch pine) and *Tanacetum vulgare* (Common tansy).

Evaluation of Data Collected from Monitoring Activities:

We continue to see a downward trend in biomass removed at selected NNIS sites, which indicates the treatments are being effective. Hand treatments can cause plants to use carbohydrate reserves, which causes a reduction in total infestation. However, eliminating populations entirely is hard to accomplish because weeds are typically hardy and produce high numbers of seed. While the HNF's average control of 77% is very good, we will likely see better long term control when we implement herbicide use for weed control. Herbicides can systematically affect the entire plant and completely kill individuals. Pre-emergent herbicides can have great effectiveness at reducing the seed bank of NNIS.

Future Monitoring Activities:

The Hiawatha has an integrated target of 540 acres in 2008. Effectiveness monitoring will be performed on 270 acres in order to meet the criteria of monitoring 50% of all treatment acres in a fiscal year. We will also examine bag data next year to determine if herbicides are having a marked improvement on amount of NNIS biomass at infestation sites. Timber sale administrators will complete cleaning inspection forms, allowing us to monitor whether equipment cleaning was implemented. Additionally, we will examine the effectiveness of prevention measures, such as equipment cleaning, by monitoring for new NNIS infestations in units that are examined through rare plant protection implementation monitoring.

17. Water Quality

Monitoring Question:

- Is the Forest adequately implementing BMPs and are they effective in protecting the beneficial uses of water?
- Is the Forest improving water quality for waters within and flowing off of Forest Service boundaries?
- How is the Forest complying with the Clean Water Act requirements?

Monitoring Activity Relationship to Forest Plan:

- 2500 Watershed Management, Desired Condition, Goals 1, 2, 3, 5, and 6, Standards 1, Guidelines 1, 3, 5, and 6; Riparian Ecosystem Standards 1, Guideline 1, 2, 5, and 7; and Aquatic Ecosystem Standard 1.
- LRMP, p. 4-6, Chapter IV, Table 4-3. Monitoring Items.

Monitoring Activity and Data Collection:

Monitoring activities and data collection associated with water quality includes Best Management Practices (BMP) monitoring and being active in project design during the Environmental Assessment Phase of a project.

BMP Monitoring

During 2007, BMP monitoring was conducted on 22 sites. The implementation of Michigan's Best Management Practices (BMPs) was monitored, along with applicable Forest Plan Standards and Guidelines pertaining to riparian management. Some of the primary considerations included:

- Identifying and avoiding wetlands/water bodies
- Applying appropriate buffer widths
- Identifying and designing road/water crossings
- Location of landings, roads, and equipment maintenance areas
- Complete removal of temporary roads and/or crossings
- Installation of erosion control structures in the unit and along access road(s)
- Slash disposal
- Presence of long-lived trees along cold water streams.

Environmental Assessment Teams

The Soil and Watershed group was involved with all major EAs that occurred in 2007, including Sprinkler, Negara, Jack Pine Budworm 2007, and Dutch Mill. Wetland input was also provided two midscale assessments. These meetings discussed ways to avoid and minimize impacts to water quality and wetlands covered under the Clean Water Act.

Evaluation of Monitoring Activities:

BMP Monitoring

No issues were identified with respect to management activity that would adversely affect streams on the sites evaluated. In every case where a stream was near a harvest unit, appropriate BMPs were used and the aquatic resource was adequately protected from slash disposal, thermal loading, and sedimentation. In most instances, stand boundaries were altered such that the sale unit remained more than 100 feet from streams. Where payment units did occur 100 feet or closer to streams, buffer zones were established and maintained such that the stream was protected. The conditions required by the Forest Plan are being implemented and appear to be effective.

The BMP monitoring documented that wetland resources were protected in situations where the payment unit was an upland site near a wetland area. Some detrimental soil rutting occurred in stands that contained small wetland inclusions, especially in hemlock dominated stands. While in most instances rutting did not occur on 15% of the entire stand, a high percentage of the wetland inclusions within the stands were impacted. This did not appear to have an impact on water quality since these seasonal wetlands do not usually flow into other surface water and are therefore not able to transport sediment. There are some water quality issues to the wetlands being impacted but it is not affecting the overall water quality on the Hiawatha National Forest or waters flowing off of the Hiawatha National Forest. These disturbances are localized and represent impacts to only a very limited portion of the wetlands/waters on the Forest.

Environmental Assessment Teams

An attempt is made during every environmental review to minimize impacts to all waters. Teams have made recommendations about which stands or portions of stands should be avoided, and where winter harvesting should occur. Monitoring has not yet occurred on these stands to determine if the recommendations were effective when combined with other management recommendations and limitations. However, given the results from the monitoring that was conducted based on past recommendations, it appears that in general we are minimizing impact and protecting water quality.

Future Monitoring Activities:

- BMP monitoring will continue in 2008. It will be performed in conjunction with the Phase I Soil Disturbance Monitoring to be more cost effective. Other suggestions from the 2007 monitoring include:
 1. Use a multi-discipline team to perform BMP monitoring at a selected number of sites.
 2. Review Environmental Assessments (EAs), Decision Notices (DN), timber sale contracts, and sale administration notes in conjunction with field visits.
 3. Develop new field monitoring sheets based on revised State of Michigan BMPs. Try to attain data that can be quantitatively assessed.

4. Omit wetlands from BMP monitoring and incorporate that evaluation into Phase I Soil Monitoring.

- Members of the Environmental Assessment teams will continue to work to identify sensitive areas and measures to protect water quality.

Water Quality Monitoring Objective:

- Implement 100 acres per year of vegetation improvements to enhance riparian function

Monitoring Activity Relationship to Forest Plan:

- 2500 Watershed management Objective 7

Monitoring Activity and Data Collection:

Several types of activities were undertaken during 2007 to improve riparian and watershed condition: planting of long lived conifers in the riparian corridor, wetland planting/restoration in Sugar Shack area, purple loosestrife control, and bioengineering project on the Indian River.

Planting Long Lived Conifers in the Riparian Corridor

Long lived conifer species were planted on 39.8 acres in the riparian corridors along the Indian River, Bear Creek, Onion Creek, and Elmhirst Creek.

Sugar Shack Wetland Restoration

Restoration and planting at the Sugar Shack Wetland area was performed in conjunction with the Forest Botany Program and the Northern Michigan University Ecological Restoration class.

Purple Loosestrife Control

Purple loosestrife (*Lythrum salicaria*), a non-native invasive species of wetlands and riparian zones, was controlled via hand pulling and herbicide. Hand pulling occurred at the north side of East Lake, the Round Lake boat access, the Horseshoe bay wilderness dead end road, the Carp River boat launch, Hwy 123 South of Eckerman corner, Hunter's Point, Indian Point, the 2235 pipeline, and Graal Shores Road. Herbicide was applied near Ogontz Bay.

Bank Stabilization

Bank stabilization activities occurred at 2 locations along the Wild and Scenic Indian River using bioengineering techniques.

Evaluation of Activities:

Planting Long Lived Conifers in the Riparian Corridor

Some of the tree planting was done via agreement with a prison crew and some was accomplished with on-forest personnel. There was some confusion on the planting and

some of the trees were planted later than was optimal. Survival surveys were not conducted in 2007; however, since the trees were planted in the riparian corridor, it is anticipated that some of the trees were able to survive the summer by reaching the shallow water table.

Planting by forest personnel was done earlier in the growing season and visual observation late in the growing season indicated survival success.

Sugar Shack Wetland Restoration

This purpose of this project was to restore wetland function primarily by establishing appropriate hydrophytic vegetative cover and removing a minor obstruction in the stream running through the site.

This wetland restoration had mixed results. The hot dry summer caused high mortality in many of the planted tree and shrub species. It is anticipated that some of the planted seeds will germinate during the 2008 growing season.

Although there are some concerns regarding plant survival, the only improvement would have been to start the planting slightly earlier in the year. Unfortunately, the timing of the planting was limited by the students that were helping perform the work as part of their class. This was the first meeting of this class and could not have been scheduled earlier.

Purple Loosestrife Control

Control of purple loosestrife is a long term project. Each year small clumps are removed and the areas are checked the following year. Since there is whole plant removal, the treatment is effective although continued treatment in an area is required for species control.

The 2007 Weed EA, in conjunction with the Botany program, awarded a contract to control 16 acres of purple loosestrife in the Ogontz Bay area using herbicides. Based on Forest Botanist contract inspection, the treatment was effective.

Bank Stabilization

The bioengineering techniques used on the Indian River were marginally effective. Banks in the location of the planting were bare sand. The exceptionally dry summer did not allow the bare root stock and the planted fascines to sprout as hoped. The areas will be checked in 2008 to see if the seed planted has germinated.

21. Heritage Resources

Monitoring Question:

- How are Heritage properties being protected from damage or disturbance?

Monitoring Activity Relationship to Forest Plan:

- 2300 Recreation Management Heritage Resources
Goals:
 1. Heritage resources are identified, evaluated, preserved and enhanced
 Objectives:
 4. In this planning period, decrease the number of heritage resource sites that do not meet national management standards.

