White Mountain National Forest

United States
Department of
Agriculture

Forest
Service

Eastern
Region

2018 Biennial Monitoring and Evaluation Report

For Fiscal Years 2015, 2016 and 2017

This document is available in large print. Contact the White Mountain National Forest Supervisor's Office 603-536-6222

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Cover: Measuring bankfull dimensions. WMNF photo by Erica Roberts.

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Forest Supervisor's Note

I am pleased to share with you the first White Mountain National Forest (WMNF) Biennial Monitoring and Evaluation Report. In this report, we consider how well we are implementing the management direction in the Forest Plan, what effects our management is having on natural, cultural, and social resources, and how those resources are being affected by other factors. We remain committed to identifying what is working well in our programs and what isn't, sharing the results, and learning from all that we do.

In April 2016, the WMNF updated the Monitoring Plan in our Land and Resource Management Plan as required by the 2012 Planning Rule (36 CFR §219.12(c)(1)). That update ensures our monitoring program addresses each of eight required resource monitoring elements in a way that is scientifically credible and provides the information needed to guide Forest management efforts into the future. The result is an up-to-date monitoring program, within our technical and fiscal capabilities, that provides us the information we need for effective, sustainable management.

When we updated our Monitoring Plan, we also changed from an annual to a biennial monitoring evaluation report. The Planning Rule (36 CFR 219.12(d)(1)(ii)) requires that the first biennial monitoring evaluation report be completed no later than two years after a Monitoring Plan is updated. It also allows the first report to be postponed for one year as long as the public is notified before the report is due out (219.12(d)(1)(iii)). Due to limitations caused by vacancies in our staffing and other management priorities, we announced on September 25, 2017 that we were postponing the first biennial monitoring evaluation report until 2018.

Our last report was published in 2014. This current report summarizes monitoring done since then. For future reports, we are working to address all the monitoring items listed in our Monitoring Guide so you don't have to look in multiple documents to find our most recent evaluations. Information on monitoring items will be updated when new results warrant it. Because we are still transitioning to this new reporting process, not all monitoring questions are updated in this report. Those questions will be updated in our next biennial report in 2020.

The monitoring evaluation presented in this September 2018 report shows that we are doing well implementing the Forest Plan as written and intended. We consistently work with local, state and federal agencies along with many other partners to manage all resources on the WMNF in an integrated way that ensures that meeting objectives in one area doesn't adversely affect another. I am proud of our many successes and am committed to finding solutions where monitoring shows a new approach is needed. I have concluded that our monitoring and this report meet the intent of the Forest's Monitoring Plan. There were no needs to amend the Forest Plan identified as a result of recent monitoring.

I appreciate your interest and ongoing commitment to the WMNF and look forward to working with you in the future.

CLARE R. MENDELSOHN
Forest Supervisor

Summary of Findings and Recommendations

Effective monitoring and evaluation helps the Forest Service and the public determine how well a Forest Plan is being implemented, whether Plan implementation is achieving desired outcomes, and whether assumptions made in the planning process are valid. It helps us adapt our management approaches and determine when we need to adjust desired conditions, goals, objectives, standards, and guidelines. The evaluation of monitoring presented in this report indicates that the Forest Plan is being effectively implemented, desired outcomes are being achieved, and the assumptions made during the planning process are still valid. The following examples illustrate this conclusion.

Strong partnerships are critical to our ability to achieve the goals and objectives of the Forest Plan. The importance of partners, adaptive management, and long-term monitoring in Forest management is well illustrated by the evaluation of 40+ years of monitoring alpine habitat on Franconia Ridge. The results of this evaluation puts us in a demonstrably better position to make specific management decisions and prescriptions for areas where there is hope for recovery. In response, the Forest and partners are engaged in vigorous, and multi-faceted planning and management initiatives that seek to protect the ecological integrity of the Ridge while still providing opportunities for recreation.

Information in this report illustrates the continued importance of the Forest Plan goals. For example, impacts from destructive insects and disease organisms, such as emerald ash borer, are a major concern for the Forest and monitoring is an important tool for early detection and response. But the increasing risk highlights the need to manage for increased resiliency of forest stands through silvicultural prescriptions that sustain a healthy forest. A healthy forest also enables us to support the local economy through recreation, the sustainable contribution of high quality timber products, and other Forest offerings.

The commitment of Forest employees to stewarding the Forest in a sustainable manner by following Forest Plan standards and guidelines during project implementation, identifying issues early, and adapting management as needed to address concerns is well documented in this evaluation. For example, monitoring results for implementation of Best Management Practices (BMPs) to protect soils and water indicates that in general BMPs were being implemented as prescribed. If contractors failed to properly implement BMPs, the issues were often identified early and adjustments were made to protect resources. There are also examples where BMPs weren't adhered to and there are recommendations for improving compliance and/or adapting management to best protect resources going into the future.

This report also highlights opportunities for using technology to improve the efficiency and timeliness of some of our monitoring and evaluation. Much of our recreation data in particular have been collected on paper forms that require a substantial amount of time to enter into databases so that they can be evaluated. Designing and implementing monitoring using technologies that collect data electronically will greatly improve our efficiency.

Long-term monitoring and evaluation continues to be a valuable tool for assessing how well we are implementing the Forest Plan and whether the Forest Plan and its components are as valid today as they were when the Plan was revised or if adjustments need to be made. This biennial report provided us, and you the public, with an opportunity to take a hard look at how we are managing the WMNF.

1.0 Introduction

Effective monitoring and evaluation helps the Forest Service and the public determine how well a Forest Plan is being implemented, whether Plan implementation is achieving desired outcomes, and whether assumptions made in the planning process are valid. It helps us adapt our management approaches and determine when we need to adjust desired conditions, goals, objectives, standards, and guidelines.

The WMNF's Monitoring Plan (Chapter 4 of the 2005 White Mountain National Forest Land and Resource Management Plan; Forest Plan) describes what we will monitor and what we expect to learn from that monitoring. The Monitoring Plan identifies several types of required monitoring, including monitoring of sustainability, outputs, services, and costs, management indicator species, objective attainment, standard and guideline implementation, and effects of management practices. Our Monitoring Plan also identifies the need to conduct monitoring on a variety of topics or resources to evaluate resource conditions and ecosystem health, and help answer the question "Are we accomplishing the overall goals of the Forest Plan?"

Monitoring is not performed on every activity, nor is most of it expected to meet the statistical rigor of formal research. Some monitoring we do as an integral part of daily activities, such as construction and timber sale contract administration. Some monitoring is conducted weekly or annually, some is done at longer intervals to track changes over time, and other items are monitored when funds and staffing are available.

The monitoring report summarizes and, at scheduled intervals, evaluates monitoring results. It also provides the public and Forest personnel with updated information about Forest Plan and project implementation. Some monitoring leads to immediate conclusions while other topics require a decade or more of data collection to produce informative results. As a result, our monitoring report has changed every year and the level of detail provided has varies by topic.

Although the Forest Service's budget continues to be constrained in response to national economic concerns, monitoring remains an important part of our annual program of work. We expect to continue funding all the monitoring items identified as required in the monitoring guide, and as many high priority items as budgets allow each year.

We are fortunate to have many partners who are willing to work with us to help maintain our roads, trails, and facilities, develop and implement projects, and monitor the status of our resources and effectiveness of our management. In some areas however, our overall funding is not keeping pace with resource requirements or public expectations. An example of this is increasing needs for road and trail maintenance that will require new approaches to ensure safe and sustainable access. We look forward to working with our current partners and developing new relationships in the coming years to address issues and opportunities as we move into our second hundred years.

2.0 Monitoring & Evaluation Requirements

Minimum monitoring and evaluation requirements have been established through the National Forest Management Act (NFMA) at 36 CFR 219. Some requirements provide guidance for the development of a monitoring program, while others include specific compliance requirements.

Monitoring and evaluation are separate, sequential activities required by NFMA regulations. Monitoring involves the repeated collecting of data by observation or measurement. Evaluation involves analyzing and interpreting monitoring data. The information gained from monitoring and evaluation is used to determine how well the desired conditions, goals, objectives, and outcomes of the Forest Plan are being met. Monitoring and evaluation are critical steps in the process of keeping the Forest Plan responsive to changing conditions, thereby providing the feedback mechanism for an adaptive management framework. The results are used to identify when changes are needed to the Forest Plan or the way it is implemented.

The Monitoring Plan included in the Forest Plan has three major components: the Monitoring Program (contained within the Forest Plan), the Monitoring Guide, and the Biennial Monitoring and Evaluation Report. Each are described below.

2.1 Monitoring Program

The monitoring program contained within the Forest Plan is strategic in nature and provides programmatic direction for monitoring and evaluating Forest Plan implementation. The monitoring program addresses several types of monitoring. These requirements fall into four broad categories:

Category 1: Required monitoring items (NFMA and 36 CFR 219 regulations)

Category 2: Attainment of objectives

Category 3: Implementation of Standards and Guidelines

Category 4: Effects of prescriptions and management practices

Required Category 1 monitoring items are mandatory components of every Forest Plan, whereas Category (2) through (4) monitoring items are more flexible and tailored to address issues raised through public scoping and interdisciplinary team review. A more complete description of Category 1 through 4 monitoring items can be found in Chapter 4 of the 2005 Forest Plan.

Budgetary constraints may affect the level of monitoring that can be done in a particular fiscal year. If budget levels limit the Forest's ability to perform all monitoring tasks, then those items specifically required by law are given the highest priority.

2.2 Monitoring and Evaluation Implementation Guide (Monitoring Guide)

The Monitoring and Evaluation Implementation Guide (Monitoring Guide) is part of the overall monitoring framework for the WMNF. While Chapter 4 (Monitoring and Evaluation) of the Forest Plan is strategic in nature and provides programmatic direction for monitoring and evaluating Forest Plan implementation, the Monitoring Guide provides direction that is more specific to implement the monitoring strategy outlined in the Forest Plan. The Monitoring Guide details the methodologies and protocols used to conduct monitoring and evaluation tasks identified in the 2005 Forest Plan. The Monitoring Guide also assigns responsibilities for monitoring and evaluation tasks, and defines where monitoring data is to be stored.

The Guide is flexible and may be changed as new methodologies and techniques are developed. It allows the principles of adaptive management to be applied so that as monitoring techniques are implemented they can be evaluated for their effectiveness and efficiency and they can be revised as needed.

2.3 Biennial Monitoring and Evaluation Report (Biennial M&E Report)

Providing timely, accurate monitoring information to the decision makers and the public is a key requirement of the monitoring and evaluation strategy. The biennial monitoring and evaluation report, which provides the analysis and summary of the monitoring results, is the vehicle for disseminating this information. As stated on page 4-13 of the 2005 Forest Plan this report, "…provides a basis for evaluating implementation of revised Forest Plan decisions and the effectiveness of specific management practices."

Evaluation is the process of transforming data into information—a value-added process. It is a process of synthesis that brings together value, judgment and reason with monitoring information to answer the question, "So what?" and perhaps, "Why?" Evaluation requires context. A sense of the history of the place or the circumstances (temporal and spatial context) are important to the evaluation of management activities. Evaluation describes movement from a known point (base line or reference condition) either toward or away from a desired condition. The desired conditions may or may not ever be fully achieved, but it is important to know if management activities are heading in the right direction. Evaluation produces information that is used to infer outcomes and trends: Conclusions will be drawn from an interpretation of evidence. These conclusions are documented in the Biennial Monitoring and Evaluation Report.

The Biennial Monitoring and Evaluation Report is intended to be a comprehensive compilation of all the monitoring and evaluation described in the plan. This report will provide summaries of data collected, and complete evaluations of the data. The evaluation process determines whether the observed changes are consistent with the Forest Plan desired conditions, goals, and objectives and identifies adjustments that may be needed. Continuous updating and evaluation of monitoring data provides a means to track management effectiveness from year-to-year and to show the changes that have been made or are still needed.

Key information displayed in the Biennial Monitoring and Evaluation Report includes:

- Forest accomplishments toward achieving multiple use objectives for providing goods and services.
- The degree to which on-the-ground management is maintaining or making progress toward the desired conditions and objectives for the plan
- The effects of the various resource management activities within the plan area on the productivity of the land
- Conclusions and recommendations regarding the need to adjust monitoring or change the Forest Plan
- Status of other agency/institution cooperative monitoring
- Update of research needs
- Documentation of any monitoring that has not been completed and the reasons and rationale (budget or staffing limitations or unexpected conditions, such as a severe fire season)

3.0 History of Monitoring Activities on the White Mountain National Forest

Monitoring of Forest Plan implementation began with the White Mountain's 1986 Forest Plan. A Monitoring and Evaluation Report was released annually for years 1987-2000. A ten-year evaluation of this information was summarized in the 1996 report. No reports were published between years 2001 and 2005 during Forest Plan revision.

The current White Mountain Forest Plan was revised under the 2005 Planning Rule (as permitted by 36CFR 219.14[e], which allowed the use of 1982 Planning Rule regulations during the revision process). As part of this process, the Monitoring Program was also updated to reflect new Forest Plan direction. The Forest Plan became effective in September 2005, and the first Monitoring and Evaluation Report was published in 2006. Monitoring Reports were subsequently released annually in years 2007 to 2014. The regulations of the 2012 Planning Rule became effective in May 2012. This established new requirements for monitoring. Implementing direction for the Planning Rule was released in January 2013. To be compliant with the 2012 Planning Rule, eight monitoring items (per 36 CFR 219.12) were required to be incorporated into the White Mountain's Monitoring Program (addressed in Questions 5, 10, 11, 18, 26, 27, 29 and 31). An administrative change to the Forest Plan was completed in April 2016, which incorporated these monitoring requirements as well as other changes into the Monitoring Program. A comprehensive list of the questions included in the new Monitoring Program are presented in Section 7 of this report.

4.0 Monitoring Activities during Fiscal Years 2015, 2016 and 2017

This report covers the period from October 1st, 2014 to September 30th, 2017 (FY2015 through FY2017). Section 5 presents the most current information (data and evaluations) for each monitoring question contained within the Forest Plan. Section 7 provides a full list of the 63 updated Forest Plan monitoring questions. Not all monitoring questions included in the 2016 Monitoring Guide were evaluated or updated in this report. Some questions weren't due for evaluation based on their last update and evaluation frequency. Other questions weren't addressed in this report due to budget constraints, staffing levels, or other Forest Priorities. Thirty-five monitoring questions were evaluated in this report. Their evaluation is presented in Section 5 and those questions are marked with an asterisk (*) in Section 7. Questions that were not evaluated or updated in this report will be updated in the next biennial report in 2020.

5.0 Monitoring Results

5.1 – Air

The WMNF lies within an area characterized as having some of the best air quality in the eastern part of the country. Many visitors to national forests value pristine areas with magnificent vistas; trends showing reduced levels of haze on the WMNF allows visitors to see further into the distance and can increase the level of their enjoyment in and around the WMNF.

Air quality is monitored by the WMNF at the Camp Dodge Interagency Monitoring of Protected Visual Environments (IMPROVE) site, in Greens Grant, NH, as part of the national network to document air quality improvement. Data from this site show that visibility has dramatically improved since 2000. This is discussed in more detail below. The WMNF manages two Class I areas - the Great Gulf and the Presidential Range-Dry River Wilderness areas. These areas were designated as Class I areas under the Clean Air Act, and are afforded the highest level of protection from air pollutants. The IMPROVE monitoring site data is used to document improved visibility in these Class I areas, as required by the Clean Air Act.

Surface water quality is being monitored in the WMNF Class I areas. This has been continuing for over a decade and is discussed below.

The Forest completed baseline lichen monitoring that will be useful in long-term monitoring of effects and recovery from air pollution and acid deposition. This baseline lichen monitoring was discussed in the previous monitoring report. No lichen monitoring was completed during the FY2015-2017 monitoring period.

Smoke monitoring from prescribed fires was accomplished for five different units during this monitoring period. Measured fine particulate matter concentration and photographic documentation during these prescribed fires is discussed below.

5.1.1 – Monitoring Question

Are Air Quality Related Values (AQRVs) being impacted by air pollution, especially in Class I areas? Are the IMPROVE protocols or similar technology being implemented? How are trends in air quality emissions affecting surface water quality in the WMNF?

Last Updated

2018

Monitoring Indicator(s)

Visibility and water quality (pH, cations, sulfate and nitrate anions)

Monitoring Frequency

Annual

Background & Driver(s)

Air chemistry is measured at Camp Dodge using the IMPROVE protocol. The IMPROVE monitor collects aerosol samples, which may impact AQRV's such as water quality, scenic values, and visibility. These are analyzed to obtain a chemical profile of the airborne particles. Use of the IMPROVE site is an objective in

the Forest Plan. States utilize the IMPROVE data to develop plans to reduce the identified pollutants which impair Class I area AQRVs.

Water quality can be affected by air quality through acidic deposition. Monitoring water quality trends in the Class I areas can assist in determining if the streams have recovered from decades of acid deposition. Water samples in Class I areas are collected through an agreement with the Appalachian Mountain Club using standard scientific methods for water sample collection and analysis.

Monitoring Indicator 1

IMPROVE protocol is continuing following established protocol (sampling occurs for a 24 hour period every 3rd day). Data reports for visibility are current through FY 2016; FY2017 data is being reviewed. Data reports for water sampling is current through FY2017.

Results

IMPROVE aerosol data is shown in Figure 1. Since 2001 there have been dramatic reductions in emissions from electric generating units (US EPA, 2018) and this has resulted in increased visibility at the Class I areas in the WMNF as measured at the Camp Dodge IMPROVE monitor. Light extinction, as measured in the period 2001-2005 on the worst air quality days has an equivalent visual range of approximately 25 miles. When comparing this with the 2012-2016 period, which has an equivalent visual range of approximately 50 miles, visual range has doubled during the 2001-2016 monitoring period (Figure 1).

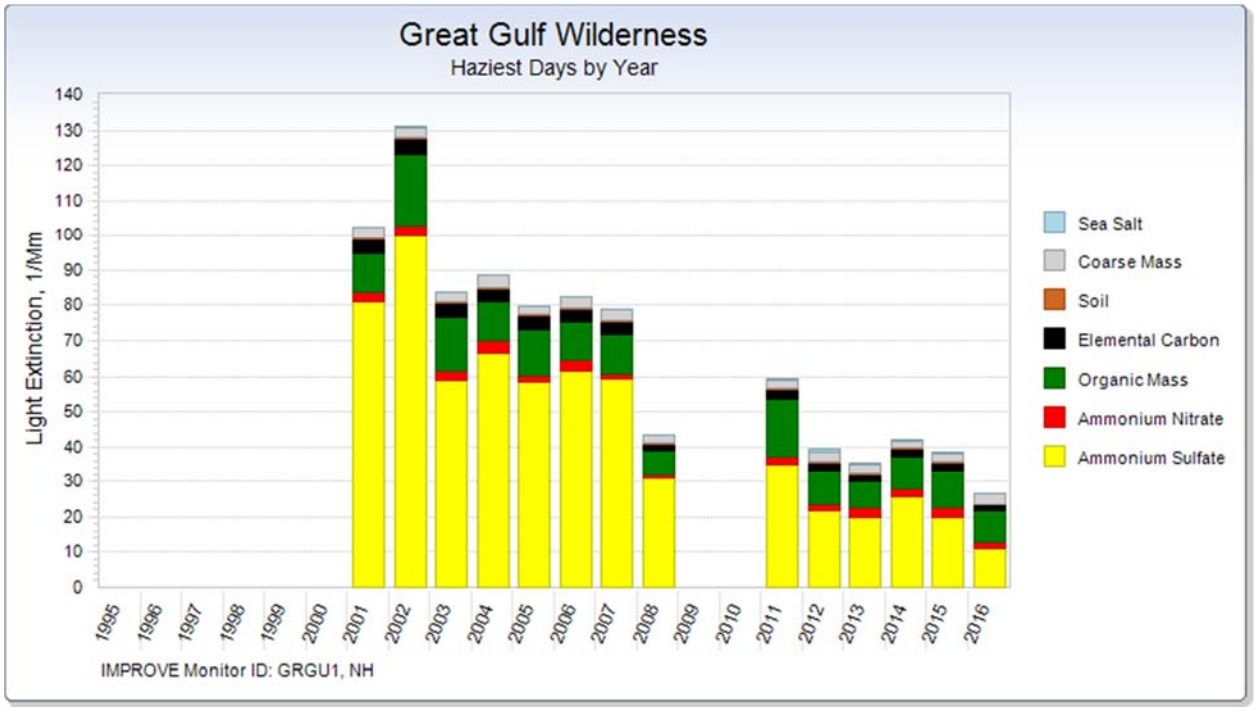

Figure 1. Changes in visibility, as measured by light extinction, since 2001, at the Camp Dodge IMPROVE monitor (FED, 2018).

Discussion

Sulfates are the largest contributor to visibility impairment (Figure 1). The primary sulfate sources are coal-fired power plants, diesel engines, industrial boilers, and volcanoes. Man-made sulfate emissions

are being reduced through the installation of pollution control technology, increased usage of cleaner diesel fuel, and increased use of fuels other than coal.

The IMPROVE site collects data which provides a regional perspective of air quality trends and effectiveness of State Implementation Plans. Data from this site show that visibility is improving at a rate of approximately 3% per year since 2001. One of the most noticeable forms of air pollution is haze, a veil of smog-like pollution that can blur the view of many urban and rural areas. As part of the Clean Air Act, Congress has established a goal to prevent future, and remedy existing, visibility impairment in 156 protected national parks and wildernesses, known as Class I Areas. Federal rules require state and federal agencies to work together to improve visibility in these areas so that natural background conditions are achieved by the year 2064. The two Class I areas within the WMNF, Great Gulf Wilderness Area and Presidential Range-Dry River Wilderness Area, are covered under this rule.

Due to reduced pollution/haze/smog, visibility has increased 100% in the past 15 years, on the worst air quality days. Or, put another way, on the worst air quality days during 2012-2016, you could see twice as far as on the worst air quality days in 2001-2005.

Monitoring Indicator 2

Water samples in Class I Areas are currently collected multiple times each year.

Results

Average acidity, as measure in pH units, for a high elevation sites in the Great Gulf Class I area and the Presidential Range-Dry River Class I area, over the past two decades does not show any trends over time (Figure 2). Average base cations and sulfate plus nitrate anions in µeq/L are shown over time in Figure 3 and Figure 4. These data represent spring and summer sampling. Data was not collected during some years due to inadequate resources.

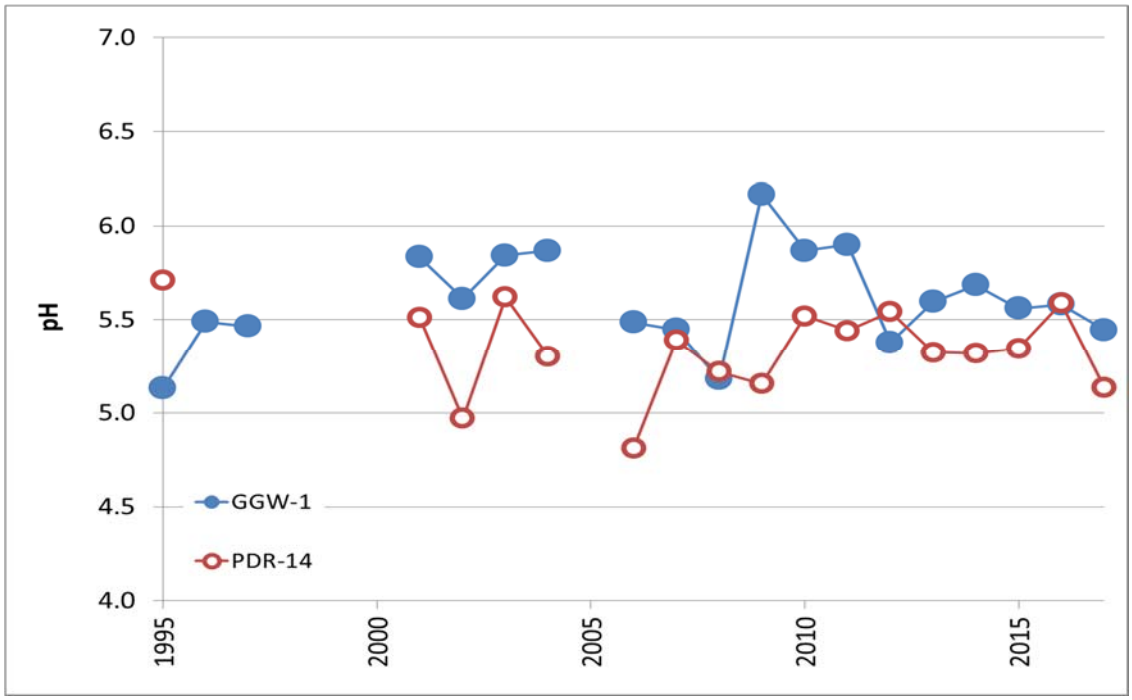

Figure 2. Average hydrogen ion concentrations, as pH (a scale of acidity), for the Great Gulf Wilderness (GGW-1) and the Presidential Range-Dry River Wilderness (PDR-14) in spring and summer over the last two decades (from Murray et al, 2017).

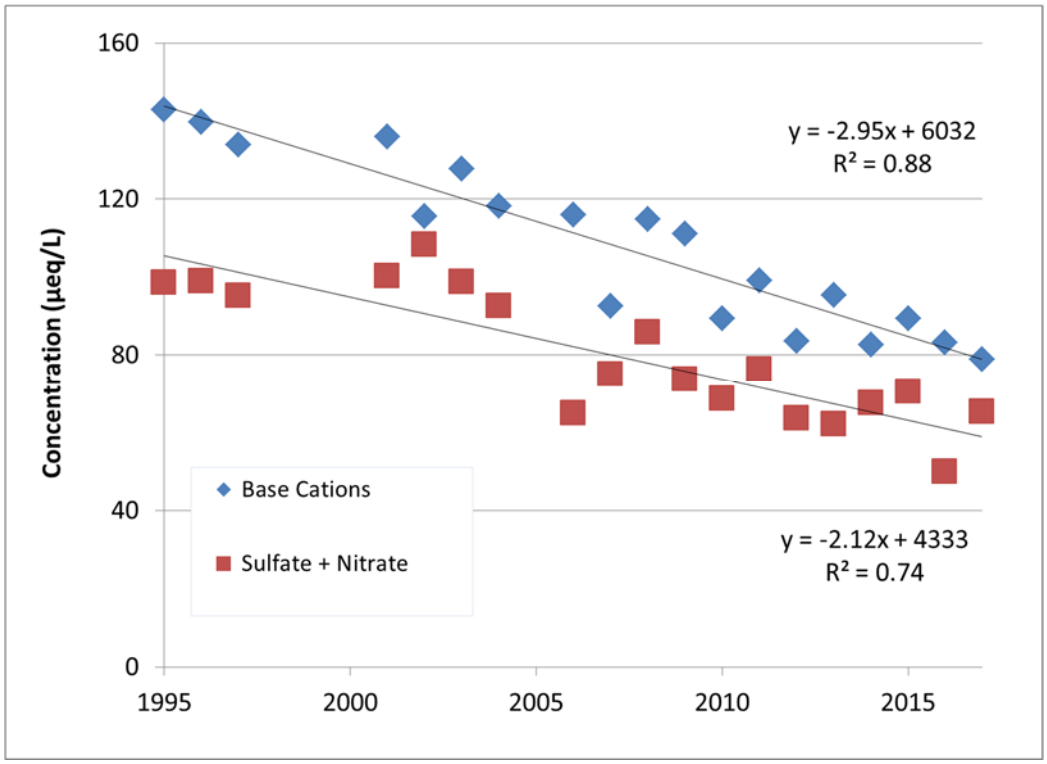

Figure 3. Declining concentrations over time of average base cations and sulfate plus nitrate anions for Great Gulf Wilderness site GGW-1 (from Murray et al, 2017).

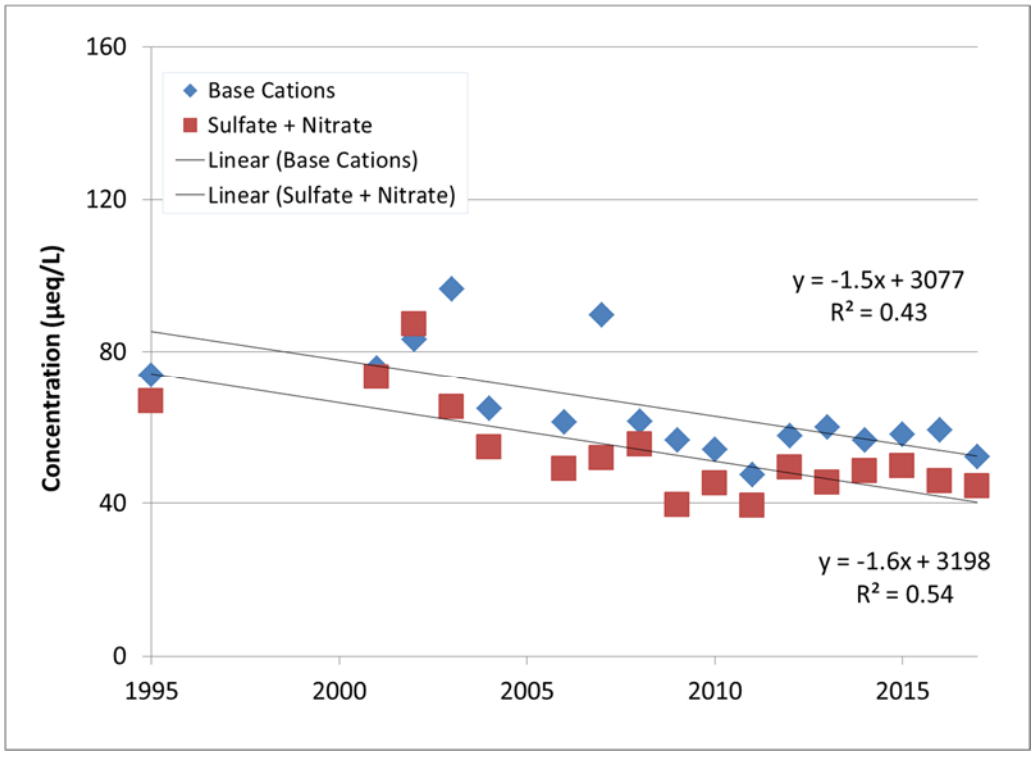

Figure 4. Declining concentrations over time of average base cations and sulfate plus nitrate anions for Presidential Range-Dry River site PDR-14 (from Murray et al, 2017).

Discussion

Long-term water quality samples have been taken in the spring and summer for high elevation sites in the Great Gulf and Presidential-Range Dry River Class I areas intermittently from 1995 to 2017 (Murray et al., 2017). No trend is apparent for pH at either of the high elevation Class I area sites (Figure 2). This may be due to pH being strongly affected by the time of year, and there has been variance in the timing of sampling over the years (Murray et al, 2017). Figure 3 and Figure 4 show the sample year average base cations and acidic anions for the Class I area high elevation sites, GGW1 and PDR14, respectively (Murray et al, 2017). Murray et al., 2017 states that "[b]oth metrics are decreasing; however, the r^2 is more robust for the Great Gulf site regressions. Another difference is the rate of decline, with the Great Gulf cations and anions declined by 2.95 and 2.12 µeq/L per year respectively, while the Presidential-Range Dry River sites saw declines of only 1.5 and 1.6. It should be noted that the sample months and number of samples varied from year to year. Declines do seem to be waning with little change or even increases in these variables over the past 5 years".

While the pH data do not show an apparent trend, the trends for base cations and anions suggest that the streams at these sampling sites are in recovery due to the declines in acidic deposition. It will be important to continue these measurements to document if chemical dilution continues, and if it does, at what point could this become disruptive to the aquatic biota (Murray et al, 2017). This apparent recovery will be important to document to determine how this may have an effect on the Class I areas, as a whole.

Recommendations

Data collection should be continued to determine if the current level of monitoring is adequate to make a determination for two of the WMNF guidelines (Air Quality Related Values (AQRVs), such as aquatic biota, vegetation, and water quality should be protected to the extent possible from adverse impacts related to air quality within the WMNF, and the Great Gulf and Presidential Range/Dry River Wilderness Class I Airsheds should be managed to protect air quality related values (AQRVs) such as visibility, vegetation, and water quality). Long term trends are variable depending on the ecosystem components being measured. A more extensive analysis accounting for seasonal variation, or other variables, would assist in helping to determine why continuing changes in air quality deposition have not contributed to trend changes of acidity.

The third air quality guideline for the WMNF is: The IMPROVE site at Camp Dodge, or similar substitute technology, should be maintained to monitor air quality in Class I Wilderness in the WMNF. This site should be maintained to demonstrate to upwind states that emissions reductions in their states is having a positive impact on increased visibility in the WMNF Class I areas.

References

United States Environmental Protection Agency. 2018. Progress Reports [Web Page]. Located at: https://www3.epa.gov/airmarkets/progress/reports/index.html Accessed 2018, June 8.

Federal Land Manager Environmental (FED) Database. 2018. Interactive Data Explore [Web page]. Located at: http://views.cira.colostate.edu/fed/Default.aspx Accessed 2018 June 4.

Murray, G., K. Westgaard, J. Hastings, P. Lynch. 2017. Water Chemistry Monitoring Report, Class I & II Wilderness Watersheds. AMC Report to the WMNF under Cost Share Agreement 14-CS-11092200-001.

5.1.2 – Monitoring Question

Are lichens being impacted by air pollution, especially in Class I wilderness areas?

Last Updated

2014

Monitoring Indicator(s)

Lichen species, condition, and changes

Monitoring Frequency

10 years

Background & Driver(s)

Lichens are another Air Quality Related Values (AQRVs) for Class I areas because air pollutants can affect lichens at moderate and high concentration levels. Future monitoring would help determine the extent of, and trends in, those impacts and inform Regional (states in the northeast and midwest) actions to improve air quality in the northeast.

Monitoring Indicator

The reporting frequency of this monitoring question is every 10 years. Results and discussion for this question were last summarized in the 2014 monitoring report. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion

These sections will be updated in the FY2020 biennial monitoring report.

Recommendations

Consider revisiting established lichen monitoring plots in 2023.

References

Dibble, A.C., J.W. Hinds, R.Perron, N. Cleavitt, R. L. Poirot, L. H. Pardo. 2016 Monitoring Air Quality in Class I Wilderness Areas of the Northeast United States Using Lichens and Bryophytyes. Gen. Tec. Rep. NRS-165.

5.1.3 – Monitoring Question

Are emissions from Forest prescribed fire activities negatively affecting sensitive receptors?

Last Updated

2018

Monitoring Indicator(s)

Particulate matter concentration and photographic documentation

Monitoring Frequency

Every 2 years based on resource availability and weather.

Background & Driver(s)

Use portable smoke monitors to record particulate matter during the activity. Selected prescribed fires will be monitored for air quality parameters, such as particulate matter. Frequency of monitoring and number of fires monitored in a given year will depend on availability of resources on Forest during burn windows as the smoke monitor is shared with other Forests.

Photographic documentation during prescribed fires can be useful to document if the smoke is dispersing vertically away towards nearby highways, homes, or sensitive receptors.

Monitoring Indicator 1

Smoke from one prescribed fire was monitored in FY2015 and smoke from four prescribed fires was monitored in FY2017

Results

Fine particulate matter concentration, as measure near Pine Bend Brook prescribed fire in FY2017, is shown in Figure 5. Figure 6 documents fine particulate matter at a sensitive receptor, during the FY2017 Hogsback prescribed fire.

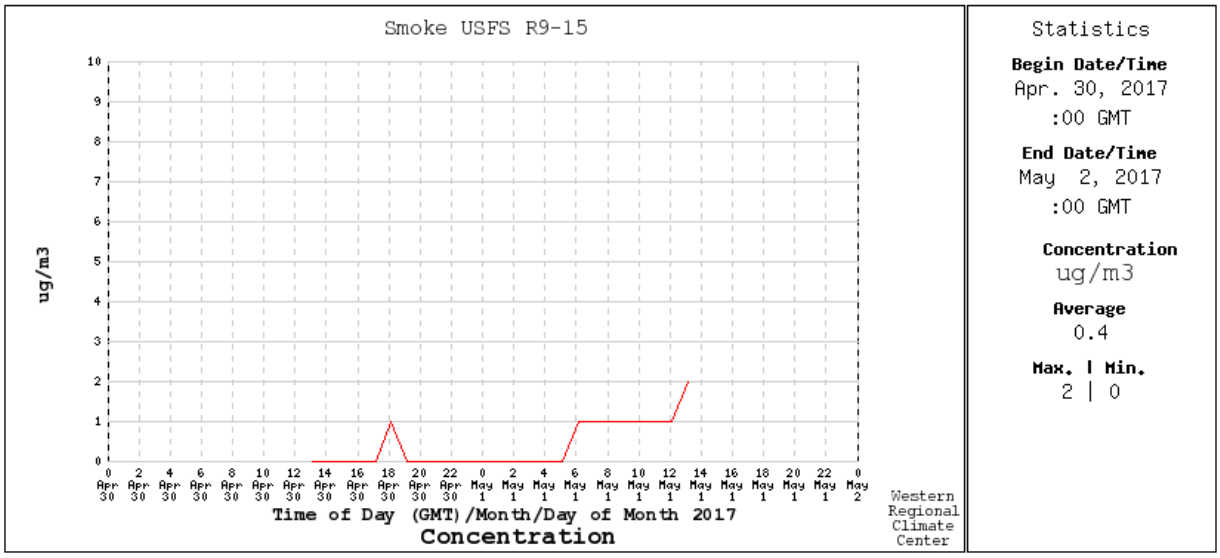

Figure 5. Fine particulate matter concentration, as measured at a log landing along NH Route 112, approximately 1000' north of the Pine Bend Brook prescribed burn unit, during the prescribed fire smoke monitor operational period (Fire Cache Smoke Monitoring Archive, 2018).

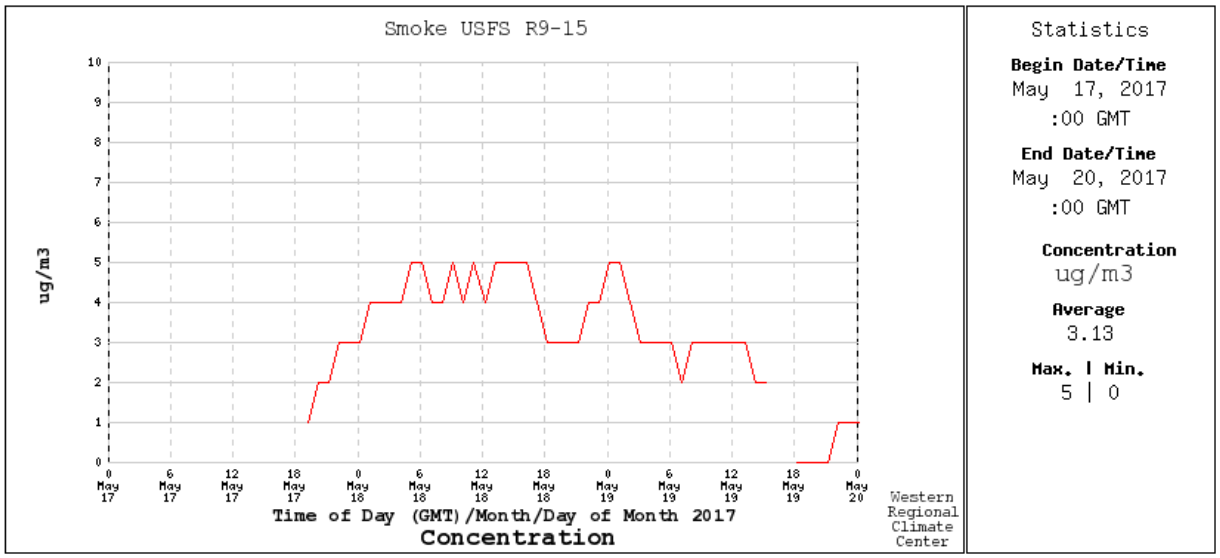

Figure 6. Fine particulate matter concentration, as measured at the Glencliff State Sanatorium, a predefined sensitive receptor for the 2017 Hogsback prescribed fire, during the prescribed fire smoke monitor operational period (Fire Cache Smoke Monitoring Archive, 2018).

Discussion

The smoke monitors measure fine particulate matter concentration (and meteorological parameters) through the use of a nephelometer (which measures light scattering). Fine particulate matter is 2.5 micrometers in diameter or less. The smoke monitors were set up at locations which were considered to be sensitive receptors (such as an elderly housing complex), near a housing development, or along a highway (where smoke levels could reduce visibility). During two of the prescribed fires monitored during this FY2015-2017 monitoring period, the smoke monitors were set up near a state highway, during another prescribed fire a smoke monitor was set up at the Glencliff State Sanatorium, and at two other prescribed fires a smoke monitor was set up near a cluster of homes.

The benchmark concentration for fine particulate matter (PM2.5) that is used to estimate levels at which smoke would become a concern to human health is 35 µg/m^3 averaged over a 24 hour period. Dispersion of smoke from the five prescribed fires that were monitored for particulate matter during this monitoring period was adequate to not cause concern to public health. The values at all five of the monitored prescribe fires was below the human health benchmark. For the Pine Bend Brook prescribed fire (Figure 5), the average PM2.5 concentration during the smoke monitor operation period was less than 1 µg/m^3. For the Hogsback prescribed fire (Figure 6), the average PM2.5 concentration during the smoke monitor operation period was less than 4 µg/m^3.

Monitoring Indicator 2

Results

As noted above, photographic documentation occurred during five prescribed fires during the FY2015-2017 monitoring period. Fine particulate matter concentration from two representative prescribed fires was discussed above and photographic documentation of those same two prescribed fires is shown here. The picture in Figure 7 was taken from Sugar Hill Scenic Vista during the Pine Bend Brook prescribed fire in 2017. The picture in Figure 8 was taken from East Haverhill during the 2017 Hogsback prescribed fire.

Figure 7. This picture was taken from the Sugar Hill Scenic Vista during the Pine Bend Brook prescribed fire in 2017. Smoke is visible in the center of the picture. The smoke was dispersing vertically, with clouds visible in the background.

Figure 8. This picture was taken from East Haverhill, across NH Route 25 from the East Haverhill Cemetery, looking at the Hogsback prescribed fire in 2017. Very good vertical rise and smoke dispersion can be seen in this picture.

Discussion

Smoke dispersion was good during five prescribed fires that were monitored for smoke during the FY2015-2017 monitoring period; two of those prescribed fires are discussed here. The smoke monitor was set up near a state highway during the Pine Bend Brook prescribed fire in 2017. As shown in Figure 7, smoke dispersed vertically during the prescribed fire. No visible smoke impacts were observed over NH Route 112 during multiple trips between the Pine Bend Brook Trailhead on NH Route 112, and the Sugar Hill Scenic Vista, during the period of active ignition.

During the Hogsback prescribed fire in 2017, vertical smoke dispersion can been seen against the backdrop of the blue sky with few clouds in the sky (Figure 8). No visible smoke impacts were observed at the Glencliff State Sanatorium, at the Oliverian Pond Boat Ramp, over NH Route 25, or over Lime Kiln Road while driving in the area during the burn period. The photographic documentation presented here is additional information to show that there were no noted concerns to public health.

Recommendations

Continued use of the smoke monitor and use of photographic documentation would assist in determining whether smoke from prescribed fires is creating a public health concern.

References

Fire Cache Smoke Monitor Archive. 2018. [Web page]. Located at: http://www.wrcc.dri.edu/cgi-bin/smoke.pl Accessed 2018 June 4.

5.2 – Botany

Alpine ecological indicators, cliff plant ecological indicators, Threatened, Endangered, and Sensitive plant population trends, and post-harvest herbaceous layer recolonization

5.2.1 – Monitoring Question

What are the effects of various recreation use levels on alpine plant communities?

Last Updated

2018

Monitoring Indicator(s)

Recreation use levels; amount (area and condition) of trampling of plants or community patches; permanent photo/plot records of strategic or important locations.

Monitoring Frequency

Varies (5-10+ years depending on component)

Background & Driver(s)

The WMNF contains the largest and most biologically diverse alpine ecosystems in the eastern United States, including species that occur only or mostly in the alpine zone on the Forest. Alpine areas are also greatly valued for many recreational opportunities and cultural and historical heritage, and these areas are designated as their own Alpine Zone Management Area 8.1 (MA 8.1). The purpose of MA 8.1 is to recognize, conserve and interpret the alpine and subalpine zone for biological, aesthetic, recreational, cultural, research and monitoring values. The Forest Plan Goals and Objectives for Rare and Unique Features specifies that: 1) alpine and subalpine communities (within and outside of mapped MA 8.1 areas) will be conserved; and 2) the WMNF will contribute to the conservation and recovery of viable populations of all Federally Threatened, Endangered, and Sensitive species and their habitats, including the more than two dozen Sensitive Species that occur in the MA 8.1. S-1 of the general standards and guidelines for MA 8.1 states “If monitoring indicates declines in alpine communities because of human use, mitigation action must be taken.” Monitoring question 5.2.2 reflects the various scales and approaches of inquiry necessary to determine if conservation and management approaches reflected in the broader Forest Plan are effective in protecting alpine resources, including a specific feedback (S-1 for MA 8.1) for mitigation in the event of declines detected by monitoring.

Monitoring Indicator 1

Results

There is a long history of vegetation studies and management efforts in the Alpine Zone of Franconia Ridge. Most recently, the WMNF partnered with Beyond Ktaadn to revisit historical studies and documentation from the Ridge. The resulting report “Vegetation of Franconia Ridge, New Hampshire: evaluation of 42 years of trail management and vegetation change” (Cogbill 2017) integrates aspects of all of the indicators and methods listed for Question 5.2.2, and it reveals a complex story of both successes and failures of management efforts over the course of decades, with the back drop of increasing hiker visitation. Cogbill (2017) builds on previous studies and documentation from Franconia Ridge from the 1970s to 1993 (see Cogbill 1994 for complete list of research), and historical photographs and records as far back as the late 1800s. The previous studies experimented with different techniques to promote revegetation of damaged trailside areas. Cogbill (2017) incorporates follow-up sampling of previous studies in the form of: ten site-specific case studies along the ridge; a series of vegetation

transects extending across trails and in undisturbed alpine reference areas and; a gallery of repeat photographs along the ridge from 1970s to 2016 (as well as several older repeat photos) (Figure 9, Figure 10, Figure 11, Figure 12, and Figure 13).

Some key conclusions from the various lines of evidence along Franconia Ridge:

- Some management efforts have resulted in successful revegetation or reversals in decline of vegetative cover (i.e., scree walls, recovery of re-routed or abandoned trail segments), but results depend greatly on site conditions, technique, and subsequent degree of control of hiker traffic.
- Active manipulation experiments to enhance recovery of alpine vegetation from the 1970s to early 1990s such as terracing, transplanting, brush cover, native seeding, alien seeding, and fertilization in severely damaged areas has mostly not worked or not enhanced recovery over background recovery rates; one transplant success story is that Bigelow Sedge can expand into unoccupied areas from transplant plugs under the right conditions.
- Full recovery of damaged alpine vegetation takes decades to a century or more to occur, averaging 1-2% gains in vegetative cover per year in the absence of active disturbance; gains made over the course of decades can be lost very rapidly with the return of foot traffic and soil erosion.
- Gravelly or rocky and heavily trampled or eroded areas that have lost original organic soil material either don't recover at all, or recover very slowly regardless of technique. Many intractably damaged sites (i.e., summit zones down to bedrock) originated many decades or a century or more ago from initial recreation use, whereas some have originated more recently (within the last 20 years).
- Overall vegetation on the ridge is stable at the gross scale (alpine meadows), but dynamic and changing at the fine scale (percent cover of specific species).
- Examples of fine scale changes: there has been a substantial decline of Bigelow's Sedge cover (a key component of alpine meadows) in many permanent plots, and a corresponding increase in the cover of heath shrubs. Overall, there has been a substantial increase in total vegetation cover across most permanent plots over a 23+ year period. Krummholz has expanded in places on the ridge (Figure 9). These are background changes unrelated to recreational use, per say, with uncertain driving mechanisms for the change.
- Eight rare species were extirpated from one or both mountains on the Ridge more than 100 years ago due to human impacts in the summit areas.
- The overall floristic composition of the Ridge over the last 70 years has remained stable (no species have been completely eliminated from the Ridge during this time); however, declines and local extirpations of rare or Sensitive species have been documented within the past 20 years in specific areas (USDA Forest Service 2017), only one of which appears to be related to foot traffic along the trail.

Figure 9. Series of images 1909-1991. Note expansion of krummholz toward ridge. Krummholz has expanded in some areas but is remarkably stable in others.

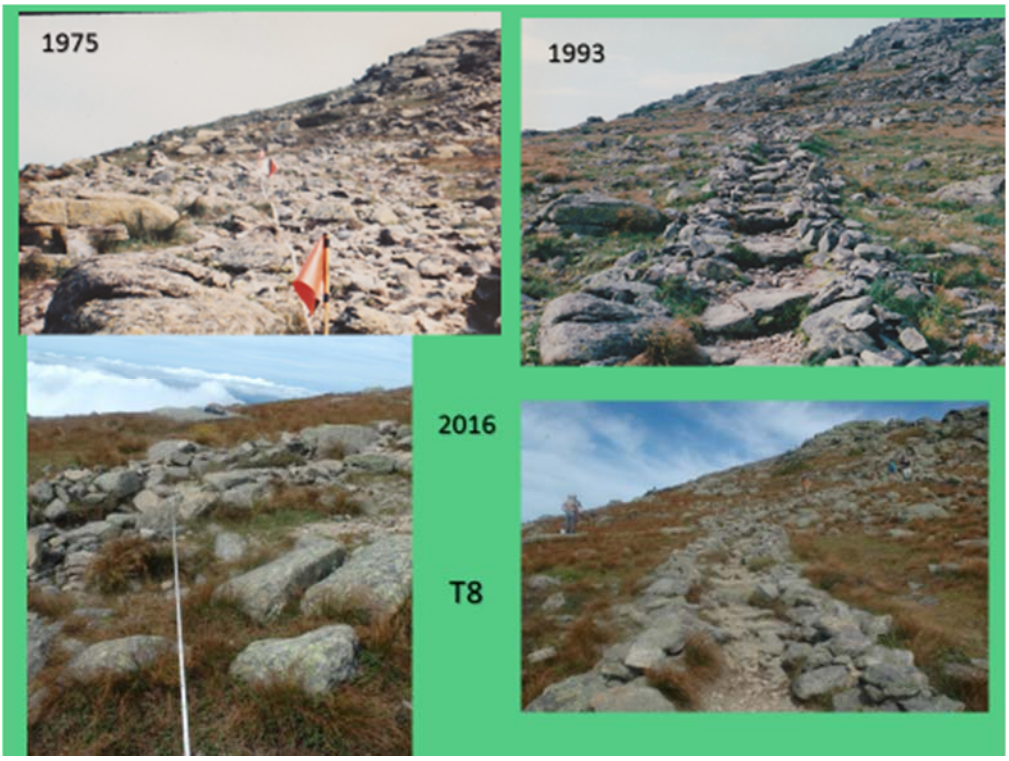

Figure 10. Regrowth of vegetation resulted on either side of scree wall built after the 1975 photo. Vegetation gains are largely maintained today on this section of trail, with the exception of one area where braiding has developed recently.

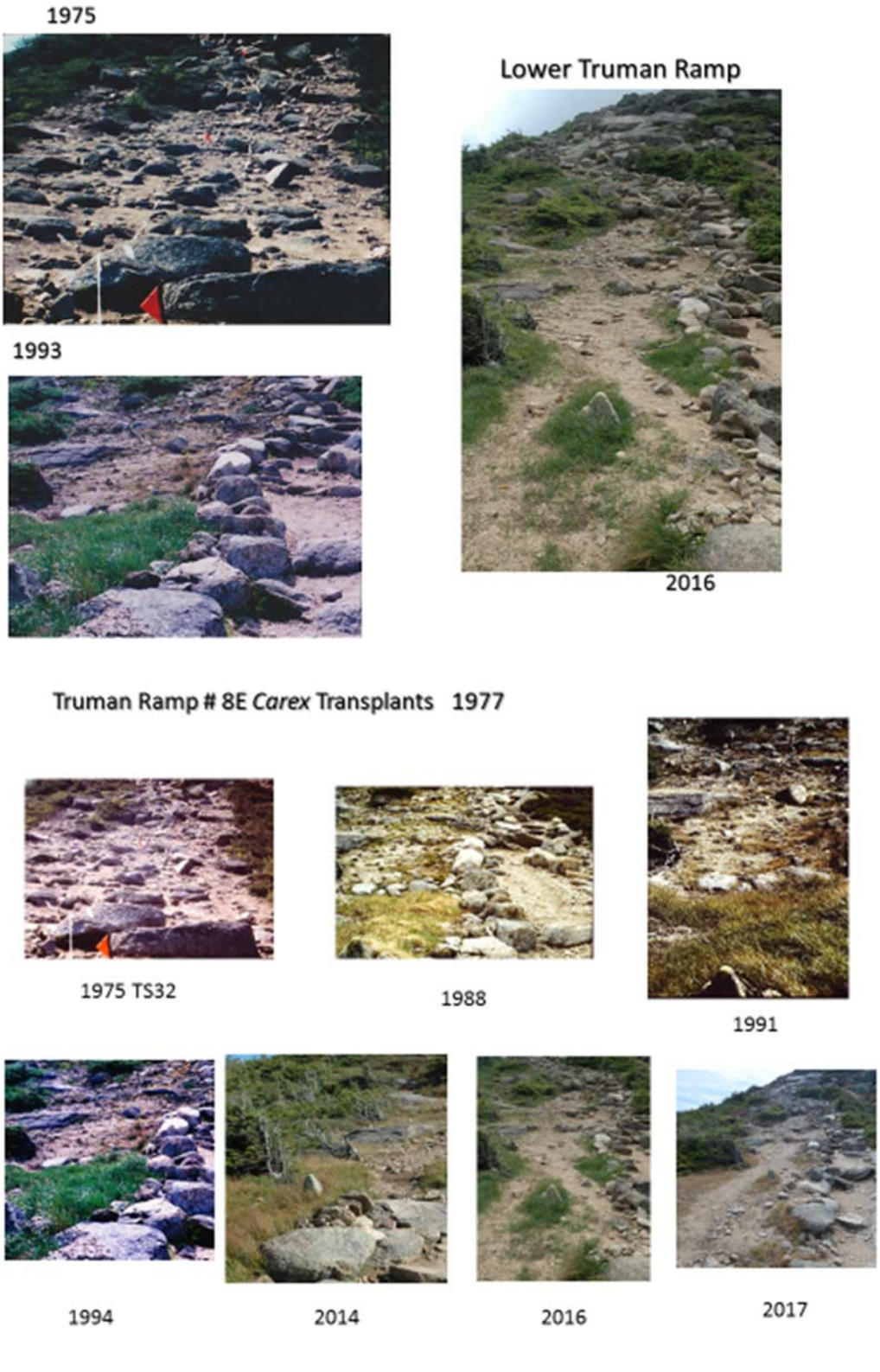

Figure 11. Detail above, overview below. Note small pyramid rock in most photos for orientation. Successful expansion of Bigelow's sedge can be seen by late 1988 through 2014, with sudden erosion and trampling from off trail traffic reversing revegetation success. Other native and non-native species planting and seeding was ineffective (only Bigelow's sedge transplants took in some locations).

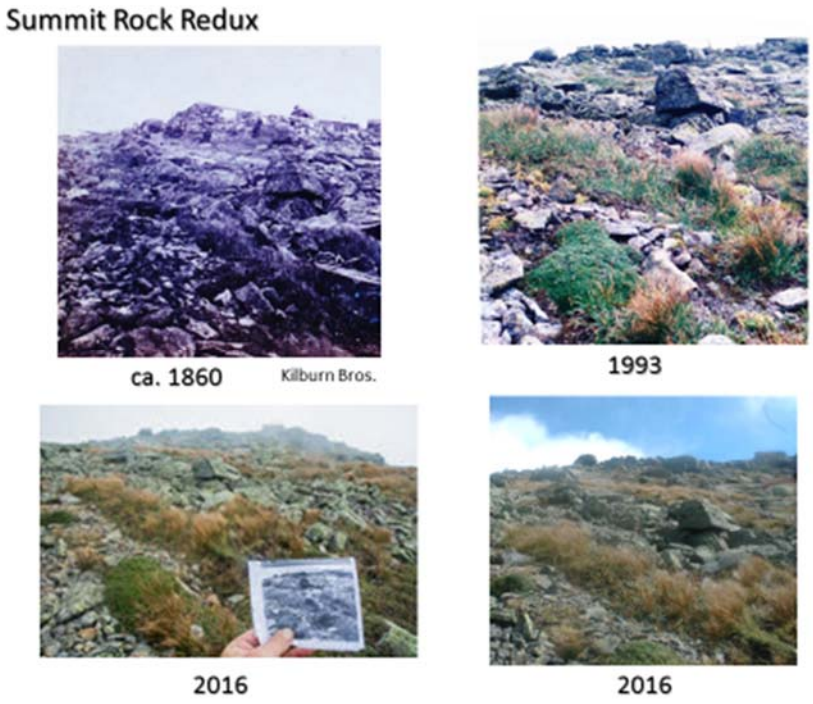

Figure 12. Series of photos of west side of Mt. Lafayette summit in the area (foreground) of old horse path. Note split-rock in each panel, and expansion of vegetation following abandonment of horse path.

Figure 13. Series of photos on an abandoned trail segment around summit of Mt. Truman (subsidiary summit between Mt. Lafayette and Lincoln). Note revegetation between 1975, 1989, and 1993, then subsequent re-establishment of bootleg trail in recent years.

Discussion

The monitoring results reveal the complexity of protecting alpine vegetation and resources in high-use areas. They indicate some substantive conclusions about efficacy of specific trail management strategies and revegetation techniques – what works and what doesn't, and under what circumstances. Primarily, any passive or active technique (e.g., appropriate trail construction and ongoing maintenance, education, stewardship, signage) that eliminates or greatly limits foot traffic off-trail will prevent vegetation damage or allow natural recovery of vegetation over the long term in all but the most severely damaged areas. Conversely, reversals in revegetation or new de-vegetation can occur rapidly if foot traffic increases substantially in previously un-trafficked areas. The challenge of keeping people on trails is multi-dimensional (trail design, maintenance, education, and social components), and the apparent substantial increase in hiker visitation on Franconia Ridge over the last 10-15 years, and more broadly in alpine areas across the northeast, only heightens the challenge.

Several pre-existing and new initiatives seek to mitigate and remedy vegetation and other impacts along the Franconia Ridge. The WMNF has strong, award-winning Trailhead Steward and Alpine Summit Steward programs in place to educate hikers about preparedness and to engage their help in protecting alpine areas on their hikes. In 2016, the WMNF, Appalachian Trail Conference (ATC), Waterman Fund, and numerous state and NGO partners convened to implement a Visitor Use Management Framework (VUMF) on Franconia Ridge. This framework was developed by all of the major federal land managing agencies (US FS, FWS, BLM, and NPS) for land areas facing complex management challenges. The VUMF is a step-wise, adaptive management strategy that identifies issues, challenges, strategies, actions, and monitoring and evaluation feedbacks needed to adjust actions to achieve desired conditions on Franconia Ridge long term. It is the first application of the framework in the northeastern U.S. In addition, the Appalachian Mountain Club (AMC) Trail Steward for Franconia Ridge initiated a trail stewardship internship with Middlebury College focused on Franconia Ridge and the AMC Trails and Research Departments are developing specific trail prescriptions for addressing needed trail work and maintenance sensitive to preserving alpine vegetation.

In summary, the recent Franconia Ridge vegetation monitoring report indicates that management of user impacts in alpine areas on Franconia Ridge have had mixed results at the scale of decades – there are examples of both positive and negative trends in the condition of vegetation adjacent to the Franconia Ridge trail in site-specific areas. The trend depends on original site conditions, degree of disturbance and remnant soil resources, technique used, and likely, the substantial and increasing hiking pressure along the Franconia Ridge/Appalachian Trail. The recovering areas are promising, but the degraded sections appear to have increased in the past 20 years and require near-term attention in cases where damage is still recoverable. The results and conclusions of 40+ years of monitoring work puts the WMNF in a demonstrably better position to make specific management decisions and prescriptions for areas that still have hope for recovery. In response, the WMNF and partners are engaged in vigorous, and multi-faceted planning and management initiatives that seek to protect the ecological integrity of the Ridge while providing opportunities for recreation.

Recommendations

At this time, the VUMF and other stewardship and trail work efforts described above are appropriate management direction for Franconia Ridge and are consistent with the Forest Plan. Many lessons from Franconia Ridge are applicable to the remainder of alpine areas and trails on the WMNF, including the need for additional monitoring and follow-up on existing monitoring efforts in the Presidential Range,

and additional site-specific follow-up on Franconia Ridge. Several monitoring efforts related to recreation impacts in the Alpine Zone monitoring question are underway in the Presidential Range, including in 2018 detailed documentation of vegetation condition and rare plants along the Crawford Path in concert with substantial trail work to remedy problem areas. Protection of all alpine areas consistent with the intent of the Forest Plan will require specific attention to preventing user impacts and recovering damaged areas in site-specific ways, as well as broader education and stewardship tactics.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question and indicators continue to be appropriate and informative.

References

Cogbill, C. V. 2017. Vegetation of Franconia Ridge, New Hampshire: Evaluation of 42 Years of Trail Management and Vegetation Change. Beyond Ktaadn, New Salem, Massachusetts. Challenge cost-share agreement FS 15-CS-11092200-021.

Cogbill, C. V. 1994. Vegetation of Franconia Ridge, New Hampshire. Historical Ecology and Management Effects. NH Natural Heritage Inventory, Concord, NH.

USDA Forest Service. 2017. Unpublished data on rare plants and vegetation of Franconia Ridge. Project files. White Mountain National Forest, Campton, NH.

5.2.2 – Monitoring Question

What are the effects of cliff-related recreation use on cliff plant abundance and rare plant persistence?

Last Updated

2009

Monitoring Indicator(s)

Rock-climbing / access hiking route use levels; Vegetative cover (percent cover) on and at base of cliffs; Surveys for circumneutral cliffs, rare plants, and sensitive habitat locations

Monitoring Frequency

5 years

Background & Driver(s)

Periodic follow-up (Phase 3) will help quantify recreational impacts on representative cliffs on the WMNF. To increase the usefulness of this monitoring in assessing potential effects on rare plant species, specific locations of greatest concern for potential recreation impacts (i.e., circumneutral cliffs and RFSS species habitat) will be identified through supplemental surveys of cliffs (Phase 3a).

Phase 3a: Identify important cliffs or cliff features on the WMNF: circumneutral cliffs (an outstanding natural community); cliffs systems with RFSS species or sensitive habitats; and specific locations within cliffs where these features occur. Surveys will be based primarily on ground-level surveys (non-technical climbing), build off of the results of Phase 1 and 2, and result in documentation of areas of cliffs most in need of additional monitoring in terms of resource sensitivity and potential for impacts (this will include identification of largely unimpacted cliffs where climbing activity is expected to increase, which offer the best opportunity to document impacts over time. Phase 3b: Ocular survey of cliff face/base and along specific climbing routes. See Cliff ecological indicator protocol documents. This is the anticipated re-survey of the original Phase 2 study, with appropriate revisions informed by Phase 2 and Phase 3a results.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 above, we are transitioning to a new monitoring evaluation and reporting process. Evaluation of this monitoring question will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.2.3 – Monitoring Question

Are individual known occurrences on the Forest increasing, stable, or decreasing?

Last Updated

2007

Monitoring Indicator(s)

Standard surveys: Number of individuals / size of population, other standard information fields.

Permanent plot surveys: Timed surveys in permanent plots or transects (defined, geo-referenced areas); number of plants and/or area of occupancy (cover); abundance of associated species; habitat parameters. Design of surveys will depend on population and site characteristics.

Monitoring Frequency

Annually

Background & Driver(s)

The monitoring helps establish population trends in order to insure these sensitive species persist on the Forest.

Standard surveys:

- Subset of RFSS plant species will be visited each year. Visit site during appropriate identification season (usually summer), count plants and report according to MNAP or NHNHB protocols (see their survey forms). Each occurrence is typically visited every five years; more often if population trends dictate.

Two concurrent methods will be employed:

- Standard survey protocols (in wide use in the region) are useful for establishing presence/absence and persistence; and potentially for detecting major changes in population size and trends. This will be employed for most species and populations.
- Permanent plot surveys: The goal is to establish permanently referenced, reproducible surveys for a subset of the most vulnerable RFSS species and populations to provide better resolution and confidence in population trends across the spectrum of habitats/communities on the WMNF in which RFSS occur. Particular species and populations selected will include taxa in each of the major plant habitats/communities on the WMNF, and will be prioritized based on rarity, threats, vulnerability, feasibility of implementation, and adequacy of trend data available from standard surveys. We expect this to involve ~25-30 populations and to be implemented over a five year period (resurveyed on a 5 year rotation).

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.2.4 – Monitoring Question

What are the effects of even-age regeneration harvesting on herbaceous species? What is the change in percent cover in the herbaceous layer? Is there a change in species composition/diversity? If a change in species composition does occur, do those species originally present re-colonize the site? How long until the site is re-colonized by these species?

Last Updated

Results from this monitoring item have not been previously reported.

Monitoring Indicator(s)

Changes in percent cover, composition, and recolonization rates compared to reference conditions.

Monitoring Frequency

5 years

Background & Driver(s)

Standard project level botany survey protocols conducted prior to all forestry projects for pre-harvest baseline. Repeat stand surveys following harvesting of select stands. This method may be appropriate to compare gross composition differences at the stand scale. Marked plots will be necessary to detect changes in percent cover, composition, and recolonization rates compared to reference conditions.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.3 – Botany and Wildlife

Ecological Conditions for Federally-listed Species

5.3.1 – Monitoring Question

What is the status of key ecological conditions required by each Federally-listed Threatened and Endangered species known to occur on the White Mountain National Forest?

Last Updated

2018

Monitoring Indicator(s)

There are three federally listed species included in this monitoring question. This report will address indicators for two of them:

- Acres of suitable foraging and denning habitat (Canada lynx)
- Number of potentially suitable roost trees (northern long-eared bat)

Monitoring Frequency

Acres of suitable Canada lynx habitat are generally calculated annually. The number of suitable roost trees for northern long-eared bat is a new monitoring item, as a result of the species being listed under the Endangered Species Act in 2015. However, data is available from both 2006 (data collected from 2002-2006) and 2016 (data collected from 2012-2016) so a decade-long comparison can be made.

Background & Driver(s)

This monitoring item addresses the following required monitoring elements:

> (5)(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.
>
> (5)(iv) The status of a select set of the ecological conditions required under 36 CFR § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.

A sustainable Canada lynx population requires two unique habitats: foraging habitat that supports abundant populations of snowshoe hare (their primary prey), and denning habitat in which to protect kittens. Lynx habitat may be considered suitable (can currently support lynx foraging and/or denning) or unsuitable (does not currently support foraging or denning). Non-lynx habitat is not reasonably expected to contribute foraging habitat. Suitable and unsuitable lynx habitats are based on stand forest type, structural conditions, and ecological land type criteria. On the WMNF, foraging habitat is defined as brushy wetlands or softwood or mixed wood stands with thick regenerating vegetation to provide cover from snowshoe hare predators. A suitable den site is generally a small area of tangled large woody material that provides cover for kittens. While intense wind events can create local patches of blown down trees of any age, suitable denning habitat is most likely to be found in older stands where trees are generally more decadent. On the WMNF, suitable denning habitat is assumed to be found in spruce, fir, or mixed wood stands at least 120 years old or white pine or hemlock stands at least 150 years old. Both foraging and denning habitat must be found in suitable quantities and juxtaposition within a lynx's home range to support a lynx population. Lynx habitat on the WMNF has been mapped into 13 Lynx Analysis Units (LAU), each of which is designed to approximate the home range of a single lynx (Forest Plan Glossary p. 16).

For northern long-eared bats, the most critical habitat feature on the WMNF is availability of roost trees, especially maternity roost trees (where adult females congregate to give birth and raise their young). Roost trees can vary in size, but are most commonly 4-10 inches in diameter and are most often hardwoods on the WMNF, with a defect of some kind to provide a suitable cavity (U.S. Fish and Wildlife Service 2015, Sasse and Pekins 1996). Northern long-eared bats will use trees that are obvious old snags, as well as trees that are mostly sound but with a small defect. Determining if a tree can function as a roost tree without seeing a bat actually exit the tree is close to impossible, so an assessment is made instead using inventory estimates of standing snags and trees with known defects. This method misses trees that appear sound but have a hidden defect, but not every snag or cull tree may be suitable for roosting, either.

Direction for these monitoring items appears in Forest Plan goals (pp. 1-8 to 1-9), as well as in Canada lynx standards and guidelines (p. 2-14). Northern long-eared bats were not listed under the Endangered Species Act when the Forest Plan was signed in 2005, but the WMNF had previously addressed the possibility of Indiana bats (an Endangered species) being present on the Forest. Using that previously developed direction, wildlife reserve tree standards and guidelines to conserve possible roost trees to benefit all woodland bats were incorporated into the revised plan (pp. 2-35 to 2-36).

Monitoring Indicator 1

Results

For Canada lynx, Forest Plan standards and guidelines taken from the 2000 Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) focus on providing minimal thresholds of denning habitat (at least 10%) and total suitable habitat (at least 70%) in each LAU. Table 1 shows a comparison of lynx habitat over the eleven-year period since the Forest Plan was revised.

Table 1. Comparison of mapped lynx habitat by Lynx Analysis Unit (LAU) on the WMNF, 2006 and 2017.

	2006 acres				2017 acres			
LAU	total lynx habitat	% total suited	% total foraging	% denning	total lynx habitat	% total suited	% total foraging	% denning
1	39896	40%	25%	25%	39282	50%	25%	35%
2	17128	29%	3%	27%	16014	36%	3%	33%
3	42203	33%	13%	27%	38545	39%	14%	32%
4	39735	56%	40%	37%	38519	63%	41%	36%
5	58279	49%	42%	25%	59568	62%	40%	27%
6	27765	38%	27%	16%	27134	45%	27%	20%
7	28651	31%	7%	26%	26607	35%	6%	30%
8	58533	42%	27%	25%	58309	34%	21%	17%
9	53782	58%	46%	24%	54452	59%	46%	21%
10	53242	65%	59%	42%	55161	66%	56%	41%
11	30027	35%	24%	20%	26455	45%	25%	23%
12	23448	39%	35%	17%	23041	42%	35%	16%
13	20004	37%	33%	7%	20234	38%	34%	9%

Discussion

For the most part, lynx habitat stayed the same across all LAUs over the decade. Raw data shows a small drop in total lynx habitat, which may be more a function of updated typing of forest types in various areas. It is unlikely the amount of total lynx habitat on the ground has changed, since ecological land types don't change and Forest Plan direction would generally move the WMNF towards more total lynx habitat, not less. Suitable lynx habitat increased across the Forest by almost 20,000 acres, resulting in a proportional increase in all but one LAU. Determining the specifics for the increase was challenging. The raw data shows total acres of denning habitat in 2017 was within a thousand acres of 2006 totals. Total acres of suitable foraging habitat decreased by over 6,000 acres over the same time period. However, some suitable foraging habitat is also suitable denning habitat. There are two situations in which stands can be counted as both, provided the stand age is sufficiently old: 1) all spruce-fir above 2500 feet elevation and 2) uneven-aged harvests of mixedwoods or softwoods on strong softwood ecological land types, done within the last 5-30 years. In this last case, the overall stand age remains the same because the majority of the stand is not harvested. However, in small gaps where trees are harvested, thick softwood regeneration can provide suitable snowshoe hare habitat.

To calculate the total acres of suitable lynx habitat, foraging and denning habitat are added together, but then the amount of overlap between them is subtracted. It is in this overlap amount where the difference between 2006 and 2017 becomes apparent. In 2017, there were almost 24,000 fewer acres of this overlap compared to 2006. Much of this amount is likely attributable to our moving to a new reporting system that made it difficult to run data queries that would enable us to associate accomplishments (e.g., group cuts that are 5-30 years old on strong softwood ELTs) with on-the-ground locations. This resulted in an anticipated underestimation of the amount of suitable foraging habitat in 2017. The remainder is likely attributable to stands outside of the overlap area growing into denning habitat, but offset by harvests elsewhere.

The challenges with this kind of analysis should be resolved as we transition to the new database system. In the meantime, the WMNF continues to be below minimum thresholds for suitable foraging habitat in all LAUs, which we may never achieve with current levels of timber harvesting. But Forest Plan standards and guidelines should help move the WMNF towards improving lynx habitat where possible. Denning habitat continues to be above minimum thresholds in all but one LAU and we have made steady progress in that LAU since 2006.

Monitoring Indicator 2

Results

To assess northern long-eared bat potential roosts, forest inventory data was queried for snags $\geq$5 inches dbh (diameter at breast height) and cull trees $\geq$3 inches dbh (Forest Inventory Data Online 2018). Snags are defined as standing dead trees. Although northern long-eared bats will roost in trees smaller than 5 inches dbh, this is the minimum captured in the database used. Rough culls are live trees that do not contain at least one eight-foot section of the merchantable bole that is reasonably free from defect. Examples of rough culls are trees with splits, large cracks, lightning strikes and other defects. Rotten culls are live trees where more than 2/3 of the merchantable bole is defective and at least half of this is due to the tree being rotten. Rotten culls are usually trees with large hollow sections. On the WMNF, northern long-eared bats showed a preference for northern hardwood roost trees, so these were also analyzed separately (Figure 14).

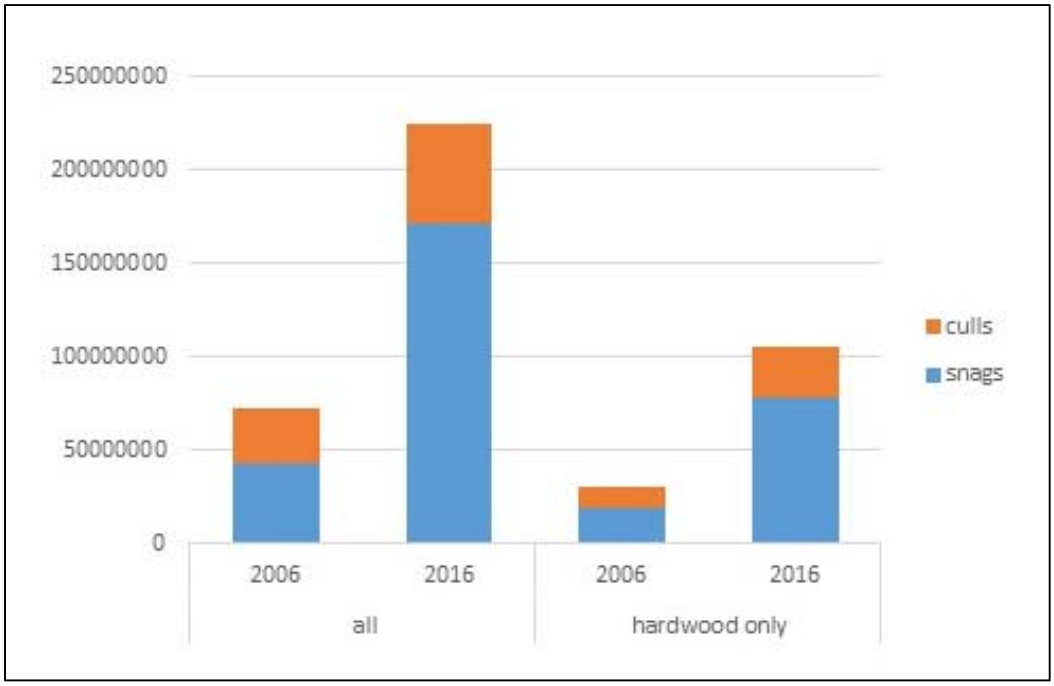

Figure 14. Estimate of northern long-eared bat potential roost trees on the WMNF.

Discussion

The sampling error varied for each species group and size class measured, but was generally higher in 2006 than 2016. Regardless, it seems likely that there were more potential roost trees in all categories in 2016 compared to 2006. This is not a surprise, as the WMNF has been steadily aging since the large-scale timber harvests at the turn of the last century and estimates of land area impacted each year by Forest Service projects is less than one percent. Estimates of the number of potential roost trees cut during project implementation is even smaller, less than one-tenth of one percent (Sease and Prout 2015 p. 54). White-nose syndrome may continue to affect WMNF bat populations, but summer roosting habitat appears abundantly available.

Recommendations

No management changes are recommended.

Evaluation of Monitoring Question and Indicator(s)

No monitoring changes are recommended.

References

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Ruediger, B., Claar, J., Gniadek, S., Holt, B., Lewis, L., Mighton, S., Naney, B., Patton, G., Rinaldi, T, Trick, J., Vandehey, A., Wahl, F., Warren, N., Wenger, D., and A. Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, NT. 142 pp.

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Sease, J. and L. Prout. 2015. Biological assessment for ongoing project activities with determinations of no effect or may affect, not likely to adversely affect for the northern long-eared bat on the Green Mountain National Forest and White Mountain National Forest. U.S. Forest Service unpublished. 120 pp.

U.S. Fish and Wildlife Service. 2015. Endangered and threatened wildlife and plants; threatened species status for the northern long-eared bat with 4(d) rule. Federal Register 80(63):17974-18033.

5.4 – Climate Change

Snow Characteristics

5.4.1 – Monitoring Question

How are the characteristics of snow changing on the White Mountain National Forest?

Last Updated

2011

Monitoring Indicators

- Maximum snow depth per season – maximum snow depth on the course during the season
- Cumulative snow depth per season – total amount of snow that falls on the course during the season
- Snow water equivalent – amount of water contained in the cumulative snow depth
- Snow cover duration - period from first recorded snow to last recorded snow

Monitoring Frequency

Annually

Background & Drivers

Determine whether established sites are being maintained to safety and resource protection standards with a focus on fee sites. This monitoring helps managers determine if additional actions are needed to protect the sites.

Monitor collection activity at other sites in the Forest including the extent of excavation, damage to other resources and the creation of de facto collection sites. This monitoring helps managers determine if additional actions are needed to designate new sites, implement closure orders, or take other actions.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.5 – Fire

Prescribed fire effectiveness, wildland fire for resource benefits

5.5.1 – Monitoring Question

Is prescribed fire being effectively used as a tool to meet management objectives set forth in the Forest Plan (Chapter 1)? Are prescribed burns meeting the fire effect objectives set forth in each burn plan?

Last Updated

2014

Monitoring Indicators

Various depending on objectives to be met; may include vegetation changes, soil conditions, fuels characteristics, and human factors

Monitoring Frequency

Annually

Background *& Drivers*

Determine whether established sites are being maintained to safety and resource protection standards with a focus on fee sites. This monitoring helps managers determine if additional actions are needed to protect the sites.

Monitor collection activity at other sites in the Forest including the extent of excavation, damage to other resources and the creation of de facto collection sites. This monitoring helps managers determine if additional actions are needed to designate new sites, implement closure orders, or take other actions.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.5.2 – Monitoring Question

Do wildland fires managed for resource benefit successfully meet objectives set forth in the Forest Plan and Fire Management Plan? Did the fire stay within the allowed management areas and fire behavior parameters presenting low risk to firefighter and public safety? Did the fire function as a natural ecosystem process to restore or maintain natural plant communities? Were hazardous fuels reduced?

Last Updated

2011

Monitoring Indicators

Various -- can include vegetation, soil, fuels, and human components

Monitoring Frequency

Periodic

Background & Drivers

Determine whether established sites are being maintained to safety and resource protection standards with a focus on fee sites. This monitoring helps managers determine if additional actions are needed to protect the sites.

Monitor collection activity at other sites in the Forest including the extent of excavation, damage to other resources and the creation of de facto collection sites. This monitoring helps managers determine if additional actions are needed to designate new sites, implement closure orders, or take other actions.

Monitoring Indicator

There weren't any unplanned wildfires managed for resource benefits during FY15-17. Thus, there are no results or discussion included in this monitoring report. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.6 – Forestry and Wildlife

5.6.1 – Monitoring Question

Are we managing forests at the project level in ways that move the Forest toward our Forest Plan wildlife habitat objectives?

Last Updated

2013

Monitoring Indicator(s)

Presence and relative abundance of seedlings of desired species in stands harvested to move conditions toward wildlife habitat composition objectives

Monitoring Frequency

Annual

Background & Driver(s)

Use stocking surveys to determine if species presence and abundance in the seedling pool is closer to the desired composition in the silvicultural prescription or EA than species presence and abundance in the overstory.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.6.2 – Monitoring Question

Are even-age regeneration harvest openings exceeding the 30 acre maximum size (Forest Plan, Vegetation Management S-1, p. 2-29)? Are we meeting wildlife habitat regeneration objectives in both size and quantity of openings by habitat types? If not, why not?

Last Updated

2010

Monitoring Indicator(s)

Even-age size maximum size of openings, size and quantity of regeneration-age openings achieved for wildlife objectives.

Monitoring Frequency

10 years

Background & Driver(s)

This monitoring helps ensure NFMA requirements to limit opening size are being met. Quantitative comparisons of the on-the-ground condition and Forest plan standard and habitat objectives. Query the FSVeg database to get stand information. Individual stand prescriptions will also be monitored through annual timber sale reviews. Wildlife program manager will track why units that are considered for even-aged regeneration harvest are dropped during project analysis.

Monitoring Indicator

This monitoring question is monitored every 10 years. Results and discussion for this question were last summarized in the 2010 monitoring report. This question will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.7 – Forestry

5.71 – Monitoring Question

To what extent have destructive insects and disease organisms increased?

Last Updated

2018

Monitoring Indicator(s)

Acres affected, species of insects and diseases, number of outbreaks

Monitoring Frequency

Annually

Background & Driver(s)

Monitoring the acres affected by insects and diseases and the number of outbreaks serves to measure changes within the forest plan area related to stressors that may be affecting the plan area. If monitoring shows greater than endemic levels, additional focused monitoring and an action plan will be required.

Monitoring Indicator 1: Acres affected & Species of insects and diseases

Results

The US Forest Service, Forest Health Protection staff conduct annual aerial detection surveys of the WMNF, monitoring acres of forestland affected by insect and diseases (Figure 15; Table 2). White Pine Discoloration, attributed to two foliar diseases, *Canavirgella* needle cast caused by the fungus *Canavirgella banfieldii* and brown spot needle blight caused by the fungus *Mycosphaerella dearnessii*, reached a peak in 2016 of 24,145 acres and has since declined significantly. Both species of fungus are widely distributed throughout the Eastern White Pine range in New England (Munck et al. 2011). During the same monitoring period, the forest tent caterpillar (FTC), *Malacosoma disstria*, a native species found throughout hardwood forests of North America, started to impact northern hardwood stands. Regional outbreaks occur at 5-15 year intervals, each outbreak lasting 2-5 years (Katovich 2001). Aerial detection survey data from 2018 indicate the acres impacted by FTC have decreased to 2,892 acres.

Table 2. Yearly insect and disease damage from aerial surveys collected from 2015 through 2017.

Damage type	**2015**	**2016**	**2017**
White pine discoloration	7,357	24,145	2,732
Red pine scale	15	0	0
Forest tent caterpillar	0	15,129	16,035
Total	**7,372**	**39,274**	**18,767**

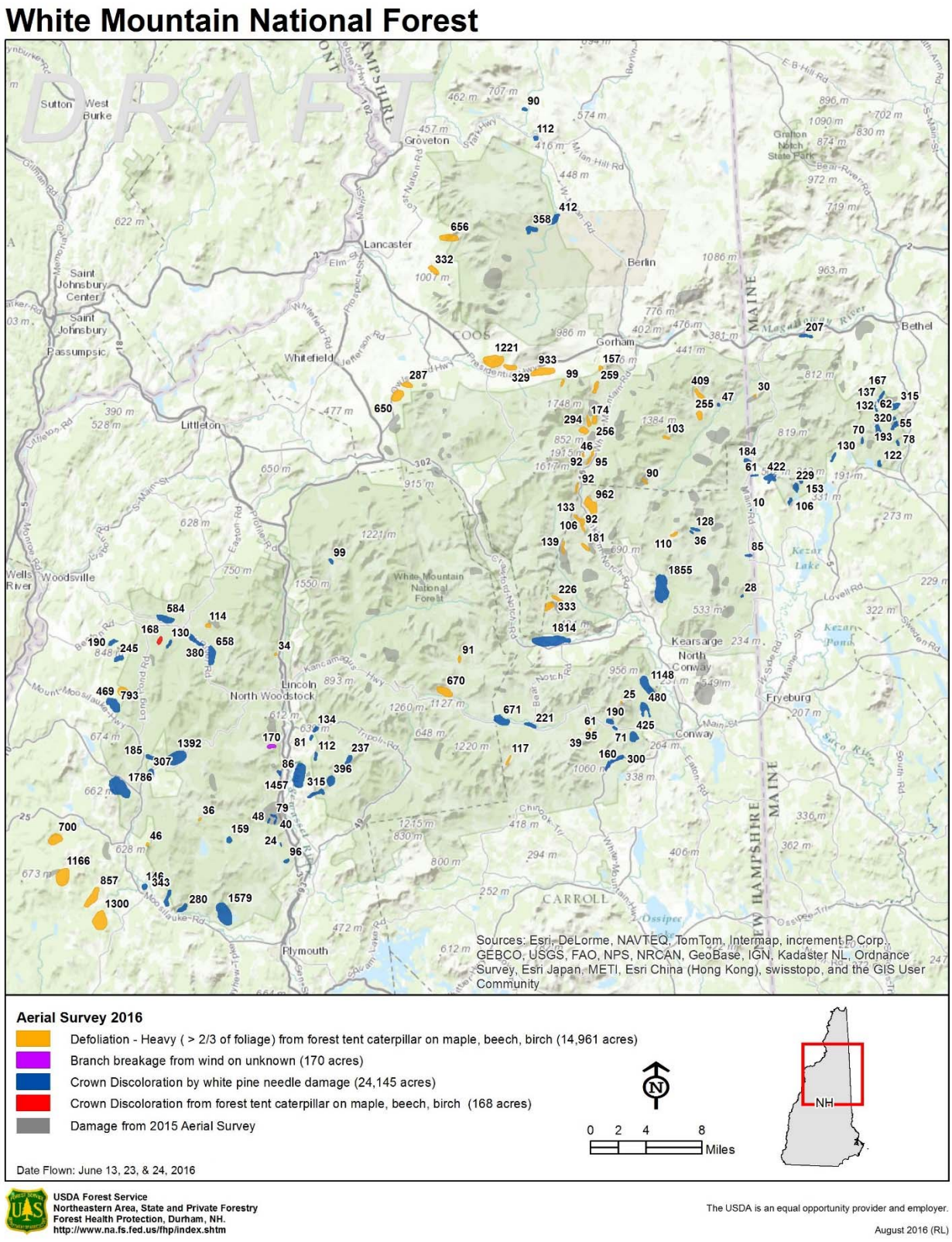

Figure 15. Aerial damage survey results from 2015 and 2016.