Monitoring Activity and Data Collection:

Heritage resource monitoring focuses on identifying the sites most threatened with damage or disturbance and the processes that pose the greatest threat to these resources. To accomplish this, a sample of known heritage site locations was field checked in Fiscal Year 2007. Two separate monitoring protocols were used: one for “Priority Heritage Assets” (PHAs) and one for “Other Heritage Assets” (as defined by Interim Directive FSH 6509.11k 2006-14). The difference between the two protocols is that monitoring information is entered into the Heritage Site database in IWEB in a different format and in more detail for PHAs. Field notes, site forms, and sketch maps were utilized to document findings. Site locations were mapped using a resource grade GPS.

Priority Heritage Assets condition surveys were conducted as required for reporting deferred maintenance needs in the Heritage Infra database. There are currently 25 PHAs on the HNF and 7 were checked in 2007. None had any critical deferred maintenance needs. Three sites showed slight impacts due to natural erosion, natural deterioration of masonry, and looting by relic hunters. Site conditions were entered into Infra/IWEB for planning future treatments to respond to these impacts. Each Heritage PHA is required to have a condition survey once every 5 years, so each year at least 20% should be visited. As of 9/30/2007, 84% of our PHAs had been checked within the last 5 years. Condition surveys planned for 2008 will result in 100% having condition surveys less than 5 years old.

Other Heritage Asset sites, which represent the vast majority of sites on the forest, were chosen for monitoring to minimize travel costs and maximize the number of sites that could be visited relative to the field time available. Since sites were selected on an opportunistic basis, they are not necessarily representative of the total number of sites on the forest. In 2007, 40 Other Heritage Asset sites were visited and monitored. This represents about 2.4% of the heritage resource sites on the Hiawatha National Forest. Ten pre-European Native American sites and 30 historic period sites such as logging

camp, homesteads, etc., were visited. A new method for analyzing damage was implemented in 2007. In past monitoring, much of the noted disturbance had occurred many decades ago before heritage resources were being actively managed by the Forest Service (circa pre-1980). Consequently, rates of damage recorded were probably not reflecting recent trends very clearly. In 2007, only sites where damage appeared to have taken place within the past 5 years were used for analysis.

At 15% of the sites checked in 2007, some evidence of damage was observed. The cumulative severity of damage was subjectively rated as heavy (0%), moderate (12.5%), or slight (2.5%). Sites with slight and moderate damage usually still possess significant potential value, and usually are being impacted by activities that periodically re-occur and gradually accumulate damage. Recent damage was caused by illegal recreation vehicle use (7.5%), and vandalism by relic hunters (7.5%). There was no evidence of damage to sites from authorized earth-disturbing forest management projects such as road construction or timber sales. Site data was entered into the Heritage database to prioritize rehabilitation, closure, and law enforcement projects to address these processes.

Evaluation of Monitoring Activities:

Based on the monitoring of sites, there is no need to revise any of the practices or guidelines concerning heritage resource protection. The management direction and mitigation measures described in the forest plan are effective in preventing undue resource damage due to authorized projects or activities. The most significant sources of impacts appear to be damage from relic hunters, recreation vehicles, and natural erosion or deterioration.

Several projects were completed in 2007 to address impacts noted in previous years. Examples include: recovery of archaeological data from a circa 1850 sawmill location that was eroding along a river bank, blocking off illegal OHV use that was damaging a 1,000 year old Native American site, and clearing vegetation that was encroaching on the stone masonry ruins of some charcoal kilns. These projects contributed to an increase in heritage sites managed to standard.

Future Monitoring Activities:

Results of 2007 monitoring activities will be used in conjunction with other data to prioritize future projects designed to reduce damage or disturbance rates. Future projects include prioritizing sites for more frequent monitoring, preservation/protective measures such as site closure, law enforcement actions, informational posting, test excavation for National Register of Historic Places evaluation, and phase 3 data recovery based on significance and the degree of risk a site faces.

25. Threatened and Endangered Species

Monitoring Question:

- To what extent is the management of the Forest contributing to the conservation of threatened, endangered and sensitive species?

Monitoring Activity Relationship to Forest Plan:

- 2600 Wildlife, Fish and Sensitive Plant Habitat Management Goals:
 2. Diverse, healthy, productive and resilient habitats for aquatic and terrestrial wildlife are provided
- Federal Threatened and Endangered Species and Regional Forester Sensitive Species Goals:
 1. The Hiawatha National Forest contributes to the conservation and recovery of federal threatened and endangered species and works cooperatively with U.S. Fish and Wildlife Service, Tribes, and other state and federal agencies and recovery teams to update and implement threatened and endangered species recovery plans and management strategies.
 2. The Hiawatha National Forest contributes to the conservation of Regional Forester Sensitive Species and works cooperatively with state and federal agencies to complete and implement conservation assessments and strategies.

Threatened and Endangered Species Monitoring Framework:

Wildlife monitoring on the Hiawatha National Forest (HNF) was done in compliance with requirements outlined by the 2006 Forest Plan. U.S. Fish and Wildlife Service annual monitoring and reporting requirements for threatened and endangered species (T&E) also influenced the extent of monitoring efforts on the HNF. Forest Service (FS) personnel, volunteers, contractors, and Michigan Department of Natural Resources (MDNR) personnel accomplished the monitoring. The annual monitoring program is designed to establish baseline information or continue established monitoring protocols and practices that will enable staff to evaluate ecological conditions and trends on the HNF. The following paragraphs include a monitoring and evaluation report for each of the species/groups that were monitored during 2007. Threatened and endangered species require continued monitoring. Regional Forester Sensitive Species (RFSS) reported here are those that had concerted survey efforts in 2007. These species/groups with significant monitoring activity during 2007 were:

Piping plover - *Charadrius melodus* (endangered)
 Canada lynx – *Lynx canadensis* (threatened)
 Kirtland’s warbler – *Dendroica kirtlandii* (endangered)
 Hine’s emerald dragonfly – *Somatochlora hineana* (endangered)
 Bald eagle – *Haliaeetus leucocephalus* (RFSS)
 Sharp-tailed grouse – *Tympanuchus phasianellus* (RFSS, MIS)
 Raptors – northern goshawk (*Accipiter gentilis*) and red-shouldered hawk (*Buteo lineatus*) (both RFSS)
 Common Loon – *Gavia immer* (RFSS)
 Hart’s-tongue Fern - *Asplenium scolopendrium* var. *americanum* (endangered)

Piping plover - *Charadrius melodus* (endangered)

Monitoring and Data Collection:

Forest Service personnel and volunteers conducted nest monitoring coordinated with US Fish and Wildlife Service (USFWS) and the Michigan Department of Natural Resources (MDNR). Monitoring along the Great Lakes shoreline began April 15, 2007 and ended August 17, 2007. Thirteen pairs of piping plovers established territories on HNF lands. Fourteen nests were documented (one of the pairs nested twice) on both East side and West side beaches along Lake Michigan. Twelve pairs were successful in producing eggs. Six adults on East side beaches likely died during the nesting season, possibly due to merlin predation. Eggs from threatened or abandoned nests were collected and artificially incubated. In 2007, a total of 23 eggs were sent to Pellston, Michigan for incubation, 15 of which hatched and were released back onto other beaches. Two of the nests were washed out by storms and both had full clutches prior to the event. Of the remaining nests, all were successful with a total of 23 eggs hatched, and 21 chicks fledged (Figure P-1). None of the failed nests or young mortality was attributed to nest protection or non-compliance of leashed pets or area closures. Personnel routinely patrolled occupied habitat, monitoring enclosure compliance and informing the public about threats to piping plovers and requirements for leashed pets.

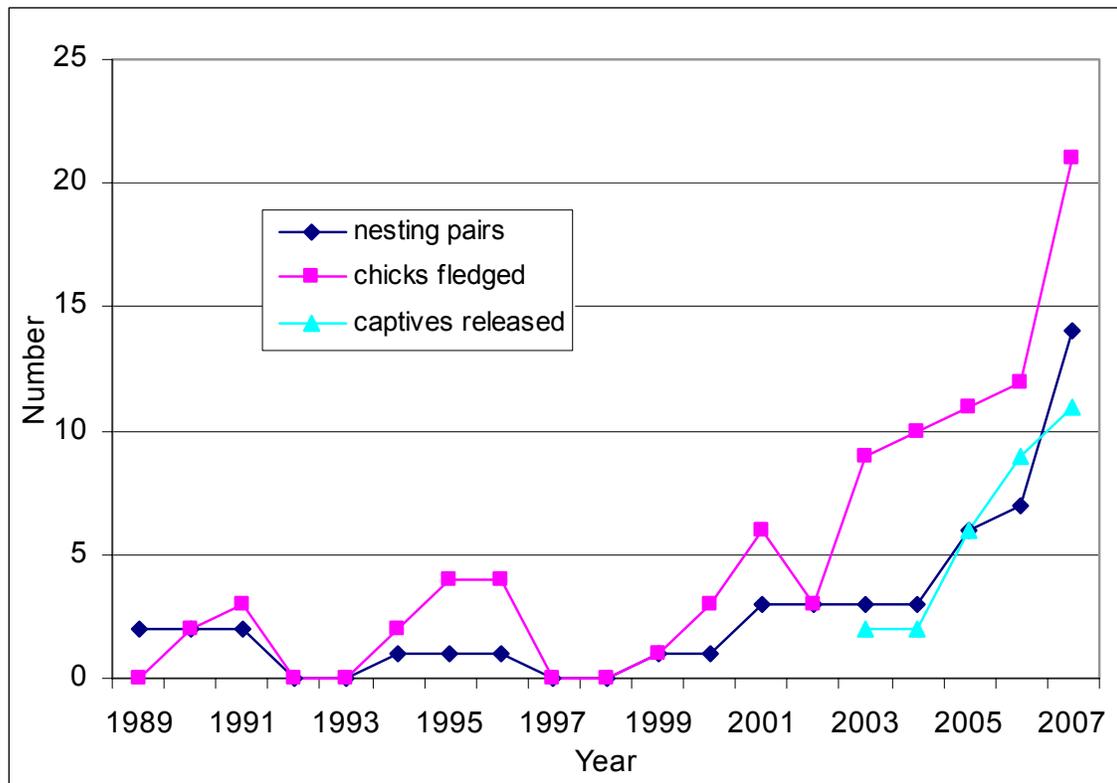


Figure P-1. Summary of piping plover nesting, fledging, and release on the HNF

Evaluation of Management Activities:

Trend lines for the number of nesting pairs on the HNF and the number chicks fledged suggest the population of piping plovers is increasing (Figure P-1). The extensive nest protection and surveillance being conducted by staff and volunteers required to achieve these results indicates there is a link between continued FS management and recovery of the species on the HNF.

Recommendations to improve nesting success of piping plovers resulted from monitoring efforts in 2007.

- The Pointe aux Chenes beach is part of the Great Lakes Beachgrass Dune Community and is constantly changing. During the 2007 nesting season strong storms and high waves threatened nesting habitat. The presence of gravel patches kept nests from washing away. Improvements could be made to the existing gravel patches, since many have been spread out and leveled down as a result of the storms. More gravel patches should be placed at Indian Point and Peninsula Point beaches on Lake Michigan.
- Monitoring has indicated that changes in human use patterns in piping plover nesting areas might result in greater nesting success. Some suggestions from 2007 included:
 - Prohibit fireworks within 3,281 feet (1000m) of piping plover territories - fireworks add to disturbance that may lead to the abandonment of clutches or young.
 - Prohibit kite flying within 656 feet (200m) of active territories - piping plovers may perceive hovering kites as an avian predator and therefore abandon chicks or eggs if kites remain long enough to invoke avoidance behavior.
 - Prohibit swimming within 328 feet (100m) of piping plover territories - people that walk in front or swim in front of the signs cause disturbances that may be a catalyst for nest abandonment.
 - While current FS monitoring and surveillance includes encounters with the public and other educational efforts, during times of high recreational use of the beaches, volunteers could be recruited to provide additional surveillance and on-site interpretation to the public.
- Efforts to control predators in the Pointe aux Chenes area should be continued. Some of potential predator's tracks and sightings include: American crow, common raven, coyote, herring gull, merlin, raccoon, red fox, ring-billed gull, sandhill crane, sharp-shinned hawk, and striped skunk. Merlin control should be considered in the future to reduce adult mortality when merlin foraging areas overlap piping plover habitat.
- Weed control efforts should be continued at Pointe aux Chenes, Indian Point and other piping plover habitats on both the East side and the West side. Activities should be directed at eliminating or controlling non-native invasive species that threaten to degrade habitat through the competitive elimination of native flora.

The HNF implements management activities in support of piping plover conservation. This is accomplished, in part, with a Forest Supervisor Closure Order that FS staffs apply to specified piping plover nesting areas. All management activities are consistent with guidance for threatened and endangered species conservation specified in the 2006 Forest Plan for the Hiawatha National Forest. There were four major management activities conducted in 2007.

- piping plover occurrences were monitored
- piping plover nests were protected with predator deterrent enclosures and information signs and rope barriers were installed to discourage human encroachment
- public education and outreach was conducted by FS staff and volunteers
- FS staffs coordinated with the USFWS and MDNR personnel regarding species conservation measures

The population of the species continues to increase on the Forest, indicating that management activities are effective. Based on data gathered in 2007, current monitoring activities and management practices should be continued. The recommendations noted above to improve piping plover nesting success were based on qualitative observations, rather than scientific research. Consequently, they will continue to be evaluated in 2008, and considered for implementation when and if practicable.

Canada lynx – *Lynx canadensis* (threatened)

Monitoring and Data Collection:

HNF staff conducted 128 miles of furbearer surveys on the HNF in 2007. These consisted of 50 miles of Michigan DNR furbearer survey routes and 68 miles of project area transects spread across both sides of the Forest. Ten miles of transects specifically targeted potential lynx habitat on the East side of the Forest. Surveys were completed in winter within a certain period of time after snowfall. Fresh snow makes it easier to identify the species. Snowmobiles were used to access routes and transects. The survey provides a means to identify the species using an area that are infrequently directly observed due to factors such as relative low abundance or secretive behavior. Survey routes were both random and non-random. The methods used for both types of surveys are adequate to detect lynx and observers are knowledgeable regarding characteristics of lynx tracks and other field signs for the species. There were no confirmed or potential lynx tracks observed along the 128 miles of surveyed routes.

Additionally, there were no individual Canada lynx documented by HNF staff. There were also no reports from the other agencies or the public regarding lynx sightings in 2007. There were no occurrences of incidental take, injuries or any known mortality of lynx on the Forest in 2007.

Evaluation of Management Activities:

The HNF implements management activities in support of Canada lynx conservation. They are consistent with guidance for threatened and endangered species conservation specified in the 2006 Forest Plan for the Hiawatha National Forest. There were four major activities conducted in 2007.

- track surveys were conducted to detect presence of the species
- habitat analysis was completed for projects conducted on the Forest
- information pamphlets were distributed by ranger district staffs
- FS staffs coordinated with the USFWS to ensure species conservation was considered for applicable projects

The trend for lynx presence on the HNF is unknown. Since 2003, when a Canada lynx was incidentally captured and released from a leghold trap set by a private citizen, there have been no confirmed or suspected occurrences of the species on the Forest. Current low intensity monitoring coupled with suspected infrequent presence of the species on the Forest does not make trend analysis possible. Management practices used on the forest are determined to be beneficial to any lynx that may occur in or pass through an area on the Forest. Therefore, the management activities should continue without modification.

Kirtland's warbler – *Dendroica kirtlandii* (endangered)

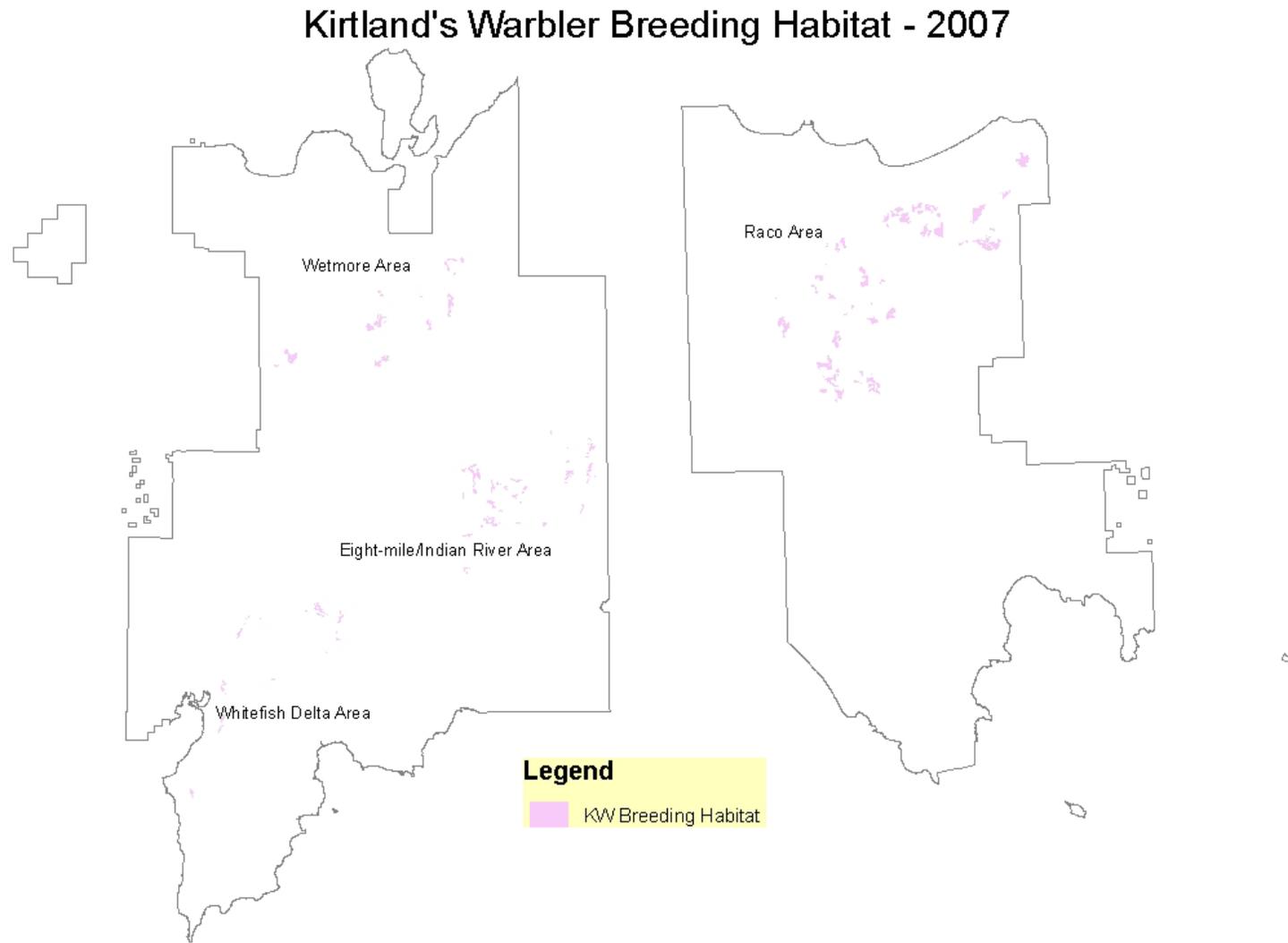
Monitoring Activity and Data Collection:

Monitoring and inventory was conducted using field census and compilation of database information. Two key metrics were monitored; breeding habitat and actual bird population. Hiawatha FS personnel and volunteers conducted all monitoring activities in 2007.

Breeding Habitat: Potential breeding habitat is identified as jack pine in the age range of 6-16 years on Ecological Land Type (ELT) 10/20 (dry sandy outwash plains) in Management Areas (MAs) 4.2 and 4.4 (Figure K-1). Based on an analysis of the HNF vegetation layer in GIS, there are approximately 8,400 acres of potential breeding habitat for KW on the HNF in Management Areas 4.4 and 4.2. These MAs were chosen due the HNF Forest Plan direction to maintain KW breeding habitat there. Of the total acreage, approximately 6,336 acres are located on MA 4.4 and 2,064 acres are located on MA 4.2. Within the two MAs, KW habitat is distributed across the Forest, including Wetmore, Whitefish Delta and Wetmore on the West side and Raco on the East side.

Suitable breeding habitat has the additional attribute of a stocking density of at least 1,089 trees per acre. Currently forest data does not include information regarding stocking density. We suspect the actual acreage of suitable KW breeding habitat is a subset of the 8,400 acres because all jack pine stands fitting age-class, ELT and MA criteria probably do not meet the minimum stocking density. However, there may be stands outside of the 8,400 acres that are suitable breeding habitat. For example, there were stands surveyed in 2007 older than 16 years that contained breeding habitat or were occupied by birds (e.g. Comp. 56, Stand 14 has a year of origin 1989 and was 18 years old). There may also be suitable habitat outside of this ELT and these MAs. This could result in an upward adjustment in suitable KW habitat from the 8,400 acres derived from the query. We are currently collecting information that will help us determine suitability more accurately.

Management direction for KW in the 2006 Forest Plan is to provide a continuous 6,700 acres of jack pine suitable for KW breeding. Management activities conducted by the Forest addressing that goal include (1) acres of jack pine sold that will be regenerated to KW stem density and openings criteria, and (2) acres of completed reforestation stocked to KW stem density. In 2007, 1,938 acres of jack pine were sold in stands to be regenerated for KW. This is well above the 1,048 acres sold in 2006 (Figure K-2). In 2007, 1,358 acres were regenerated to KW breeding habitat criteria, well up from the 532 acres regenerated in 2006 (Figure K-3). The number of acres of jack pine regenerated to KW stem density and openings criteria can be used to assess the likelihood of future KW habitat on the forest (see discussion below).



KRP 3.08

Figure K-1. KW habitat - acres of jack pine in Management Areas 4.2 and 4.4 on ELT 10/20 between 6-16 years of age in 2007.

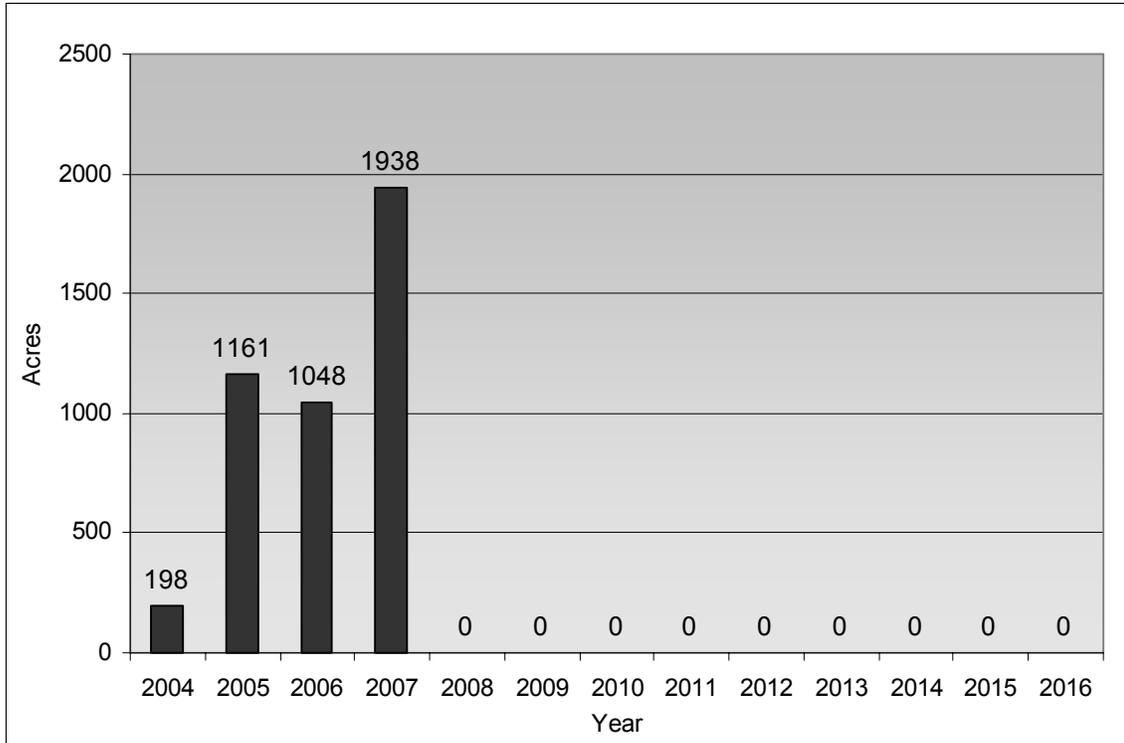


Figure K-2. Acres of jack pine sold for Kirtland’s warbler (KW) on the HNF.

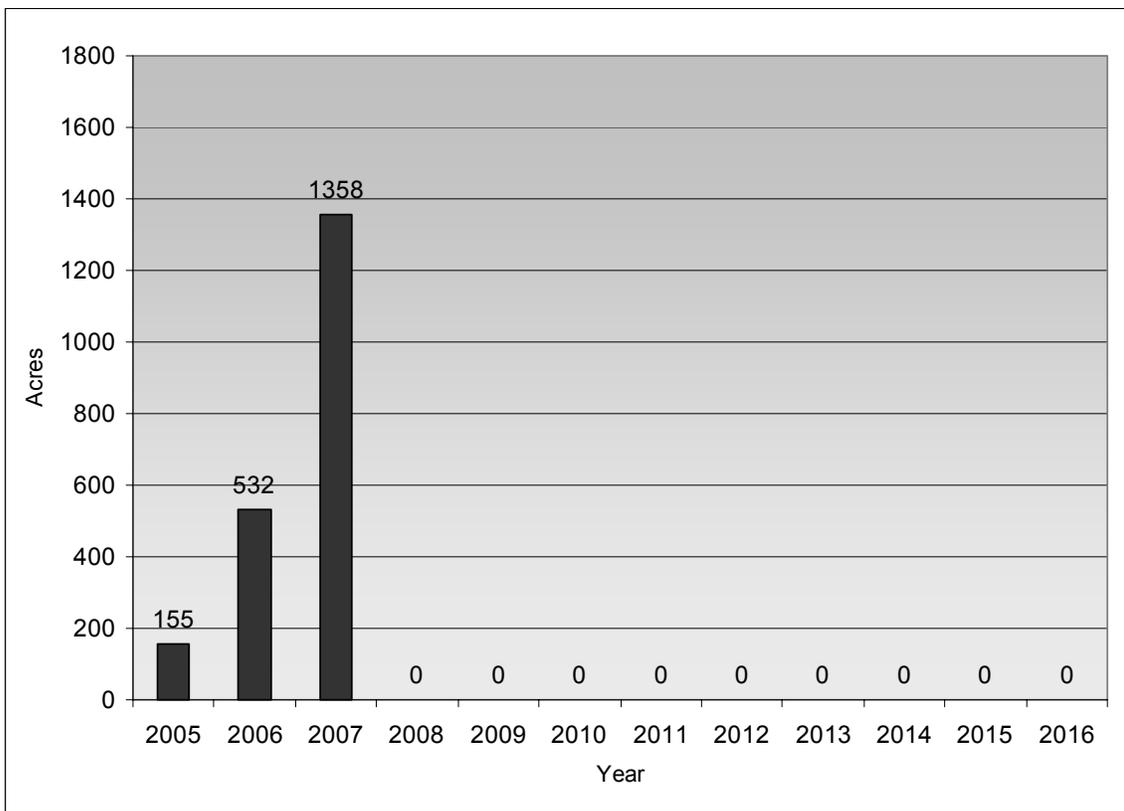


Figure K-3. Acres of reforestation for Kirtland’s warbler (KW) on the HNF.