Discussion

The aerial detection survey results indicate acres affected have generally fluctuated, consistent with regular outbreak intervals for native insects and diseases.

Monitoring Indicator 2 (if applicable): Number of outbreaks

Results and Discussion

Staff of the WMNF monitor for outbreaks of hemlock woolly adelgid (HWA) and emerald ash borer (EAB). HWA, originally from Asia, was first discovered in New Hampshire in Portsmouth in 2000 and is a pest of concern for the hemlock resource on the WMNF. HWA monitoring efforts consist of ocular surveys of hemlock foliage across the WMNF, with particular focus on hemlock within timber sale areas. To date, no outbreaks of HWA have been discovered on the WMNF. However, HWA has been confirmed several miles to the south of the National Forest boundary.

The emerald ash borer (EAB), *Agrilus planipennis*, was discovered in Concord, NH in April 2013 and is considered a pest of concern for the ash resource on the WMNF. Forest staff, in an ongoing partnership with State and Private Forestry Forest Health Protection and the State of New Hampshire, continue to establish white ash trap trees adjacent to and in campgrounds across the WMNF. These locations were chosen because of the amount of firewood typically imported to campgrounds by visiting campers. EAB has somewhat limited flying capacity and is typically transported longer distances through the moving of firewood. Therefore, foresters and entomologists reasoned that the most likely location for an EAB infestation on the WMNF is in or around one of the campgrounds. Trap trees are girdled annually in the spring (Figure 16).

Figure 16. Clare Mendelsohn, Forest Supervisor, girdles an ash tree to be used as a "trap" tree for EAB monitoring.

Girdling, which involves removing a band of bark and phloem around the trunk of a tree, interrupts the ability of the tree to transport carbohydrates – the food needed by the tree. Girdled trees become increasingly stressed over the summer. As stress increases, the chemicals emitted from the foliage, bark, or wood of the tree change. The wavelengths of light reflected by the leaves also differ between healthy

and girdled trees. Female beetles are attracted to stressed ash trees and tend to lay more eggs on stressed trees than on healthy trees. Trap trees were felled, cut into bolts (3' sections), and had the bark peeled in late November. EAB eggs hatch in July and early August, at which point the larvae start to feed. As they feed and grow, galleries (chambers or passages in wood tissue made by feeding larvae) are formed under the bark (McCullough et al. 2015). By September these galleries are visible to the naked eye once the bark is peeled.

No EAB larvae have been discovered. However, new infestations of EAB have been discovered several miles south of the National Forest in Bridgewater and Moultonborough, NH. The WMNF plans to continue monitoring efforts through use of trap trees annually.

Recommendations

Aerial detection surveys, HWA monitoring, and EAB trap tree monitoring should continue into the future. Continued monitoring improves the chances of early detection and eradication of pests.

Foresters should continue to implement silvicultural prescriptions that promote healthy and resilient forested stands and encourage a diversity of age classes and species. Many insects and diseases tend to prefer stressed, dying, and dead trees. Maintaining diverse age classes of healthy trees can increase resistance and resiliency to pests.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan.

References

Katovich, Steven; Hanson, Jim. 2001. Forest Tent Caterpillar in the Upper Midwest. USDA For. Ser. Information Sheet NA-PR-02-01, Northeastern Area, State and Private Forestry, St. Paul, MN. 1 p.

McCullough, Deborah G.; Schneeberger, Noel F.; Katovich, Steven A.; Siegert, Nathan W. 2015. Pest Alert Emerald Ash Borer. USDA For. Ser. NA-PR-02-04, Northeastern Area, State and Private Forestry, Newtown Square, PA. 2 p.

Munck, Isabel A.; Ostrofsky, William D.; Burns, Barbara. 2011. Pest Alert Eastern White Pine Needle Damage. USDA For. Ser. NA-PR-01-11, Northeastern Area, State and Private Forestry, Newtown Square, PA. 4 p.

5.72 – Monitoring Question

Are lands adequately restocked within 5 years of a regeneration harvest or site preparation activities?

Last Updated

2018

Monitoring Indicator(s)

Stocking levels of suitable species in regeneration harvest areas.

Monitoring Frequency

Annually

Background & Driver(s)

There is a legal requirement in the National Forest Management Act of 1976 (NFMA) all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans. Deciding officials must address stocking in their decision documents. This monitoring item ensures there is data to inform deciding officials when making their findings.

This question is tied to the LMP objective of managing for commercial products using well-integrated prescriptions that protect biotic and abiotic resources and are compatible with the high level of recreational use on the Forest. Stocking levels of suitable species in regeneration harvest areas are determined from a series of 1/1000 acre (3.72 ft. radius) plots (WMNF Supplement: FSH 2409.26b-2000-1). For example, within northern hardwood type, approximately 40% of the plots should be stocked with acceptable northern hardwood species to result in “C” line stocking. Sixty percent (60%) will result in “B” line stocking (Leak 2014).

Monitoring Indicator 1

Results

Monitoring results from stocking surveys and photo monitoring continue to demonstrate that lands are adequately restocked within 5 years of a regeneration harvest or site preparation activities. Figure 17 shows a series of photos documenting adequate restocking following a clear cut. The photos were taken immediately following harvest (2012) and the five years following (2016 through 2017). Stocking survey results are updated annually into a database called the Forest Service Activities Tracking System (FACTS).

Discussion

Current monitored conditions are consistent with the requirements for reforestation as outlined in the NFMA. This effectiveness monitoring demonstrates that silvicultural prescriptions implemented on the WMNF are effective for adequately restocking stands within 5 years of a regeneration harvest or site preparation activities. Maintaining stocking levels of suitable species in regeneration harvest areas ensures a sustained yield of high quality sawtimber and other timber products, which is one of the primary purposes and desired conditions of the land in management area MA 2.1 – General Forest Management.

Figure 17. Photo point series taken of a clearcut in the Base Road Salvage Sale immediately following harvest in 2012 and the five years following (2013-2017).

Recommendations

WMNF staff should continue to monitor stocking levels of suitable species in regeneration harvest areas through the use of walk-through ocular estimates, 1/1000 acres plots, and photo monitoring.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan.

References

Leak, William B.; Yamasaki, Mariko; Holleran, Robbo. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Ser. Gen. Tec. Report NRS-132, Northern Research Station, Newtown Square, PA. 8 p.

5.7.3 – Monitoring Question

Are harvests occurring on lands suitable for timber management? Are our databases being kept current with identified changes that affect suitability determinations at the project and Forest Plan level?

Last Updated

2008

Monitoring Indicator(s)

Annually pick a recent project area to verify that the harvest areas only occurred on suited lands. In addition, review our GIS and FSVeg databases for the area to see if they reasonably reflect accurate suitability determinations.

Monitoring Frequency

Annually

Background & Driver(s)

The first question provides information to help decision makers address an NFMA requirement in their project decision findings.

Keeping our databases updated helps with future project planning and will inform our suitability analysis in our next plan revision. Changes can also affect our assumptions in the Forest Plan about the long-term availability of old forest habitat.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.74 – Monitoring Question

Are we accomplishing silvicultural objectives related to our Forest Plan wildlife habitat types at the project level? For instance, if a forestry activity was intended to help perpetuate a paper birch/aspen forest type, did we meet that objective for the stand or harvest area?

Last Updated

2018

Monitoring Indicator(s)

Majority of plots with preferred species in dominant crown position 3 years and 10 years post regeneration harvest (i.e. clearcut, shelterwood, single tree selection).

Monitoring Frequency

Annually and decadal

Background & Driver(s)

This question exists to determine if implemented silvicultural prescriptions are resulting in the desired habitat type outcome. Question vii of the eight required monitoring elements within 36 CFR 210.12 is addressed with this question. Question vii reads; "Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities."

The question is tied to the LMP plan habitat composition (forest type) and age class objectives.

Forest type is defined by its vegetation, particularly its dominant vegetation as based on percentage cover of trees (SAF 1998).

Monitoring Indicator 1

Results & Discussion

Field crews visit stands 3 years post regeneration harvest to determine if forest type management objectives have been attained (Figure 18). This is determined either by a "walk-through" or by installing 1/1000 acre stocking survey plots. With each method, conditions are photo documented on a subsample of stands.

The "walk-through" is an ocular estimate made while traversing the stand. For instance, if objective of silvicultural prescription was to perpetuate paper birch and crew could easily determine through visual inspection that majority of stand was clearly dominated by paper birch, crew would record stand as attaining management objectives. The walk-through method is only used where it is obvious the stand is dominated by a particular species.

When conditions are inappropriate for walk-through method, crews install 1/1000 acre plots across the stand and record on paper tally sheets the dominant, codominant and softwood species present. Remarks are also recorded. Crews then determine percentage of total plots with particular dominant species and make an assessment of whether management objective were met or not. For example, in 2016, a crew visited a stand where the objective was to regenerate northern hardwoods for wildlife habitat. The crew installed 20 plots across the stand. 60% of plots were dominated by pin cherry, 20% by yellow birch, and 20% by American beech. The crew noted that although pin cherry was the dominant species at the time of the field visit (3 years post-harvest) yellow birch will eventually dominate due to

the short lived nature of pin cherry and the preponderance of yellow birch in the codominant position. The crew then recorded the stand as having attained the management objective.

Figure 18. Third year post harvest stocking survey photo documenting regeneration. Photo taken in 2016 in the Sebosis Sale.

The above example is typical of 3rd year stocking surveys. Crews continuously use professional judgement, local knowledge and experience to reach a determination regarding management objectives.

Data collected using both of the above methods is reviewed at the district and forest level. The data is currently not quantified by staff, but receives a thorough qualitative review.

Of the stands visited from 2015 through 2017, the majority were determined to have attained the management objective at 3 years post regeneration harvest. Areas where objectives were not attained include stands where objectives were very specific. Such as a stand visited in 2016 where the objective was to regenerate 50% of a stand as red oak and 50% northern hardwoods. Through installing plots, the crew determined that although the stand was completely stocked with commercial species, 55% of the plots were dominated by northern hardwood species and the remaining 45% by mixed hardwoods, while 0% had red oak. The crew noted regeneration did not contain red oak, however, red oak was observed regenerating from stump sprouts outside of the plot locations. Ultimately, the crew recorded the objective as not being met.

Based on the findings above, the silviculturist have moved to creating objectives with less exacting parameters to more of a range or description of the desired condition. Predicting exact percentages of regeneration prior to harvest is exceptionally difficult due to a variety of biotic and abiotic factors. For instance, regeneration recorded at 3 years post-harvest can be influenced by heavy moose browse, poor seed year, or weather.

Recommendations

Protocols were developed in FY 2018 to systematically visit a subsample of ten-year old stands/harvest areas to review project and prescription objectives and outcomes on the ground. To date, the protocols have not been implemented. Visiting stands 10 years post regeneration will help gain a greater understanding of attainment of management objectives and it is recommended to implement the protocol in FY 2019.

Based on the findings above, it is recommended to continue to describe habitat objectives as a range versus exact percentage requirements and continue to monitor stand 3 years and 10 years post regeneration harvest.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan. We should consider an even great time period for post-harvest monitoring (possibly 20, 30, or even 40 years post harvest).

References

The Society of American Foresters. The Dictionary of Forestry. 1998. 72 p.

5.75 – Monitoring Question

Is residual tree damage from silvicultural activities within acceptable levels to meet our resource objectives?

Last Updated

2018

Monitoring Indicator(s)

Stocking levels of acceptable growing stock of suitable species in harvest areas to meet resource objectives.

Monitoring Frequency

Annual

Background & Driver(s)

There is a legal requirement in the National Forest Management Act of 1976 (NFMA) all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans. This question is tied to the Forest Plan goal of managing vegetation using an ecological approach to provide both healthy ecosystems and a sustainable yield of high quality forest products, with special emphasis on sawtimber and veneer. The term “acceptable growing stock” (AGS) commonly is used to describe trees that have log potential now, or in the future, and a reasonable crown (Leak et al. 2014). Maintaining stocking levels of acceptable growing stock of suitable species in harvest areas helps ensure a sustainable yield of high quality sawtimber and veneer.

Monitoring Indicator 1

Results

The timber sale administration team monitors protection of residual trees (ie provision BT6.32 under 2400-6T Timber Sale Contract) during routine inspections of operations (often inspections take place multiple times per week during active logging operations). Results of inspections on recorded on Timber Sale Inspection Reports (TSIR) and reviewed and signed by the sale administrator (SA), forest service representative (FSR), and timber purchaser/contractor. All harvest units are visited during logging operations with data recorded on corresponding TSIR. Some, not all, TSIR’s include photo documentation of residual stand conditions (Figure 19).

Two timber sales per year are visited for a comprehensive log accountability audit by the timber sale contracting officer and law enforcement officer. A major component of the log accountability audit is inspection of residual stand conditions. Although residual stand damage was noted during several of the log accountability audits, it was determined damage was not significant enough to impact sustainability of high quality sawtimber and veneer products. All sales visited were found to have acceptable residual stand conditions. Data collected using the above methods are reviewed at the district and forest level. The data are currently not quantified by staff, but receives a thorough qualitative review.

Discussion

All units actively harvested from 2015 through 2017 were visited by various members of the sale administration team. It was determined that residual tree damage from silvicultural activities was within

acceptable levels in the majority of units. Some TSIR's indicated residual tree damage. As a result, increased communication with purchasers/contractors about contractual requirements to protect residual stand have occurred. Additionally, in some instances where protection of residual stand is of extraordinary importance, timber sale contracts require specialized equipment. For example, use of a cut-to-length/forwarder harvest system for a timber sale within a campground to protect picnic tables, fire rings, tent pads, etc.

Figure 19. Example of residual stand damage.

Recommendations

Annually pick a recent sale area to verify that residual tree damage from silvicultural activities is within acceptable levels to meet resource objectives. Involve district silviculturist, timber sale administration team, and other specialists as needed in the review. We should consider updating the stocking survey protocol to include a category for acceptable growing stock.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan

References

Leak, William B.; Yamasaki, Mariko; Holleran, Robbo. 2014. Silvicultural Guide for Northern Hardwoods in the Northeast. USDA For. Ser. Gen. Tec. Report NRS-132, Northern Research Station, Newtown Square, PA. 9 p.

5.8 – General

This section assesses the implementation of Forest Plan goals and objectives and standards and guidelines.

5.8.1 – Monitoring Question

To what extent are Forest Plan goals and objectives being attained?

Last Updated

2014

Monitoring Indicator(s)

Varies by program and by goal or objective.

Monitoring Frequency

Biennially

Background & Driver(s)

Varies by program and by goal or objective. Every year, a sample of Forest Plan goals and objectives should be considered by Forest resource program managers to determine whether the Forest is on-track to attain the stated outcome or if additional or different work needs to be done.

Monitoring Indicator

This monitoring question is not being updated directly, however, many of the monitoring questions evaluated in this report speak to this question. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.8.2 – Monitoring Question

Are Forest Plan standards and guidelines being implemented at the project level consistent with the Plan and NEPA analysis?

Last Updated

2014

Monitoring Indicator(s)

Varies by project based on applicable S&Gs

Monitoring Frequency

Annually

Background & Driver(s)

Project-level reviews, post decision and post implementation. Post decision reviews will determine whether S&Gs identified as applicable during the NEPA analysis were incorporated into project design and contracts. Post implementation monitoring will evaluate whether the S&Gs were followed on the ground. Random samples selected by program. At least 1 project per District per year. Not every S&G applicable to a given project can be evaluated in every review; select appropriate S&Gs for review based on importance to minimizing effects and to cover S&Gs for all programs over a ten year period (i.e. not the same few on every project)

Monitoring Indicator

This monitoring question is not being updated directly, however, many of the monitoring questions evaluated in this report speak to this question. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.9 – Heritage

Every year WMNF heritage program staff and paraprofessionals conduct surveys and evaluate the potential for effects on cultural resources during all project planning efforts. Recommendations of site significance and determination of effects are validated through the National Historic Preservation Act Section 106 consultation process with the appropriate State Historic Preservation Office (SHPO). Where loss of historic values during project implementation is unavoidable, mitigation measures are developed in coordination with the SHPO and others, as appropriate, to capture the existing condition and history of the site before project implementation and to interpret those historic values in a public format.

The WMNF heritage program works extensively with partners, including the SHPOs in New Hampshire and Maine, to interpret the rich history of the White Mountains. A conservation and historic preservation ethic that reflects federal historic preservation law is part of that message. The WMNF Heritage Monitoring Strategy recognizes that management practices and uses of the Forest have the potential to adversely affect cultural resources. Two areas of potential effects are highlighted in the monitoring guide: recreation management and use and vegetation management (timber harvest). A central element of cultural resource management is the determination of National Register of Historic Places (NRHP) eligibility for cultural sites on the Forest. It is this evaluation of significance and a site's status as an "historic property" that guides the management strategy for each site. A loss of integrity, as defined by NRHP criteria for eligibility, may irreparably diminish a historic property's significance. In the absence of a formal evaluation, all cultural sites must be treated as potentially eligible for the NHRP, and their integrity must be preserved.

5.9.1 – Monitoring Question

What effect do management of recreation facilities and recreational use of the forest have on cultural and historic sites?

Last Updated

2018

Monitoring Frequency

One-two times per year.

Background & Driver(s)

Effects of Recreation

It is an inevitability of hiking and camping that a good place to walk, and a good place to camp, has been used by people in the historic (and possibly prehistoric) past. On the WMNF, modern campers often choose campsite locations in the vicinity of historic archaeological sites (cellar holes, mills, barns, lumber camps, etc.). Monitoring of historic sites has found that modern campers have occasionally disturbed an historic site: using a rock from an historic house foundation in a modern fire pit, cutting an historic telegraph pole to use as firewood, building a modern campfire ring within an historic site, collecting and disposing of historic artifacts in an effort to "clean up" the site. Most of these effects are inadvertent and a byproduct of recreation use. Efforts are underway to raise the general awareness of historic preservation issues with both Forest employees and the public in an educational format. In situations where effects seem to be purposeful, law enforcement involvement may be needed.

Results & Discussion

Monitoring of two cultural sites in 2015, including one standing structure and one archaeological site, indicate that recreational users of the forest continue to have negative effect to cultural sites, whether or not signage is in place. The monitored archaeological site, which was not signed, is co-located with an historic logging camp, and several large garbage bags of artifacts were collected by campers, though law enforcement intervened before the artifacts were disposed of. The monitored historic structure, which is adjacent to a dispersed camping area and is well signed and interpreted, was vandalized by someone attempting to enter through the locked door, breaking the window and damaging the wood paneling of the door.

Each of the sites monitored displayed damage from recreational use, including deliberate artifact collection and removal and vandalism. Artifact disturbance results in a loss of historic integrity to archaeological sites, and may impact eligibility for listing to the National register of Historic Places. Similarly, destruction of historic period features of a historic building may result in a loss of integrity to an historic building. Enhanced signage was posted at both sites in an effort to deter future disturbance, as well as increased monitoring by law enforcement.

Evaluation of Monitoring Question and Recommendations

Recent decisions and projects on the forest have included closing camp sites that are co-located with known historic sites in an effort to minimize associated impacts. This seems to be a positive trend, and will provide comparative data in the future. Continued monitoring of archaeological sites that have been used as camp sites but are now closed to modern camping, as well as continued monitoring of archaeological sites currently being used as camp sites with signage warning against archaeological site disturbance, and sites where camping occurs on archaeological sites with no signage, will provide comparison data as to the effectiveness of signing and/or closing archaeological sites to modern camping usage.

5.9.2 – Monitoring Question

What effect do vegetation management activities have on cultural and historic sites?

Last Updated

2018

Monitoring Frequency

One-two times per year.

Background & Driver(s)

Timber harvest includes ground disturbance as a result of road construction and heavy equipment operation, and has potential to disturb subsurface archaeological deposits and destroy surface features such as stone building foundations. Past practices included minimal flagging of stone features, such as cellar holes, for avoidance, but did not consider disturbance to subsurface archaeological deposits, resulting in ground disturbance and compaction within archaeological sites. Such disturbance may result in destruction of artifacts, and loss of integrity to archaeological stratigraphy and cultural contexts. A 50 foot buffer, delineated by Heritage specialists, has been utilized in recent years, and monitoring is conducted to evaluate whether this buffer provides adequate archaeological site protection, or if a larger buffer may be necessary. Road maintenance and/or construction needed to access timber harvest areas also has potential to negatively impact cultural sites and features. As in many parts of the eastern United States, the modern transportation system on the Forest (highways, roads, skid trails) often overlays and overlaps with a transportation system that has been used for over 200 years. In many cases the historic (more than 50 year-old) elements of the road are considered historically significant. And in many cases, modern roads and trails occupy the same routes as the roads that once connected historic farm sites and communities. Project surveys and resource monitoring have helped us realize that maintenance of currently used roads and trails may affect their historic features, and historic sites located adjacent to them.

Results & Discussion

Monitoring at timber sales in recent years has shown that, in some cases, buffers established to protect cultural sites have been inconsistently marked, resulting in harvest or road/trail construction too close to historic features and within archaeological sites. Heritage specialists and foresters are currently working to ensure that adequate buffers are marked and that there is open communication between staff representing these resources. An ongoing dialogue will help ensure that historic properties are adequately protected during timber harvest and related activities. Heritage specialists are working with maintenance crews and timber sale administrators to ensure historic values are considered as harvest plans as developed and implemented.

Evaluation of Monitoring Question and Recommendations

Additional monitoring of recent timber sales where a 50 foot buffer around cultural sites was utilized will be needed to evaluate the effectiveness of this strategy. Improved coordination and communication among program areas regarding project implementation timing will ensure that appropriate sites are monitored during or immediately post implementation to acquire the necessary data.

5.10 – Minerals

Recreational rock and mineral collecting

5.10.1 – Monitoring Question

Are mineral collectors adhering to Forest Plan standards and guidelines?

Last Updated

2011

Monitoring Indicators

Annual report of geology/mineral activities on the forest includes number of permits sold at Deer Hill, other permit information as available, inventory reports, GIS data, site reports, pictures, and other items.

Monitoring Frequency

Annually

Background & Drivers

Determine whether established sites are being maintained to safety and resource protection standards with a focus on fee sites. This monitoring helps managers determine if additional actions are needed to protect the sites.

Monitor collection activity at other sites in the Forest including the extent of excavation, damage to other resources and the creation of de facto collection sites. This monitoring helps managers determine if additional actions are needed to designate new sites, implement closure orders, or take other actions.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.11 – Non-Native Invasive Species (NNIS)

Invasive species eradication effectiveness, presence of non-native invasive insects and diseases, and invasive plant species prevention.

5.11.1 – Monitoring Question

To what extent have been NNIS control objectives been attained?

Last Updated

2011

Monitoring Indicator

Area of infestation post-treatment (area of coverage, number of stems, etc. depending on species)

Monitoring Frequency

Annually

Background & Driver(s)

Monitoring effectiveness of control efforts at know locations helps determine how effective NNIS eradication treatments are and guides future actions. Visit treatment sites and monitor effectiveness. Measure occurrences. Revisit populations of NNIS after eradication treatment to determine if size/condition of population has declined. Frequency of visits to a given site depends on species, treatment, etc.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.11.2 – Monitoring Question

Are invasive insects or diseases present on the WMNF? Where are the nearest infestations of these species?

Last Updated

2014

Monitoring Indicator

Record presence/absence on each Ranger District. If not present, update on a quarterly basis the nearest known infestation of each species. If present, identify location with GPS and map total acres affected.

Monitoring Frequency

Annually

Background & Driver(s)

This monitoring tracks the movement and presence of several invasive pests that pose the greatest risk for the forests of the WMNF. The insects that are monitored for/tracked are Asian Long-horned beetle, emerald ash borer, hemlock woolly adelgid, sirex wood wasp, sudden oak death. Ocular ground survey of host trees in campgrounds (using binoculars). Canopy inspection of host trees by tree climbing (NA FHP). Data collection/survey work conducted in part by WMNF staff, contractors, and concessionaires while conducting hazard tree removal. Other data collected via ground detection surveys in campgrounds and at high use recreation areas by staff of WMNF and Northern Area Forest Health Protection (NA FHP).

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.11.3 – Monitoring Question

What portion of the Forest is infested with non-native, invasive plant species?

Last Updated

2018

Monitoring Indicator(s)

Number of new occurrences of infestations

Monitoring Frequency

Annually (ongoing inventory of some portion of the Forest each year depending in part on budget and project locations).

Background & Driver(s)

The Forest Plan and Forest-Wide Invasive Plant Control Project (USDA Forest Service 2007) provides specific management direction and guidance for NNIS plant prevention, control, and eradication. Standards and Guides are listed in the Forest Plan on pages 2-11 to 2-12. Monitoring question 5.11.3 relates to prevention of NNIS infestations on the Forest, toward the goal of remaining "as free of non-native invasive species as reasonably possible" (Forest Plan p. 1-7). Trends in gauging infestation levels is accomplished by documenting which species occur where and the number of new infestations. Although the number of new occurrences provides a raw measure of infestation level, a better picture emerges by looking at the broader distributions of individual species on the Forest (i.e. are species widespread, or very limited in extent? Do they occur in interior areas?), and the extent to which Early Detection/Rapid Response (EDRR) is helping limit or eliminate new species arrivals to the Forest. Results below summarizes changes in NNIS species and distribution on the Forest and EDRR efforts.

Monitoring Indicator 1 – Distribution of Invasive Species

Results

Approximately 300 individual patches of invasive species were mapped as of 2012 within the boundaries of the WMNF, and an additional 1700 were documented from in the immediate surrounding landscapes (valley bottoms and road corridors). Since 2012, WMNF staff have documented an additional 114 patches on the Forest, and partners (NH Natural Heritage Bureau, Division of Forests and Lands) have conducted additional widespread and detailed invasive species inventories from 2016-2017. WMNF staff are in the process of remapping invasive species distribution and extent at a detailed scale based on the new data points on NNIS collected over the past two years. Until the new data are reconciled with the existing official database it is difficult to calculate precisely how many new patches of invasive species there are as opposed to remapped extents of pre-existing populations.

A good gauge of the spread of invasive species over time into and across the Forest can be obtained by looking at coarser scale patterns. We compared the distribution of known and newly documented species on the Forest at the scale of Habitat Management Units (HMU) in 2012 vs 2017 (Table 3), including the existing official NNIS database and the new raw data. There are 60 HMUs on the Forest, averaging 13,000 acres or 21 square miles in size. At this scale, we can see the expansion of NNIS across the Forest, and additions of NNIS to the Forest since 2012.

Table 3. HMU Distribution and Status of Non-Native Invasive Plants on the White Mountain National Forest. HMU 2012 indicates number of HMUs species was present in as of 2012, and HMU 2017 is the number of new HMUs documented for the species between 2013 and 2017. Of the 38 species or genera, 25 occur in five or fewer HMUs, indicating a low infestation level (8% of HMUs). Thirteen plants are more widespread , with four (Japanese barberry, Japanese knotweed, glossy buckthorn, and Asiatic bittersweet) in 38-45% of HMUs. Newly observed plants since 2012 are shaded gray. Administrative and legal status of each plant is noted on columns: WMNF A-List (2007 species known or high potential for occurrence on WMNF and targeted for treatment); WMNF B-List (EDRR species with high potential to occur as of 2007r; NH-P (Prohibited for transport or sale, NH Dep't Ag) and NH-R (Restricted); and ME-P (Prohibited). Ten new species have been observed since 2012, but only two of 13 original "B"-list species expected to occur within 10-15 years have been documented.

Common name	Scientific name	HMUs 2012	New HMUs 2017	Total HMUs	Interior dist.	WMNF A-List	WMNF B-List	NH Prohib.	NH Restrict.	ME Prohib.
Part 1: Plants on original 2007 WMNF "A" and "B" lists and newly documented state Prohibited or Restricted species										
Autumn olive	*Elaeagnus umbellata*	4	4	8	No	X		X		X
Beach rose	*Rosa rugosa*	0	1	1	No				X	
Bittersweet nightshade	*Solanum dulcamera*	0	1	1	No	X				
Black locust	*Robinia pseudoacacia*	13	5	18	No	X			X	X
Swallow-worts	*Cynanchum spp.*	1	0	1	No					
Black swallow-wort	*Cynanchum louiseae*	1	0	1	No		X	X		
Pale swallow-wort	*Cynanchum rossicum*			0			X	X		
Winged euonymus, Burning Bush	*Euonymus alatus*	4	0	4	No	X		X		X
Canada thistle	*Cirsium arvense*	0	1	1	No	X			X	
Coltsfoot	*Tussilago farfara*			0	No	X				
Common buckthorn	*Rhamnus cathartica*	2	1	3	No	X		X		
Common dandelion - in alpine	*Taraxacum vulgare*	0	1	1	Occ.					
Common reed	*Phragmites australis*	6	3	9	Occ.	X				
Crown vetch	*Securiga varia*	0	1	1	No				X	
Cypress spurge	*Euphorbia cyparissias*	1	3	4	Occ.		X		X	X
Dames rocket	*Hesperis matronalis*			0			X	X		X
European barberry, Common barberry	*Berberis vulgaris*	2	0	2	No	X		X		X
European black alder	*Alnus glutinosa*	0	1	1	No			X		
False spiraea	*Sorbaria sorbifolia*	2	0	2	No					
Fig buttercup	*Ranunculus ficaria*			0			X			
Garlic mustard	*Alliaria petiolata*	4	0	4	Occ.	X		X		X
Giant hogweed	*Heracleum mantegazzianum*			0			X	X		
Glossy buckthorn	*Frangula alnus*	16	7	23	Occ.	X		X		X
Goutweed, Bishop's weed	*Aegopodium podagraria*	2	0	2		X			X	X
Honeysuckles	*Lonicera spp.*	17	1	18	No	X				
Morrow's honeysuckle	*Lonicera morrowii*	16	1	17				X		X

White Mountain National Forest

Common name	Scientific name	HMUs 2012	New HMUs 2017	Total HMUs	Interior dist.	WMNF A-List	WMNF B-List	NH Prohib.	NH Restrict.	ME Prohib.
Amur honeysuckle	*Lonicera maackii*			0				X		
Amur honeysuckle, Bush honeysuckle	*Lonicera maackii*			0						X
Tartarian honeysuckle	*Lonicera tatarica*	1	0	1				X		X
Bella honeysuckle	*Lonicera × bella*			0				X		
Japanese barberry	*Berberis thunbergii*	24	3	27	Occ.	X		X		X
Japanese knotweed	*Fallopia japonica*	19	5	24	No	X		X		X
Japanese stilt grass	*Microstegium vimineum*			0			X	X		X
Knapweeds & starthistles - all	***Centaurea spp.***	7	4	11	No					
Black knapweed	*Centaurea nigra*	0	1	1	No					
Brownray knapweed	*Centaurea jacea*	5	2	7	No					
Spotted knapweed	*Centaurea stoebe* ssp. *micranthos*	2	1	3	No			X		
Diffuse knapweed	*Centaurea diffusa*			0		X			X	
Yellow starthistle	*Centaurea solstitialis*			0		X			X	
Leafy spurge	*Euphorbia esula*			0			X		X	
Marsh thistle	*Cirsium palustre*			0		X				
Mile-a-minute weed	*Persicaria perfoliata*			0			X	X		X
Moneywort	*Lysimachia nummularia*			0		X		X		
Mugwort, Common mugwort	*Artemisia vulgaris*	0	1	1	No				X	X
Multiflora rose	*Rosa multiflora*	1	4	5	Occ.	X		X		X
Musk thistle	*Carduus nutans*	0	1	1	No				X	
Narrow-leaved bittercress	*Cardamine impatiens*			0			X			
Norway maple	*Acer platanoides*	3	0	3	No	X		X		X
Oriental bittersweet, Asiatic bittersweet	*Celastrus orbiculatus*	18	8	26	Occ.	X		X		X
Porcelain berry	*Ampelopsis glandulosa*			0	No				X	X
Privets	*Ligustrum spp.*	0	1	1	No					
Blunt-leaved privet	*Ligustrum obtusifolium* var. *obtusifolium*			0		X		X		
California privet	*Ligustrum ovalifolium*			0		X				
Chinese privet	*Ligustrum sinense*			0		X				
Common privet	*Ligustrum vulgare*			0		X		X		X
Purple loosestrife	*Lythroughm salicaria*	15	3	18	No	X				X
Reed canary grass	*Phalaris arundinacea*	7	9	16	No	X			X	
Tree of heaven	*Ailanthus altissima*			0			X	X		X
True forget-me-not	*Myosotis scorpioides*			0		X				

Common name	Scientific name	HMUs 2012	New HMUs 2017	Total HMUs	Interior dist.	WMNF A-List	WMNF B-List	NH Prohib.	NH Restrict.	ME Prohib.
Yellow iris; water flag	*Iris pseudacorus*	1	0	1	No	X		X		X
Wild chervil	*Anthriscus sylvestris*			0			X		X	
Part 2: Recent additions to NH or ME state Prohibited/Restricted list; not present on WMNF										
Amur cork tree	*Phellodendron amurense*			0						X
Amur maple	*Acer ginnala*			0						X
Bicolor lespedeza	*Lespedeza bicolor*			0					X	
Bohemia knotweed	*Reynoutria × bohemica*			0				X		
Castor-aralia	*Kalopanax septemlobus*			0					X	
Chinese bindweed	*Fallopia baldschuanica*			0						X
False indigo	*Amorpha fruticosa*			0						X
Giant knotweed	*Reynoutria sachalinensis*			0				X		
Japanese honeysuckle	*Lonicera japonica*			0				X		X
Japanese hops	*Humulus japonicus*			0					X	
Jimsonweed	*Datura stramonium*			0					X	
Kudzu	*Pueraria montana var. lobata*			0				X		
Ornamental jewelweed	*Impatiens glandulifera*			0				X		X
Paulownia	*Paulownia tomentosa*			0						X
Perennial pepperweed	*Lepidium latifolium*			0				X		
Reed sweet grass	*Glyceria maxima*			0				X		
Russian olive	*Elaeagnus angustifolia*			0					X	
Siberian elm	*Ulmus pumila*			0					X	
Wall lettuce	*Mycelis muralis*			0					X	
White poplar, White cottonwood	*Populus alba*			0					X	X
Wild parsnip	*Pastinaca sativa*			0					X	
Wintercreeper	*Euonymus fortunei*			0					X	

Discussion

Table 3 reflects some interesting and revealing patterns. First, many widespread NNIS continue to expand their extent within the Forest boundaries at the scale of HMUs (purple loosestrife, Asiatic bittersweet, reed canary grass, Japanese knotweed, Japanese barberry, glossy buckthorn, black locust, and knapweeds). Some of these no doubt represent new populations that were not present during original surveys of the forest in the early 2000s; others may be overlooked observations of pre-existing populations, but likely the new observations do reflect some expansion of range. In other cases (i.e. reed canary grass) the species are likely to have been widespread and established along roads and simply under documented, in part because of their lower priority as control targets. The distributional spread of many of the primary NNIS across the Forest noted above is not surprising: it reflects an expected and predicted pattern of expansion globally and regionally on the New England landscape, particularly given the network of managed corridors of roads and pressure of NNIS sources in the surrounding developed private landscapes. It should be noted that Table 3 does not reflect control results at HMU scale (some individual infestations have been eliminated); control efficacy is considered in monitoring question 5.11.1 which will be updated in the next biennial monitoring report.

Second, with a few exceptions, the vast majority of invasive populations occur along existing public road corridors, in maintained openings, and in certain wetland or stream corridors near roads or proximal to development. Most interior forested and naturally open locations of the Forest appear to remain largely invasive free, although there are exceptions.

Third, it is encouraging that roughly half of the known NNIS species on the Forest are not widespread and have a low frequency (present in 5 or fewer HMUs). Further, at this time we have not seen infestation and remain vigilant to presence of many EDRR species known from other places in northern New England.

Fourth, six new NNIS species have been documented on the WMNF since 2012 – black knapweed, beach rose, privet, European black alder, common dandelion (in alpine zone), Canada thistle, and bittersweet nightshade. Four of these have been discovered in the past two years and most have had initial control efforts when possible.

Fortunately, compared to many parts of central and southern New England, most of the new and existing populations on the WMNF are still relatively small and accessible, and most are presumed controllable with a continued commitment to the Forest Plan goals, objectives, and Standards and the Forest-wide Non-native Invasive Plant Control Project. The control project calls for ongoing prioritization and responsiveness to new information on invasives, including focus on EDRR to control new species, and on infestations that are most threatening to high value natural communities and other resources. In this respect, the inventory and tracking of infestations has been an important and effective means of evaluating the implementation of Forest Plan goals and objectives.

Monitoring Indicator 2 – Early Detection/Rapid Response (EDRR) Efforts

Results

Part of the prevention goals for NNIS to limit the number of species and infestations on the Forest relies on the EDRR approach to detect and quickly control new invasives species to an area. This is critical because controlling invasives when infestation levels are low and populations small requires substantially less effort than when infestation levels are high and populations large. Two examples of

successful EDRR efforts are European black alder (*Alnus glutinosa*) along the Swift River and Common Dandelion (*Taraxacum officinale*) invasion of alpine meadows on Mt. Washington.

1. **European black alder (*Alnus glutinosa) invasion of Swift River valley.***

This species was discovered along the Swift River below Lower Falls in 2014, apparently planted from misidentified nursery stock thought to be Speckled Alder. At the time of detection in 2014, it was not on state or regional prohibited/restricted species or EDRR lists, but has exhibited very aggressive and invasive ability in other parts of United States, and more recently Vermont and several other sites in NH. Appeal to the NH State Invasive Species committee was made to add this species to the restricted list, and control was initiated in 2015. The population is considered 90% controlled, but will require several years of commitment to ensure that regrowth from sprouts and seeds continue to be controlled.

2. **Common Dandelion invasion of alpine meadows on Mt. Washington**.

Common dandelion (*Taraxicum officinale*) was first observed around the Summit House on Mt. Washington in 1895. This raised no concern until 2014 when Allison Bell (member of a snowbed research team led by Bob Capers and Nancy Slack) discovered a large infestation in a natural meadow below Ball Crag on the WMNF. This was troubling, because dandelion infestations have been reported from other alpine and Arctic sites around the world, where it has become problematic. WMNF initiated a project to remove dandelions in 2015. The NEPA analysis (USDA Forest Service 2015 and 2016) was complicated by the novelty of the situation, including: the sensitivity of the alpine environment and rare species involved; the occurrence in four management zones on the WMNF and five landowners, each with different management direction and permitting requirements; and coordination with other partners and groups. Manual dandelion removal was approved and initiated in 2015 by the WMNF on federal and state land, with digging and monitoring help from the Slack-Capers group (via Waterman Fund support), and other partners. In 2016 and 2017, NH Natural Heritage Bureau and Division of Parks organized additional volunteer crews, and the AMC removed dandelions at two huts. Dig crews involved dozens of volunteers including students, and other members of the public. Species composition and cover, number of dandelions, and dandelion biomass removal weights are monitored along two permanent transects in natural alpine meadows, and dandelion removal weights from all other locations are also recorded. From 2015-2017, dandelions were dug with hand weed diggers, totaling more than 150 person-days (Figure 20).

Results (Sperduto et al. 2018) from monitoring transects, and dandelion weights elsewhere, indicate substantial progress in diminishing dandelion vigor and biomass over the three year period (**Error! Reference source not found.**), with minimal change detected in the cover of native alpine species. Dandelions occur primarily in lee positions of summit infrastructure features and along upper sections of the Auto Road on mineral soil; disturbed soils at two AMC Huts near treeline; as well as in four locations on organic soil in natural alpine communities, including herbaceous-shrub snowbank or Bigelow sedge meadows above Great Gulf, east of Ball Crag, on the south facing summit cone of Mt. Washington. Numerous locations of rare plants have been discovered growing near or with dandelions, including *Saxifraga rivularis*, *Salix herbacea*, *Poa pratensis* ssp. *alpigena*, *Nabalus boottii*, and *Rhinanthus minor* ssp. *groenlandicus*. Dandelions occur within 100 feet of the Great Gulf Wilderness, and a few hundred feet from the Alpine Garden RNA.

Figure 20. Digging efforts in 2015, showing the mostly dug area in lower part of meadow, and yet un-dug area above.

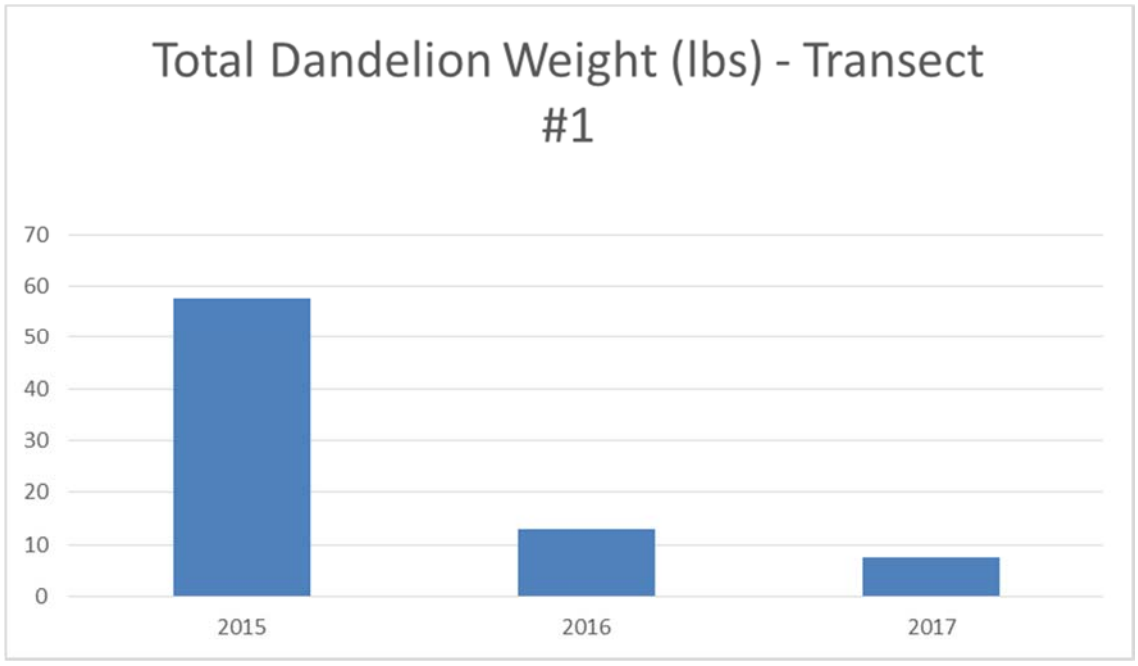

Figure 21. Gross weight (lbs) of dandelions dug from Snowbank Meadow (Transect #1) near Ball Crag in three successive years. Results indicate that digging is an effective initial means of controlling dandelions in natural meadows, greatly reducing the vigor of plants emerging from root fragments in subsequent years. 2018 results are not graphed, but totaled 1.98 lbs of dandelion.

Discussion

The Forest Plan and Non-Native Invasive Plant Control Project inclusion and emphasis on EDRR approach is effective. We rely on a network of staff and partners for detection of new species and infestation. Table 3 indicates current status of known species and distribution on the forest. In the case of dandelions in the alpine zone, a network of several partners and land owners work in concert with one another to achieve the common goal of controlling dandelions that threaten certain parts of regionally rare and critical alpine areas. In both specific cases, we are confident that EDRR has been a critical aspect in preventing additional spread of these invasive species. Neither species were on EDRR lists at the time, which underscores the importance of remaining observant to all species and invasive behavior more broadly. The dandelion invasion in natural snowbank communities may be indicate a vulnerability of this habitat to not only dandelions, but possibly other wetland invasive species.

Recommendations

EDRR is an important part of any successful NNIS control strategy, and will remain an important component of NNIS control strategy on the WMNF in the future.

Evaluation of Monitoring Question and Indicator(s)

The number of new occurrences is a useful metric, but other indicators should be considered to determine if there are better ways to address this monitoring question.

References

USDA Forest Service. 2016. Invasive Dandelion Removal in the Alpine Zone. Decision Memo. White Mountain National Forest, Campton, New Hampshire.

USDA Forest Service, 2015. Mount Washington Dandelion Removal Project. Decision Memo. White Mountain National Forest, Gorham, New Hampshire.

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Sperduto, D., N. Slack, B. Capers, R. Johnson, and A. Lamb. 2018. Invasive common dandelion (*Taraxacum officinale*) Removal Effort on Mt. Washington, New Hampshire. Presentation to the 10th Biennial Alpine Stewardship Gathering. April 2018, Fairlee, Vermont.

5.12 – Recreation

The rugged mountains of the WMNF form a significant scenic and cultural landscape of New England. Whether viewing the forest via roads and trails or challenging themselves in the wilds of the backcountry, visitors find respite in the naturalness of the forest as nearby urban areas continue to grow. Cultural and recreation history are a key part of the recreation experience. The forest maintains quality recreation opportunities while working closely with communities, partners and private providers.

There are several different recreational experiences available on the WMNF. The area has an extensive non-motorized trail system which focuses on hiking, backpacking, snowshoeing and skiing. Amenities such as shelters, camping areas, and huts are available for backcountry use. Campgrounds accessed by motor vehicles are open both seasonally and year round across the Forest for tent and RV camping. Six congressionally designated Wildernesses are managed for a natural, primitive experience. There are scenic byways that cross the Forest allowing for scenic drives with pull offs for views and picnics and a number of developed day use areas with short walks to waterfalls, swimming areas, and other beautiful natural features. Rock climbing and mountain biking have become popular and appear to be growing uses of the Forest. Alpine and Nordic skiing opportunities are provided by permittees. In addition, the Forest works with the States of New Hampshire and Maine to allow for a snowmobile trail system throughout the winter.

The WMNF provides a unique and important recreational opportunity and experience for visitors from around New England and beyond. The WMNF is classified as an Urban Forest drawing in millions of visitors each year. It is within a day's drive of Boston, New York and Montreal. As a National Forest its mandate is to manage for multiple uses including water quality, wildlife, timber and recreation. While recreation is a vital use of the forest it must be balanced with protecting its beautiful and valuable natural resources. Monitoring off-road vehicle effects, use at developed sites, trails, and by permittees, the quality of experience and perception of crowding among Forest visitors is monitored to assess how well that balance is being achieved.

5.12.1 – Monitoring Question

What is the effect of off-road vehicles when using snowmobile trails early or late in the winter use season on soil, water, vegetation, fish and wildlife, forest visitors and cultural and historic resources?

Last Updated

2018

Monitoring Indicator

Incidents of resource damage in the shoulder season by snowmobile use.

Monitoring Frequency

Annually

Background & Driver(s)

Monitoring of off-road vehicles is required by regulation. The results will help identify if there are problems in the shoulder seasons when there is higher risk of damage and will help determine if management action is needed.

Monitoring Indicator 1

Results

There is no discernable trend in the number or location of incidents of resource damage. While some years have seen isolated and localized damage on a trail (mainly due to a thaw) there has not be significant damage recorded.

Discussion

Prior to 2011 this monitoring this indicator was not occurring on a systematic basis. Therefore, we could not draw conclusions regarding the need for management action. A protocol was developed and a database for tracking the off-road vehicle monitoring was developed. Implementation of the protocol started in 2012. To date, the data has been collected at the District level showing a low incidence of damage.

Recommendations

By continuing to work with the States of New Hampshire and Maine on the opening and closing of the statewide systems we can reduce the number of resource damage incidents noted. We need to continue to monitor the trail use during the early/late season and in the mid-winter thaws.

5.12.2 – Monitoring Question

Where and how much backcountry use is attributed to permitted outfitter/guides?

Last Updated

2018

Monitoring Indicator(s)

Number of Outfitter/Guide Permits, number of people using Outfitter Guides, organizations making use of Outfitter/Guide permits, activities being accomplished with Outfitter/Guides, location of Outfitter/Guide activity on the forest.

Monitoring Frequency

Annually

Background & Driver

This monitoring will help identify trends and locations of use by outfitters and guides. The information will be helpful should the need arise to control use and protect areas of currently low use.

Monitoring Indicator 1

Number of Visitors and Guides on Trips

Results & Discussion

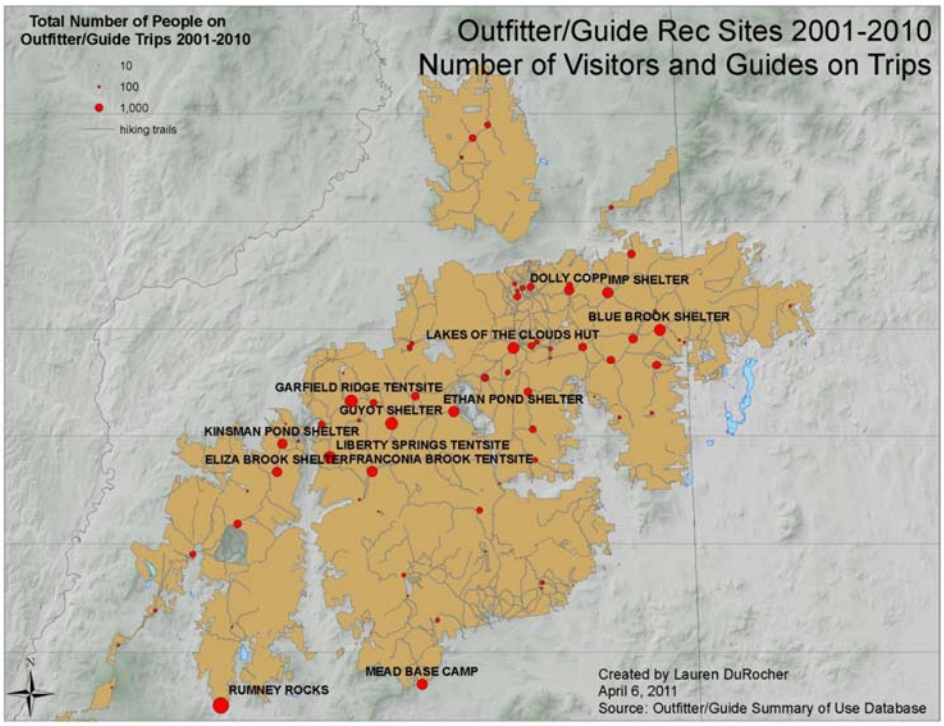

Figure 22. Total number of people on outfitter/guide trips reported by destination from 2001 to 2010.

The monitoring question assesses where and how much backcountry use is attributed to outfitter/guide use. All outfitters and guides who charge visitors a fee for a service they provide on the Forest are required to obtain a special use permit. As part of the permit outfitter/guides submit a summary of when and where their trips took place. This information includes the type of activity, trails and

overnights sites visited. The information is entered into a database that has this information going back to 2001. There are currently over 150 outfitter/guides operating with permits on the WMNF. The number of outfitter/guides operating on the WMNF has stayed between 150 and 165 permit holders in the past decade.

While examining this data, it is important to remember that this data is only the outfitter/guide use. The WMNF does not have a data that show where and how much general recreation use is being contributed by the general public. An area could be a high use outfitter/guide area but might not necessarily receive the same level of high use by the general public.

Outfitter/Guide Use of Recreation Sites

On the summary of use forms, outfitter/guides report which recreation sites, particularly overnight camping spots, they visited. Using this information, the total number people (clients and leaders) on trips from 2001-2010 was summed by recreation sites. Figure 22 shows which recreation sites were used with their proportional use as reported during this time period. The sites with the most use are labeled on the map. Generally, the sites listed are known to be popular areas on the Forest. Blue Brook shelter no longer exists and is now currently a platform tent area which could change the amount of outfitter/guide use in the future. Another area that stands out is the rock climbing area Rumney Rocks. It receives by far the most use by outfitter/guide groups of any recreation site. Annually there are between 120,000 and 200,000 people visiting recreation sites on outfitter/guide trips. Due to this fact, Rumney Rocks was part of the use/experience study conducted in the last few years (see monitoring guide question 5.12.3).

Monitoring Indicator 2

Outfitter/Guide Use of Trail

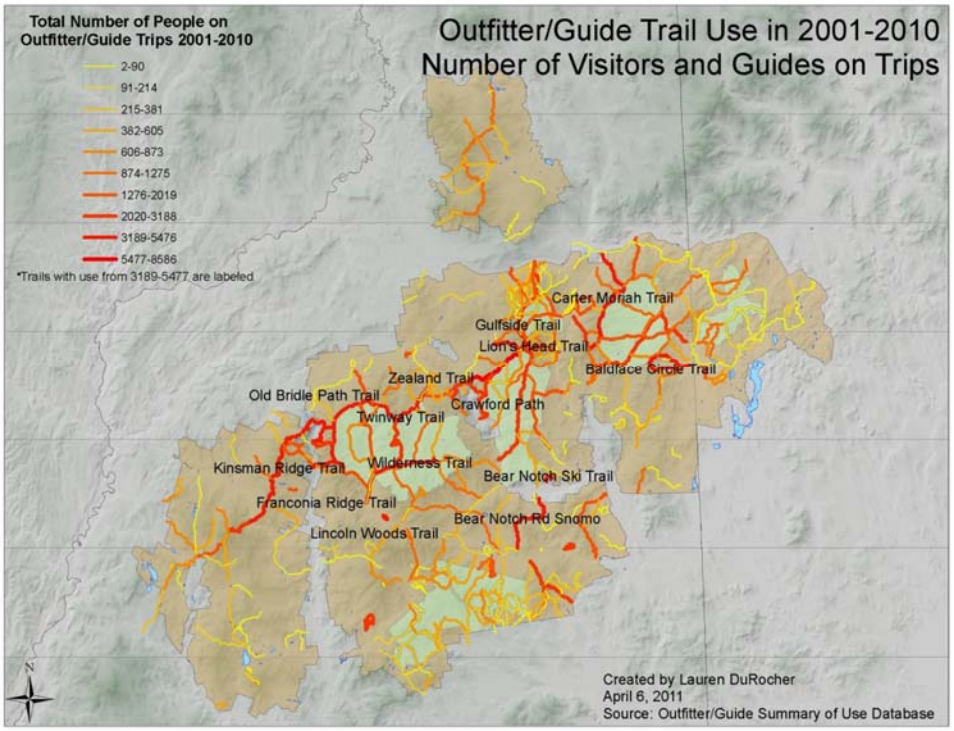

Figure 23. Total number of people on outfitter/guide trips reported by trail used from 2001 to 2010.

Results & Discussion

The trails that are used during outfitter/guide trips are also reported on the summary of use forms. This includes all types of trail use such as hiking, mountaineering, cross country skiing and snowmobiling. Each year approximately 200,000 to 300,000 people are on outfitter/guide trips that include using the trail system.

Using the information provided, the total number of people (clients and leaders) on trips from 2001-2010 was summed by trail. The amount of use was divided into ten classifications for analysis based on the natural breaks of the data (Figure 23). The trails with the most use are labeled on Figure 23. The trails listed are once again not particularly surprising and are generally recognized as higher use trails on the Forest. There are a few discrepancies with the trail use level designations. From looking at past reports and talking with Forest recreation staff, these trail level designations were determined in the late 1990s from District knowledge of the trails. It appears from both the trail register data and the outfitter/guide data that some of the initial classification is not an accurate reflection of actual use. Particular trails that should be re-examined based on the outfitter data include Kinsman Ridge (currently listed as low use), Bondcliff trail and Wilderness trail.

Recommendations

No new management actions should be taken based on the findings above. Districts should work to continue data collection to help inform future decisions.

Evaluation of Monitoring Question and Indicator(s)

The process of inputting all the summary of use information is a time consuming task. As a result, there is a backlog of forms needing to be input into the database. In the winter of 2011, a seasonal employee was able to address past data, which is presented here. The Forest needs to develop a new strategy for keeping this data up to date and in a usable form. The exercise of looking at the summary of use data should be repeated every 3-5 years to ascertain any trends.

References

DuRocher, L. (May 2011). Visitor Use and Wilderness Trends at the White Mountain National Forest.

5.12.3 – Monitoring Question

What is the rock climbing use on the Forest?

Last Updated

2018

Monitoring Indicator

Rock-climbing/ access hiking route use levels in visits - 2015 Rumney Rocks Climbing Area

Monitoring Frequency

3-5 years.

Background & Drivers

This monitoring question exists in order quantify rock climbing use on the Forest.

Monitoring Indicator 1:

Level of use on trails accessing rock climbing areas.

Results

Figure 24 and Figure 25 show the trail counter results from data collected at Rumney Rocks during summer 2015 (UVM Park Studies Laboratory 2015).

Figure 24. Average hourly use counts on weekends during summer 2015.

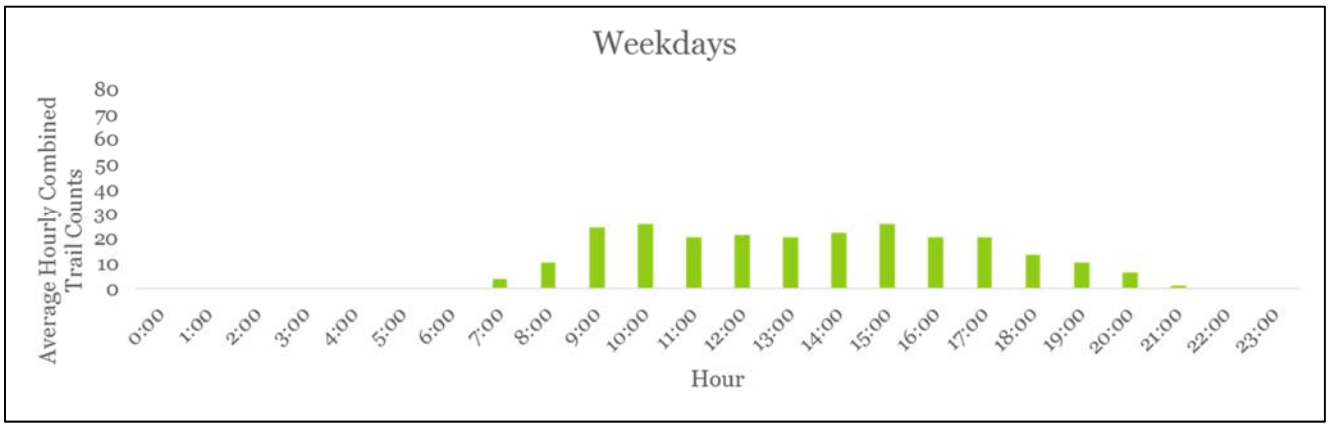

Figure 25. Average hourly use counts on weekdays during summer 2015.

Discussion

The dataset for climbing use only applies to Rumney Rocks, for 82 days, during the summer of 2015. It is therefore, not a complete picture of the Rock Climbing use on the Forest. It is safe to say that Rumney Rocks is by far the most popular climbing area, in all seasons, located within the WMNF boundaries. However, no attempts were made to quantify use at other climbing areas around the Forest.

Monitoring Indicator 2

Parking lot occupancy and capacity at Rumney Rocks during summer 2015.

Results

Table 4. Parking lot occupancy and capacity at Rumney Rocks during summer 2015.

	Parking Occupancy and Capacity (Design Capacity = 76)	
		15:00
	Total number of days	82
Parking Occupied	Average estimated parking occupancy	69
	Median estimated parking occupancy	70
	75th percentile estimated parking occupancy	96
	90th percentile estimated parking occupancy	111
Parking Capacity	Number of day in excess of capacity	34
	Percent of days in excess of capacity	41%
	Average number of excess vehicles when capacity is exceeded	100
	Average percent of capacity when capacity is exceeded	131%

Discussion

As with the trail use data presented above, the trailhead parking data displayed in Table 4 was collected for an 82 day period during the summer of 2015. It is therefore, not a complete picture of the Rock Climbing use on the Forest.

Recommendations

No recommendations can be made from the current dataset. Further evaluation of the need to quantify climbing use is necessary.

Evaluation of Monitoring Question and Indicators

This indicator has not been fully implemented as of 2017. It may be worth narrowing the scope to Rumney Rocks and repeating the use counts with the counters in the same locations as used during the previous survey.

References

UVM Park Studies Laboratory (2015) Unpublished Draft: Summary of Field Research and Preliminary Results.

5.12.4 – Monitoring Question

How is the amount of use at Forest developed campgrounds, day use areas, developed facilities, and ski areas changing over time?

Last Updated

2014

Monitoring Indicator(s)

Use data from concessionaire, day use and ski areas.

Monitoring Frequency

Annually

Background & Driver(s)

This question is about capacity at sites. Occupancy rates in developed campgrounds and use levels at day use and ski areas can help show a demand for additional or fewer facilities. Use figures will help determine where management approaches need to be changed or where capacity needs to be adjusted. The developed campground information can help in discussing changes with concessionaires.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results

This section will be updated in the FY2020 biennial monitoring report.

Discussion

Through 2011 the use data showed a downward trend in camping and skiing. Data has not been analyzed since 2011. Ski areas are reporting an increase in both winter and summer use and the campground concessionaire is seeing a slight increase in occupancy at certain campgrounds around the forest.

Recommendations

Continue to collect data and update the 2011 analysis with current year's data.

Evaluation of Monitoring Question and Indicator

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan

References

DuRocher, L. (May 2011). Visitor Use and Wilderness Trends at the White Mountain National Forest.

5.12.5 – Monitoring Question

Over time is there a change in use at permitted Forest backcountry facilities?

Last Updated

2018

Monitoring Indicator(s)

Number of overnight visitors.

Monitoring Frequency

Annually

Background & Driver(s)

This monitoring provides an idea of use trends in the backcountry. When combined with other backcountry trail monitoring, it can help inform managers about the type of use occurring and if changes in the amount of use indicate a need to change management in order to meet the recreation strategy of protecting recreation opportunities in low use areas.

Monitoring Indicator

2014-2017 reported overnight use at Appalachian Mountain Club (AMC)

Results

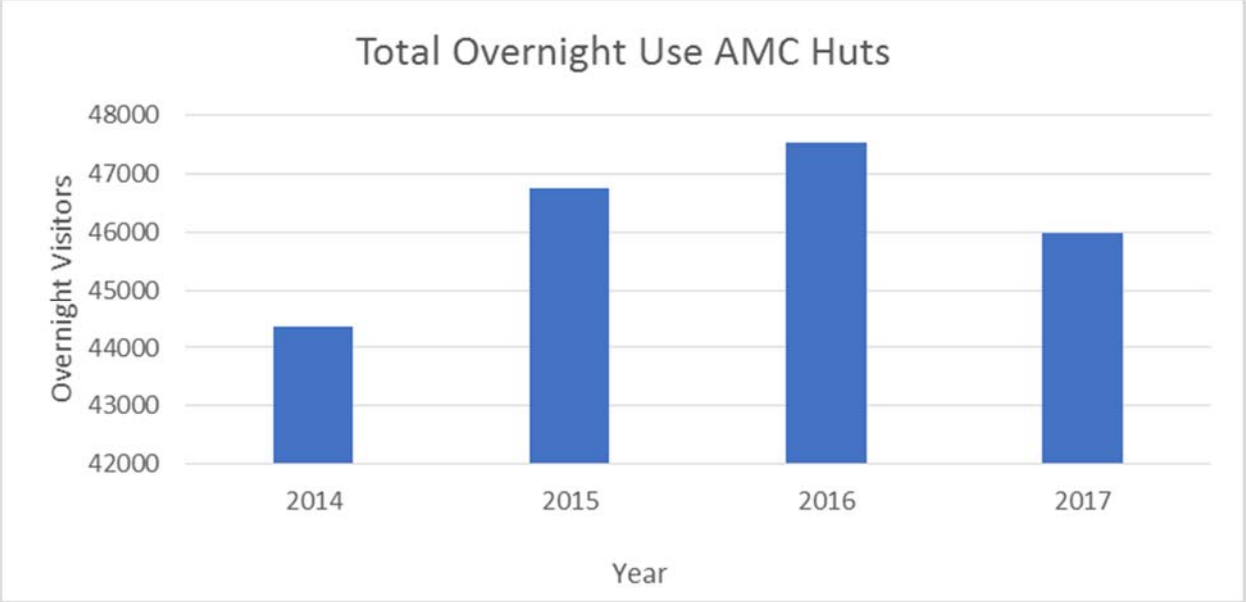

Figure 26. Reported overnight use at Appalachian Mountain Club Huts 2014-2017..

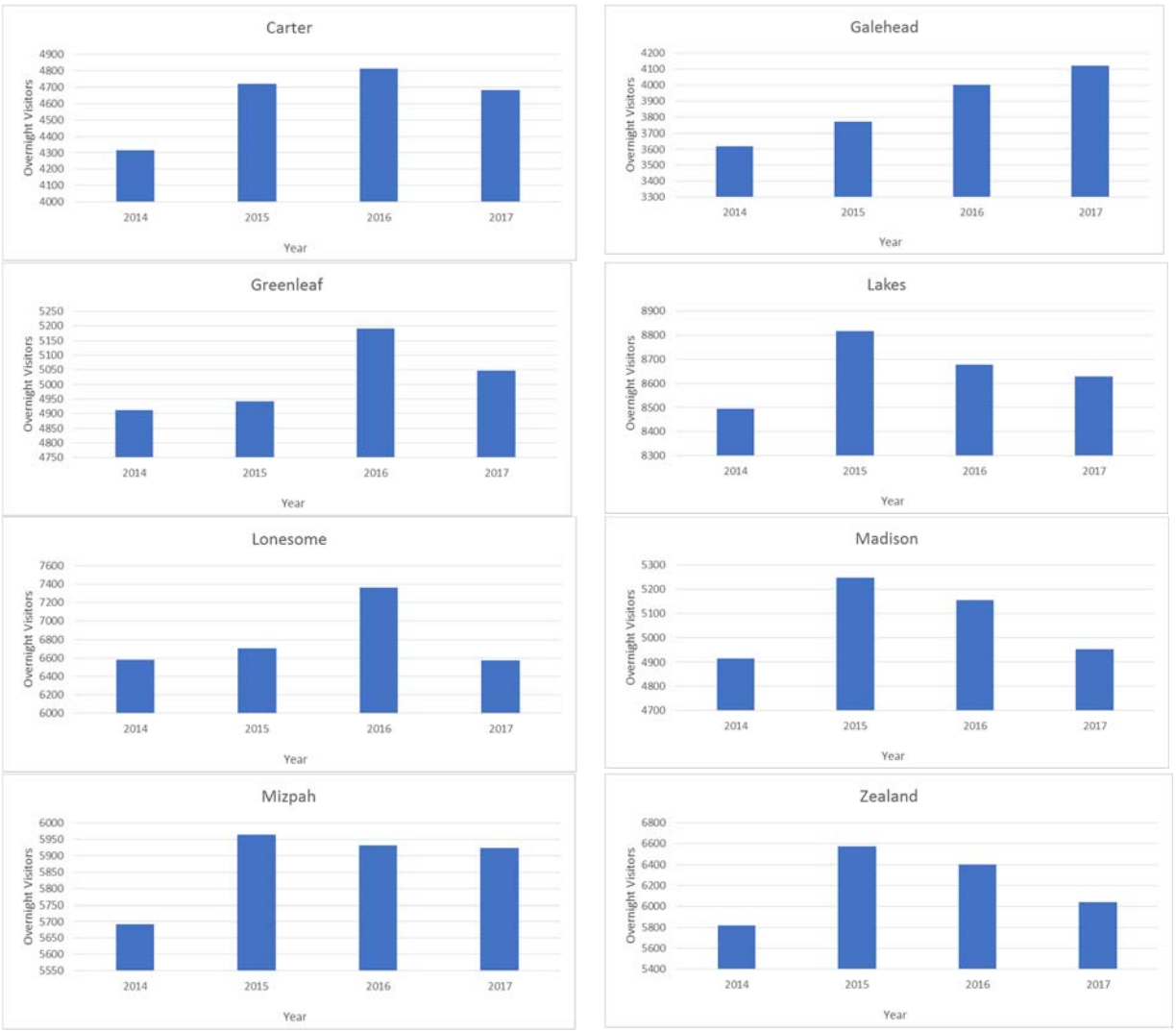

Figure 27. Overnight use for individual Appalachian Mountain Huts reported during 2014-2017.

Table 5. Capacity observed by University of Vermont (UVM) staff at four AMC campsites during 2015.

	2015 UVM, Observed Percent of Tent Camper Capacity			
	Liberty Springs	Garfield Ridge	Guyot	13 Falls
Sunday	81%	25%	138%	50%
Monday	100%	42%	175%	44%
Tuesday	81%	113%	194%	56%
Wednesday	92%	92%	181%	78%
Thursday	96%	117%	194%	56%
Friday	77%	113%	231%	78%
Saturday	188%	142%	313%	144%

Monitoring Indicator 2

2015-2017 reported overnight visitor use at AMC permitted shelters.

Results

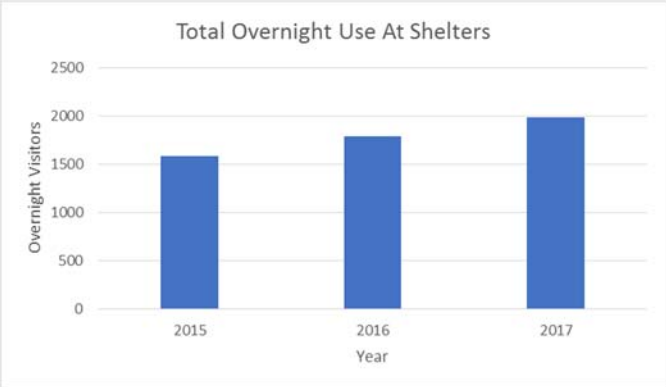

Figure 28. Total reported overnight use at AMC Permitted Shelters 2015-2017.

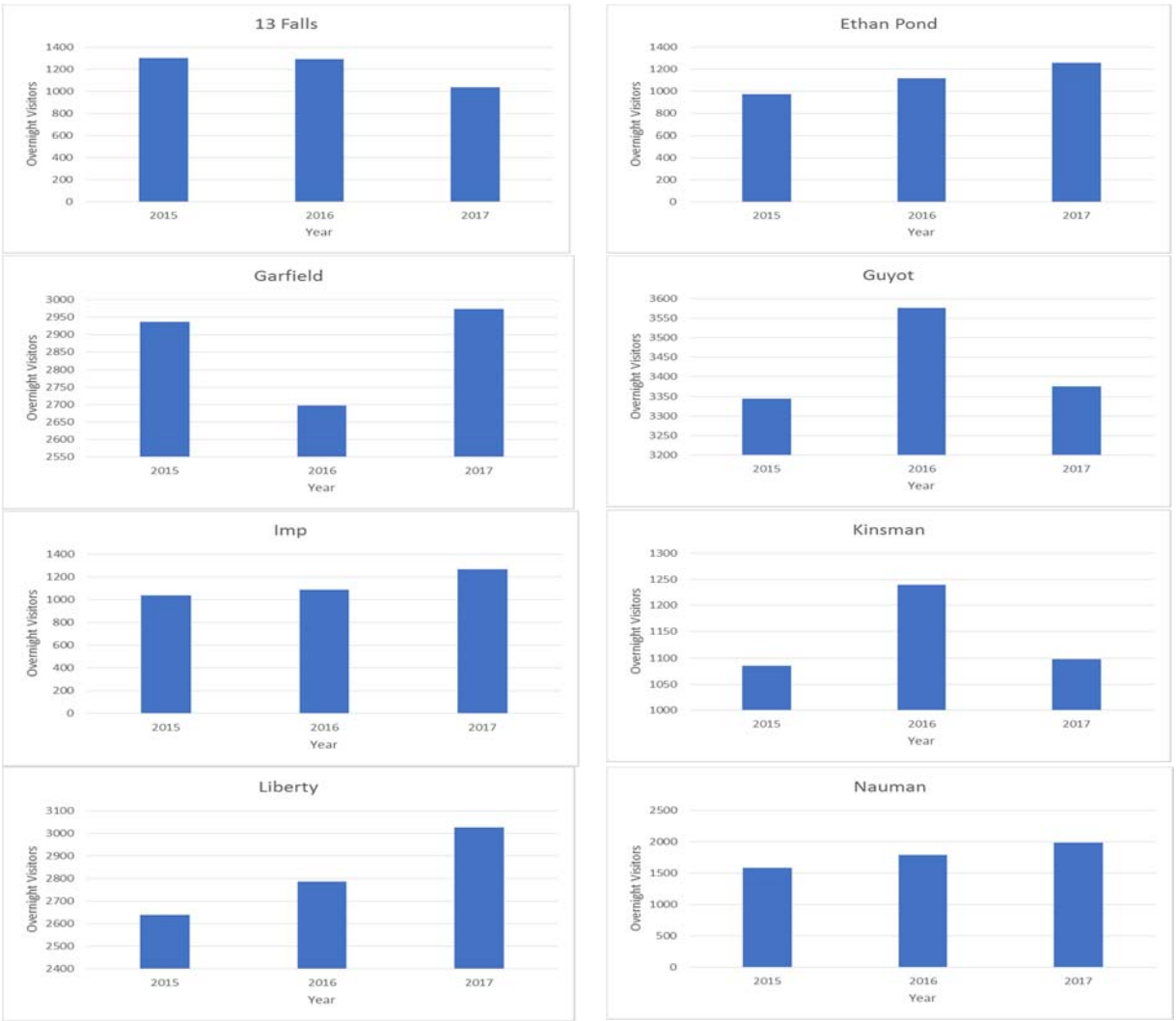

Figure 29. Reported overnight use for individual AMC permitted shelters during 2015-2017.

Discussion

Total reported use for AMC Huts is seeing an upward trend overall, with individual huts having upward trends of varying degrees. As Huts have fixed capacities and a strict reservation system, there is no additional environmental or social concern for a hut being at capacity throughout the summer. The EIS and permit used these capacities in their analysis.

Total reported use at AMC permitted shelters and tensites is seeing an upward trend though trends at individual shelters vary (Figure 28 and Figure 29). Of greater concern are the capacity issues seen across the system. The 2015 University of Vermont (UVM) study confirmed that, of the observed nights at selected shelters, all of them were above design capacity on Saturday nights. Additionally, Guyot was above design capacity on every single observed night. Garfield was beyond capacity approximately 40% of the observed time. AMC has a policy, generally supported by the Forest Plan, of concentrating use at shelters. In practical terms, this means they do not turn anyone away. This leads to situations where use far exceeds the design capacity of the site.

Recommendations

If use trends upwards it will be important to work with AMC regarding their policy to indefinitely concentrate use. Other management actions may be necessary in order to assure resource and visitor experience goals are met.

Evaluation of Monitoring Question and Indicator(s)

AMC use numbers at permitted facilities remain an important data source. The Forest should continue to require annual use number reporting.

References

Reported use as part of AMC's backcountry shelter permit with the USFS.

5.12.6 – Monitoring Question

Over time is there a change in use on Forest motorized and non-motorized trails?

Last Updated

2018

Monitoring Indicator(s)

Visits and visitor use numbers.

Monitoring Frequency

3 year cycles every 10 years or so.

Background & Driver(s)

This monitoring information is needed to implement the Forest plan recreation approach of maintaining a balance of recreation opportunities across the high, moderate, and low use areas on the Forest. The information will indicate if there is a need to take management action to insure a balance is maintained.

Monitoring Indicator 1

Results

There are no new results to report in this monitoring period. This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Discussion

This section will be updated in the FY2020 biennial monitoring report.

Recommendations

The summer trail monitoring should be completed in three year cycles approximately every 10 years. Trails were sampled from 1998-2000 and 2008-2010. The monitoring provides insight on how trail us is changing over time. Monitoring is conducted across very high, high, moderate and low use trails to indicate if there are changes in the balance of the recreation opportunities in differing use areas.

The use levels appear to be assigned incorrectly for some trails. Using trail register data from 2008-2010 and current district knowledge the lists need to be updated. Having a more accurate list would provide a more accurate extrapolation of the data. Also on high and very high use trails, registers often ran out of space for signing in thus missing some use. Infra-red trail counters may be a more efficient method for collecting this information.

The registers are reliant on self-reporting by those visiting the trail. To adjust for those who do not self-register, each sampled trail should also have compliance monitoring. The compliance monitoring estimated the percentage of visitors who do not register. Due to the labor intensity of compliance monitoring, it did not occur consistently across the forest. This lack of information affects the final estimates of hikers on the forest. The balance of hiker visits on the Forest appears to be staying consistent with use level across the forest. The Forest Plan outlines that the Forest should try to keep use levels at their current balance.

In 2014 during the UVM study, trail use data was collected using infra-red counters. This method should continue to be explored to replace the trail register data method. It is a more efficient and accurate way to collect data.

Evaluation of Monitoring Question and Indicator(s)

Monitoring has only occurred for summer non-motorized use. There is not capacity to monitor winter motorized and non-motorized use on the Forest.

References

DuRocher, L. (May 2011). Visitor Use and Wilderness Trends at the White Mountain National Forest.

5.12.7 – Monitoring Question

What is the level of visitor satisfaction on the Forest (as measured by quality of experience and perception of crowding) at developed sites as well as in the backcountry?

Last Updated

2018

Monitoring Indicator

Perceived quality of experience and perception of crowding among Forest visitors.

Monitoring Frequency

10 years.

Background & Drivers

Intent is to provide trend information to help managers determine if visitor expectations are being met. This gives managers an indication of management actions that may need to be taken to meet visitor needs and to judge their reaction to the implementation of the recreation strategy.

Monitoring Indicator 1

Satisfaction survey results from UVM 2016 survey

Results

Survey results collected during the summer of 2016 show the majority of visitors are very satisfied with their recreation experience on the Forest (Figure 30).

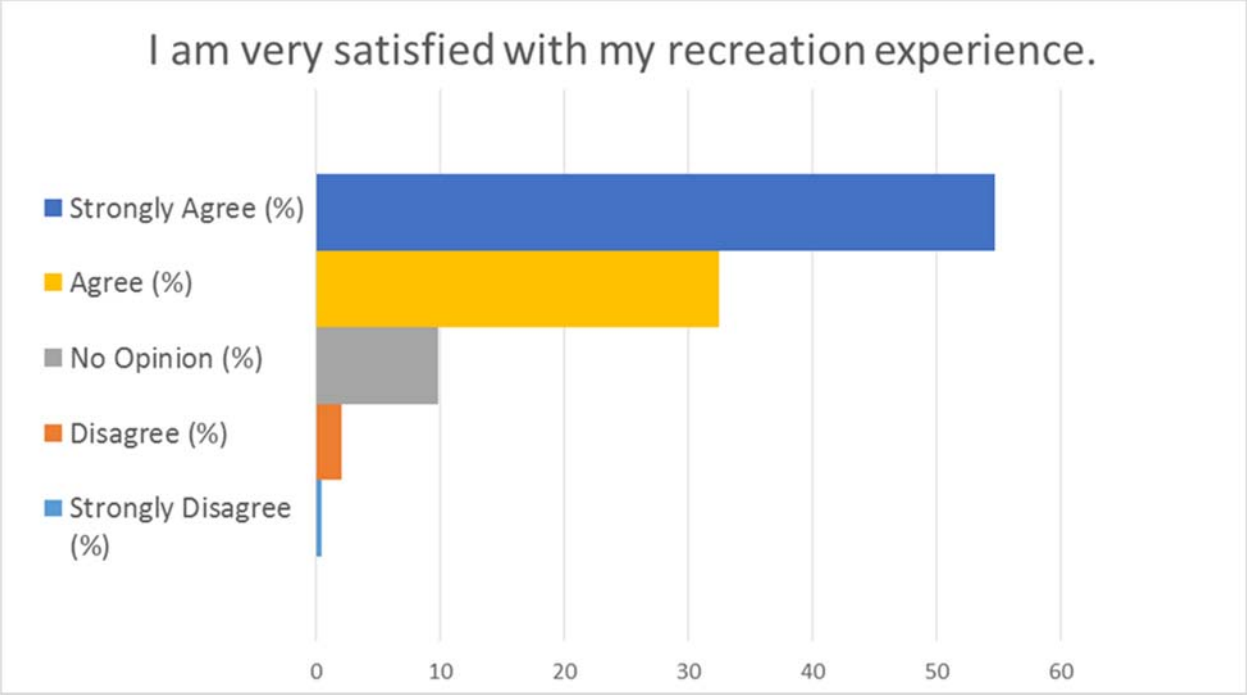

Figure 30. Survey results based of satisfaction with recreation experience from UVM 2016 survey.

Survey results collected during the summer of 2016 show the majority of visitors believe the Forest's trails are in good physical condition (Figure 31)

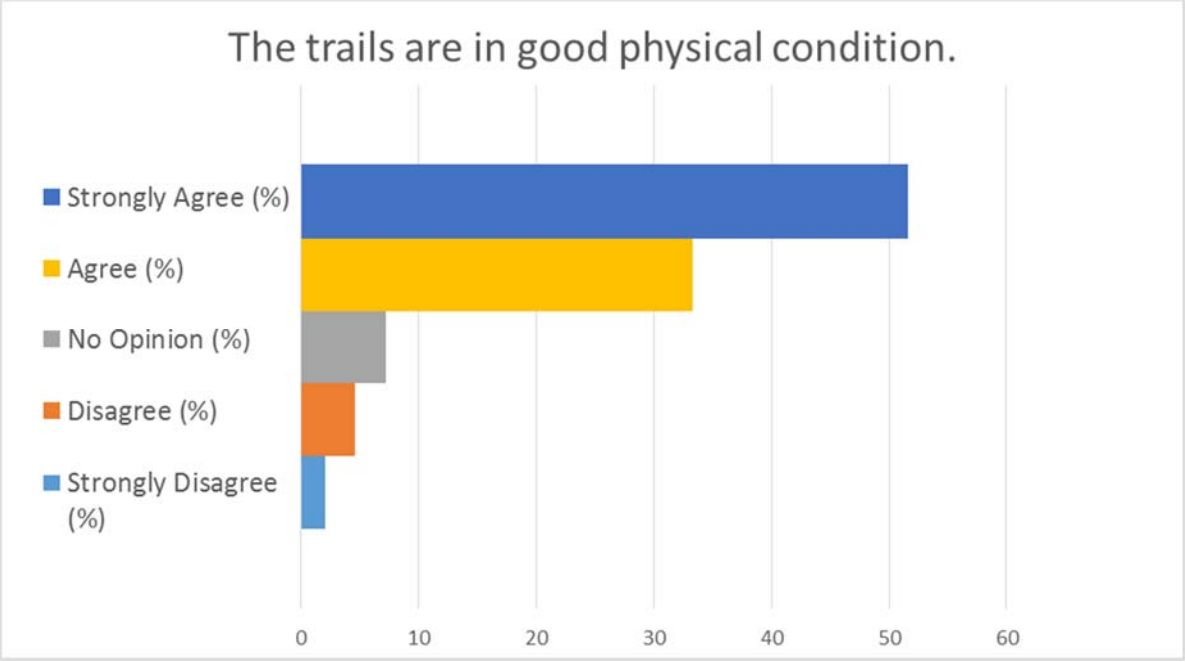

Figure 31. Survey results based of perception of trail conditions from UVM 2016 survey.

Survey results collected during the summer of 2016 show the majority of visitors believe Forest recreation facilities are in good condition (Figure 32).

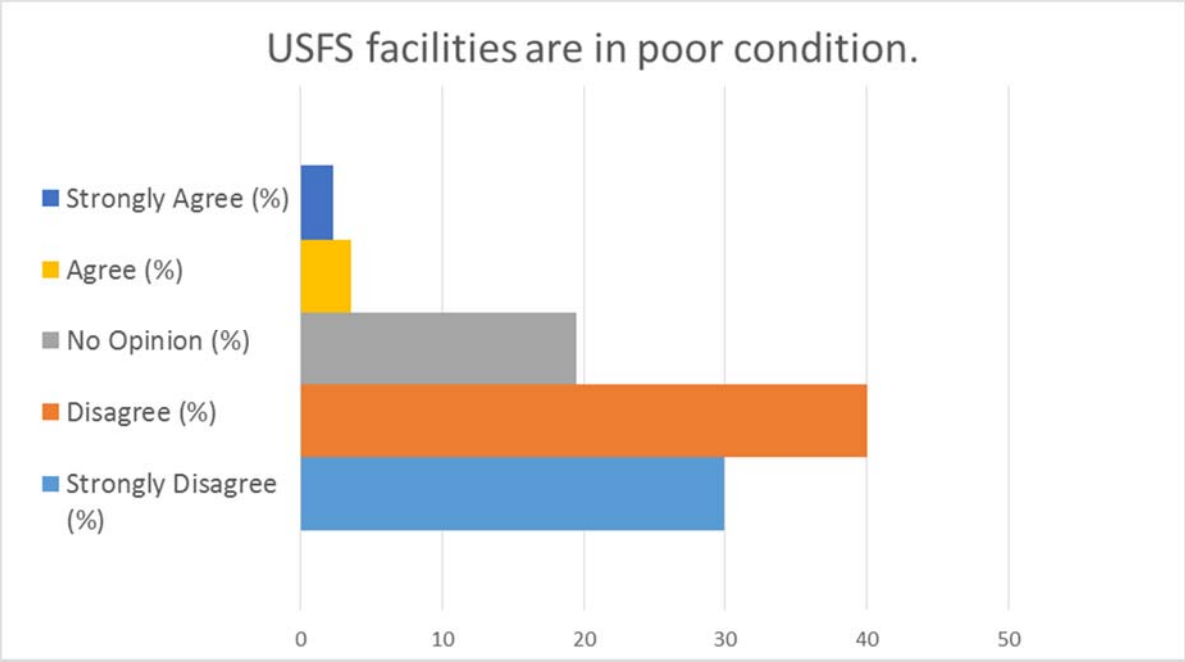

Figure 32. Survey results based of perception of facilities conditions from UVM 2016 survey.

Most visitors surveyed in 2016 do not believe that the trails are too crowded (Figure 33).

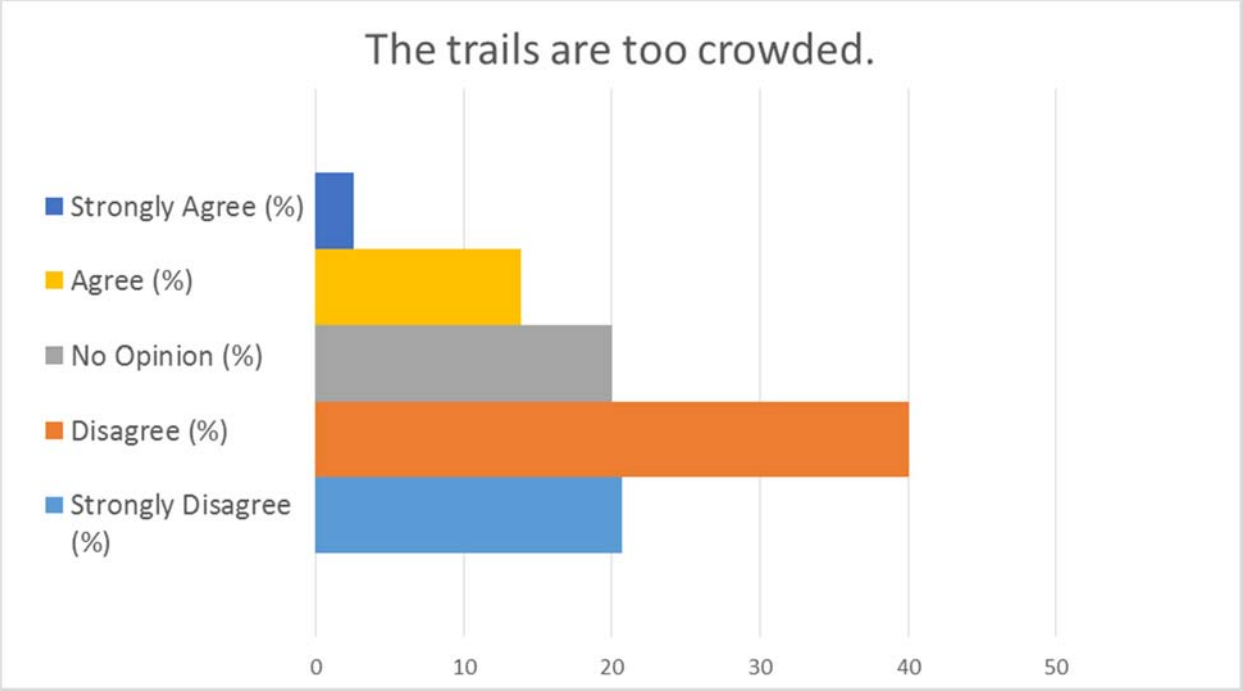

Figure 33. Survey results based of perception of trail crowding conditions from UVM 2016 survey.