KW Population Monitoring: Forest staff and volunteers conducted the annual KW census on the HNF in 2007 (Figure K-4). The census was conducted by driving or walking through known and mapped potential KW habitat and listening for or observing the number of singing males present. Singing males are counted because they are both easily observable (by their call) and occupy distinct non-overlapping territories. Females are more secretive and do not defend a territory. Total singing males can be used to indicate the size of the total KW population. The 2007 survey counted 21 singing males on the HNF, which accounted for 66% of the total Upper Peninsula (UP) population. Nine female Kirtland's warblers were also observed during the surveys, indicating the likelihood that successful nesting is occurring. There was no known KW mortality on the Forest in 2007. The results indicate that the species population is increasing on the HNF and on Michigan's Upper Peninsula.

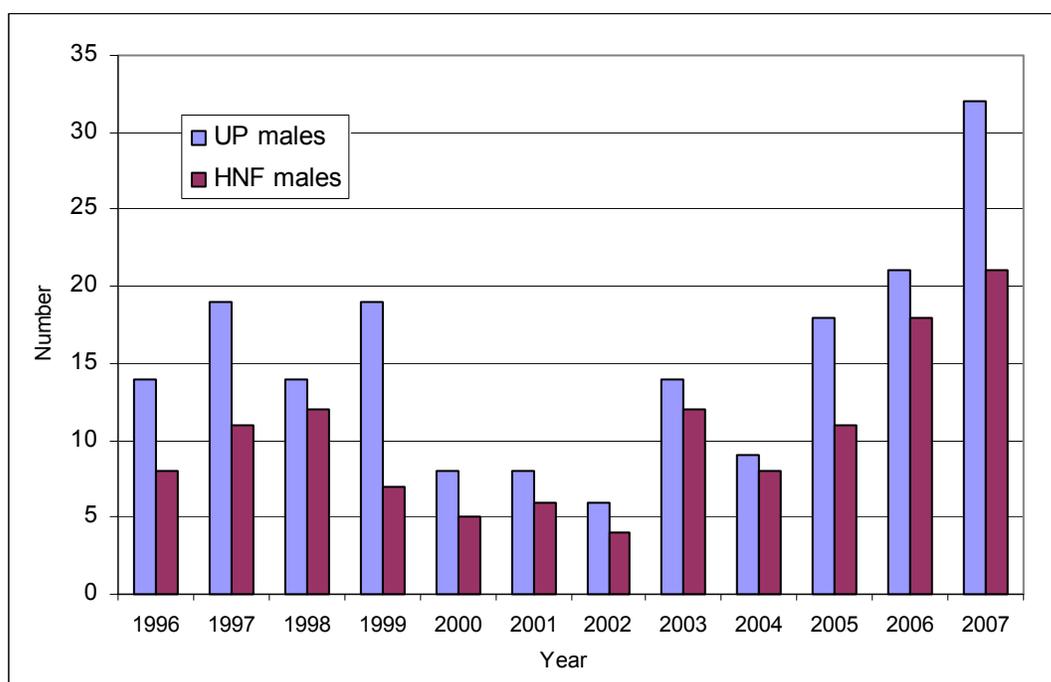


Figure K-4. Kirtland's warbler (KW) singing males on the HNF and Michigan's Upper Peninsula (U.P.).

Evaluation of Management Activities:

FS staff on the HNF implements management activities in support of Kirtland's warbler (KW) conservation that are consistent with guidance for threatened and endangered species specified in the 2006 Forest Plan. There were seven major activities conducted in 2007.

- KW occurrences were monitored
- KW nests were protected by limiting project activities within and adjacent to occupied stands
- goals for creation of breeding habitat were applied to project analysis and design

- stands of pine, especially on Management Areas (MAs) 4.2 and 4.4, were considered for KW management, specifically higher stem density of jack pine during reforestation
- stands with potential for use by KW were designated for minimum stocking density that would be suitable for species nesting
- FS staff conducted in-house outreach regarding species conservation and management activities
- FS staffs coordinated with the USFWS and MDNR personnel regarding species conservation measures

The population of the species continues to increase on the Forest, leading to the conclusion that the activities being implemented are effective. It is known that presence of jack pine stands having the minimum stem density of about 1,100 trees per acre drives KW use during the breeding season. As current efforts produce more jack pine stands in the appropriate age class we expect numbers of nesting KW to continue to increase.

In 2006, there were 532 acres of future KW breeding habitat created (regenerated). In 2007, this number increased to 1358 acres for an average of 945 acres annually between the two years. This is more than the goal outlined in the HNF Forest Plan of 670 acres per year. In 2007 there were 1938 acres of jack pine sold on the forest. Sold data indicates the likelihood of KW breeding habitat creation several years in the future. The data indicates that there should not be a gap in breeding habitat produced on the forest in the near future. Sold acres from 2007 alone will cover approximately three years worth of the 670 acre per year goal. We do not anticipate similar annual quantities of habitat to be created in the long-term. Most of the recent habitat creation and jack pine sales has been in conjunction with the intensive harvests implemented in response to the jack pine budworm infestations. The current outbreak is expected to be controlled by 2009, and therefore the long-term trend in creation of KW breeding habitat is expected to drop closer to the levels projected in the HNF Forest Plan.

Implementation of conservation recommendations for KW is an ongoing process. The forest staff is currently in the process of 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 KW breeding habitat.

Based on the 2007 monitoring information there is no reason to change any of the management practices for this species. The current monitoring and inventory practices are effective in assessing trends of the species on the forest. They should be continued in the future.

Hine's emerald dragonfly – *Somatochlora hineana* (endangered)

Monitoring Activity and Data Collection:

Monitoring for Hine's emerald dragonfly (HED) was conducted by HNF staff, contractors, and personnel from other land management agencies. Suitable habitat was identified from site observations, aerial photography, and soil maps. Sites identified as having elements of suitable habitat were field checked for presence of HED during the summer when adults are flying and more easily observed.

In 2007, approximately 1,800 acres of potential habitat on the East side of the HNF was surveyed. Due to drought conditions, many of the areas were dried up, so dragonflies were difficult to find or voucher. However, of the 1,800 acres surveyed, about 1,475 acres were classified as suitable for TES species (warpaint emerald, Hine's emerald, ringed boghaunter, or ebony boghaunter). One new ebony boghaunter location was vouchered south of Brevoort Lake in Mackinac County. A possible new Hine's emerald site was reported in the Point aux Chenes Candidate Resource Natural Area. The site was revisited (during severe drought conditions), but no HED were observed. Consequently, this area should be checked again in 2008. The survey included dragonflies in the same genus as HED. There were no HED observed during 2007 surveys.

On July 12, 2007, a HED workshop/field survey was conducted in the eastern Upper Peninsula. It included representatives from the U.S. Forest Service and U.S. Fish and Wildlife Service. Summerby swamp and the east side of Interstate 75 (known HED locations) were surveyed. No new HED sites were documented during the workshop.

There were no occurrences of incidental take, injuries or any known mortality of HED on the Forest in 2007.

Evaluation of Management Activities:

There are 11 known locations for the HED on the Forest, all on the East side. The 11 known sites are protected from disturbances. The HNF implements management activities in support of HED conservation. They are consistent with guidance for threatened and endangered species conservation specified in the 2006 Forest Plan for the Hiawatha National Forest. There were four major activities conducted in 2007.

- breeding site surveys were conducted to detect presence of the species
- habitat analysis was completed for projects conducted on the Forest
- results of habitat analyses were applied to project design, as applicable, to lessen impacts to habitat or improve habitat conditions
- FS staffs coordinated with the USFWS to ensure species conservation was considered for applicable projects

Breeding site surveys continue on the forest. Surveys on the West side for HED have not yielded any observations of the species. It's possible that the species is rare on the Forest with few locations yet undiscovered. Future surveys may focus on substantiating

breeding in locations where only presence has been documented, as well as locating new sites. The management activities conducted in 2007 should continue in 2008 to help ensure conservation of the species.

Bald eagle – *Haliaeetus leucocephalus* (RFSS)

Monitoring Activity and Data Collection

Monitoring was conducted by volunteers, FS staff and Michigan DNR personnel and included breeding/population surveys.