Most visitors surveyed in 2016 agree or strongly disagree with trail use limits (Figure 34).

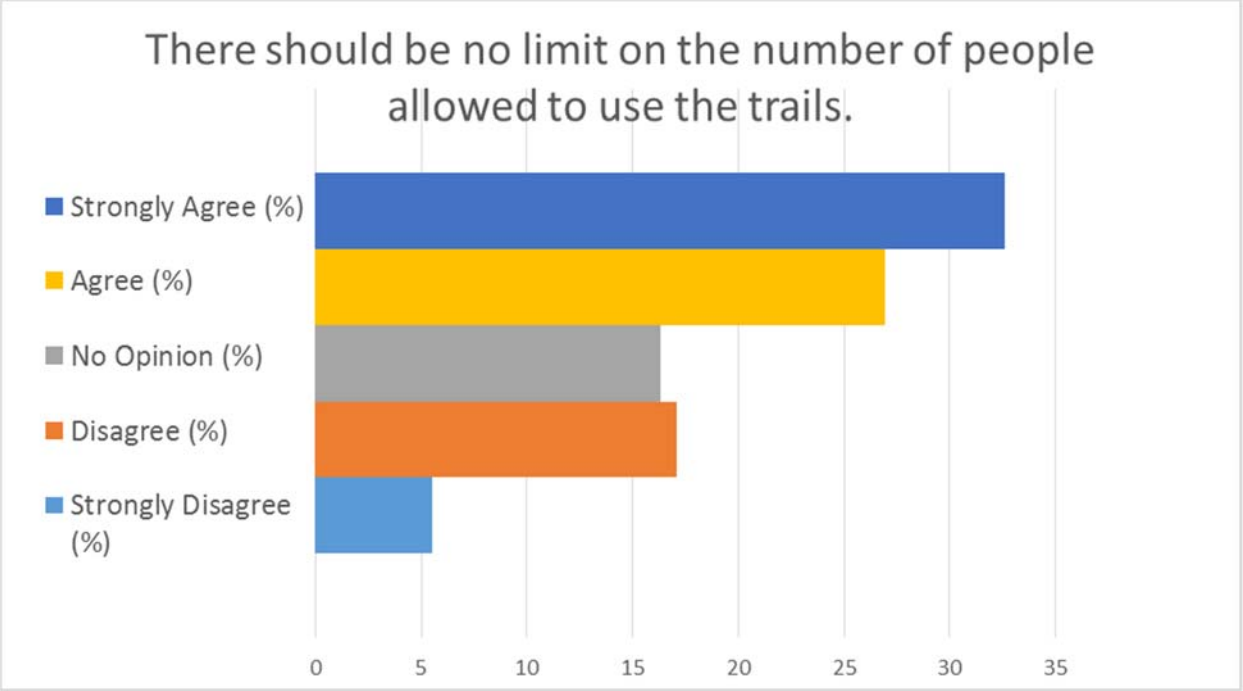

Figure 34. Survey results based of desire for trail use limits from UVM 2016 survey.

Discussion

The preliminary results show the vast majority of the ~800 respondents to UVM's survey do not appear to perceive issues with crowding. These same visitors overwhelmingly answered that they had a great experience on the WMNF and would not support any visitor use limits for trails. Furthermore, they generally agree that the trails and facilities are in good condition.

Evaluation of Monitoring Question and Indicator(s)

Continue UVM protocol into the future as time and funds permit. Seek ways to address critique that displaced or

References

UVM Park Studies Laboratory (2015) Unpublished Draft: SUMMARY OF FIELD RESEARCH & PRELIMINARY RESULTS.

5.13 – Scenery

Scenery is an important resource on the WMNF. It attracts many visitors to the Forest and influences the lives of those living in the Forest region. Maintaining a natural-appearing landscape is a key component of the Forest Plan. The rugged mountains of the Forest form a significant scenic and cultural New England landscape. Whether viewing the forest via while driving, hiking, biking, or skiing, visitors find respite in the scenic naturalness of the Forest as nearby urban areas continue to grow. There are two National Scenic Byways that cross the Forest allowing for scenic drives with pull offs for views and picnic areas. The WMNF is classified as an Urban Forest drawing in millions of visitors each year. The Forest is within a day's drive of Boston, New York and Montreal. Although, scenery is vital to the appeal of the Forest for recreation and for living in the region, the WMNF is a working forest, and management for this resource must be balanced with other Forest uses including timber management.

Scenery is a challenging resource to evaluate and manage because it is subjective. As the saying goes, beauty is in the eye of the beholder. How people perceive the landscape is influenced by their history, beliefs, work, knowledge, use of the land, and many other factors. Add in the complexities of the landscape (slope, aspect, vegetation, distance, houses, fields, development, mature and young forest, weather, etc.) and each viewer will have a different perspective and assessment of what is "natural-appearing" or appropriate within the context of the overall landscape. The following monitoring questions were developed to assess how well other uses are being balanced with protecting the scenic resources.

5.13.1 – Monitoring Question

How do different harvest methods affect the visual landscape over time? Does modeling accurately display scenic conditions on the landscape?

Last Updated

2018

Monitoring Indicator(s)

Visibility of openings created by harvesting (from several prescription types: Clearcuts and Group Selection Treatment). Impacts to the visual landscape are assessed using pre- and post- harvest photography and a comparison of modeling to these photos.

Monitoring Frequency

Annual

Background & Driver(s)

Evaluating the rate at which visual impacts of each harvest type change and impact on foreground, middleground, and background views. The goal is to determine whether Forest Plan direction regarding size of openings relative to Scenic Integrity Objectives, project-level design features, and overall amount of opening on the landscape are appropriate given the types of harvest, variety of viewpoints, and rate of vegetative regrowth on the Forest. The results of the monitoring analysis will help to determine if the design concepts proposed as mitigation measures for the projects units, as derived by the modeling and associated analysis, are sufficient and if the design features are being applied during implementation.

Monitoring Indicator

Visual comparisons of pre- and post-harvest landscape and computer simulation modeling. Field observations and photographs were taken from the Mt. Washington Hotel and Crawford Path Trailhead viewpoints during the summer and the fall of 2008 and 2009. Due to the locations and timing of harvests, first year and third year post-harvest data was collected in September of 2016 (1st year and 3rd year treatments are immediately adjacent to one another).

Visibility modeling was applied to each viewpoint in order to provide a base reference as to what stands in the project area would be visible from that given point. The stand boundaries were then overlaid onto the terrain of the three dimensional model and colored to allow a simulated view of the proposed treatment (clearcuts and group selection treatments) on the simulated landscape from the viewpoint. Modeling is limited to bare earth or terrain modeling; stand height and foreground vegetative or architectural barriers must be interpreted using field data, including photographic data. The models provide a visualization of the view from the viewpoints and how the landscape might appear following harvest. Stands are projected as a two-dimensional representation; they appear on top of the vegetation of a three-dimensional model. This creates an illusion of potentially greater visual impact. Depending on the perspective and angle of the view being projected, the models overestimate visible canopy opening after harvest by approximately ½ to ¾ and even more visible ground opening. As such, the models predict much more canopy opening than would ever actually be visible.

Results

Figure 35 : Model Image - Map of Proposed Project as Analyzed (Clearcuts)

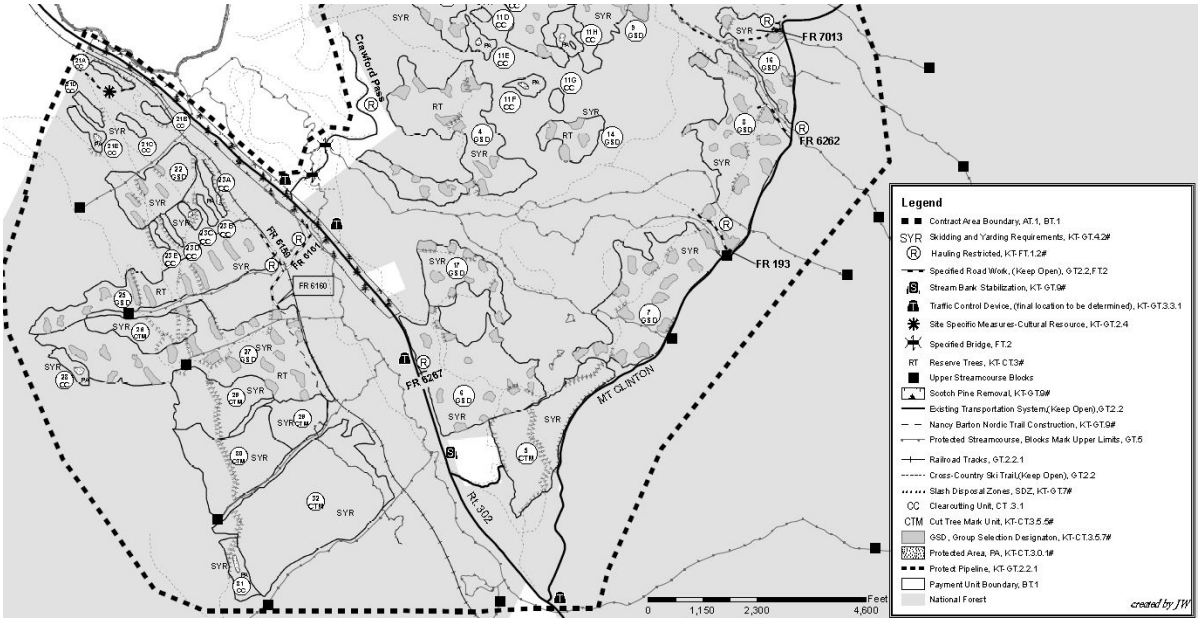

Figure 36 : Map of 2013-2015 Post Harvest -Treatment Area (Left side of Rt. 302) within both the Mt Washington Hotel and Crawford Trailhead Viewsheds

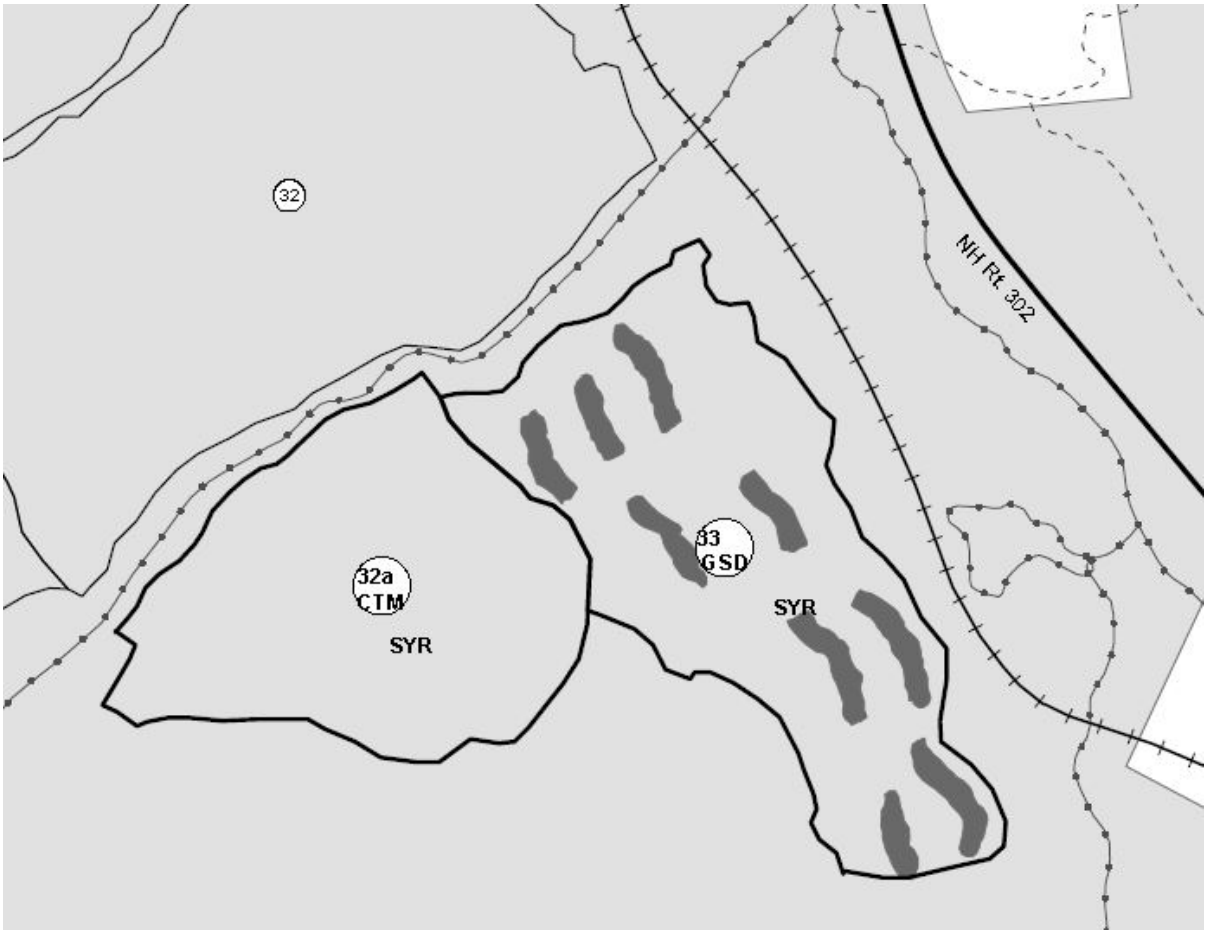

Figure 37 : Map of Additional Harvest Area within both the Mt Washington Hotel and Crawford Trailhead Viewsheds

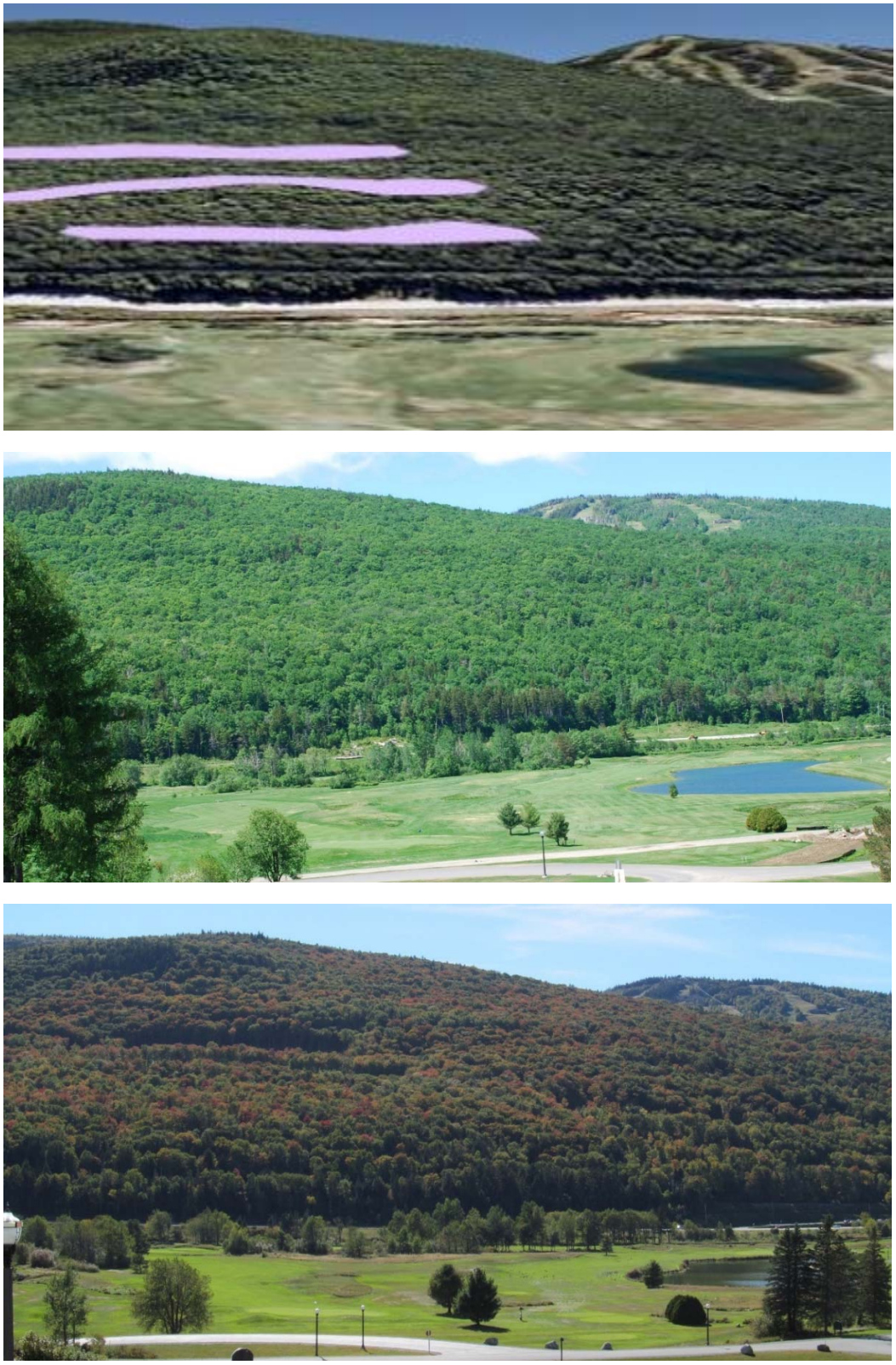

Figure 38. Model of proposed treatment (top), 2008 pre-harvest (middle), 2016 postharvest (bottom) view from Mount Washington Hotel.

Figure 39. Model of Proposed Treatment Area (top), 2008 pre-harvest (middle), and 2016 post-harvest (bottom) from the Mt Washington Hotel (toward Crawford Notch)

Figure 40. Model of proposed treatment (top), 2008 pre-harvest (middle), 2016 postharvest (bottom) view from the Crawford Trailhead parking lot.

Figure 41. Model of proposed treatment (top), 2008 pre-harvest (middle), 2016 postharvest (bottom) view from the Crawford Trailhead parking lot looking toward Crawford Notch.

Discussion

As illustrated by Figure 35, Figure 36, and Figure 37 (proposed mapping vs harvested) the work on the ground is not always translated exactly as the proposed mapping was analyzed and the designed mitigations created. This is partially expected due to the unknown, on the ground restrictive or inoperable features that have to be adjusted for and is noted as having a possibility of occurrence in the specialist report. As technology improves (and has improved since the layout of this project) designed layout and mitigations will become more accurately translated to the ground for harvest.

The modeling and mapping efforts prove to be accurate (within acceptable tolerances), displaying the scenic conditions and translating the proposal into a successful harvest that is visually sensitive to the landscape (Figure 38, Figure 39, Figure 40, Figure 41). The views monitored in this analysis have received many visitors since harvesting has been completed, including State elected officials and Regional and National leaders of the Forest Service. They have noted that they were extremely impressed with the visual results and integrity of the scenic condition from these viewpoints. When asked, members of the public have indicated that they did not notice or recognize that there had been harvest activity on the hillside they were observing.

Recommendations

If the sale layout results in substantial changes to the stand boundaries, the modifications should be reviewed to determine whether the changes affect consistency with scenery guidelines.

References

5.13.2 – Monitoring Question

To what degree are Scenic Integrity Objectives being followed in our decisions?

The Scenery Management System (SMS) was used during Forest Plan revision to identify those areas of the Forest where scenery is of greatest concern due to concentrated public use and current high scenic quality. SMS also helped with developing direction on how to maintain a natural-appearing landscape. The result was a series of scenery-related data layers identifying the scenic concern level of all roads and trails, the current scenic integrity, and the scenic integrity objective.

As with many resources, much of the direction in the Forest Plan related to scenery management is in the form of guidelines, not standards. This was intentional to allow some flexibility to balance resource needs based on site-specific conditions and project objectives. However as the Forest Plan says (p. 2-3), "a guideline is a required course of action or level of attainment". A guideline can be modified or not implemented, but only when site-specific conditions indicate it is necessary so the Forest can move toward its goals and objectives.

The goal is that WMNF will conduct all management activities to be consistent with assigned Scenic *Integrity* Objectives, realizing the importance to local communities and Forest users of a natural-appearing landscape, distinct from the human-made environments dominant in the East.

Forest standards are actually descriptions of the Scenic Integrity Objectives (SIOs) and tools available to help the Forest meet those objectives, not management direction. Table 2-02a identifies the SIOs for the management areas most commonly managed as part of integrated projects.

> G-1 All management activities should meet or exceed Scenic Integrity Objectives established for the Forest through the Scenery Management System (SMS) outlined in *Agriculture Handbook 701, Landscape Aesthetics — A Handbook for Scenery Management*.

The project monitored is in a "High" and "Moderate" Scenic Integrity Objective area (The Forest Plan has them assigned as most and more visually sensitive) and are in the Foreground and Middleground viewsheds of a National Scenic Byway, as well being across from a historic hotel and cultural landscape, plus a frequented and popular year round trailhead (Crawford Path).

Last Updated

2018

Monitoring Indicator(s)

Units meeting the intent as identified in the Forest Plan and as the decision stated.

Monitoring Frequency

Annually

Background & Driver(s)

The results of the monitoring analysis will help to determine if the Scenic Integrity Objectives are being followed in decisions. The mapping / modeling compared to and with photographic data collected on the ground during follow up monitoring provides a comparative to assist in this analysis.

Monitoring Indicator 1

Results

The Crawford Notch project included lands within low and medium scenic integrity objectives. Modeling was used during project development to meet those objectives (Figure 42).

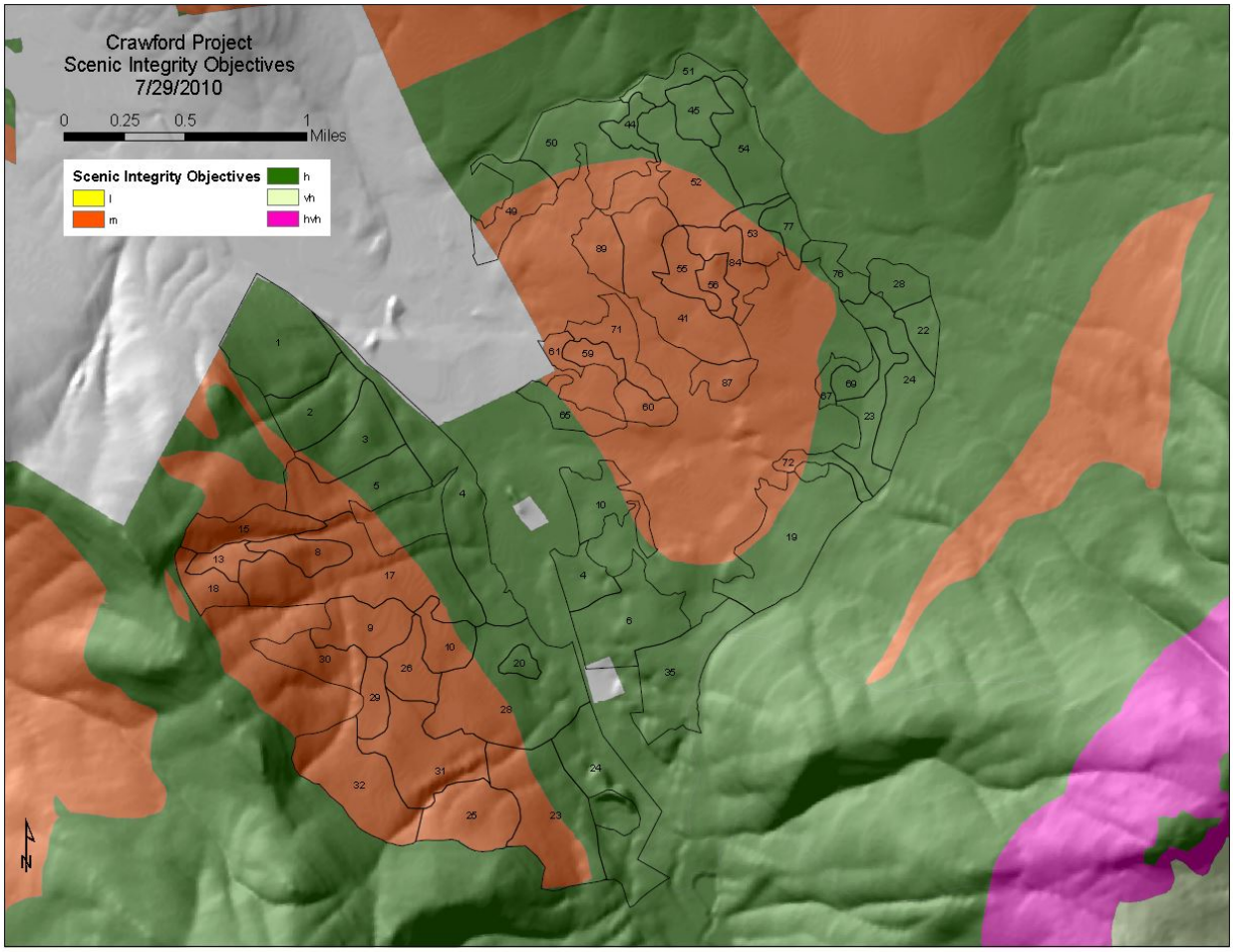

Figure 42. Scenic Integrity Objective overlayed on stands for the Crawford Notch Project.

Discussion

The decisions have been in congruence with the Scenic Integrity Objectives.

Recommendations

If the sale layout results in substantial changes to the stand boundaries, the modifications should be reviewed to determine whether the changes affect consistency with scenery guidelines.

Evaluation of Monitoring Question and Indicator(s)

Monitoring may best record the changes occurring on the landscape if performed annually for the first 5 years, then on year 7, 10, 15, and 20. During the 20th year the regeneration of the vegetation should be sufficient height and canopy to be blending in the context of the surroundings.

References

5.14 – Socioeconomics

Socioeconomic indicators, Outputs accomplished

5.14.1 – Monitoring Question

What is the economic role of the Forest in the region?

Last Updated

2018

Monitoring Indicator(s)

Payments to States (PTS); Payments in Lieu of Taxes (PILT); Stumpage value and volume of timber sold and harvested; Special use permit receipts; Recreation pass receipts; Recreation use; WMNF annual budget and expenditures; Number of full and part-time employees;

Monitoring Frequency

10 years

Background & Driver(s)

Data will be collected from multiple sources, primarily recurring budget and finance reports available from the Forest, Region and Washington Office.

Monitoring Indicator

This monitoring question was addressed in Lee et al., 2015.

Results and Discussion

The results and discussion for this monitoring question are presented in Lee et al., 2015.

Recommendations

No recommendations were generated from the evaluation of this monitoring question.

Evaluation of Monitoring Question and Indicator

The evaluation of this monitoring question using this indicator continues to provide important information regarding the goals and objectives of the Forest Plan and its implementation.

References

Lee, D., Hall, M., Lacroix, Z. 2015. Socioeconomic Assessment to provide context for management of the White Mountain National Forest. Prepared by Plymouth State University Center for Rural Development for the White Mountain National Forest.

5.14.2 – Monitoring Question

How do actual outputs and management activities compare with the estimated practices identified in Forest Plan Appendix B?

Last Updated

2018

Monitoring Indicator(s)

Volume of sawtimber and pulp sold, Acres of even-aged regeneration, even-aged intermediate, and uneven-aged harvest, Total acres harvested, Miles of stream habitat restored, Number of road crossings where fish passage was restored, Net increase in miles of non-motorized trails and snowmobile trails, Net increase in number of developed campground sites, Net increase in backcountry facility capacity (persons at one time or PAOT), Miles of roads constructed, reconstructed, and decommissioned, Acres of improved watershed or soil conditions, Number of fires where wildland fire was managed for resource benefits.

Monitoring Frequency

Biennially

Background & Driver(s)

Appendix B of the Forest Plan identifies a specific set of expected outputs and accomplishments for the first decade of the Plan's implementation, as well as some limits. Most of these measures come from the resource goals and objectives in Chapter 1 of the Plan. For this question, we utilize annual target reporting and existing data bases to assemble the information.

Monitoring Indicator 1

Results

Table 6 shows the combined total accomplishment for each measure in FY2015, FY2016, and FY2017 as well as the total for the first twelve years of Forest Plan implementation (FY2006-2017). For activities implemented through contracts, the accomplishment is reported in the year the contract is awarded because most accomplishment reporting is tied to funding. Table 6 summarized our success at achieving those outputs and services identified in Appendix B of the Forest Plan, which are a small part of our annual work, along with other accomplishments in some program areas.

Table 6. Estimated Management Practices and Accomplishments for the FY2015-2017 reporting period and during the length of Forest Plan implementation FY2006-FY2017.

Activity or Product	Unit of Measure	Estimate for First Decade	FY15-17 Accomp.	FY06-FY17 Accomp.
Aquatics				
Stream habitat restoration	Miles	30	4.5	23.3
Restore fish passage	Road crossings	10	5	17
Fire Management				

Activity or Product	Unit of Measure	Estimate for First Decade	FY15-17 Accomp.	FY06-FY17 Accomp.
Unplanned wildfire managed for resource benefit (Wildland Fire Use)	Fires	4 – 8	0	1
Forestry				
Volume sawtimber harvested	MMBF	137	13.6	58.2
Volume pulp harvested	MMBF	106	15.3	74.7
Volume of timber sold	MMBF	240	34.0	131.5
Even-aged regeneration harvest	Acres	9,400	838	3,529
Even-Aged Intermediate harvest	Acres	5,600	529	4,433
Uneven-aged harvests	Acres	19,300	1,015	9,218
Total harvest	Acres	34,300	2,382	17,180
Recreation				
Net increase hiking trail construction	Miles	Up to 25	0	0
Net increase snowmobile trail construction	Miles	Up to 20	0	1.4
Net increase developed campground sites	Sites	Up to 32	0	0
Net increase backcountry facility capacity	PAOT	Up to 40	0	0
Soils and Watershed				
Improved Watershed/Soil Conditions	Acres	At least 250	500	1296.6
Transportation				
Road construction	Miles	10	1.0	6.4
Road reconstruction	Miles	70	11.0	74
Classification of unclassified roads	Miles	N/A	2.4	18.7
Road decommissioning	Miles	5 - 40	0.0	3.9
Unclassified road decommissioning	Miles	N/A	0.2	13.3

Discussion

The Forest continues to manage resources to meet the accomplishments and stay within the limits set forth in the Forest Plan. During FY2015 through FY2017, the Forest implemented several stream habitat restoration and aquatic organism passage projects to improve aquatic habitat and restore fish passages. Additional work will be implemented as integrated resource projects move forward or funding is available for stand-alone aquatic organism passage projects.

No wildfires occurred in areas where wildland fire use is permitted and conditions allowed for its safe use to meet other resource benefits.

As in previous years, harvested and sold volumes remain below Forest Plan estimates. Harvested volumes and acreages fluctuate from year to year based on markets for various products and choices by sale purchasers on which units to cut. Given national priorities for funding, our forestry and wildlife habitat accomplishments are likely to increase slightly in the next few years. It remains our goal to gradually increase the volume sold and acres treated.

New hiking and snowmobile trail segments are constructed in most years to get existing trails on more sustainable ground or improve access to key areas. Relocation projects to address resource concerns always include decommissioning the segment that is moved; some of these projects result in a net increase in mileage, others a net decrease. As a result, the net increase, which is what Forest Plan objectives limit, remains at zero. There was no net increase in developed campsites or the capacity at backcountry facilities.

FY2015 to FY2017 saw 500 acres of soil and water improvement activities. Work included closing and rehabilitating campsites in riparian areas, improvements to bridges and culverts, improvements to reduce erosion on Forest roads, decommissioning of roads, trail relocation and drainage improvements, invasive plant control, and prescribed burning. The predicted accomplishment of at least 250 acres of watershed and soil improvement work was based on the average annual accomplishment before the revised Forest Plan was signed. It was identified as a minimum to allow for as much of this type of work as is needed and feasible with available funding. Accomplishments in FY2015 through FY2017 were lower than predicted during Forest Plan revision, although the Forest took advantage of opportunities to increase resiliency as part of Tropical Storm Irene recovery, and landscape-scale conservation efforts such as the Two Chiefs' Joint Landscape Restoration Partnership and National Forest Foundation's Treasured Landscapes program.

Two years into the second decade of Forest Plan implementation, most mileages remain within the accomplishments projected in the Plan. Road decommissioning is a bit less than what was projected. As in previous years, the Forest implemented several road reconstruction projects to repair damage to roads and bridges from Tropical Storm Irene. Recovery projects also included decommissioning of damaged classified road segments. Between FY2015 and FY2017 there were two NEPA decisions that resulted in classification or decommissioning of unclassified roads. The Forest-wide travel analysis that recommends which National Forest System roads are likely to be needed in the future and which are not was completed in FY2015. These recommendation are being ground-truthed and final decisions made during site-specific NEPA analyses.

Recommendations

No recommendations were generated from this evaluation of monitoring.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan

References

5.15 – Soils

Effects of management actions on soil physical condition and productivity, long-term soil chemistry and productivity

5.15.1 – Monitoring Questions

Is soil compaction or displacement occurring as a result of Forest management actions (harvest, prescribed fire, recreation management)? If so, are there indirect effects on forest productivity and/or forest health?

Last Updated

2018

Monitoring Indicator(s)

Soil compaction: severity of bulk density

Soil displacement: sheet, rill, and gully

Monitoring Frequency

Annually

Background & Driver(s)

The following documents provide direction for monitoring soils for soil productivity and health:

- FSM 2500-Watershed and Air Management
- Chapter 2550-Soil Management
- Supplement No: R9-RO-2550-2012-1
- 2551.6-Mointoring Plans
- 2551.61-Soil Quality Monitoring Projects and Plans

Monitoring Indicator 1

This report presents data from Long Pond Sale Unit 20 (20.6 acres) pre-harvest data collected in June 2016 and post-harvest data collected in June 2017. Soil Disturbance level 1 consists of: wheel tracks or depressions evident, but faint and shallow, Forest-floor layers are present and intact, Surface soil has not been displaced, Soil burn severity from prescribed fires is low (slight charring of vegetation, discontinuous), Soil compaction is shallow (0 to 4 inches) and Soil structure is changed from undisturbed conditions to platy or massive albeit discontinuous. Soil Disturbance level 2 consists of: Wheel tracks or depressions are evident and moderately deep, Forest-floor layers are partially missing, Surface soil partially intact and maybe mixed with subsoil, Soil burn severity from prescribed fires is moderate (black ash evident and water repellency may be increased compared to preburn condition), Soil compaction is moderately deep (up to 12 inches) and Soil structure is changed from undisturbed conditions and may be platy or massive. Soil Disturbance level 3 consists of: Wheel tracks or depressions are evident and deep, Forest-floor layers are missing, Surface soil is removed through gouging or piling, Surface soil is displaced, Soil burn severity from prescribed fires is high (white or reddish ash, all litter completely consumed, and soil structureless), Soil compaction is persistent and deep (greater than 12 inches) and soil structure is changed from undisturbed and is platy or massive throughout.

Results

Post-harvest monitoring results found that 19% of the sites had a level 1 soil disturbance, 14% had a level 2 and 3% had a level 3 soil disturbance. Level 3 disturbance has the potential to be detrimental to soil health; however, the disturbance recorded as level 3 in these sites was not enough to be considered detrimental to soil health. This indicates that the application of current Best Management Practices are protecting soil health.

Discussion

The results indicate that the current Best Management Practices are being applied and they are limiting the amount of detrimental soil disturbance and protecting Forest soil health. These data, collected following approved FS monitoring protocol, do not indicate that levels of soil disturbance are approaching or exceeding any thresholds. Monitoring results show that the amount of soil disturbance resulting from harvesting is consistent with the level of soil disturbance analyzed in the project and is consistent with the Forest Plan.

Recommendations

No recommendations were generated from the evaluation of this monitoring question.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan

References

USDA-Forest Service Manual, Supplement R9RO 2550-2012-1 – Soil Management.

USDA-Forest Service, General Technical Report WO-82b, September 2009. The Forest Service Soil Disturbance Monitoring Protocol.

5.15.2 – Monitoring Question

Is soil base cation depletion occurring? If so, are there indirect effects on forest productivity or forest health?

Last Updated

2018

Monitoring Indicator(s)

Change is Soil Chemistry or Forest Health: Vigor and Dieback Ratings or Forest Productivity: Biomass Accumulation.

This report uses soil chemistry as the indicator.

Monitoring Frequency

10 years

Background & Driver(s)

The following documents provide direction for monitoring soils for soil productivity and health:

- *FSM 2500-Watershed and Air Management*
- *Chapter 2550-Soil Management*
- *Supplement No: R9-RO-2550-2012-1*
- *2551.6-Mointoring Plans*
- *2551.61-Soil Quality Monitoring Projects and Plans*

This is a long term monitoring effort to measure soil, and ultimately forest, productivity. It responds to concerns about acid deposition effects on forest productivity.

Monitoring Indicator

Forty long-term soil monitoring plots were established in 2001-2002 for informing the 2005 Forest Plan. These plots were retested in 2014- 2015, and the data is currently being analyzed by a PhD Candidate at the University of New Hampshire with results expected in spring of 2019.

This 2018 Monitoring Report presents the results from a clearcut study set up within two sites in partnership with Trinity College's Environmental Science Program. The sites were Hogsback, located in the western region of the forest in New Hampshire, and Milstone, located on the eastern region in Maine. Hogsback is located in the Pemigewasset Ranger District outside of Benton, New Hampshire. Pre-harvest sampling occurred on June 23, 2013 at 35 sample locations over three transects. Post-harvest sampling occurred on August 4, 2014 at 35 sample locations along three transect and on June 29, 2015 at 38 sample locations along three transects. Milstone is located within the Androscoggin Ranger District outside of Bethel, Maine. Pre-harvest sampling occurred on June 24, 2013 at 49 sample locations over six transects. Post-harvest sampling occurred on October 11, 2014 at 50 sample locations along six transects and on June 30, 2015 at 53 sample locations along six transects.

Results

No significant change in aluminum concentrations were found by this study (Figure 43). A few sample locations of exceptionally high Al concentrations skewed averages, although no statistical change was found. No significant change in the O-horizon calcium was found at either site. Calcium in the B-horizon

did not change significantly at Hogsback, but did decline significantly at Milstone. In both soil horizons at Hogsback, and in the O-horizon at Milstone, soils showed resiliency in rapidly recovering from their respective changes. Soil pH did not change significantly at Hogsback, and increased significantly at Milstone. Soil acidification is not occurring at either location. There was an association between pH and aluminum concentration for two of the three sample years at each site. There was a weak association of calcium and pH for only one year at one site. Thus, no correlation between calcium and pH was found.

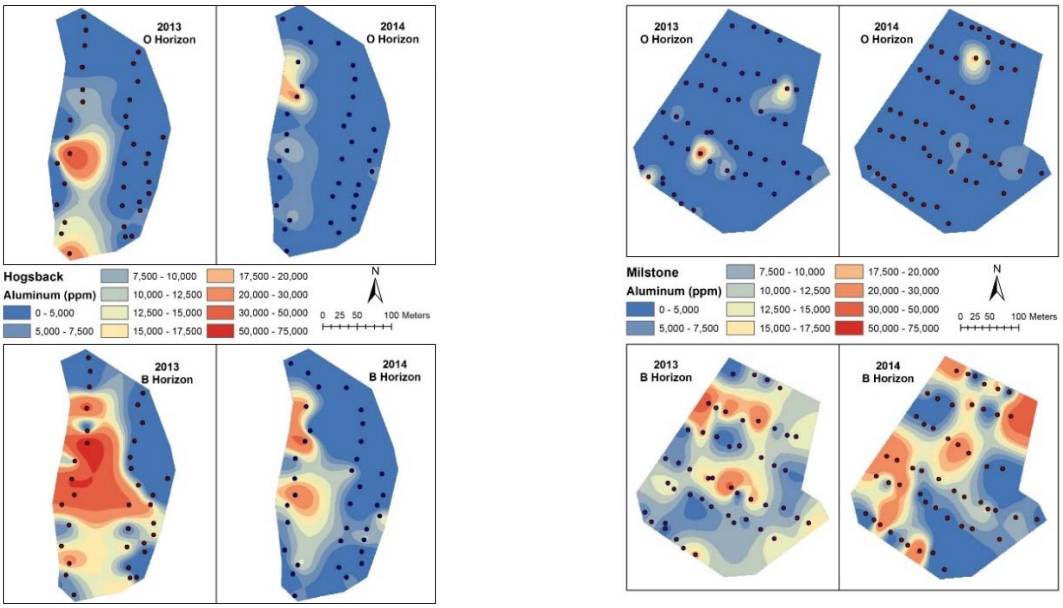

Figure 43. Pre- and post-harvest aluminum concentrations measured at Hogsback and Milstone.

Discussion

The results indicate consistency with the Forest Plan objective of not reducing soil productivity as a result of land management activities; the soil is not losing nutrient capacity to sustain vegetation due to timber harvesting. This monitoring is consistent with applicable laws and regulations. The results show that we are not we are approaching or exceeding this threshold and we are consistent with the Forest Plan direction for monitoring soil base cation depletion. The management practices required by the Forest Service have minimized the potentially harmful impacts of clear-cutting on forest soil nutrients. The validation monitoring shows that we did consider whether soil base cation depletion occurring. The results from this monitoring indicates that there is no effect to soil nutrients.

Recommendations

No recommendations were generated from the evaluation of this monitoring question.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan

References

Agosta, J. 2017. The Effect of Commercial Clear-Cutting on Soil Nutrients and Soil pH in the White Mountain National Forest. Senior Thesis: Trinity College, Hartford, CT. 52p.

USDA-Forest Service Manual, Supplement R9RO 2550-2012-1 – Soil Management.

5.16 – Water Resources & Aquatic Species

Monitoring questions within this section address the effectiveness of aquatic habitat improvements, effects of recreation use on water quality, effects of land management on water quality and brook trout (focal species), long-term effects of climate change on aquatic resources, wild trout assessments, watershed condition, and the implementation and effectiveness of Best Management Practices (BMPS).

5.16.1 – Monitoring Questions

Are stream habitat restoration/improvement projects meeting objectives and increasing habitat complexity and fish productivity? Are AOP projects providing fish passage and stable stream beds through the crossings?

Last Updated

2014

Monitoring Indicators

Biomass and density of fish populations. Habitat complexity (%pool, riffle, glide); substrate size distribution; large woody debris size and abundance; bankfull dimensions;

Monitoring Frequency

Annually

Background & Drivers

Determine whether established sites are being maintained to safety and resource protection standards with a focus on fee sites. This monitoring helps managers determine if additional actions are needed to protect the sites. Monitor collection activity at other sites in the Forest including the extent of excavation, damage to other resources and the creation of de facto collection sites. This monitoring helps managers determine if additional actions are needed to designate new sites, implement closure orders, or take other actions.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.16.2 – Monitoring Questions

What are the effects of recreation use and related infrastructure on water quality?

Last Updated

2014

Monitoring Indicators

Evidence of erosion, sedimentation, and/or waste in or near water bodies

Turbidity, Nutrients (nitrogen, phosphorus species), Bacteria (*E. coli),* Specific conductance, Temperature

Monitoring Frequency

Annually

Background & Drivers

Determine whether established sites are being maintained to safety and resource protection standards with a focus on fee sites. This monitoring helps managers determine if additional actions are needed to protect the sites.

Monitor collection activity at other sites in the Forest including the extent of excavation, damage to other resources and the creation of de facto collection sites. This monitoring helps managers determine if additional actions are needed to designate new sites, implement closure orders, or take other actions.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.16.3 – Monitoring Question

Are Forest Plan S&G's sufficient for protecting, restoring, or improving headwater stream ecosystems (riparian and aquatic)? This question will be considered in two separate evaluations.

Are 25' no-cut zones and riparian management zones on perennial streams being implemented on timber sales?

Last Updated

2018

Monitoring Indicator(s)

Distance of vegetation management prescription to stream

Monitoring Frequency

Annually

Background & Driver(s)

This monitoring question addresses the Forest Plan Goal of protecting and restoring aquatic habitats and riparian areas. Forest Plan Guidelines #1 and #2 for Riparian and Aquatic Habitats address protection of riparian forest canopy and providing future downed instream wood. This monitoring will examine how forestry staff is implementing guidance for the 25' no-cut zone and the additional 75' riparian management zone (RMZ). The "no-cut" zone allows for a future source of downed wood to accumulate in stream zones. RMZ's were identified in the Forest Plan primarily to maintain stream temperatures of perennial streams, therefore uneven-aged forest management is emphasized in the RMZ. Even-aged forest management, such as clearcutting, is discouraged within the RMZ in Forest Plan guidance.

Monitoring Indicator 1

Results

Four harvest units located near perennial streams in active timber sales from the Province Integrated Resource Project Area were visited in 2016. Although not all units were harvested, unit boundaries could be checked for implementation of the no-cut zone and/or RMZ. As Table 7 shows, implementation of the Forest Plan guidelines for no-cut and/or RMZ were met.

Table 7: Harvest Units near perennial streams within the Province Project Area.

Harvest Unit	*Timber Sale*	*Treatment*	*Harvested at Time of Monitoring?*	*Guidelines Met?*
45	*Province*	*Clear-cut*	*Yes*	*Yes; Clear-cut > 100' of stream*
46	*Province*	*Group selection*	*No*	*Yes; Group boundary > 25' from stream*
49	*Province*	*Group selection*	*No*	*Yes; Group boundary > 25' from stream*
14	*Peaked Hill*	*Group selection*	*Yes*	*Yes; Group harvest > 25' from stream*

Figure 44: Boundary of Clear-cut Harvest Unit #45 of the Province Timber Sale

Figure 45: Unnamed tributary to Weeks Brook adjacent to clear-cut unit #45

Foresters marked the boundary of the clear-cut unit along the break in slope from the upland down to the stream valley bottom as a natural buffer of the stream (Figure 44). Distance from the clear cut to the stream edge was over 100' following the slope of the landform. A straight line measurement along the same elevation would certainly have been less than 100'. Dense forest canopy provides sufficient shade over this small headwater tributary of Weeks Brook adjacent to the clear-cut (Figure 45). Although water temperature was not measured, the stream was very cold to touch and young brook trout were commonly observed on this hot and sunny August day.

Figure 46: Post-harvest of a Group Cut (unit #14) along Middle Brook in the Peaked Hill Timber Sale

Harvest unit boundaries along mapped perennial streams of three units emphasizing "group cuts" were visited in 2016. Only one of the units was harvested. An individual group cut is shown in Figure 46. The harvest met Forest Plan guidance as less than one acre of the unit harvest occurred within 100' of Middle Brook and the unit boundary was > 25' from the stream. The cut was located on a natural bench landform and away from the slope down to the stream. Trees located on this slope have the highest potential for falling into the stream and serve as future sources of instream downed woody debris. Unit boundary lines of the two un-cut units, (#46 and #49) were also >25' from the perennial streams in the Province Sale. In general, distances of harvest units from streams varied along the boundary and in general far exceeded 25'.

Discussion

Implementation monitoring shows that the forest management planned in the Province Integrated Resource Project is consistent with Forest Plan guidelines regarding riparian objectives. Guidelines for riparian and stream protection often focus on minimum distances from the stream where management activities are allowed. In reality, streams, floodplains, and their riparian areas vary in width across the landscape. Monitoring results indicate that forestry staff look for major changes in slope rather than abide by strict "buffer" distances. Unit distances from streams tend to meet or exceed distances

recommended for no-cut zones and RMZ. Results indicate that stream and riparian features were both considered and protected by forestry staff, who independently located harvest boundaries along streams, in the harvest units examined.

Monitoring Indictors 2, 3, and 4

These monitoring indicators were used to access whether Riparian and Aquatic Habitats Guidelines #1 and #2 of the Forest Plan were implemented on the Than Timber Sale and whether they were effective at protecting coldwater stream habitat. In this monitoring effort, the proximity of forest harvesting to the stream is documented, and a comparison of post-harvest water temperature and brook trout biomass, measured 5-6 years after harvesting was completed, is compared to a range of values measured across the WMNF historically. In addition, the range of stream temperatures at these sites is compared to the threshold for coldwater streams, identified in the best available science.

Monitoring Indicator 2

Distance of Timber Harvest Units to Stream (feet)

Results and Discussion

Measurements from unit boundaries to Davis Brook ranged from 35’ to 50’ at the three harvest units where single tree selection and group selection were prescribed to the upland forest (Figure 47). Distance from Davis Brook to the actual location of the closest cut tree were much higher ranging from 60-70’. An additional harvest unit (not shown in the figure) was a clear-cut unit that was more than 200’ from the Davis Brook.

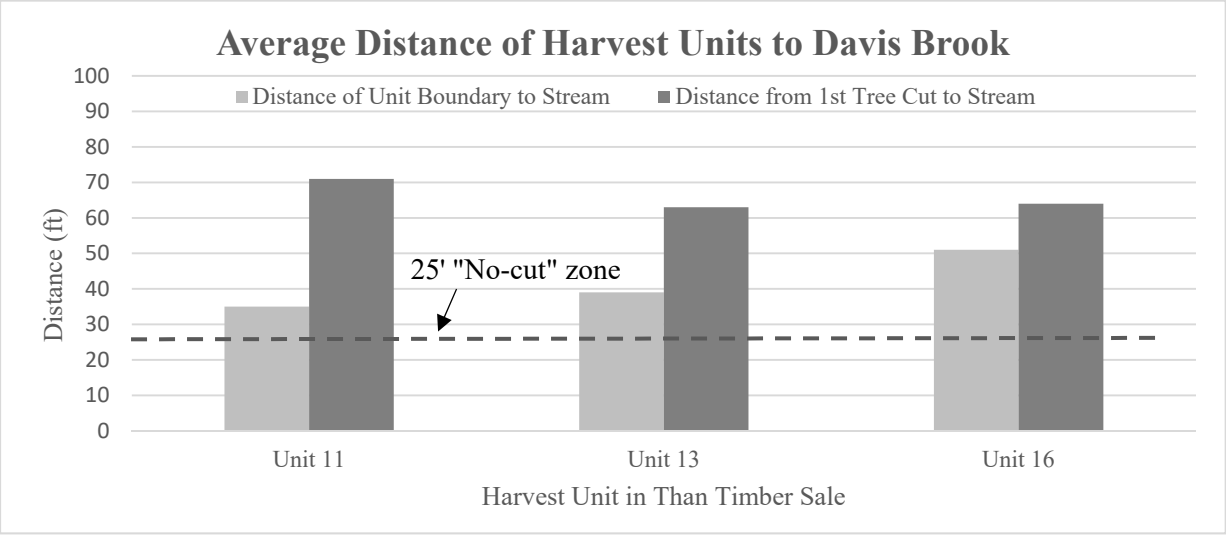

Figure 47: Average distance of Unit Boundaries of Three Harvest Units along Davis Brook in the Than Timber Sale.

The layout of the harvest units along Davis Brook by WMNF forestry staff was done without any riparian area designations identified by water resources staff. Monitoring shows that forestry staff applied silvicultural prescriptions to individual forest stands along Davis Brook with riparian and stream protection in mind. Guidelines for both no-cut zones and even-aged management (i.e. clearcutting) were exceeded at harvest unit boundary lines (Figure 48). Unit boundaries were largely outside of landform features such as stream “benches” and steep valley slopes. In general, riparian “distance” guidelines are more commonly approached only when adjacent upland forests features are on flatter

ground adjacent to stream valleys, a wider valley bottom of Davis Brook is only found at the south end of Unit #11, as the brook approaches its confluence with the Wildcat River.

Figure 48: View of Davis Brook in 2016, Between Harvest Units #13 and #16 of the Than Timber Sale

Monitoring Indicator 2

Maximum average 30-day summer water temperature (°C)

Results and Discussion

The maximum average 30-day water temperature in Davis Brook was 15.0 C in 2016. Davis Brook is well below the temperature threshold for coldwater streams (18 C) and similar to other small streams (<1.5 sq. mile drainage areas). Stream temperatures measured in 2016 at six other WMNF streams of similar size ranged from 14.1 to 17.0 C. Five of these streams had not experienced forest harvesting in over two decades. While this monitoring effort cannot show the magnitude of any temperature change that may have occurred from forest harvesting, it does show Davis Brook remains a productive coldwater stream after “typical” forest management activities in the WMNF.

Monitoring Indicator 3

Biomass of brook trout (Kg/hect)

Results and Discussion

Biomass of brook trout in Davis Brook exceeded 40 kg/hectare in 2016, and ranks within the top 10% compared to other sites sampled between 2000 and 2016 in the WMNF (Figure 49). It seems unlikely that stream temperatures would have changed drastically immediately following the completion of the timber sale given the high biomass of brook trout present in 2016. This would also suggest that the appropriate BMPs were implemented during the sale as brook trout production is high. In addition, there were no signs of habitat degradation in the sampling reach, given that intermittent channels draining the harvest units enter Davis Brook above the monitoring station. Overall, both interpretation and application of riparian and stream guidelines for protection were effective on the Than Timber Sale.

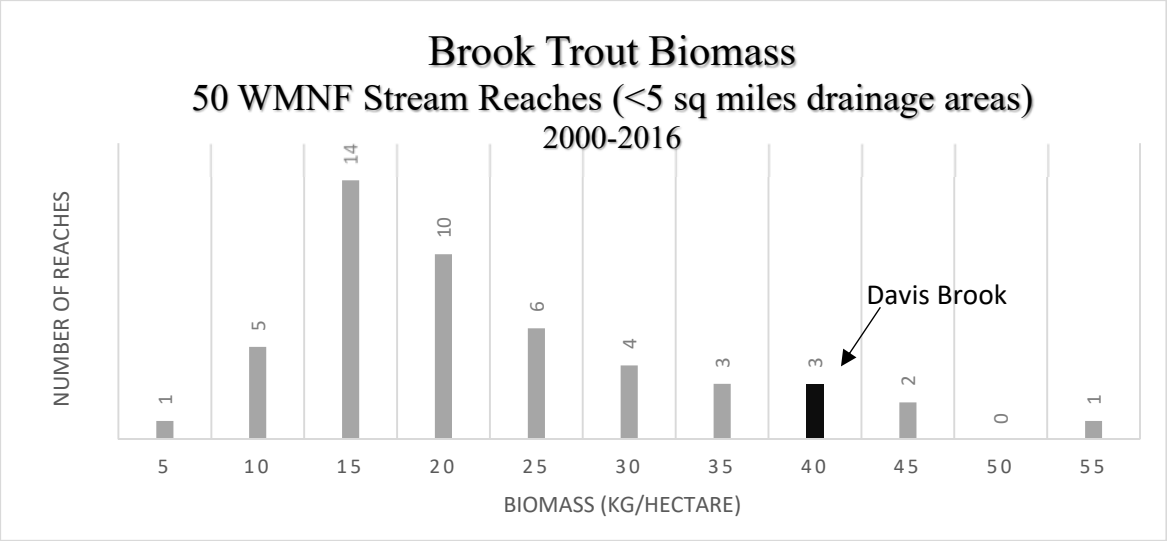

Figure 49: Comparison of Biomass of Brook Trout in Davis Brook in 2016 with Brook Trout Biomasses measured at other WMNF streams from 2000-2016.

Recommendations

Ensure newer forestry staff continues focusing on landform features to protect riparian zones and stream habitats, as demonstrated in this monitoring effort.

Evaluation of Monitoring Question and Indicator(s)

Effectiveness monitoring of riparian management guidelines will be reported in future monitoring reports and with additional focus on “before and after” multi-year sampling of selected timber sale areas. This will allow documentation of the intensity of any short term effects. Several of these monitoring efforts are ongoing at active and proposed timber sales

References

5.16.4 – Monitoring Question

Are stream temperatures changing over time? Are fish communities changing with temperature changes?

Last Updated

2018

Monitoring Indicator(s)

Maximum Average 30 Day Summer Water Temperature

Monitoring Frequency

Annual

Background & Driver(s)

Summer stream temperatures in general control the aquatic species composition of stream ecosystems. Landforms, current climate, summer weather patterns, and land management activities ultimately control summer stream temperatures. A goal of the WMNF is to maintain the coldwater stream communities within the natural capability of the land. During the last 5 years, WMNF staff have focused on documenting the range of stream temperatures within 5 watersheds that contain large portions of Management Area 2.1 (General Forest Management). Additional data has also been collected for streams at the project level in other watersheds, but these will not be reported here at this time. The annual data collected in the five watersheds serves to track long term trends of stream temperatures as well as for comparing the effects of land management at the project level across the WMNF.

Monitoring Indicator 1

Results

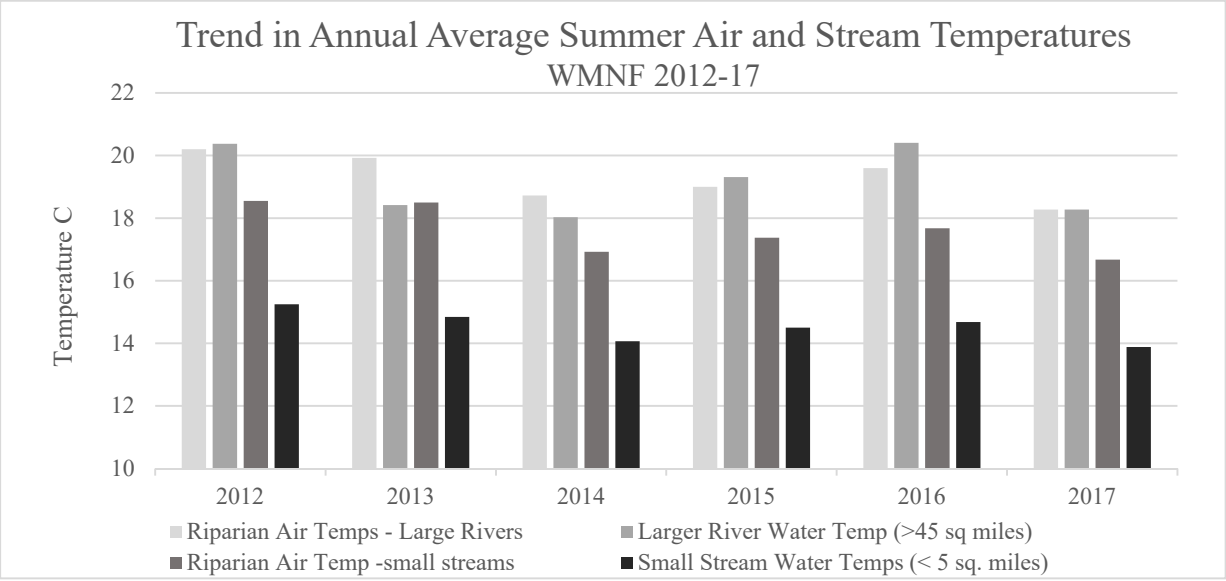

Figure 50: Annual average summer riparian air temperatures and stream temperatures for large main stem rivers (4 sites) and smaller headwater streams (12 sites) within five watersheds of the WMNF (Mad River, Wild Ammonoosuc River, Swift River, South Branch of the Israel River, and the Upper Ammonoosuc River).

Both large rivers and small headwater streams followed year to year patterns of air temperature over the summers of 2012 to 2017 (Figure 50). As expected, larger rivers varied more from year to year than small streams and mimicked air temperatures. The dense shading of small streams in the WMNF kept average

stream temperatures nearly 3 degrees cooler than their riparian average air temperatures. Individual small streams varied 1.1 to 2.2°C year to year over the six year period, while individual large rivers varied 2.1 to 2.5 °C.

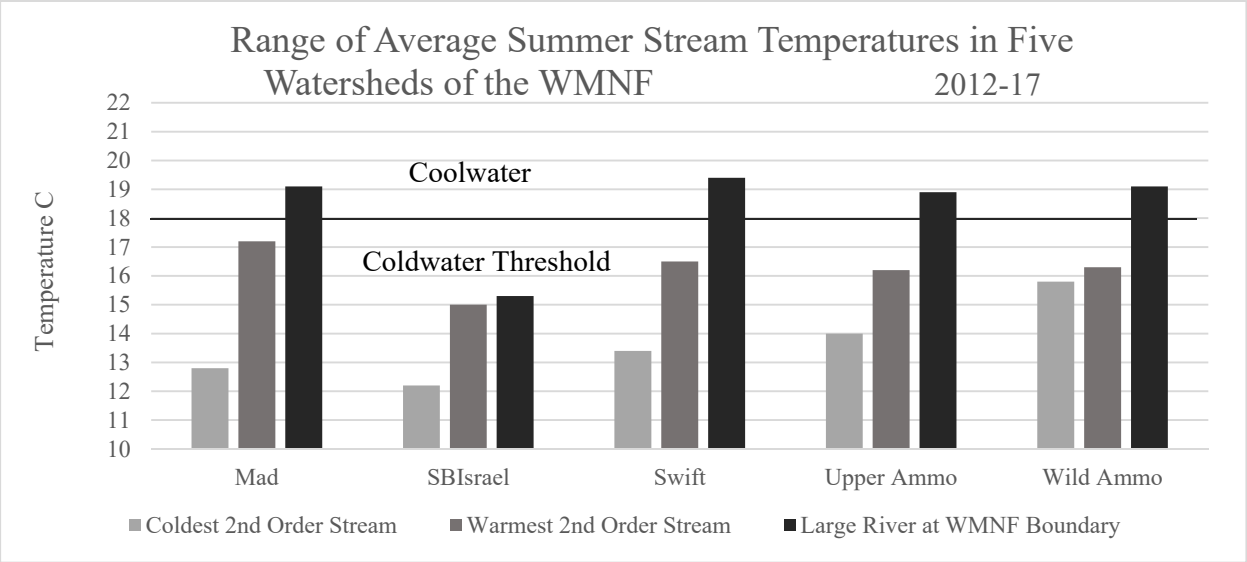

Figure 51: Average Summer Stream Temperatures for Large Main Stem Rivers and Small Headwater Streams within each of the Five Watersheds. Averages are for Years 2012-2017 Combined

Summer water temperatures of individual small streams, averaged over the years 2012-17, ranged from 12.2°C to 17.2°C across the five watersheds (Figure 51). Despite the broad range in small stream temperatures, all lie below the coldwater threshold of 18°C. Water temperatures of the four largest river sites were very similar, ranging from 18.9 to 19.4° and classified as coolwater streams. The South Branch of the Israel River, a much smaller watershed, classified as coldwater throughout its entirety. Fish sampling in 2012-13 confirmed that brook trout and slimy sculpin (coldwater fish species) dominated all streams with average summer water temperatures less than 19°C.

Discussion

Brook trout are considered the focal species for cold headwater streams in the WMNF. The WMNF has identified 18° C as the water temperature threshold for "true" coldwater streams, based on the best available science (Beauchene et.al., 2014; Lyons et.al., 2009). All 1st and 2nd order streams monitored here averaged well below the coldwater threshold over the six year period. While brook trout are an indicator of coldwater streams, they can also be common in coolwater streams (18°-21° C), although other fish species may be more dominant. Given that temperatures of the larger rivers averaged less than 19.5 C in all watersheds monitored, it is clear that any increase in stream temperatures that may have occurred over past decades has not resulted in a loss or fragmentation of coldwater stream communities in these watersheds. During this short monitoring period of six years, no trends in annual summer stream temperatures were found.

Recommendations

No recommendations were generated from the evaluation of this monitoring question.

Evaluation of Monitoring Question and Indicator(s)

Baseline temperature data has been collected across a broad range of streams in the WMNF over the last six years. Coldwater streams dominate the landscape while the larger mainstem rivers transition to coolwater streams as they exit the National Forest. Future monitoring will focus on fewer long-term sites for the purpose of detecting trends in temperature changes. Additional monitoring in the near future will focus on the magnitude and duration of any forest management effects to determine if riparian management guidelines are effective at maintaining coldwater stream temperatures. The long-term stream temperature sites can be used for comparison to sites undergoing forest management.

References

Beauchene, M, M. Becker, C.J. Bellucci, N. Hagstrom, & Y. Kanno. 2014. Summer thermal thresholds of fish community transitions in Connecticut streams. North American Journal of Fisheries Management, 31:1, 119-131.

Lyons, J., T. Zorn, J. Stewart, P. Seelbach, K. Wehrly & L. Wang. 2009. Defining and Characterizing Coolwater Streams and Their Fish Assemblages in Michigan and Wisconsin, USA, North American Journal of Fisheries Management, 29:4, 1130-1151

5.16.5 – Monitoring Question

Is the Forest providing a range of fishing opportunities that meets fishing demand while identifying and protecting wild populations of brook trout?

Last Updated

2006

Monitoring Indicator(s)

Wild trout biomass

Monitoring Frequency

Annual

Background & Driver(s)

This helps determine if we are meeting one of the Fisheries goals in the Forest Plan to provide a balance between wild and stocked indigenous fish species. In cooperation with NH Fish and Game, Forest staff will electrofish select watersheds to estimate wild trout biomass. All stocked fish in the watershed will be marked for the years that the assessment occurs to ensure origin of fish is known.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.16.6 – Monitoring Question

Are watersheds fully functioning as ecological systems? Is watershed condition being maintained or improved?

Last Updated

2018

Monitoring Indicator

Watersheds moved to an improved condition.

Monitoring Frequency

Annually

Background & Driver(s)

The Forest Plan lists the following goals and objectives for water resources:

Goals

Surface waters on the WMNF are considered "outstanding resource waters," and water quality is maintained or improved to protect existing and designated instream water uses such as aquatic life.

The Forest Service will use watershed assessments to help guide planning and management activities.

The Forest Service will manage streams at proper functioning condition (PFC) to dissipate stream energy associated with high water flows, thereby decreasing erosion, reducing flood damage, and improving water quality.

Watersheds will continue to provide high quality water for public water supplies, recreational activities, aquatic biota such as fish, and other purposes.

The Forest Service will work cooperatively with communities within public water supplies to maintain high quality drinking water. Management activities may occur in these watersheds consistent with management area objectives.

Objectives

1. Improve watershed and soil condition on at least 25 acres per year.

Collectively, these goals and objectives are met by improving the condition of watershed(s). In 2011, the Forest Service implemented a nation-wide program called the Watershed Condition Framework. The WCF is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands (USDA Forest Service, 2011). More information on WCF can be found at https://www.fs.fed.us/biology/watershed/condition_framework.html

Monitoring Indicator

Results

In 2017, the Headwaters Ammonoosuc River Watershed was improved from a rating of "functioning at risk" to "properly functioning." Watershed condition classification data and priority watershed information is available to the public at https://apps.fs.usda.gov/wcatt/

Discussion

The WCF has provided an efficient mechanism to document the focused efforts to address the goals and objectives for water resources as stated in the Forest Plan. Complete information can be found at the following websites:

https://apps.fs.usda.gov/wcatt/

https://www.fs.fed.us/biology/watershed/condition_framework.html

Data and Watershed Restoration Action Plans (WRAP) for all National Forests can be found at these locations. Rather than copying information from these websites to this report, readers are encouraged to visit these websites.

Recommendations

The current recommendation is to continue full support of the WCF and to continue to assign priority watershed status to new watersheds as WRAP are completed.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan

References

USDA Forest Service, 2011. Watershed Condition Framework. FS-977. https://www.fs.fed.us/sites/default/files/legacy_files/media/types/publication/field_pdf/Watershed_Condition_Framework.pdf

5.16.7 – Monitoring Question

Are Best Management Practices (BMPs) for soil and water being implemented? Are BMPs effective at preventing negative impacts to soil and water?

Last Updated

2018

Monitoring Indicator(s)

Rather than analyzing a specific set of indicators, addressing this monitoring question involves the use of nationally standardized forms that help determine the level of BMP implementation and BMP effectiveness across a diverse set of management activities.

Monitoring Frequency

Every two years, approximately 14 BMP assessments are performed.

Background & Driver(s)

In 2013, the Forest Service began implementing a national BMP program, which includes a National Core BMP Technical Guide and monitoring protocols for various activities. The national core BMPs tier to state BMPs and Forest Plan standards and guidelines, allowing these items to be monitored in an integrated fashion.

In addition to the eight required monitoring elements within 36 CFR 210.12, the Forest Plan lists several other monitoring goals in table 4-03. This monitoring question is directly tied to Goal 1: Manage for Ecosystem Health. By addressing this monitoring question, we are determining whether management activities are being implemented in such a way that satisfies Goal 1. Furthermore, this monitoring question helps to answer whether Forest Plan Standards and Guidelines are being implemented and if they are effective at meeting Goals and Objectives as stated in the Forest Plan.

Monitoring Indicator 1

Results

From 2015 through 2017, 17 BMP assessments were performed by interdisciplinary teams following the protocols established as part of the national BMP monitoring program. Sites were randomly selected, except when indicated otherwise. Results of each assessment are summarized below, grouped by the type of management activity being monitored.

Monitoring activity: Rec_A – Developed Recreation Sites

Site: Smarts Brook Trailhead

Evaluation Type: Both implementation and effectiveness

Date: 08/18/2016

Results summary: At the time of evaluation, there was no operation and maintenance plan for this site, so there were no provisions for protecting water, aquatic, and riparian resources. Inspections were not performed during critical times for addressing water quality issues. There was evidence of erosion, but sediment was not reaching Smarts Brook at the time of evaluation. Minor erosion was occurring due to user-created trails and bank trampling along Smarts Brook, as well as runoff from the parking area. It was determined that corrective actions and/or adaptive management actions were not necessary at this site for implementation and effectiveness of BMPs. Impacts were observed to be minor overall and not

contributing to water quality problems. Given the amount of use at this site, observed impacts were at an expected level.

Site: Jigger Johnson Campground
Evaluation Type: Both implementation and effectiveness

Date: 08/22/2017

Results summary: Provisions in the operation and maintenance plan to protect water, aquatic, and riparian resources were fully implemented and were effective in preventing erosion and/or waste issues on campsites, roads, parking areas, and sanitation facilities. No evidence of erosion, sedimentation, trash or waste was observed at this site.

Monitoring activity: Rec_C – Completed Construction or Re-routing of Motorized or Nonmotorized Trails

Site: Three Ponds Snowmobile Trail Relocation
Evaluation Type: Both implementation and effectiveness

Date: 08/21/2015

Results summary: A Categorical Exclusion (CE) was the primary planning document used to specify BMPs for this project. Provisions in the CE to protect water, aquatic, and riparian resources were fully implemented and were effective in preventing erosion and sedimentation. No evidence of erosion or sedimentation was observed at this site.

Monitoring activity: Rec_D – Motorized or Nonmotorized Trail Operation and Maintenance

Site: Tritown Trail, 32236
Evaluation Type: Both implementation and effectiveness

Date: 07/24/2015

Results summary: This site was non-randomly selected for training purposes. Provisions in the operation and maintenance plan to protect water, aquatic, and riparian resources were not implemented fully. Corrective actions needed include the reconstruction and addition of water bars and erosion control features, the addition of a bog bridge or step stones in a wet portion of the trail, and the replacement of two under-sized trail culverts. Sheet erosion, rill erosion, and rutting were observed on the trail tread, but sediment remained over 100 feet from the stream. The primary cause of erosion was the lack of functional water control features. At culvert crossings, sedimentation in the stream was occurring, causing changes to stream morphology due to undersized culverts. Corrective actions needed to improve the effectiveness of BMPs that were implemented include the maintenance of erosion control features.

Site: Highwater Trail, 31485
Evaluation Type: Both implementation and effectiveness

Date: 06/11/2015

Results summary: Provisions in the operation and maintenance plan to protect water, aquatic, and riparian resources were fully implemented and were effective in preventing erosion and sedimentation. No evidence of erosion or sedimentation was observed at this site.

Site: John Deer Nordic Ski Trail

Evaluation Type: Both implementation and effectiveness

Date: 09/15/2016

Results summary: This site was non-randomly selected due to known unresolved maintenance needs related to protecting water, aquatic, and riparian resources. The operation and maintenance plan for this site contains provisions for protecting water, aquatic, and riparian resources, but cross drains and stream crossing techniques were not fully implemented. Problems affecting water and aquatic resources were occurring and needed corrective actions, but actions were not taken. Treatments were needed on the trail segment being evaluated to reduce negative impacts to water, aquatic, and riparian resources, but treatments were not applied during the past five years. Corrective actions needed to improve implementation of BMPs include the repair or replacement of the culvert, the maintenance of non-functioning water bars, and additional water bars. The lack of BMP implementation was causing sedimentation in the stream in multiple locations and sheet erosion on the trail. At the culvert crossing, sediment deposition in the stream was observed due to unhardened crossing approaches, inadequate culvert size, and inadequate maintenance.

Site: Shelburne Trail, 31450

Evaluation Type: Both implementation and effectiveness

Date: 08/23/2017

Results summary: Provisions in the operation and maintenance plan to protect water, aquatic, and riparian resources were not implemented, and no inspections were performed during critical times for addressing water quality issues. Excluding stream crossings and their approaches, there was no evidence of erosion or sedimentation. The lack of stream crossing structures and unhardened crossing approaches were causing very minor erosion and sedimentation into the stream. The observed erosion was no different than bank erosion at other undisturbed locations along the stream banks; therefore, corrective actions and/or adaptive management are not necessary for this site.

Monitoring activity: Rec_H – Completed Ski Area Construction or Reconstruction

Site: Wildcat Ski Area, Polecat/Tomcat

Evaluation Type: Both implementation and effectiveness

Date: 09/16/2016

Results summary: This BMP evaluation was for the installation of snowmaking systems for the Polecat/Tomcat runs. Provisions to protect water, aquatic, and riparian resources were fully implemented. Supplemental erosion control was needed and applied during project implementation. Sediment barriers including cloth and straw bales were used. Some BMPs were not constructed to perform at full potential. Specifically, cross drain pipes, although functioning at the time of the evaluation, should be larger, and one water bar was draining to an intermittent stream. Evidence of sediment transport and deposition in an intermittent stream was observed in one location. This sedimentation was traceable to erosion in the project area. The causes of the erosion were improper construction of a water bar, issues with the access road, and steep grades. No evidence of erosion or sedimentation was observed at the stream crossing and its approach. Overall, this project had minimal impacts with minor erosion and sedimentation.

Site: Waterville Valley, Green Peak

Evaluation Type: Both implementation and effectiveness

Date: 06/26/2017

Results summary: Provisions to protect water, aquatic, and riparian resources for the Green Peak expansion project were evaluated in an Environmental Assessment (EA) and provided in a Decision Notice. Further provisions exist in the Forest Plan as well as State laws and regulations pertaining to Alteration of Terrain. Many provisions were not fully implemented. Project work exceeded timelines, proper project phasing was not implemented, the number of cross drains was inadequate, cross drains were inadequately constructed, ground cover requirements (mulch, vegetation coverage) were not met, and access road culverts were not being maintained, silt fencing near the intermittent stream was not installed properly. Sedimentation in the intermittent stream was observed due to lack of BMP implementation and lack of adherence to the provisions to protect water, aquatic, and riparian resources.

Monitoring activity: Road_A – Active Road or Waterbody Crossing Construction or Reconstruction

Site: FR70, Dolly Copp Road

Evaluation Type: Both implementation and effectiveness

Date: 06/29/2017

Results summary: Several provisions included in the Decision Notice and evaluated in the EA to protect water, aquatic, and riparian resources were not fully implemented. At the intermittent stream crossing, erosion control was not used. Disturbance to the stream bed was excessive, the construction of the crossing was not implemented during low flow conditions, and erosion control was lacking as the base of disturbed slopes. The need for corrective actions, such as the need for erosion control in sensitive areas, was identified during project implementation but it was not implemented. At the stream crossing, rill erosion was observed, but there was no apparent deposition into the stream. Silt fences that were installed were not properly keyed in. Despite the inadequate implementation of BMPs, no sedimentation was observed in the stream throughout the evaluation area.

Monitoring activity: Road_B – Completed Road or Waterbody Crossing Construction or Reconstruction

Site: FR87, Eastside Road

Evaluation Type: Both implementation and effectiveness

Date: 10/06/2016

Results summary: This site was non-randomly selected, as it was an area of interest for monitoring. Provisions to protect water, aquatic, and riparian resources were fully implemented. During construction, risks to aquatic resources were identified, and corrective actions were taken. Neither corrective actions nor adaptive management were needed to improve both implementation and effectiveness. At the waterbody crossing, there was evidence of sheet erosion, bank trampling, and vegetation damage, but sediment was not reaching the stream. The source of the sediment was the road surface and fillslopes. The causes were inadequate armoring of the bridge at the corners, the angle of the fillslope, and impacts from hikers (this is a heavily-used trail). However, the erosion was minor, and overall, the project was successful and had minimal impacts.

Site: FR90, Russell Pond Road
Evaluation Type: Both implementation and effectiveness

Date: 06/29/2017

Results summary: Provisions to protect water, aquatic, and riparian resources were fully implemented. There was no evidence of erosion or sedimentation at the stream crossing or its approaches. Rill erosion was observed along the edge of the road shoulder, but there was no evidence of sedimentation in the stream. Overall, BMPs for this project were implemented successfully.

Monitoring activity: Road_F – Completed Road Decommissioning

Site: FR700, Tunnel Brook Road
Evaluation Type: Both implementation and effectiveness

Date: 09/14/2016

Results summary: Most provisions to protect water, aquatic, and riparian resources were fully implemented. In some places, what was constructed was not as planned, such as placement of stones, logs, etc. Some tree deflectors were not properly installed. In areas where slash treatment was prescribed, it was not implemented appropriately and was insufficient as an erosion control method. Adaptive management is needed at this project site due to recreational use negatively impacting erosion control structures and vegetation growth. In the area evaluated, there were several observations of erosion and sedimentation in waterbodies, including ephemeral streams, intermittent streams, and Tunnel Brook. The evidence of erosion included bank instability, bank trampling and compaction, vegetation damage and bare ground, sheet erosion, and rill erosion. The causes were poor overall treatment prescriptions for the site conditions and inadequate soil cover. Overall, project results were satisfactory, given the difficulty of project implementation, challenges due to site characteristics, and other issues that are difficult to avoid, such as recreational use.

Monitoring activity: Veg_A Ground-Based Skidding and Harvesting

Site: Douglas Timber Sale, unit 51
Evaluation Type: Both implementation and effectiveness

Date: 09/01/2015

Results summary: This unit was non-randomly selected for training purposes. Most provisions to protect water, aquatic, and riparian resources were fully implemented. Erosion control for the landing and erosion control on skid trails were not fully implemented. However, corrective actions were not needed to improve implementation. Adaptive management was needed to improve implementation, with the recommendation that no decking of wood shall occur in sensitive areas such as a wetland. Within the unit, sediment accumulations were observed less than ten feet from the perennial stream, but sediment was not reaching the stream. The source of the sediment was a skid trail and associated stream crossing, and the cause was a poorly designed crossing structure. Erosion and sedimentation was also observed on the landing, but sediment was not reaching the stream. Causes of erosion on the landing included poor erosion control around the perimeter of the landing, poor landing location, and improper grade on the landing. Sediment deposition and transport occurred at stream crossings, with the evidence being localized sediment deposition in the stream, changes to stream morphology, bank instability, bank trampling, vegetation damage, sediment plumes/accumulations, and rutting. Corrective actions and/or

adaptive management were not needed to improve effectiveness because the observed erosion and sedimentation was minor.

Site: Hogsback, unit 30

Evaluation Type: Both implementation and effectiveness

Date: 09/02/2015

Results summary: Provisions to protect water, aquatic, and riparian resources were fully implemented. Corrective actions were not needed to improve implementation. Adaptive management was needed to improve implementation, with the recommendation to emphasize placement of reserve areas along intermittent streams. Within the unit along the intermittent stream, no erosion or sedimentation was observed. There was evidence of erosion on the landing, but sediment was not reaching the stream. Sheet erosion from the landing deck was caused by compaction. No erosion or sedimentation was observed on the skid trails. Two skid trail crossings were evaluated, and neither showed evidence of erosion and/or sedimentation. Corrective actions were not needed. Adaptive management that would improve effectiveness include using seed mixes that would better revegetate landings used in summer, and using mulch in addition to seeding landings.

Site: Peaked Hill, unit 27

Evaluation Type: Both implementation and effectiveness

Date: 09/07/2016

Results summary: Provisions to protect water, aquatic, and riparian resources were fully implemented. Supplemental erosion control was needed on the skid trail, and slash was applied during project implementation. Neither corrective actions nor adaptive management were needed to improve both implementation and effectiveness. No erosion or sedimentation was observed in the unit, on the skid trail, at stream crossings, or on the landing. The perennial stream was mapped as an intermittent stream, but during project layout and implementation, the appropriate BMPs for mapped perennial streams were successfully applied.

Site: NE Swift, unit 12

Evaluation Type: Both implementation and effectiveness

Date: 09/07/2016

Results summary: Provisions to protect water, aquatic, and riparian resources were fully implemented. Corrective actions were needed and implemented during implementation to reduce or eliminate problems that may have affected water, aquatic, or riparian resources. Neither corrective actions nor adaptive management were needed to improve both implementation and effectiveness. No erosion or sedimentation was observed in the unit, on the skid trail, or at stream crossings. Minor erosion and sedimentation was observed on the landing but sediment was trapped a short distance from the landing, so there were no effects to water, aquatic, or riparian resources.

Discussion

Overall, BMPs are mostly being implemented as planned across multiple types of projects on the Forest. BMPs are being adequately included in planning documents and contracts. Issues in BMP implementation are generally caused by the contractor not following the operating plan or contracts.

When and where BMPs have been properly implemented and installed, they have been effective at minimizing effects to water, aquatic, and riparian resources due to erosion and sedimentation.

Recommendations

Based on results from the BMP evaluations, the recommendation is to improve upon our ability to keep contractors, permit holders, and partners accountable for adhering to the project plans and/or contracts. BMP evaluations are beneficial and should continue indefinitely.

Evaluation of Monitoring Question and Indicator(s)

This monitoring question should remain as-is.

5.17 – Wild and Scenic Rivers

Compliance of developments or activities within Wildcat W&SR river corridor

5.17.1 – Monitoring Question

Are developments and projects within the Wildcat Wild & Scenic River corridor consistent with the Wild and Scenic Rivers Act?

Last Updated

2007

Monitoring Indicator(s)

Number of wetland permit applications received and consultations provided.

Check for consistency of private and agency activities, and town zoning ordinances, with the CRMP and the Wild and Scenic Rivers Act.

Monitoring Frequency

3-5 years

Background & Driver(s)

The Forest has a legal responsibility as the lead agency to insure both federal and private land use in the corridor is consistent with the Comprehensive River Management Plan (CRMP) and Section 7 requirements of the Clean Water Act. This monitoring evaluates recent and past Section 7 consultation reports to insure that we are meeting this responsibility. Field review of completed projects where permit is issued by state or town every three to five years. Approval of NHDES Wetland permit or 404 Clean Water Act permits prior to Section 7 determination, if applicable.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.18 – Wilderness

There are currently six Wildernesses on the WMNF. They are:

- The Great Gulf: 5,500 acres, designated by the 1964 Wilderness Act.
- The Presidential Range-Dry River: 29,000 acres, designated by the 1975 Eastern Wilderness Act and expanded in the 1984 New Hampshire Wilderness Act.
- The Pemigewasset: 45,000 acres, designated by the 1984 New Hampshire Wilderness Act.
- The Sandwich Range: 35,800 acres: 25,000 designated by the 1984 New Hampshire Wilderness Act and 10,800 designated by the 2006 New England Wilderness Act.
- The Caribou-Speckled Mountain: 14,000 acres, designated by the 1990 Maine Wilderness Act.
- The Wild River: 23,700 acres, designated by the 2006 New England Wilderness Act.

These lands are managed to allow natural processes to continue with minimal impediment, to minimize the effects and impacts of human use, to provide primitive and unconfined recreation opportunities, to foster appreciation of the qualities of wilderness landscapes, to continue use for educational and scientific purposes, and to recognize their evolving roles in the history of the landscape.

The WMNF Wilderness Management Plan is an appendix to Forest Plan. The plan selected indicators for measuring Wilderness conditions and set clear standards, beyond which direct management action may become necessary. These indicators looked at visitor trail use, visitor destination use, perceptions of crowding and experience quality, campsite density, campsite size, and litter and human waste issues.

5.18.1 – Monitoring Question

Is there a change in the number of incidents of improperly disposed of human litter and waste in Wilderness?

Last Updated

2018

Monitoring Indicator(s)

Litter and human waste.

Monitoring Frequency

Every 3 years

Background & Driver(s)

Concerns around the inability for workforce to effectively control litter and human waste through basic operations and maintenance.

Monitoring Indicator 1

Results

Reported incidents of human waste have declined since 2008 in all wilderness areas monitored (Figure 52).

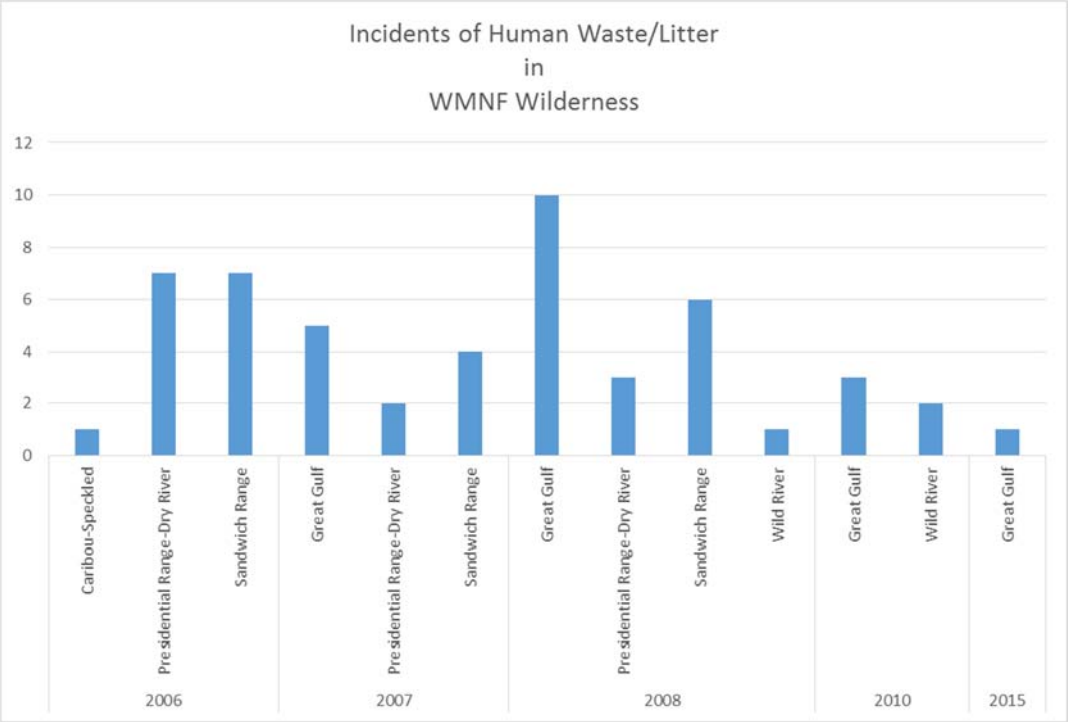

Figure 52. Observed incidents of human waste and litter in each of the six WMNF designated wilderness areas.