There were 34 bald eagle territories observed on the Forest in 2007 (Tables BE-1 and BE-2). A territory is an area protected by a pair of bald eagles. There were 16 territories observed on the West side of the HNF (Table BE-1) and 18 on the East side of the HNF (Table BE-2). All known territories, with the exception of one on the East side, were surveyed during the 2007 nesting season. Of the total, there were 19 active territories documented where nesting occurred. This is a decrease of 2 from the 21 documented in 2006. There were 13 successful territories (68%) that fledged at least one young. Twenty-one young fledged from the 13 nests (1.6 young per nest).

Six active territories were apparently unsuccessful at fledging young, (32% of the active territories). None of the unsuccessful nests were known to have resulted from HNF active management activities. There were no known instances of partial nest failure. There was no known bald eagle mortality on the HNF in 2007.

Table BE-1. West side bald eagle nest activity/productivity summary for nests on the HNF.

Year	Total Territories	Active Territories	Successful Territories	Young
2004	18	11	8	10
2005	19	9	6	12
2006	17	11	8	11
2007	16	11	6	10

Table BE-2. East side bald eagle nest activity/productivity summary for nests on the HNF.

Year	Total Territories	Active Territories	Successful Territories	Young
2004	6	6	2	3
2005	8	6	5	6
2006	18	10	7	12
2007	18	8	7	11

Evaluation of Management Activities:

The HNF implements management activities in support of bald eagle conservation. All management activities are consistent with guidance for sensitive species conservation specified in the 2006 Forest Plan for the Hiawatha National Forest. There were four major activities conducted in 2007.

- bald eagle nests were surveyed
- active bald eagle nest trees and historic nest trees were protected
- habitat analysis was completed for projects conducted on the Forest
- FS staffs coordinated with the USFWS and MDNR personnel regarding species conservation measures and surveys

Based on the monitoring data collected in the past four years, the bald eagle population on the HNF appears to be stable on both the West side and East side of the forest. Monitoring efforts should continue to survey for active nests and document nesting success, as well as note any disturbance activities from either HNF management or other human uses (such as OHV trails). Based on the results of monitoring no changes in bald eagle management are recommended.

Sharp-tailed Grouse – *Tympanuchus phasianellus* (RFSS, MIS)

Monitoring Activity and Data Collection:

Monitoring was conducted by FS staff and volunteers at 29 leks across the Forest. A lek is the location where males and females are concentrated during the breeding season. Lek habitat is critical to the success of local grouse populations. These locations are selected for surveys because adult sharp-tailed grouse can be readily observed and counted there. The number of dancing males and the number of flushed individuals was counted at each of the lek sites. Survey results indicate 2 years of decline in the sharp-tailed grouse population on the Forest from 2004-2006. In 2007 the number of dancing males increased by 19% to 57, and the total birds flushed increased by 12% to 106 when compared to 2006. In 2006 the total number of dancing males decreased 27% to 47 from 2005 results, and total flushed also decreased by 27% to 95 individuals (Figure S-1). In 2006, only 4 dancing males were observed on the west side of the Forest in 2006. Dancing males on the West side numbered 11 in 2007, and increase of 175% from last year's results (Figure S-2).

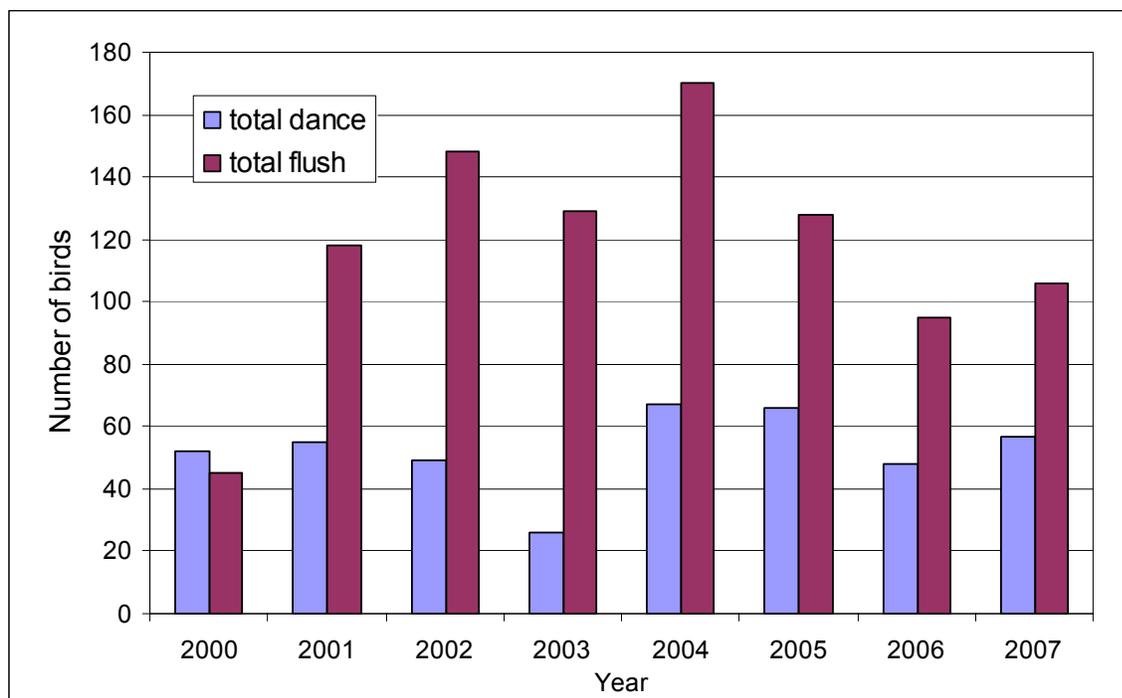


Figure S-1. Sharp-tailed grouse lek counts on the HNF, 2000 – 2007.

In 2006, monitoring efforts detected the presence of cross country snowmobile use in close proximity to two of the known leks. Grouse are known to flush from snow burrows when snowmobiles pass. Flushing results in greater energy expenditure and possible loss of fitness which in turn increases mortality. It also exposes the species to higher levels of predation. Consequently, FS staff closed two roads and the surrounding off-road areas to snowmobiles. The closed road remained in effect for 2007.

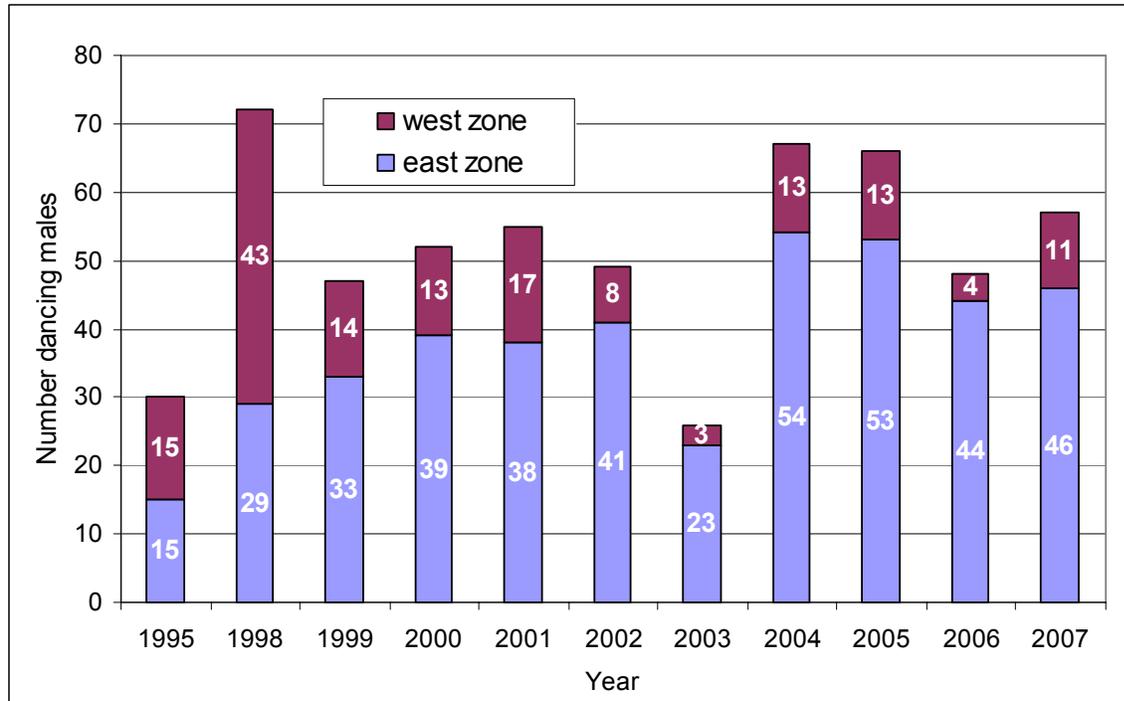


Figure S-2. Sharp-tailed grouse lek counts on the HNF, 2000 – 2007.

Evaluation of Management Activities:

The HNF implements management activities in support of sharp-tailed grouse conservation. All management activities are consistent with guidance for sensitive species conservation specified in the 2006 Forest Plan for the Hiawatha National Forest. There were five major activities conducted in 2007.