Discussion

The number of reported incidents of human waste appear to be on a sharp decline from 2008 on. This is likely due to a lack of reporting due to a decrease in Wilderness/Backcountry staffing rather than a an actual decrease in occurrences. Given the data gaps, it is not possible to draw any significant conclusions from the available data. In 2018 discussions with Backcountry/Wilderness staff, anecdotal evidence suggests that incidents of human waste are likely to be stable or increasing. However, there are less staff patrolling and focusing on entering incidents in 2018 than there were in 2006 - 2008.

Recommendations

There are no management recommendations that can be drawn from the current dataset. In order to take management actions based on this data the Forest will need a renewed focus on incident entry.

Evaluation of Monitoring Question and Indicator(s)

The Forest should consider implementing ArcGIS Online with Survey123 in order to increase the ability of staff to report and analyze data.

References

WMNF Wilderness Monitoring Database.

5.18.2 – Monitoring Question

Over time is there a change in visitor use at Wilderness destinations?

Last Updated

2014

Monitoring Indicator(s)

Visitor use, destination.

Monitoring Frequency

Annually.

Background & Driver(s)

The Forest Plan lists a variety of sites and desired conditions for the sites. This monitoring will help determine if desired future conditions for these sites are being met and if management action is needed. Part of the Wilderness Plan's Social component. This indicator samples at the same destinations and on determined dates and times over the life of the plan. The intent is to measure the direct and immediate human effects on other humans. Standards in the social component are definable and measurable but can be viewed as subjective and arbitrary. Excess of the desired standard triggers examination of management actions and policies. Data informs decision-making and serves warning that use-related problems may increase.

Monitoring Indicator 1

Results

Figure 53 shows the total reported visitation to wilderness areas on the WMNF while Figure 54 shows use by wilderness area.

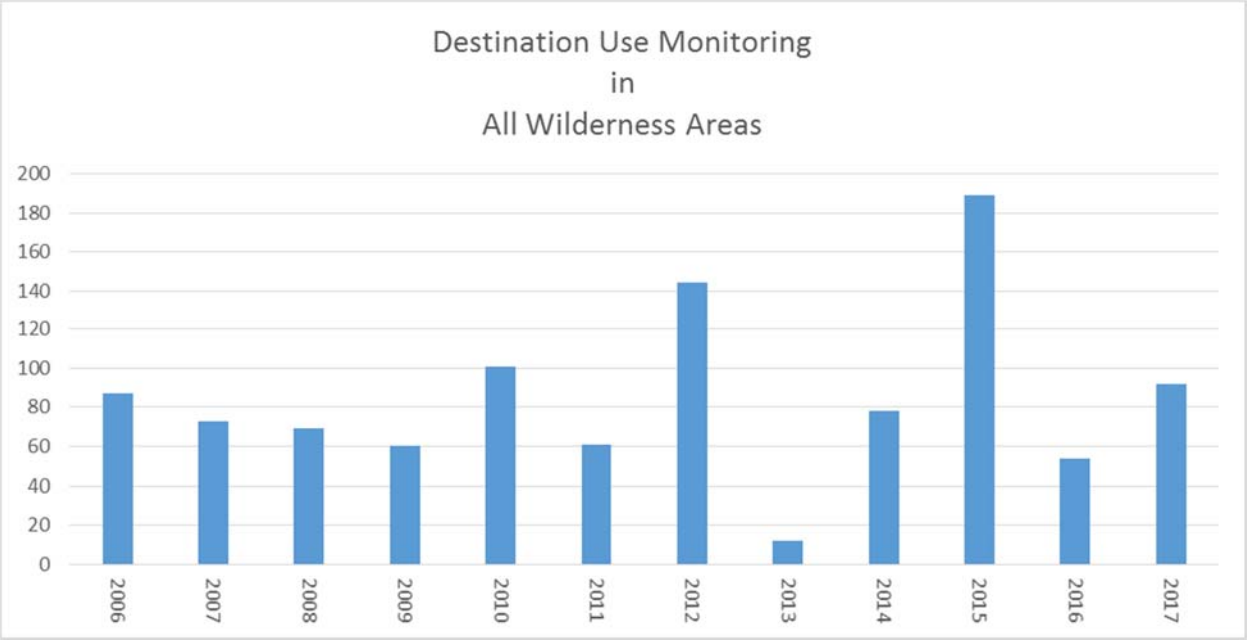

Figure 53. Reported annual visitation to destination areas in Wilderness from 2006 through 2017.

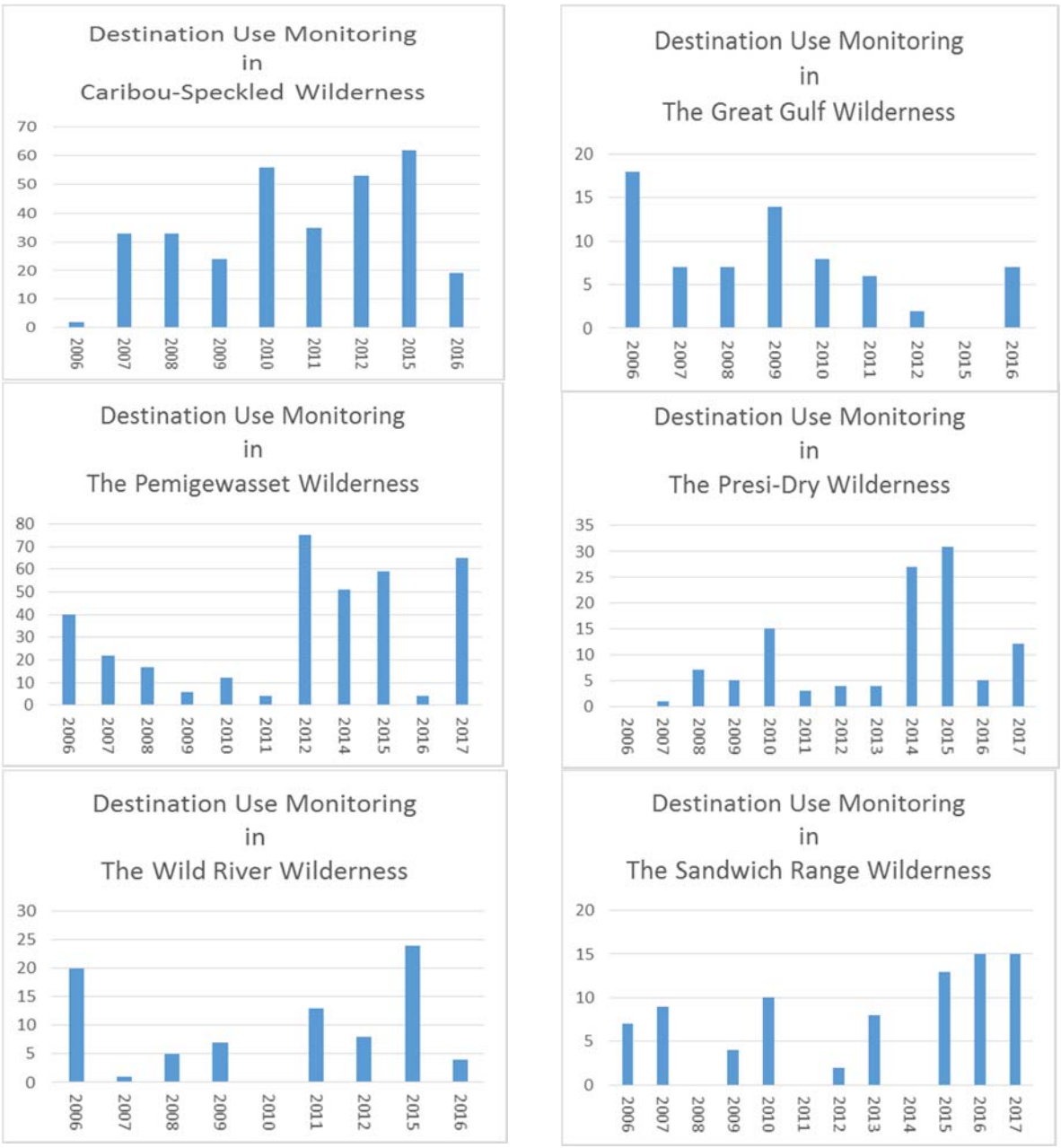

Figure 54. Reported destination use in each of six WMNF designated wilderness areas.

Discussion

In aggregate, reported annual visitation to destination areas in wilderness during monitoring sessions appears to be relatively stable (Figure 53). There is a notable, but vacillating, increase and decrease of use during monitoring sessions in the 2010-2015 period. However, use appears to have returned to previous levels during 2016 and early results from 2017 sessions.

For individual Wilderness areas, there is a high degree of variability of reported use during monitoring sessions from year to year (Figure 54). The plan states analysis should occur on a three year window. Within those windows, reported use appears to fall and drop with no discernable pattern. The only outlier is a steady general increase in reported use in Caribou-Speckled. This is followed by a sharp

decline in 2016. Though anecdotal evidence suggests that use is on the rise across Wilderness areas, the snapshot of use at these locations and times offer no distinct conclusions.

Recommendations

There is no conclusive evidence from reported use during monitoring sessions that management actions need to be taken in order to address use in wilderness. Efforts should be made, if possible and as funding allows, to gather more robust use numbers within WMNF Wilderness areas.

Evaluation of Monitoring Question and Indicator(s)

Destination and trail use monitoring are the longest running and most robust data sets for wilderness use that the WMNF currently has. Though there is currently no discernable pattern, it is possible that these indicators may still trigger future actions if necessary. Though we may be able to discern how use is changing over time, this question doesn't address what is an acceptable use level from a social standpoint. It will continue to be necessary to use this indicator in consort with other visitor experience and ecological-based indicators. Additional consideration is necessary to set more definitive guidance on appropriate levels of use for each zone.

References

WMNF Wilderness Monitoring Database.

5.18.3 – Monitoring Question

Does the density and size of dispersed campsites in Wilderness meet set criteria?

Last Updated

2018

Monitoring Indicator(s)

Campsite density, campsite size.

Monitoring Frequency

On a three year rotation.

Background & Driver(s)

As part of the Wilderness Plan's aesthetic component, this indicator attempts to measure the density and size of dispersed campsites in Wilderness. These numbers are then compared to a standard set for each zone classification within the Wilderness area. The intent is to measure the direct effect on the land that primarily affects the experience by other humans within a Wilderness area. In terms of Wilderness character, this indicator seeks to quantify opportunities for solitude and opportunities for primitive or unconfined recreation. Standards in the aesthetic component of the Wilderness Plan are definable and measurable. Excess of the desired standard triggers controlling action on Wilderness visitors.

Monitoring Indicator 1: Size

Results

The exact size of campsites in wilderness was abandoned as a standard after it was found that multiple people measured the same campsite differently. The use of size as an indicator was abandoned in 2011 as part of an all-hands meeting on Wilderness monitoring. The program switched over to the more general Wilderness Rapid Campsite Assessment method. Density of sites remains a monitoring standard. There are no results display.

Discussion

It was determined that the *exact* size of a campsite was impossible to determine at the level of the plan's standard. Small variations in how each individual measures a campsite might trigger the standards prematurely. The decision was made to move to the Wilderness Rapid Campsite Assessment. One of the measurements is a general look at size within broad categories. This keeps the variance of individual measurements down to a minimum. It does not lend itself as well to checking for 10% increases as precisely because the group breaks are beyond 10% increments. However, there is an ability to clearly note when a campsite moves from one impact category to the next.

Monitoring Indicator 2: Density

Results

There are no results to display in this report. This section will be updated in the 2020 biennial monitoring report.

Discussion

Campsite density outside of the plan's prescription continues to be a problem within all of our Wilderness areas. Recent work, funded through an internal USFS grant, allowed for the rehab of 150 total campsites within the six Wilderness areas.

Recommendations

It is expected that campsite rehab will remain a large part of the workload for our backcountry/wilderness staff. Staff will continue to use the Wilderness Plan standards to evaluate the priority of rehab for old sites, and suitability of new sites as they develop. A renewed commitment to monitoring and tracking campsites is necessary for the full utilization of this indicator.

Evaluation of Monitoring Question and Indicator(s)

The density indicator should remain as is. The size indicator needs to be dropped or reworded in favor of the new method of Wilderness Campsite classification.

References

WMNF Wilderness Monitoring Database.

Wilderness Rec Site Monitoring
https://www.wilderness.net/toolboxes/documents/recsitemonitor/National%20Minimum%20Recreation%20Site%20Monitoring%20Protocol.pdf

5.18.4 – Monitoring Question

Over time is there a change in visitor use on trails in Wilderness?

Last Updated

2018

Monitoring Indicator(s)

Visitor use, Trail.

Monitoring Frequency

Annually.

Background & Driver(s)

This is part of the Wilderness Plan's Social component. This indicator samples at the same destinations and on determined dates and times over the life of the plan. The intent is to measure the direct and immediate human effects on other humans. Standards in the social component are definable and measurable but can be viewed as subjective and arbitrary. Excess of the desired standard triggers examination of management actions and policies. Data informs decision-making and serves warning that use-related problems may increase. Added sessions monitoring sessions bring the direction provided in the Wilderness Plan up to National Solitude Monitoring standards.

Monitoring Indicator 1

Results

Data on trail use in WMNF Wilderness was collected from 2006 through 2017 (Figure 55 and Figure 56).

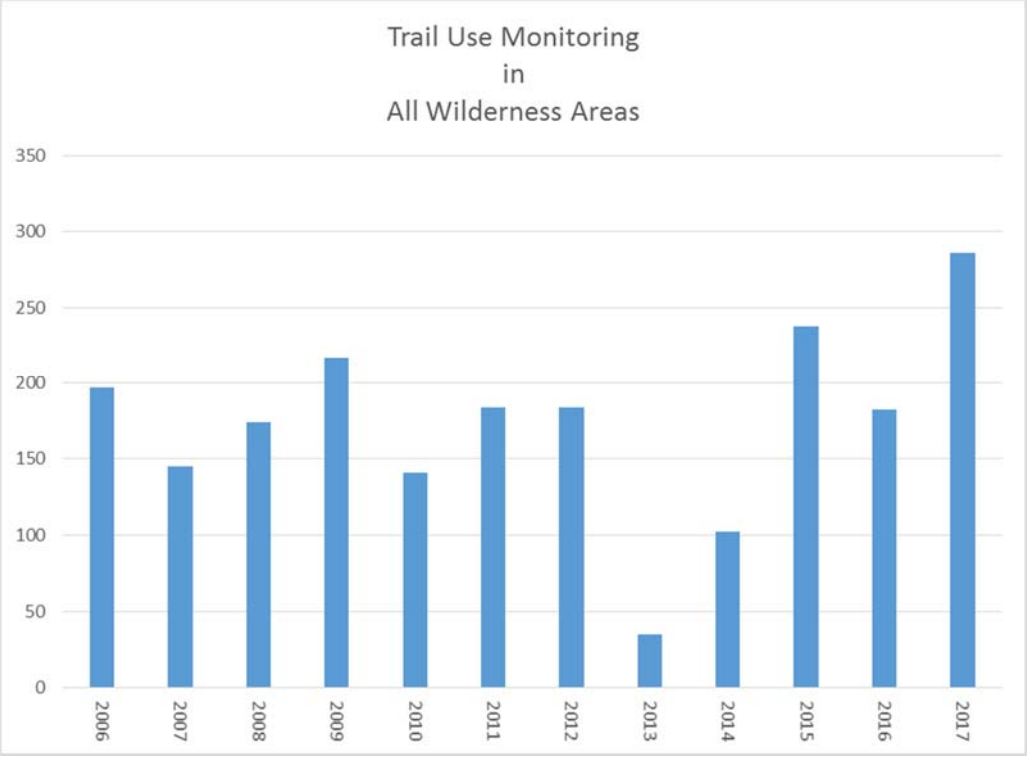

Figure 55. Total reported trail use by visitors in WMNF Wilderness.

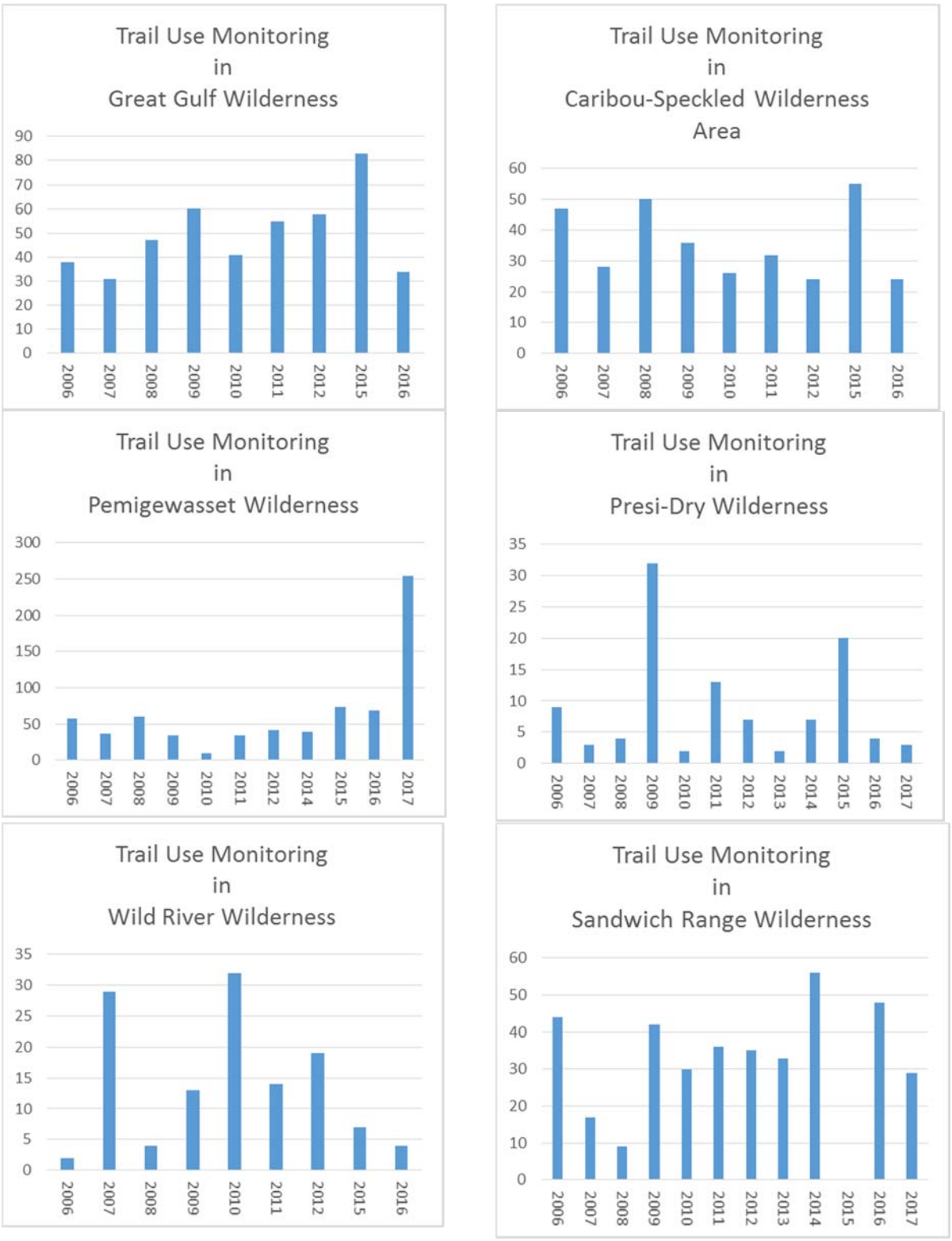

Figure 56. Reported trail use by Wilderness area.

Discussion

Though there are ebbs and flows in reported use, trail visitation in Wilderness during monitoring sessions appears to be trending slightly upwards (Figure 55). That slight uptick holds true for most of the

individual Wilderness areas (Figure 56). Presidential-Dry Range and Wild River Wilderness are the two notable exceptions. These areas show reported use trending slightly downward. All areas saw a wide range of variability throughout the dataset. It is unclear how much missed or additional monitoring sessions impacted these counts. As with destination monitoring, the plan states analysis should occur on a three year window. Within those windows, reported use appears to fall and rise with no discernable pattern. Anecdotal evidence suggests that use is on the rise across Wilderness areas. Reported trail use monitoring generally supports this assertion.

Recommendations

There is no conclusive evidence from reported use during monitoring sessions that management actions need to be taken in order to address use in Wilderness. Efforts should be made, if possible and as funding allows, to gather more robust use numbers within WMNF Wilderness areas.

Evaluation of Monitoring Question and Indicator(s)

The variability in the dataset makes it difficult to know when it is necessary to take/explore additional management actions based on these data points. This is exacerbated by the plan's direction to evaluate on a three year cycle. A longer 5 to 10 year cycle should be considered.

References

WMNF Wilderness Monitoring Database.

5.18.5 – Monitoring Question

What is the level of visitor satisfaction in Wilderness (quality of experience and perception of crowding)?

Last Updated

2018

Monitoring Indicator(s)

Quality of experience, perceptions of crowding.

Monitoring Frequency

Survey once for baseline information and once halfway through the life of the plan. Survey will focus on visitor perceptions of crowding at selected sites within Wilderness and quality of recreation experience. Survey will also assess whether information delivery and education messages are helping visitors find the appropriate recreation opportunity within or outside Wilderness.

Background & Driver(s)

Part of the Wilderness Plan's Social component. The intent is to measure the direct and immediate human effects on other humans. Standards in the social component are definable and measurable but can be viewed as subjective and arbitrary. Excess of the desired standard triggers examination of management actions and policies. Data informs decision-making and serves warning that use-related problems may increase. This indicator was meant to capture visitor perceptions of outstanding opportunities for solitude or primitive and unconfined recreation.

Monitoring Indicator 1: UVM Survey

Results

The Forest partnered with the UVM to develop a survey and trail count method that helped evaluate this indicator. We do not have the final results from the UVM survey. Trail counters were used to collect data in 2015 and surveys were completed in 2016. Full results are expected in 2018. Here, we present preliminary results. Figure 57 shows the results from four survey questions that were directly related to overall experience of visitors and their perceptions of crowding. The results are presented as the percentage of visitors that choose a particular response to each question. There were approximately 800 survey respondents.

Discussion

It is important to note that these surveys and the associated use counts were not completed within actual Wilderness areas. These surveys were conducted at the following very-high use areas throughout the Forest: Franconia, Gulfside trail, Crawford Path, and Rumney Rocks Climbing Area. It is possible that the very-high use nature of these locations will limit the applicability of these results to direct Wilderness experiences and perceptions. The level of use seen at these survey locations would generally be incompatible with Wilderness Management objectives. However, the preliminary results show respondents to this survey do not appear to perceive issues with crowding on the Forest at these high use locations. These same visitors overwhelmingly answered that they had a great experience on the WMNF and would not support any visitor use limits for trails.

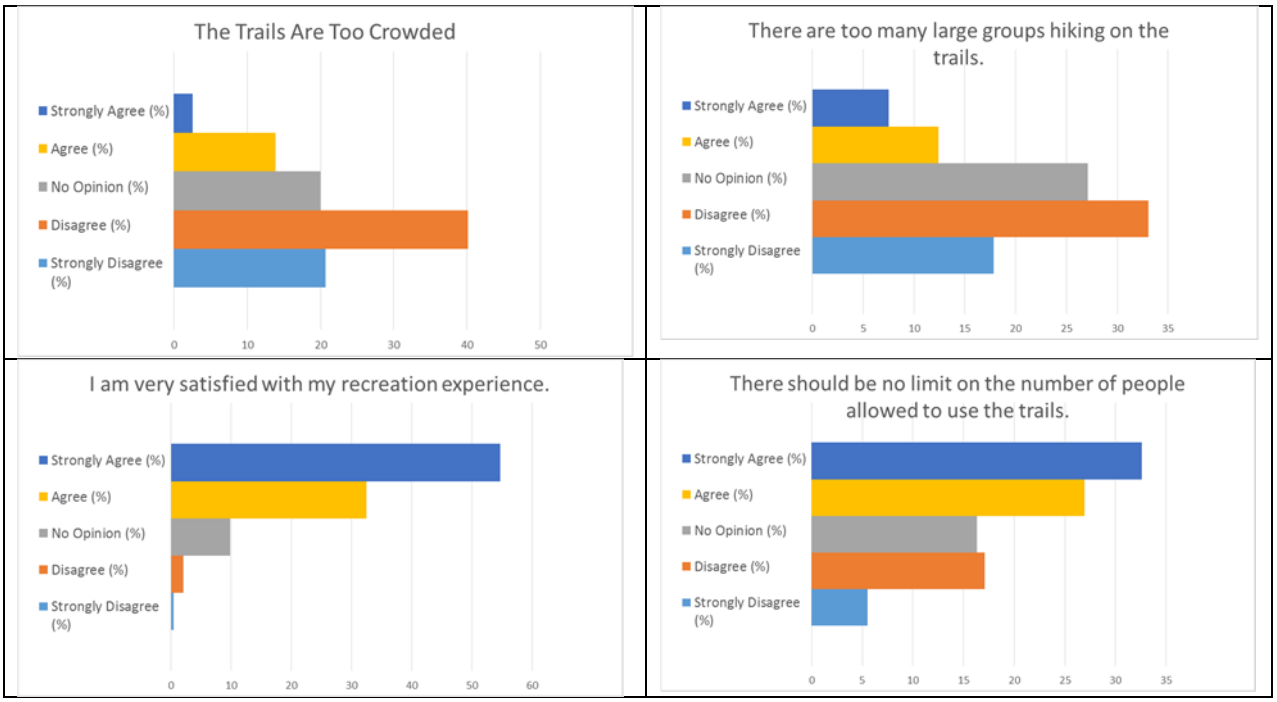

Figure 57. Results of visitor surveys completed by the University of Vermont in 2016.

Monitoring Indicator 2: National Visitor Use Monitoring (NVUM) Results

Results

NVUM surveys were conducted in 2005, 2010, and 2015. Visitors were asked to rate their satisfaction with various factors of their experience accessing and recreating in the WMNF Wilderness. These factors were: Restroom Cleanliness, Developed Facilities, Condition of Environment, Employee Helpfulness, Interpretive Displays, Parking Availability, Parking Lot Condition, Recreation Information Availability, Road Condition, Feeling of Safety, Scenery, Signage Adequacy, Trail Condition, and Value for Fee Paid. The results of these surveys were combined to provide one overall metric of satisfaction (Figure 58).

Discussion

NVUM results show that respondents overwhelmingly felt that they were very satisfied with their Wilderness experience. There does not appear to be a significant change in satisfaction between these five year snapshots.

Recommendations

Based on the results, there does not appear to be a visitor experience reason to alter direct visitor management actions in our Wilderness areas. Current visitor management practices should continue until better research or other factors necessitate intervention.

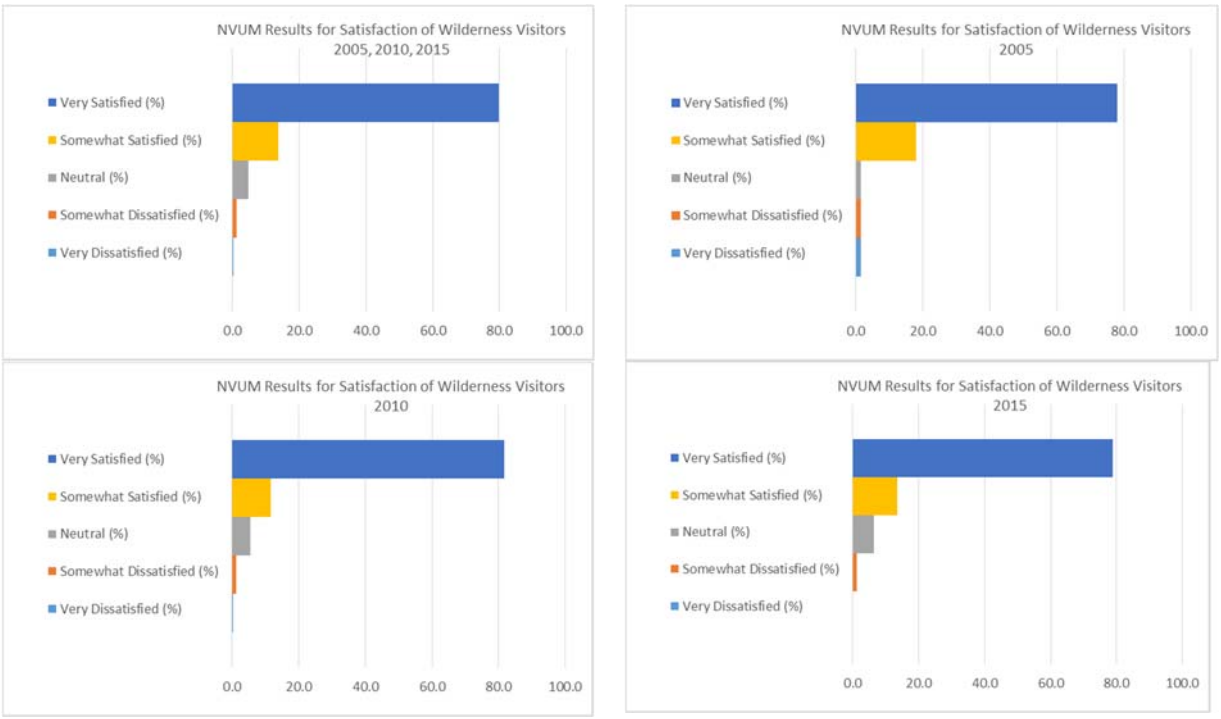

Figure 58. Cumulative (2005, 210, and 2015 combined) and individual year results from National Visitor Use Monitoring (NVUM) surveys.

Evaluation of Monitoring Question and Indicator(s)

Monitoring questions and indicators should continue as is. Additional Wilderness-specific surveys should be completed as funding and workload allow.

References

UVM Park Studies Laboratory (2015) Unpublished Draft: SUMMARY OF FIELD RESEARCH & PRELIMINARY RESULTS.

NVUM results for the White Mountain National Forest; 2005, 2010, 2015

5.19 – Wildlife

Low elevation breeding bird population trends, vegetation composition and age class trends, monitoring: Bicknell's throughsh, TES large mammals, Woodland bat acoustics, Wood turtles, RFSS butterflies, Bald eagles, Loons, Peregrine falcon ecological indicator, vernal pools

5.19.1 – Monitoring Question

Are population trends of low elevation breeding birds consistent with those projected under the Plan based on projected habitat changes?

Last Updated

2012

Monitoring Indicator(s)

Number of birds over time or Proportion of points with positive detections over time depending on relative abundance.

Monitoring Frequency

Every 2 years

Background & Driver(s)

The Forest Plan FEIS disclosed wildlife changes based on habitat objectives using Management Indicator Species (MIS). Although MIS are no longer required, this monitoring is still needed in order to determine if changing habitat conditions are reflected in corresponding population shifts. This monitoring uses a coarse filter approach that covers a broad suite of species so that unrelated variability in a single species trend does not confound analysis results. This monitoring is intended to provide long-term Forest-wide trends. The purpose is to count and evaluate the number of breeding birds by species along fixed transects over time. As various habitat types (based on composition and age class) increase or decrease substantially, we would expect to see corresponding shifts in population trends of breeding birds that are supported by these habitats. Gross level habitat changes can be determined by using the FSVegSpatial database, harvest records, or other methods.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.19.2 – Monitoring Question

How has the amount and quality of habitat changed relative to the changes projected by the Plan?

Last Updated

2014

Monitoring Indicator(s)

Acres of habitat by forest type and age class.

Monitoring Frequency

5 years

Background & Driver(s)

Query acres of habitat type and age classes from existing databases. Use the Habitat Guidance document to identify which forest types and age classes are tied to each habitat type (e.g. hardwoods, softwoods, etc.) for each habitat category.

Monitoring Indicator

The frequency of this monitoring question is every five year.

As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.19.3 – Monitoring Question

What is the population trend of Bicknell's throughsh on the Forest?

Last Updated

2018

Monitoring Indicator(s)

Population changes over time.

Monitoring Frequency

Bicknell's throughsh and other high elevation ecological indicator species are counted in odd-numbered years.

Background & Driver(s)

Bicknell's throughsh is a globally rare species that breeds in montane and coastal forests dominated by balsam fir. Suitable habitat is found in just 4 northeastern states: New York, Vermont, New Hampshire, and Maine, and in reaches of southern Canada. The WMNF supports both the largest block of Bicknell's throughsh habitat in the U.S. (26%) and the largest proportion of the total species population (31%) (Hill and Lloyd 2017). Potential threats on the breeding grounds include climate change, wind energy development, communication towers, acid precipitation, ski area development, and others. The Forest Service has recognized the important conservation role it plays in the management of Bicknell's throughsh, designating it a Regional Forester sensitive species for more than two decades and the WMNF included a standard in the Forest Plan (p. 2-16) to assure no net loss of Bicknell's throughsh habitat from Forest Service decisions.

Bicknell's throughsh monitoring addresses the following required monitoring elements:

*(5) **(iv)** The status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern*

The most direct way of determining if the Bicknell's throughsh population is changing is to count individuals during the breeding season when birds are most vocal. A standard breeding bird survey also allows data to be collected for multiple species in addition to Bicknell's throughsh, providing opportunities to compare trends across multiple species. Over 500 fixed survey points have been established in high elevation spruce-fir habitats on the WMNF. They were surveyed annually from 1993-2000 and then biennially from 2003-2017. All birds (not just Bicknell's throughsh) seen or counted during a 5-minute period are recorded.

Monitoring Indicator 1

Results

Mean Bicknell's throughsh observations per point were compared by year (Figure 59). Data from 2003 were omitted due to a skewed lack of survey effort in that year.

Because Bicknell's throughsh is a migratory species, population trends can be influenced by outside factors such as habitat conditions on the wintering grounds. Examining population trends of other high elevation species over the same time period can help to identify if non-local factors might be contributing to changes. The Forest Plan includes a suite of 5 ecological indicator species to represent

high elevation spruce-fir habitats (Figure 60). In addition to Bicknell's throughsh, these include the blackpoll warbler, yellow-bellied flycatcher, boreal chickadee, and spruce grouse. Of these species, three are long-distance, neotropical migrants. Bicknell's throughsh spend the winter on just four Caribbean islands, primarily on Hispaniola. Blackpoll warblers and yellow-bellied flycatchers travel to northern South America and Central America, respectively. Both the boreal chickadee and spruce grouse are winter residents that don't migrate.

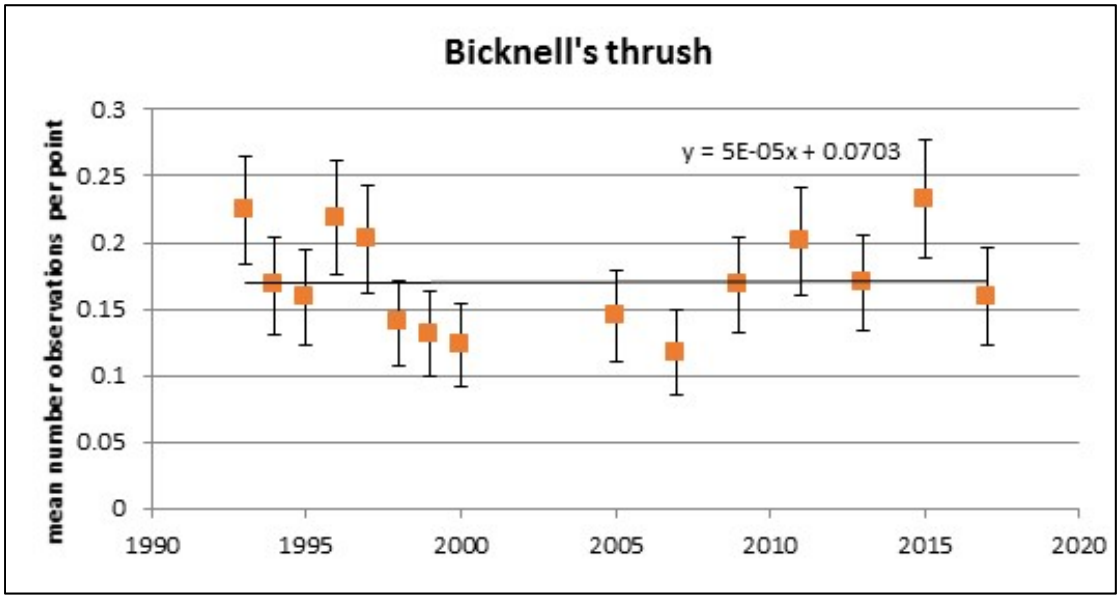

Figure 59. Bicknell's throughsh observations on the WMNF 1993-2017.

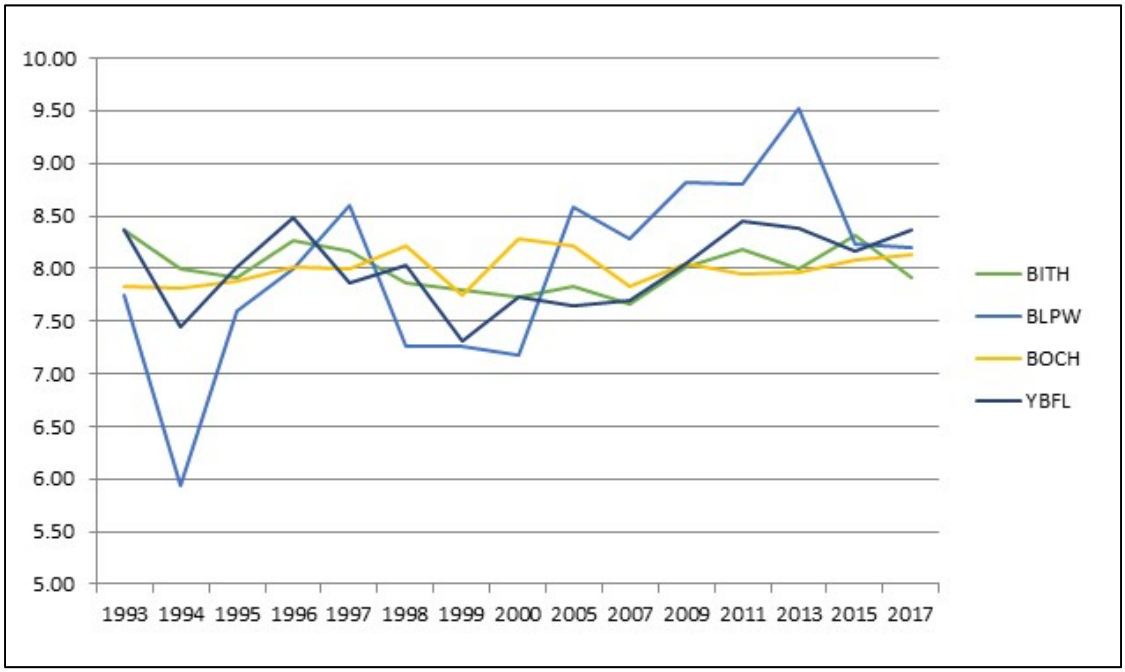

Figure 60. Relative rank of mean observations per point per year for Bicknell's throughsh (BITH), boreal chickadee (BOCH), and yellow-bellied flycatcher (YBFL).

Spruce grouse have only been detected 39 times over the 13 years of the survey data, which isn't enough to elucidate meaningful trends. However, the other four species are more common. Bicknell's throughsh were recorded at a total of 450 points (78%), with blackpoll warblers and yellow-bellied flycatchers found at 99.7% and 94% of points, respectively. Boreal chickadees were slightly less common, being recorded at 64% of points. In order to compare occurrence over time for these species together, the mean number of observations per point were ranked by year for each species, shown in Figure 60.

Discussion

Results show that despite a seemingly downward trend between 1993 and 2000, the Bicknell's throughsh population seems to have rebounded since 2006, with an overall stable trend. A similar pattern was documented by the Vermont Center for Ecostudies (2018) using citizen science data collected throughout the breeding range. A stable trend over the survey period is also reflected in the boreal chickadee and yellow-bellied flycatcher. The blackpoll warbler shows much more volatility over time on the WMNF, but with a likely increasing trend over the whole survey period.

This information indicates that, at the very least, high elevation spruce-fir forests on the WMNF continue to provide suitable habitat for these indicator species. The significance of this habitat is expected to become more pronounced in the future, as a result of climate change. A temperature increase of just 1°C is predicted to reduce the amount of suitable habitat by more than 50 percent (Rodenhouse et al. 2007). The tall peaks of the White Mountains may provide the last available habitat in the northeast U.S.

Recommendations

No management changes are indicated at this time.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan.

References

Hill, J.M. and J.D. Lloyd. 2017. A fine-scale U.S. population estimate of a montane spruce-fir bird species of conservation concern. Ecosphere 8(8):e01921. 10.1002/ecs2.1921

Rodenhouse, N.L., Matthews, S.N., McFarland, K.P., Lambert, J.D., Iverson, L.R., Prasad, A., Sillett, T.S., and R.T. Holmes. 2007. Potential effects of climate change on birds of the Northeast. Mitig. Adapt. Strat. Glob. Change 13:517-540.

Vermont Center for Ecostudies. 2018. The state of the mountain birds. Available: https://mountainbirds.vtecostudies.org/. Accessed February 12, 2018.

5.19.4 – Monitoring Question

Are Canada lynx and gray wolf present as residents on the WMNF?

Last Updated

2008

Monitoring Indicator(s)

Number of individuals by transect

Monitoring Frequency

Annually

Background & Driver(s)

The monitoring helps determine if these federally-listed species exist on the Forest in more than simply a transient status. It also tracks the prey base for these species. This information will help inform decisions on protection should either species become established on the Forest. The information will also play a role in implementing recovery/conservation plans.

At the same time, presence/absence and relative abundance can be obtained for other important carnivores such as bobcat, marten, fisher, and coyote, all of which may compete for the same prey resources as lynx and wolf. Additional uses for information captured with this protocol include comparison of presence by elevation (climate change concerns), snow depth over time, and counts of prey base (snowshoe hare or deer/moose). The data are collected with large mammal winter track counts and camera traps along established transects.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.19.5 – Monitoring Question

Where are woodland bats located on the Forest and what are their population trends?

Last Updated

2018

Monitoring Indicator(s)

Monitoring indicators for this question include species presence or absence per survey site (for stationary surveys), as well as relative call abundance over time (for driving surveys). Call abundance is more suited for driving surveys, where the assumption that each call is from a different bat is less likely to be violated. Stationary surveys, where bat detectors are left for days at a time, collect calls that may be from many bats flying by the microphone once or a few bats flying past the microphone multiple times. Bat population trends based on acoustic driving surveys were last evaluated in the monitoring report for fiscal year 2014. Trends based on the most recent acoustic survey protocol using stationary detectors has not been previously reported. Only stationary survey results are presented in this year's report.