- sharp-tailed grouse leks were surveyed
- active leks were protected
- snowmobile closure orders were implemented on two open areas with species conservation concerns
- habitat analysis was completed for projects conducted on the Forest
- openland habitat were treated mechanically or with prescribed fire to maintain or enhance habitat for sharptail or associated species

Based on the population monitoring data, the sharptail grouse population on the HNF appears to be stable on both the West side and East side of the forest. West side numbers of dancing males recovered from a recent low of four individuals observed in 2006. This was a positive occurrence.

Snowmobile activity should be monitored in the two closed areas to determine whether the closures were effective. Sharp-tailed grouse populations should also be monitored in these areas to ensure that the closures had the desired effect on preserving the grouse population. Known leks should continue to be monitored for detrimental snowmobile activity.

The current monitoring and inventory practices are effective in assessing trends of sharp-tailed grouse on the forest. They should be continued in the future. Based on the 2007 monitoring information there is no reason to change any of the management direction for this species.

Raptors – Northern goshawk (*Accipiter gentilis*) (RFSS) and red-shouldered hawk (*Buteo lineatus*) (RFSS)

Monitoring Activity and Data Collection:

Monitoring for raptors was conducted by HNF staff and contractors. The surveys focused primarily on historic northern goshawk and red-shouldered hawk nests, but included other raptor species as well. Both northern goshawk and red-shouldered hawk are Regional Forester Sensitive Species (RFSS). Initial field surveys were conducted in April to determine nest and territory status. Productivity surveys on previously active nests were conducted in June. Surveys were conducted using a handheld Garmin Legend and navigating to historic nest site coordinates. Any new nest locations discovered were recorded in NAD83, UTM Zone 16 coordinates. After determining apparent nest status, calling sequences at inactive nests were initiated. These calling sequences utilized a FoxPro handheld speaker using northern goshawk and red-shouldered hawk calls. Broad-winged calls were used only in those nesting territories previously documented with those species. If a raptor present, it was assumed the bird would respond with a call or movement to or away from the observer.

On the West side, due to the high number of inactive territories in 2006 and 2007, additional survey effort was implemented within historic territories. Aerial photos and recent digital orthophoto quads were used to look at the nearest adjacent suitable habitat to the historic nest locations. This allowed an additional round of activity status checks that in some instances surveyed areas approximately 1/4 - 1/2 mile away from historic nest sites. This was done to ascertain if the birds were still in the general area, but had moved a distance unlikely to be detected utilizing the caller in the vicinity of the historic nest. No additional occupied territories were discovered in this manner.

For both sides of the Forest, productivity surveys were conducted. Surveys utilized a 50' fiberglass telescopic lineman's pole with a wireless video camera attached at the top. Observers on the ground used a hand-held monitor, enabling the survey crew to see directly into the nest.

A total of 157 nests were surveyed, 88 of which were on the East side and 69 on the West side. This is a sample of the total nests on the forest, since the entire forest is not surveyed in any year. Raptor use included 32 known active nests representing four species (Tables R-1 and R-2). These nests are termed "Active – Breeding" in Tables R-1 and R-2, and are thought to represent successful nesting activities. Successful nests are those having live young at the time surveys were conducted. The majority of the nests represented two species: red-shouldered hawk and northern goshawk. There were 23 active red-shouldered hawk nests documented on the Forest, 20 of which were located on the East side. Only one nest was known to have failed, It was a red-shouldered hawk nest located on the West side that failed for unknown reasons. There were seven northern goshawk nests, all of which were thought to have produced young. Five of the goshawk nests were located on the East side.

Table R-1. Raptor survey results for 2007 nesting season on the East side of the HNF (n=88 nests).

Species	Active - Breeding	Active - Failed	No. Live Young
Broad-winged hawk	0	0	0
Cooper's hawk	0	0	0
Great horned owl	0	0	0
Northern goshawk	5	0	10
Osprey	0	0	0
Red-shouldered hawk	20	0	42
Red-tailed hawk	0	0	0
Unknown	0	0	0
Total	25	0	52

Table R-2. Raptor survey results for 2007 nesting season on the West side of the HNF (n=69 nests).

Species	Active - Breeding	Active - Failed	No. Live Young
Broad-winged hawk	1	0	2
Cooper's hawk	0	0	0
Great horned owl	0	0	0
Northern goshawk	2	0	3
Osprey	1	0	Unknown
Red-shouldered hawk	3	1	6
Red-tailed hawk	0	0	0
Unknown	0	1	0
Total	7	2	11

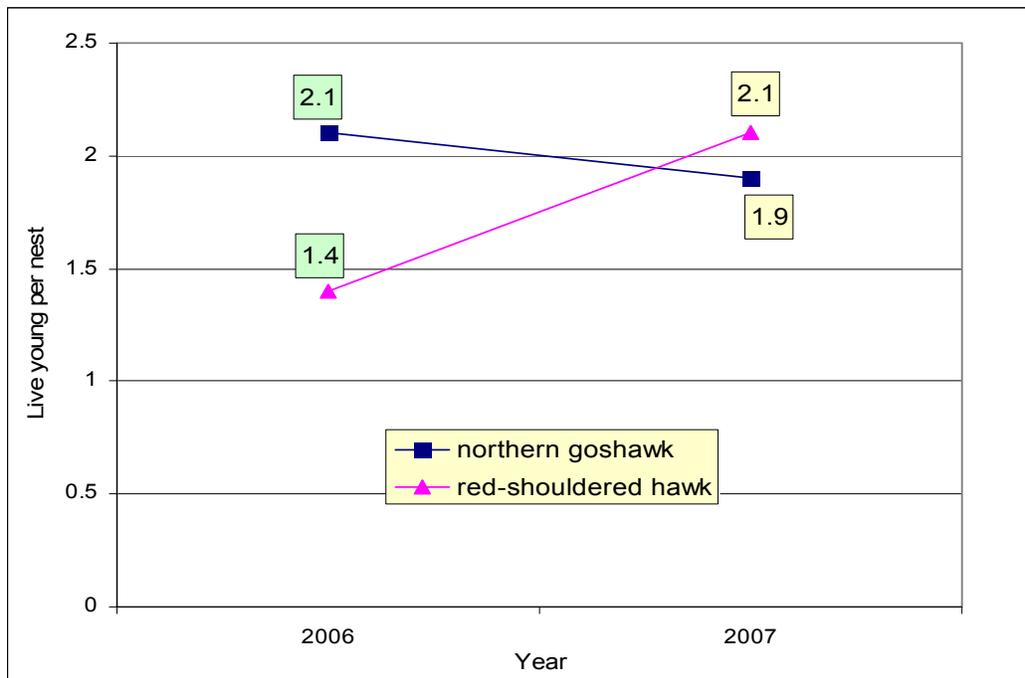


Figure R-3. Comparison of average number northern goshawk and red-shouldered hawk young observed for actives nests in 2006 and 2007 on the HNF.

Nest surveys indicated successful nests contained a total of 48 red-shouldered hawk young and 13 northern goshawk young in 2007. Based on the number of active nests, an average of 2.1 red-shouldered hawk young and 1.9 northern goshawk young were produced on the HNF. In 2007, there was an increase in red-shouldered hawk productivity compared to 2006 (Figure R-3). There was a slight decrease in goshawk productivity from 2006 (Figure R-3).

Evaluation of Management Activities:

The HNF 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 2006 Forest Plan for the Hiawatha National Forest. There were five major activities conducted in 2007.

- historic nests were surveyed for presence of nesting pairs
- historic nests were surveyed for evidence of successful nesting and productivity
- active nest trees were protected with buffers and seasonal restrictions, as detailed in the Implementation Guide for the HNF Forest Plan
- habitat analysis was completed for projects conducted on the Forest
- results of habitat analyses were applied to project design, as applicable, to lessen impacts to the species

Based on the monitoring conducted over the past several years, the red-shouldered hawk appears in greater numbers and is possibly more secure than the northern goshawk. Even though our current monitoring and inventory constitutes a sample of the total population of the two species, it appears to be effective in assessing broad trends of the species on the Forest. The disparity in the number of active nests between each side of the HNF is noteworthy, since it is generally believed habitat for raptors is widely distributed across the HNF. Future analysis might investigate possible explanations. Based on the 2007 monitoring information there is no reason to change management direction in the Forest Plan for northern goshawk and red-shouldered hawk.

Common Loon – *Gavia immer* (RFSS)

Monitoring Activity and Data Collection:

Monitoring for common loons was completed by FS personnel on several lakes on the East side of the HNF in 2007. Lakes were visited throughout the spring and summer to determine if loons were utilizing the lakes and if breeding was occurring. Table CL-1 summarizes the monitoring information (at some point, since 1980, loon activity has been documented on each lake included in the table).

Table CL-1. Common loon survey results for lakes on the East side of the HNF in 2007.

Lake Name	2007 Status	2007 Young
Walker Lake	Foraging ³	0
East Lake	Pair ²	0
Chain Lake	Pair	0
Brevoort Lake	Pair	0
Cranberry Lake	Inactive ⁴	0
Hay Lake	Pair	0
Round Lake	Inactive	0
Satago Lake	Breeding ¹	2
Betchler Lake (North)	Not Checked	-
Pendills Lake	Inactive	0
Rice Lake (West)	Breeding	1
Rice Lake (East)	Not Checked	-
High Banks Lake	Not Checked	-
Avery Lake	Inactive	0
Eight Lakes	Foraging	0
Monocle Lake	Pair	0
Lake Superior (Whitefish/Pendills Bay)	Not Checked	-
Frenchman Lake	Not Checked	-
Hulbert Lake	Not Checked	-
Carp Lake	Not Checked	-
Wegwass Lake	Not Checked	-
Piatt Lake	Not Checked	-
Mud Lake	Not Checked	-
Whitmarsh Lake	Pair	0
	2007 Total Young	3

¹Breeding = Pair of two adults seen on the lake and a nest is found or chicks are seen.

²Pair = Two adult loons on the lake, but no nest or chicks are seen.

³Foraging = One adult foraging on a lake. No other loons present and breeding has not occurred.

⁴Inactive = No loons seen or heard.

Evaluation of Management Activities:

The HNF implements management activities in support of common loon conservation. The management activities are consistent with guidance for sensitive species

conservation specified in the 2006 Forest Plan for the Hiawatha National Forest. There was one major activity conducted in 2007.

- selected lakes with historic nesting use were surveyed for presence of nesting pairs (under guidance in the Forest Plan, lakes with confirmed or suspected nests can be considered for protection from potentially conflicting use through application of restrictions such as buffer areas)

Ten lakes were observed to have common loons present. Of these, breeding was confirmed at two locations. In 2008, monitoring activities should be extended to the West side of the Forest. Efforts should also be directed at determining breeding status for lakes on both the West side and East side of the Forest.

American Hart's-tongue Fern – *Asplenium scolopendrium* var. *americanum* (endangered)

Monitoring Question

- To what extent is management contributing to the conservation of Hart's-tongue Fern?

Monitoring Activity and Data Collection:

There are six known populations of American Hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) occurring on the east side of the Hiawatha National Forest. The purpose monitoring is to get an updated census of the populations, assess the health of the populations, and determine if any threats are present, such as disturbance, vandalism or non-native invasive plant (NNIP) infestations.

A records review was performed to get background data for each site. Some of the previous monitoring data had GPS locations of the boulders that contain ferns. At each population, the surveyors located the boulders by traversing the population area and checking each rock. The number of ferns was counted as well as the number of boulders at most sites. We tried to find as many boulders as time allowed, but it is certainly likely that some of the boulders that were previously recorded as having ferns were missed in our search.

Hart's tongue fern surveys can be done at any time of the year, because they persist all winter long. The sites were visited at different times throughout the summer. One of the reasons for staggering the site visits was that it allowed the surveyors to look at ferns throughout the growing season. The best time for survey is early spring or late summer/early fall. In the spring, it is best to search the boulders before the leeks are at their peak leaf production, because they can obscure the small ferns at the base of the boulders. Mid-summer was especially difficult to see the ferns behind the lush associate vegetation. By August and September the ferns are the most visible. Population numbers may be higher at this time of year because new tiny ferns can be counted.

General associate species were recorded at each site, rather than percent cover for all species. No light or canopy measurements were taken. Photos were taken of some individual ferns and boulders, and also of the general surroundings and habitat.

Due to lack of budget and time, surveyors did not do separate counts of mature fertile ferns vs. juvenile ferns. Tiny ferns, called "sporophytes", with fronds as small as 3mm were counted as individuals. At this size the fronds are round, but still identifiable as Hart's tongue. It is difficult in some cases to distinguish the number of individuals within a tight clump of fern fronds or clumps of sporophytes. For these reasons the census numbers in this report are conservative estimates. General notes were taken on the health of the populations, but not assessed for individuals.

Evaluation of Monitoring Activities:

Overall the population is stable and appears to be healthy. After the completion of this year's monitoring, a new population (Gryke Site) of Hart's tongue fern was discovered on the Hiawatha National Forest in September, 2007, bringing the total to 7 populations. This site was found during botanical surveys for the Niagara project. Sporophyte production was observed at all the sites, except the new Gryke Site. The eastern Upper Peninsula experienced a severe drought during the late summer of 2007. This year's drought may have affected the viability of the small sporophytes. The census results are included in Table 1.

Non-native invasive plants were observed very infrequently near the populations, and usually in association with roads. Non-native species that were observed include mullein (*Verbascum thapsus*), wild parsnip (*Pastinaca sativa*), orchard grass (*Dactylis glomerata*), burdock (*Arctium minus*), or dandelion (*Taraxacum officinale*). As a result of this observation, an effort will be made in the following years to hand pull weeds along road that are in close proximity to the fern populations.

Several threats to the fern populations were identified, but are unlikely to cause any significant disturbance to the population. Collection of this species is a threat because of its global rarity, but there was no evidence of ferns being removed from the sites. The forest makes a distinct effort to not disclose location information. The populations are in remote locations with very infrequent recreation use, and the ferns that are marked are done so discreetly. Trampling by forest recreation users could occur from people who may climb boulders, but this would be a rare occurrence. Deer browse on associate vegetation was observed at a few of the sites, but no direct herbivory was observed on the ferns themselves. No insects or other pests were observed on any of the ferns. Other threats include scorching by wildfire or canopy gaps created by blowdown or wildfire. Loss of shade would affect the habitat by drying out the moss on the boulders that supports the ferns.

Table 1. Hart's tongue fern monitoring results by site

Site Number	Site name	Date Monitored	Boulder count	Fern count
1	Pipeline	Sept. 12	9	65
2	NW of East Lake	May 31	21	91
3	SE of East Lake	August 16	7 + grykes, bedrock, and cliffs	438
4	East Lake	May 31	10	42
5	Southwest of East Lake (Sugar Camp)	June 21	25	194
6	Taylor Creek	August 21	44	549
7	Gryke Site	Sept. 20	Grykes and bedrock	15

The Hiawatha NF has maintained stable populations at known Hart's tongue fern sites. The new location will be managed to maintain potential habitat in the Niagara Project

area. Specific management activities contributing to the health and stability of this species are listed below:

1. Protection of known sites through old growth designation. This helps stabilize populations since this species prefers shade, a closed canopy, and moist rocky substrates.
2. Identification of NNIP near populations and scheduling those species for treatment. This will help maintain habitat in a healthy ecological condition.
3. Resource surveys and protections applied to known species and habitat during the Niagara project.

Future Monitoring Activities:

Threatened and endangered species rare plant monitoring will consist of two activities. The first will consist of taking census data for the five species on a five year rotation. This will enable to HNF to produce data on a five year trend. The second monitoring activity will consist of implementation monitoring of RFSS plant protection in timber sales. This will enable the HNF to confirm that species are being appropriately protected.

28. Snowmobiles

Monitoring Question:

- To what extent is the Forest providing snowmobile opportunities?
- What are the effects of snowmobiles on the physical, biological and social environment?
- How effective are Forest management practices in managing snowmobile use?

Monitoring Activity Relationship to Forest Plan:

- 2300 Recreation Management, Motorized and Non-Motorized Trails.
Goals:
 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. The system includes loops and connections to access recreation facilities and local community services.
 2. Trail and route development provide for multiple use, mitigate social conflicts and prevent natural resource damage.
 3. Through coordination with adjacent public land/road management agencies complementing OHV and snowmobile policies and routes are provided.Objectives:
 1. In this planning period complete a snowmobile and OHV trail agreement with the State and other Michigan National Forests
 2. In this planning period, provide snowmobile trails and routes and areas indicated in Table 2300-6.

Monitoring Activity and Data Collection:

The number of miles of snowmobile trails has remained constant since the approval of the Forest Plan. The Forest currently has 302 miles of designated snowmobile trails. The Forest Plan allows a maximum of 340 miles of designated snowmobile trails. The current system of trails continues to provide access to services in local communities. The Forest Plan allows cross country travel in non-motorized management areas in the Forest. Illegal snowmobile use has been observed in non-motorized management areas, especially the Rock River Canyon Wilderness Area.

In 2006 a Memorandum of Understanding (MOU) was signed with the State of Michigan and the Michigan National Forests. The MOU defines the working relationship between the Michigan Department of Natural Resources and the Forest Service in the planning and administration of snowmobile trail location and use on public land within Michigan. This MOU meets the Forest Plan objective to complete this agreement.

In 2007 the Forest continued its long-term partnership with the Michigan Department of Natural Resources (MDNR) and local snowmobile clubs to manage the snowmobile trail system on the Forest.

Evaluation of Monitoring Activities:

Based on the monitoring of snowmobile use on the Hiawatha National Forest, there is no need to revise any of the standards and guidelines. We will emphasize wilderness education to reduce the amount of illegal use in wilderness and other non-motorized areas. New visitor education signage has been developed and will be posted at the areas of intrusion in the Rock River Canyon Wilderness Area in Fiscal Year 2008. The effectiveness of that signage will be monitored during the 2008-2009 winter season.

Future Monitoring Activities:

The Forest will continue to monitor miles of snowmobile trails using the INFRA database. We will monitor the effectiveness of signs posted at Rock River Canyon Wilderness Area for illegal motorized use. Illegal use in other non-motorized management areas will be noted if it occurs and site-specific management strategies will be developed as necessary.