Monitoring Frequency

Some level of bat acoustic monitoring has been completed annually since 2009. Stationary surveys from 2014 through 2017, conducted following the U.S. Fish and Wildlife Service survey protocol, are analyzed and presented in this report.

Background & Driver(s)

This monitoring question responds to the following required monitoring element:

> *(5)**(iv)** The status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.*

In 2007, biologists discovered a fungus causing massive mortality in hibernating bats in the northeastern U.S. The new disease, named white-nose syndrome (for the "fuzzy" appearance of the fungus on bats' faces) has spread rapidly and population declines were estimated at over 90 percent just a few years after the disease reached a new location. As a result, the U.S. Fish and Wildlife Service in 2015 listed the northern long-eared bat (*Myotis septentrionalis*) as Threatened under the Endangered Species Act. The remaining WMNF bats that hibernate (little brown bat (*M. lucifugus*), eastern small-footed bat (*M. leibii*), and tri-colored bat (*Perimyotis subflavus*)) have all been designated Regional Forester sensitive species.

This monitoring supports the following Forest Plan Rare and Unique Features Goal (p. 1-8):

- The White Mountain National Forest will provide sufficient habitat and protection to preclude the need for species listing under the Federal Endangered Species Act due to National Forest habitat conditions or effects of activities.
- For species currently listed under the Federal Endangered Species Act or designated Regional Forester's sensitive species, the Forest Service will contribute to conservation and recovery of species and their habitats.

Prior to white-nose syndrome, species such as the little brown bat and northern long-eared bat were considered fairly common and widespread on the WMNF (e.g., Chenger 2002, Chenger 2004). The eastern small-footed bat and tri-colored bat were considered naturally less common for unknown reasons. However, except for some historical survey work, specific occurrence data was limited. Now that populations are clearly reduced, biologists have speculated as to where remaining bats may congregate in the summer. All of these hibernating bats have evolved a behavioral reproductive strategy where adult females form maternity colonies occupying multiple roost trees in a local area. Females and their young rest in the roost trees during the day and the females leave at night to forage. The period of time (generally June and July) during which young of the year bats can't yet fly is a particularly vulnerable life stage, as any tree cutting during this time is likely to cause mortality. Stationary acoustic surveys allow biologists to identify possible locations of these colonies on the landscape, as well as track overall changes in distribution and potential habitat preferences.

Survey methods were developed by the U.S. Fish and Wildlife Service for the Indiana bat and northern long-eared bat, but are useful for recording all bat species occurrences. Survey areas (most often based on proposed projects) are subdivided in a way to allow two bat detector stations for every 123 acres. The detectors are programed to record all bat calls between 6:00 pm and 5:00 am and are left to record for at least two nights with suitable weather conditions (at least 50°F and minimal rain/wind). Calls are first screened, then passed through two automated species classifier programs and confirmed by hand to obtain results.

Monitoring Indicator 1

Results

Table 8 lists the number of stationary sites at which each WMNF bat species was detected between 2014 and 2017.

Table 8. Number of stationary sites at which WMNF bats were detected, 2014-2017.

Species	2014	2015	2016	2017
Big brown bat	5	5	16	9
Silver-haired bat	5	4	8	4
Red bat	4	3	9	4
Hoary bat	17	11	13	13
Eastern small-footed bat	0	1	4	0
Little brown bat	13	18	16	14
Northern long-eared bat	9	5	9	4
Tri-colored bat	0	1	1	2
# projects surveyed	9	4	2	3
Total # sites surveyed	146	126	66	86
Total # nights surveyed	706	511	356	436
Average # nights/site	5	4	5	5

Figure 61 graphs this same information as a percentage. Interestingly, almost all species showed the same general pattern over time, with the highest detection rates in 2016. The one exception to this was the tri-colored bat, which showed a much more stable increasing trend. One likely explanation is that

this species has always been very uncommon on the WMNF. The data shows a 200% increase between 2014 and 2017, but that is the result of detecting this species at just two sites. Drawing conclusions from such low raw numbers can be misleading. In addition, calls with unclear species identifications are labeled as "unknown" and were not included in this analysis. Finally, all survey stations were located in suitable woodland bat habitat; however, no assessment of habitat quality was conducted as part of this analysis. Trends in detectability might possibly reflect better quality habitat surveyed in 2016 compared to other years as opposed to actual population changes.

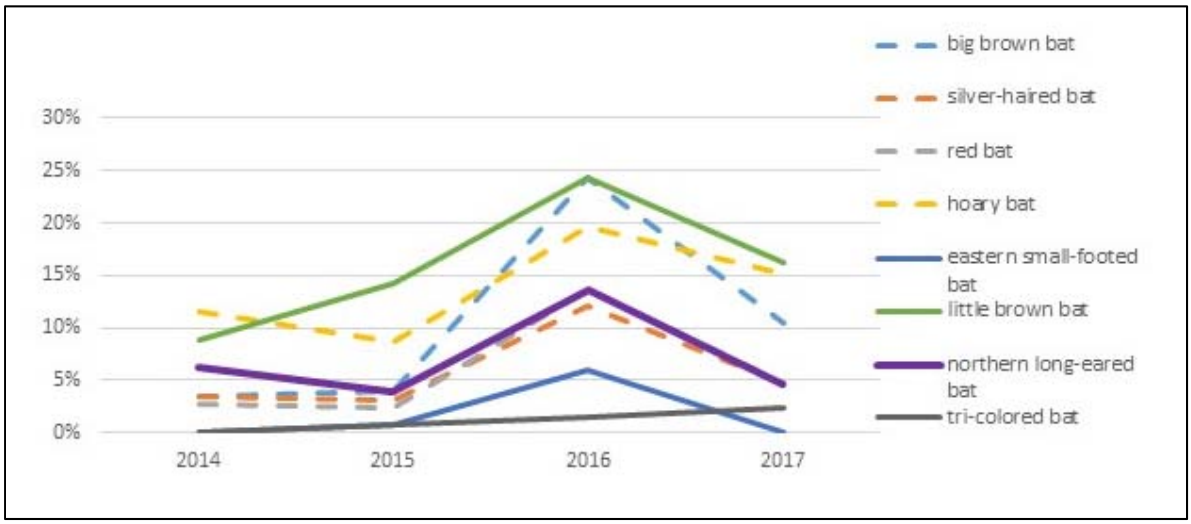

Figure 61. Percent of survey sites where bats were detected on the WMNF, 2014-2017. Species most affected by white-nose syndrome are shown as solid lines; less affected species are shown as dashed lines.

Discussion

Despite catastrophic population reductions from white-nose syndrome, uncommon bat species are still present on the WMNF. For example, although the northern long-eared bat was found at relatively few sites, those sites were located in almost every project area. This species (as well as the little brown bat) were still fairly well distributed across the Forest in suitable habitats, albeit in greatly reduced numbers. Also encouraging was the eastern small-footed bat and tri-colored bat, uncommon species even prior to white-nose syndrome, still documented at several sites.

Recommendations

No management changes are recommended.

Evaluation of Monitoring Question and Indicator(s)

Best available science on what constitutes the best survey or monitoring protocols have changed almost annually since white-nose syndrome was first discovered. However, the amount of effort that can be expended on these is a function of time and funds available. Recent direction for the Forest Service to contribute more effort to the North American Bat Monitoring Program (a long-term, continent-wide bat survey), may reduce our efforts to the local WMNF stationary survey protocol, but does not yet warrant a formal change to the monitoring guide.

References

Chenger, J. 2002. Summer survey for New Hampshire woodland bats; report prepared for U.S. Fish and Wildlife Service Ecological Services, New England Field Office. Bat Conservation and Management. Carlisle, PA. 47 pp.

Chenger, J. 2004. 2004 woodland bat survey of the White Mountain National Forest. Bat Conservation and Management, Inc. Carlisle, PA 45 pp.

White Mountain National Forest. 2015. Monitoring and Evaluation Report 2014. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd475522.pdf

5.19.6 – Monitoring Question

Are wood turtles continuing to persist on the WMNF?

Last Updated

2008

Monitoring Indicator(s)

Location/number of individuals per site

Monitoring Frequency

Biennial

Background & Driver(s)

The monitoring helps confirm whether this sensitive species remains present on the Forest. Identify suitable streams for wood turtles; time-constrained active search of overwintering pools, root wads, undercut banks, and along shores in identified segments during April and May or in September. To determine population trends, need photo-documentation of individuals captured. Recommend initial survey first to look for evidence of turtles (tracks), then follow-up detailed search for nests and evidence of hatched eggs.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This question will be considered for updating in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.19.7 – Monitoring Question

What is the population trend of sensitive butterfly species on the Forest?

Last Updated

2008

Monitoring Indicator(s)

Number of individuals / size of population over time.

Monitoring Frequency

5 years

Background & Driver(s)

The monitoring helps establish population trends in order to ensure these sensitive species persist on the Forest. McFarland protocol: Ocular count of target species; weekly visits throughout summer in potential alpine habitat (minimum). Could also add mark-recapture effort to improve statistics.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.19.8 – Monitoring Question

What is the population trend of breeding bald eagles on the WMNF?

Last Updated

2008

Monitoring Indicator(s)

Number of individuals / size of population

Monitoring Frequency

Annually

Background & Driver(s)

Identification of suitable nesting habitat on the Forest, which may be limited to Lake Tarleton. This contributes to recovery efforts and helps point out needs for nest protection. Monitoring is to determine if breeding is occurring on Lake Tarleton. Ocular survey for, and count of, eagles following NH Audubon Society protocols.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.19.9 – Monitoring Question

What is the population trend of loons on the Forest?

Last Updated

2008

Monitoring Indicator(s)

Number of individuals / size of population

Monitoring Frequency

Annually

Background & Driver(s)

The monitoring, using nest productivity surveys, helps establish population trends in order to insure this sensitive species persists on the Forest. Visit lakes or ponds where loon nesting is known or has occurred historically. Count nesting pairs during breeding season (June and July). Follow up to determine number of chicks fledged.

Monitoring Indicator

This monitoring question is not being updated in this report. As discussed in Sections 3 and 4 of this report, we are transitioning to a new monitoring and reporting process. This section will be updated in the FY2020 biennial monitoring report.

Results, Discussion, Recommendations, Evaluation of Monitoring Question and Indicator, References

These sections will be updated in the FY2020 biennial monitoring report.

5.19.10 – Monitoring Question

What are the effects of cliff-related recreation use on peregrine falcons and their nest success?

Last Updated

2018

Monitoring Indicator(s)

Number of active peregrine nests, percent of nestlings fledged

Monitoring Frequency

Planned monitoring frequency is every three years, but some data collection has occurred every year since the Forest Plan was revised in 2005.

Background & Driver(s)

This monitoring item responds to the following monitoring elements:

(5)(iv): The status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.

The peregrine falcon was once listed under the Endangered Species Act, primarily as a result of widespread organochlorine pesticide use that lead to eggshell thinning and failed reproduction across the continent. Once pesticides such as DDT were banned, peregrine falcon populations slowly began to rebound. The WMNF contains a number of historic cliff nest locations that have successfully produced chicks over many years. However, increasing interest in rock climbing could potentially result in unacceptable disturbance at cliff locations and reduced reproduction. As such, the peregrine falcon remains on the Regional Forest Sensitive Species list and monitoring activity at known nest locations tracks the status of reproductive success.

Peregrine falcon monitoring has been managed by the Audubon Society of NH in NH and the Maine Department of Inland Fisheries and Wildlife in ME. Volunteers coordinated by these organizations complete the bulk of monitoring, with limited assistance from WMNF staff.

Monitoring Indicator 1

Results & Discussion

Figure 62 shows the total number of active peregrine falcon nests on the WMNF and throughout the rest of NH over the past decade. WMNF nest sites include those physically on lands managed by the Forest Service or in sufficiently close proximity that WMNF management could affect the nest (e.g., hiking trails nearby).

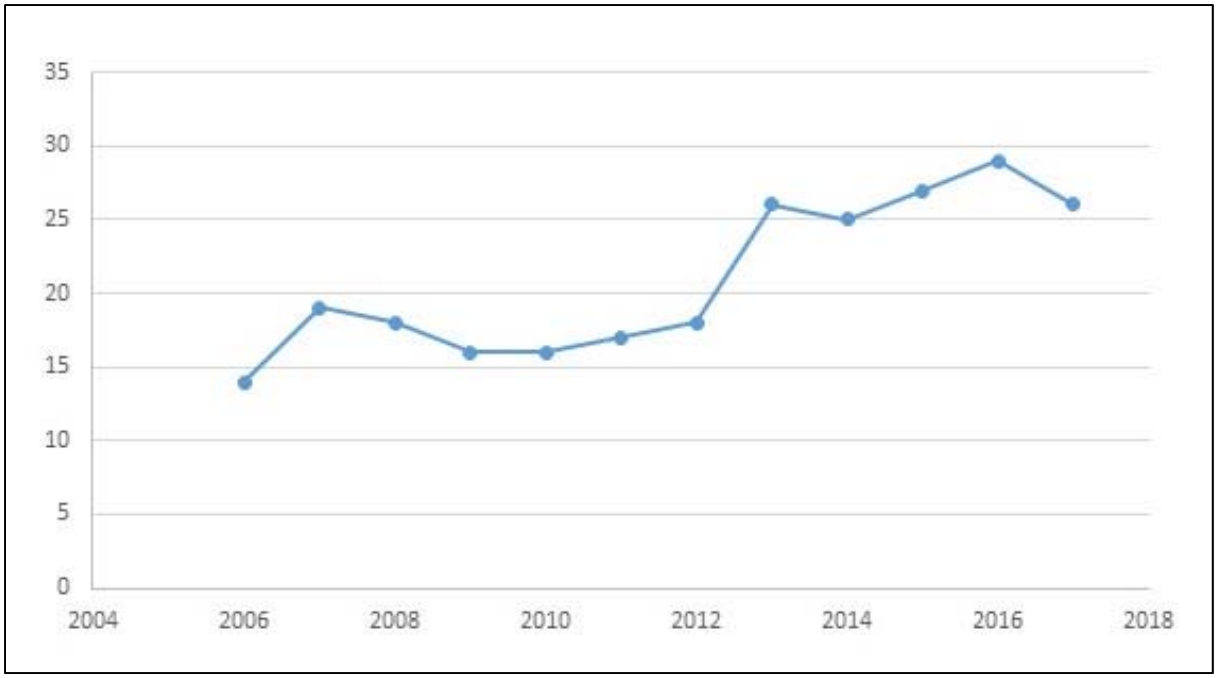

Figure 62. Active peregrine falcon nests in WMNF and New Hampshire combined

The total number of active peregrine falcon nests on the WMNF and in NH has grown since 2006, following increases in prior decades (not shown). Figure 63 summarizes data on active nests. Non-WMNF nests are those occurring elsewhere in New Hampshire (all NH data is courtesy of Chris Martin, Audubon Society of New Hampshire). Two WMNF nests occur in Maine.

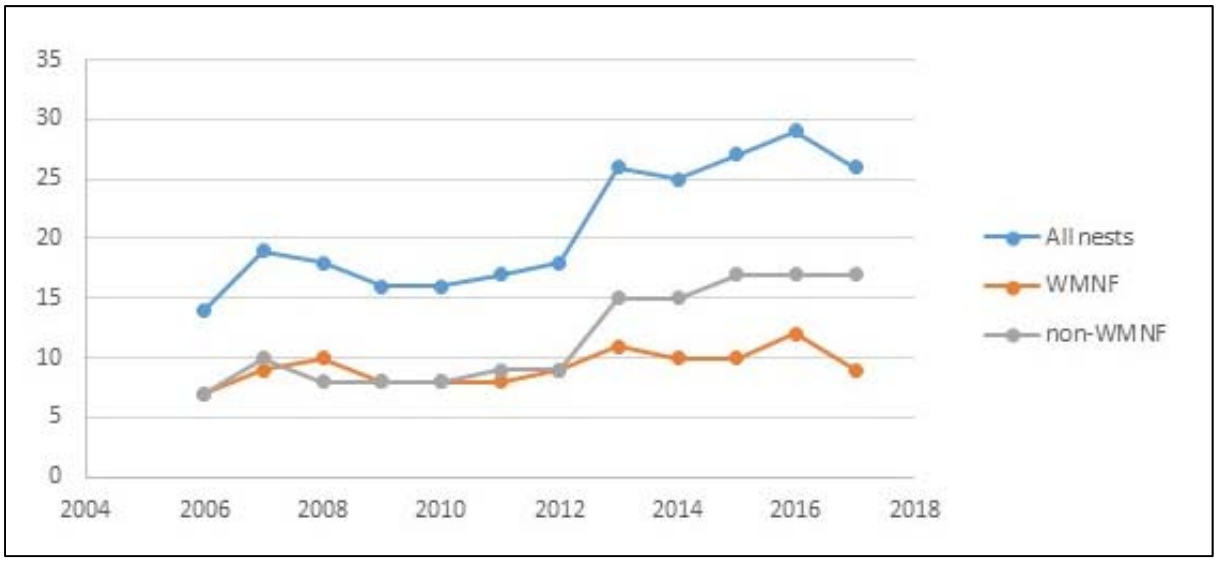

Figure 63. Number of active peregrine falcon nest sites, 2006-2017.

Like many wildlife populations, monitoring shows some year to year fluctuations, but the number of active nests on the WMNF has held fairly steady over the last decade, perhaps indicating that suitable habitat on the Forest is saturated. However, there seems to be little correlation in the number of chicks presumed successfully fledged between WMNF nests and non-WMNF nests (Figure 64). The most chicks

were fledged from WMNF nests in 2014, which was one of the lower years on record for non-WMNF nests. Similarly, the highest year for non-WMNF nests (2010) corresponded to a lower than average year for WMNF nests. Likely, there are conditions specific to each pair or nest causing the variation. However, the last three years were inexplicably the lowest of the decade for WMNF nests. Disturbance from rock climbing would be the most obvious cause for concern, but anecdotal evidence suggests ample support from the local rock climbing community in response to temporary closure notices around active cliffs.

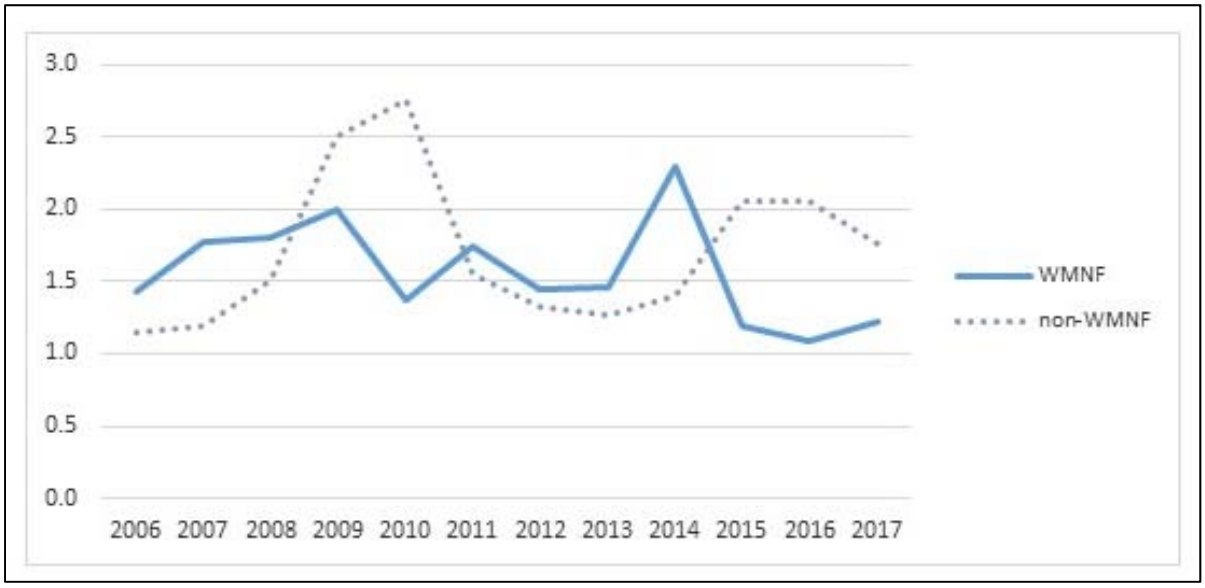

Figure 64. Number of peregrine falcon chicks presumed fledged per active nest

Recommendations

Wildlife populations commonly fluctuate based on a wide range of variables. While the reduction in number of young fledged per nest is cause for attention, it is not yet alarming. Continued monitoring over a few more years would help identify if this indicates a typical fluctuation or a definite downward trend. Analysis of any climbing use data at particular cliffs could also prove insightful.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan.

References

Martin, C. 2017. Peregrine falcon monitoring data, 2006-2017. Audubon Society of New Hampshire. Concord. NH

5.19.11 – Monitoring Question

Where are vernal pools on the Forest located and are they continuing to provide suitable habitat?

Last Updated

2018

Monitoring Indicator(s)

Number of egg masses of indicator species per pool.

Monitoring Frequency

Because this is a new monitoring item, we are still in early stages of data collection. We have collected one year of indicator species inventory on a number of vernal pools. Target of a 3 year cycle.

Background & Driver(s)

Vernal pools are small, natural depressions that temporarily hold water in the spring. They provide critical breeding habitat for certain amphibians, invertebrates, and plants. They may be threatened by development, road construction, or timber harvest that changes the local hydrologic regime through decreased shading over the pool (causing faster evaporation). In addition, changes in precipitation resulting from predicted climate change (e.g., Hayhoe et al. 2007) may cause widespread future reductions in available breeding habitat and resulting population isolation. The WMNF Forest Plan includes a number of Riparian and Aquatic standards and guidelines that specifically restrict certain activities around vernal pools (Forest Plan pp. 2-24 to 2-26).

This monitoring item responds to the following elements in 36 CFR 210.12:

(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems; and

(vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.

This monitoring item surveys for activity of 5 key indicator species: spotted salamander, blue-spotted salamander, Jefferson's salamander, wood frog, and fairy shrimp, consistent with other local vernal pool survey programs (NH Fish and Game Department 2016, ME DIFW and DEP 2017). In particular, evidence of reproductive activity of the vertebrate species (e.g., presence of egg masses, spermatophores, etc.) is targeted to make sure the pools are actually being used for breeding.

Monitoring Indicator 1

Results

Since 2009, WMNF staff have mapped 51 natural pools containing evidence of vernal pool indicator species. Of the 5 indicator species used on the WMNF, the spotted salamander and wood frog predominate, with at least one of these species found in 100 percent of confirmed vernal pools. Almost 40 percent of the pools had evidence of both species. Egg masses were the most common evidence of species present, being found in 100 percent of spotted salamander pools and 82 percent of wood frog pools. There seemed to be little correlation between species in year to year numbers of egg masses (Figure 65).

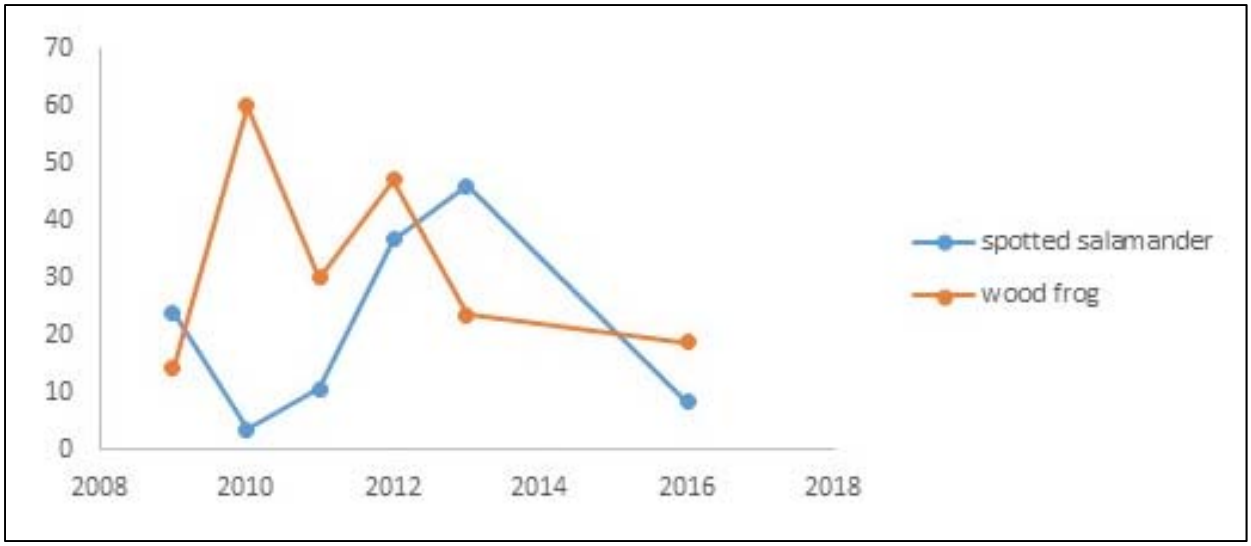

Figure 65. Average egg masses per vernal pool.

However, spotted salamanders appeared to use pools that were slightly deeper than those used by wood frogs (Table 9).

Table 9. Average maximum water depth in inches of WMNF Vernal pools used by spotted salamanders and wood frogs.

	2009	2010	2011	2012	2013	2016
Spotted salamander	23	42	32	23	22	51
Wood frog	10	18	24	14	13	20

Overall pool size ranged from as small as 38 ft^2 to 80,000 ft^2, with a median of 2,300 ft^2. Observers identified wood frog tadpoles or spotted salamander juveniles in 10 pools, indicating eggs had successfully hatched. Five of these pools were observed prior to May 15, with one as early as April 30.

Discussion

Vernal pool sample sizes are relatively small and not equally distributed across the Forest, so quantitative conclusions would be premature at this point. However, it seems apparent that spotted salamanders and wood frogs are far more abundant than the other vernal pool indicator species.

Target survey dates of late April/early May were validated to identify pools with egg masses. Initial efforts have been simply to identify where vernal pools on the WMNF are located so they can be considered when projects are proposed nearby. Their small size and the short window in which to confirm presence of indicator species makes them challenging to find. LIDAR technology may provide a new tool to more rapidly identify small depressions across large areas, where surveys can then be focused. Initial testing of this new technique shows promise and we hope to implement it in coming years to document many more vernal pools.

Recommendations

No changes are recommended at this time. Additional future work (once sample sizes are larger) includes more closely tracking the reproduction success of individual pools to see how frequently eggs fail to hatch due to becoming suspended out of the water from evaporation/lack of rainfall.

Evaluation of Monitoring Question and Indicator(s)

Evaluation of this monitoring question using the prescribed indicators continues to provide important information relevant to Forest Management and implementation of the Forest Plan.

References

Hayhoe, K., Wake, C.P., Huntington, T.G., Luo, L., Schwartz, M.D., Sheffield, J., Wood, E., Anderson, B., Bradbury, J., DeGaetano, A., Troy, T.J., and D. Wolfe. 2006. Past and future changes in climate and hydrological indicators in the U.S. Northeast. Clim. Dyn. 28:381-407

Maine Department of Inland Fisheries and Wildlife. 2017. Maine state vernal pool assessment form. Maine Department of Inland Fisheries and Wildlife, Bangor, ME. 3 pp.

New Hampshire Fish and Game Department and Maine Department of Environmental Protection. 2016. Identifying and documenting vernal pools in New Hampshire, third edition. M. Marchand, ed. New Hampshire Fish and Game Department, Concord, NH. 88 pp.

6.0 Recommendations

This section includes the recommendations resulting from evaluation of the monitoring questions presented in this report. Only evaluations that resulted in recommendations are included in this section.

5.1 – Air

5.1.1 – Are Air Quality Related Values (AQRVs) being impacted by air pollution, especially in Class I areas? Are the IMPROVE protocols or similar technology being implemented? How are trends in air quality emissions affecting surface water quality in the WMNF?

Recommendations

Data collection should be continued to determine if the current level of monitoring is adequate to make a determination for two of the WMNF guidelines (Air Quality Related Values (AQRVs), such as aquatic biota, vegetation, and water quality should be protected to the extent possible from adverse impacts related to air quality within the WMNF, and the Great Gulf and Presidential Range/Dry River Wilderness Class I Airsheds should be managed to protect air quality related values (AQRVs) such as visibility, vegetation, and water quality). Long term trends are variable depending on the ecosystem components being measured. A more extensive analysis accounting for seasonal variation, or other variables, would assist in helping to determine why continuing changes in air quality deposition have not contributed to trend changes of acidity.

The third air quality guideline for the WMNF is: The IMPROVE site at Camp Dodge, or similar substitute technology, should be maintained to monitor air quality in Class I Wilderness in the WMNF. This site should be maintained to demonstrate to upwind states that emissions reductions in their states is having a positive impact on increased visibility in the WMNF Class I areas.

5.1.3 – Are emissions from Forest prescribed fire activities negatively affecting sensitive receptors?

Recommendations

Continued use of the smoke monitor and use of photographic documentation would assist in determining whether smoke from prescribed fires is creating a public health concern.

5.2 – Botany

5.2.1 – What are the effects of various recreation use levels on alpine plant communities?

Recommendations

At this time, the VUMF and other stewardship and trail work efforts described above are appropriate management direction for Franconia Ridge and are consistent with the Forest Plan. Many lessons from Franconia Ridge are applicable to the remainder of alpine areas and trails on the WMNF, including the need for additional monitoring and follow-up on existing monitoring efforts in the Presidential Range, and additional site-specific follow-up on Franconia Ridge. Several monitoring efforts related to recreation impacts in the Alpine Zone monitoring question are underway in the Presidential Range, including in 2018 detailed documentation of vegetation condition and rare plants along the Crawford Path in concert with substantial trail work to remedy problem areas. Protection of all alpine areas consistent with the intent of the Forest Plan will require specific attention to preventing user impacts and recovering damaged areas in site-specific ways, as well as broader education and stewardship tactics.

5.3 – Botany and Wildlife

5.7 – Forestry

5.7.1 –To what extent have destructive insects and disease organisms increased?

Recommendations

Aerial detection surveys, HWA monitoring, and EAB trap tree monitoring should continue into the future. Continued monitoring improves the chances of early detection and eradication of pests.

Foresters should continue to implement silvicultural prescriptions that promote healthy and resilient forested stands and encourage a diversity of age classes and species. Many insects and diseases tend to prefer stressed, dying, and dead trees. Maintaining diverse age classes of healthy trees can increase resistance and resiliency to pests.

5.7.2 – Are lands adequately restocked within 5 years of a regeneration harvest or site preparation activities?

Recommendations

WMNF staff should continue to monitor stocking levels of suitable species in regeneration harvest areas through the use of walk-through ocular estimates, 1/1000 acres plots, and photo monitoring.

5.7.4 – Are we accomplishing silvicultural objectives related to our Forest Plan wildlife habitat types at the project level? For instance, if a forestry activity was intended to help perpetuate a paper birch/aspen forest type, did we meet that objective for the stand or harvest area?

Recommendations

Protocols were developed in FY 2018 to systematically visit a subsample of ten-year old stands/harvest areas to review project and prescription objectives and outcomes on the ground. To date, the protocols have not been implemented. Visiting stands 10 years post regeneration will help gain a greater understanding of attainment of management objectives and it is recommended to implement the protocol in FY 2019.

Based on the findings above, it is recommended to continue to describe habitat objectives as a range versus exact percentage requirements and continue to monitor stand 3 years and 10 years post regeneration harvest.

5.7.5 – Is residual tree damage from silvicultural activities within acceptable levels to meet our resource objectives?

Recommendations

Annually pick a recent sale area to verify that residual tree damage from silvicultural activities is within acceptable levels to meet resource objectives. Involve district silviculturist, timber sale administration team, and other specialists as needed in the review.

Consider updating the stocking survey protocol to include category for acceptable growing stock.

5.9 – Heritage

5.9.1 – What effect do management of recreation facilities and recreational use of the forest have on cultural and historic sites?

Recommendations

Continued monitoring of archaeological sites that have been used as camp sites but are now closed to modern camping, as well as continued monitoring of archaeological sites currently being used as camp sites with signage warning against archaeological site disturbance, and sites where camping occurs on archaeological sites with no signage, will provide comparison data as to the effectiveness of signing and/or closing archaeological sites to modern camping usage.

5.9.2 – What effect do vegetation management activities have on cultural and historic sites?

Recommendations

Additional monitoring of recent timber sales where a 50 foot buffer around cultural sites was utilized will be needed to evaluate the effectiveness of this strategy. Improved coordination and communication among program areas regarding project implementation timing will ensure that appropriate sites are monitored during or immediately post implementation to acquire the necessary data.

5.11 – Non-Native Invasive Species (NNIS)

5.11.3 – What portion of the Forest is infested with non-native, invasive plant species?

Recommendations

EDRR is an important part of any successful NNIS control strategy, and will remain an important component of NNIS control strategy on the WMNF in the future.

5.12 – Recreation

5.12.1 – What is the effect of off-road vehicles when using snowmobile trails early or late in the winter use season on soil, water, vegetation, fish and wildlife, forest visitors and cultural and historic resources?

Recommendations

By continuing to work with the States of New Hampshire and Maine on the opening and closing of the statewide systems we can reduce the number of resource damage incidents noted. We need to continue to monitor the trail use during the early/late season and in the mid-winter thaws.

5.12.2 –

Where and how much backcountry use is attributed to permitted outfitter/guides?

Recommendations

No new management actions should be taken based on the findings above. Districts should work to continue data collection to help inform future decisions.

5.12.3 – What is the rock climbing use on the Forest?

Recommendations

No recommendations can be made from the current dataset. Further evaluation of the need to quantify climbing use is necessary.

5.12.5 – Over time is there a change in use at permitted Forest backcountry facilities?

Recommendations

If use trends upwards it will be important to work with AMC regarding their policy to indefinitely concentrate use. Other management actions may be necessary in order to assure resource and visitor experience goals are met.

5.12.6 – Over time is there a change in use on Forest motorized and non-motorized trails?

Recommendations

The summer trail monitoring should be completed in three year cycles approximately every 10 years. Trails were sampled from 1998-2000 and 2008-2010. The monitoring provides insight on how trail us is changing over time. Monitoring is conducted across very high, high, moderate and low use trails to indicate if there are changes in the balance of the recreation opportunities in differing use areas.

The use levels appear to be assigned incorrectly for some trails. Using trail register data from 2008-2010 and current district knowledge the lists need to be updated. Having a more accurate list would provide a more accurate extrapolation of the data. Also on high and very high use trails, registers often ran out of space for signing in thus missing some use. Infra-red trail counters may be a more efficient method for collecting this information.

The registers are reliant on self-reporting by those visiting the trail. To adjust for those who do not self-register, each sampled trail should also have compliance monitoring. The compliance monitoring estimated the percentage of visitors who do not register. Due to the labor intensity of compliance monitoring, it did not occur consistently across the forest. This lack of information affects the final estimates of hikers on the forest. The balance of hiker visits on the Forest appears to be staying consistent with use level across the forest. The Forest Plan outlines that the Forest should try to keep use levels at their current balance.

In 2014 during the UVM study, trail use data was collected using infra-red counters. This method should continue to be explored to replace the trail register data method. It is a more efficient and accurate way to collect data.

5.13 – Scenery

5.13.1 – How do different harvest methods affect the visual landscape over time? Does modeling accurately display scenic conditions on the landscape?

Recommendations

If the sale layout results in substantial changes to the stand boundaries, the modifications should be reviewed to determine whether the changes affect consistency with scenery guidelines.

5.13.2 – To what degree are Scenic Integrity Objectives being followed in our decisions?

Recommendations

If the sale layout results in substantial changes to the stand boundaries, the modifications should be reviewed to determine whether the changes affect consistency with scenery guidelines.

5.16 – Water Resources & Aquatic Species

5.16.3 – Are Forest Plan S&G's sufficient for protecting, restoring, or improving headwater stream ecosystems (riparian and aquatic)? This question will be considered in two separate evaluations.

Are 25' no-cut zones and riparian management zones on perennial streams being implemented on timber sales?

Recommendations

Ensure newer forestry staff continues focusing on landform features to protect riparian zones and stream habitats, as demonstrated in this monitoring effort.

5.16.6 – Are watersheds fully functioning as ecological systems? Is watershed condition being maintained or improved?

Recommendations

The current recommendation is to continue full support of the WCF and to continue to assign priority watershed status to new watersheds as WRAP are completed.

5.16.7 – Are Best Management Practices (BMPs) for soil and water being implemented? Are BMPs effective at preventing negative impacts to soil and water?

Recommendations

Based on results from the BMP evaluations, the recommendation is to improve upon our ability to keep contractors, permit holders, and partners accountable for adhering to the project plans and/or contracts. BMP evaluations are beneficial and should continue indefinitely.

5.18 – Wilderness

5.18.1 – Is there a change in the number of incidents of improperly disposed of human litter and waste in Wilderness?

Recommendations

There are no management recommendations that can be drawn from the current dataset. In order to take management actions based on this data the Forest will need a renewed focus on incident entry.

5.18.2 – Over time is there a change in visitor use at Wilderness destinations?

Recommendations

There is no conclusive evidence from reported use during monitoring sessions that management actions need to be taken in order to address use in wilderness. Efforts should be made, if possible and as funding allows, to gather more robust use numbers within WMNF Wilderness areas.

5.18.3 – Does the density and size of dispersed campsites in Wilderness meet set criteria?

Recommendations

It is expected that campsite rehab will remain a large part of the workload for our backcountry/wilderness staff. Staff will continue to use the Wilderness Plan standards to evaluate the priority of rehab for old sites, and suitability of new sites as they develop. A renewed commitment to monitoring and tracking campsites is necessary for the full utilization of this indicator.

5.18.4 – Over time is there a change in visitor use on trails in Wilderness?

Recommendations

There is no conclusive evidence from reported use during monitoring sessions that management actions need to be taken in order to address use in Wilderness. Efforts should be made, if possible and as funding allows, to gather more robust use numbers within WMNF Wilderness areas.

5.18.5 – What is the level of visitor satisfaction in Wilderness (quality of experience and perception of crowding)?

Recommendations

Based on the results, there does not appear to be a visitor experience reason to alter direct visitor management actions in our Wilderness areas. Current visitor management practices should continue until better research or other factors necessitate intervention.

5.19 – Wildlife

5.19.10 – What are the effects of cliff-related recreation use on peregrine falcons and their nest success?

Recommendations

Wildlife populations commonly fluctuate based on a wide range of variables. While the reduction in number of young fledged per nest is cause for attention, it is not yet alarming. Continued monitoring over a few more years would help identify if this indicates a typical fluctuation or a definite downward trend. Analysis of any climbing use data at particular cliffs could also prove insightful.

5.19.11 – Where are vernal pools on the Forest located and are they continuing to provide suitable habitat?

Recommendations

No changes are recommended at this time. Additional future work (once sample sizes are larger) includes more closely tracking the reproduction success of individual pools to see how frequently eggs fail to hatch due to becoming suspended out of the water from evaporation/lack of rainfall.

7.0 List of 2016 Monitoring Guide Questions

The following is the list of questions included in the 2016 Monitoring Guide. Questions that are evaluated in this report are identified with an asterisk (*)

5.1 –Air

*5.1.1 - How are trends in air quality emissions affecting surface water quality in the WMNF? Are Air Quality Related Values (AQRVs) being impacted by air pollution, especially in Class I areas? Are the IMPROVE protocols or similar technology being implemented?

5.1.2 - Are lichens being impacted by air pollution, especially in Class I wilderness areas?

*5.1.3 – Are emissions from Forest prescribed fire activities negatively affecting sensitive receptors?

5.2 – Botany

*5.2.1 – What are the effects of various recreation use levels on alpine plant communities?

5.2.2 – What are the effects of cliff-related recreation use on cliff plant abundance and rare plant persistence?

5.2.3 – Are individual known occurrences on the Forest increasing, stable, or decreasing?

5.2.4 – What are the effects of even-age regeneration harvesting on herbaceous species? What is the change in percent cover in the herbaceous layer? Is there a change in species composition/diversity? If a change in species composition does occur, do those species originally present re-colonize the site? How long until the site is re-colonized by these species?

5.3 – Botany & Wildlife

*5.3.1 – What is the status of key ecological conditions required by each Federally-listed Threatened and Endangered species known to occur on the White Mountain National Forest?

5.4 – Climate Change

5.4.1 – How are the characteristics of snow changing on the White Mountain National Forest?

5.5 – Fire

5.5.1 – Is prescribed fire being effectively used as a tool to meet management objectives set forth in the Forest Plan (Chapter 1)? Are prescribed burns meeting the fire effect objectives set forth in each burn plan?

5.5.2 – Do wildland fires managed for resource benefit successfully meet objectives set forth in the Forest Plan and Fire Management Plan? Did the fire stay within the allowed management areas and fire behavior parameters presenting low risk to firefighter and public safety? Did the fire function as a natural ecosystem process to restore or maintain natural plant communities? Were hazardous fuels reduced?

5.6 – Forestry & Wildlife

5.6.1 – Are we managing forests at the project level in ways that move the Forest toward our Forest Plan wildlife habitat objectives?

5.6.2 – Are even-age regeneration harvest openings exceeding the 30 acre maximum size (Forest Plan, Vegetation Management S-1, p. 2-29)? Are we meeting wildlife habitat regeneration objectives in both size and quantity of openings by habitat types? If not, why not?

5.7 – Forestry

*5.7.1 – To what extent have destructive insects and disease organisms increased?

*5.7.2 – Are lands adequately restocked within 5 years of a regeneration harvest or site preparation activities?

5.7.3 – Are harvests occurring on lands suitable for timber management? Are our databases being kept current with identified changes that affect suitability determinations at the project and Forest Plan level?

*5.7.4 – Are we accomplishing silvicultural objectives related to our Forest Plan wildlife habitat types at the project level? For instance, if a forestry activity was intended to help perpetuate a paper birch/aspen forest type, did we meet that objective for the stand or harvest area?

Are we keeping our database updated relative to forest types? If forest type changed as a result of a harvest or new stand exam, did we update the FSVeg database to reflect the change?

*5.7.5 – Is residual tree damage from silvicultural activities within acceptable levels to meet our resource objectives?

5.8 – General

5.8.1 – To what extent are Forest Plan goals and objectives being attained?

5.8.2 – Are Forest Plan standards and guidelines being implemented at the project level consistent with the Plan and NEPA analysis?

5.9 – Heritage

*5.9.1 – What effect do management of recreation facilities and recreational use of the forest have on cultural and historic sites?

*5.9.2 – What effect do vegetation management activities have on cultural and historic sites?

5.10 – Minerals

5.10.1 – Are mineral collectors adhering to Forest Plan standards and guidelines?

5.11 – NNIS

5.11.1 – To what extent have been NNIS control objectives been attained?

5.11.2 – Are invasive insects or diseases present on the WMNF? Where are the nearest infestations of these species?

*5.11.3 –What portion of the Forest is infested with non-native, invasive plant species?

5.12 – Recreation

*5.12.1 – What is the effect of off-road vehicles when using snowmobile trails early or late in the winter use season on soil, water, vegetation, fish and wildlife, forest visitors and cultural and historic resources?

*5.12.2 – Where and how much backcountry use is attributed to permitted outfitter/guides?

*5.12.3 – What is the rock climbing use on the Forest?

5.12.4 – How is the amount of use at Forest developed campgrounds, day use areas, developed facilities, and ski areas changing over time?

*5.12.5 – Over time is there a change in use at permitted Forest backcountry facilities?

5.12.6 – Over time is there a change in use on Forest motorized and non-motorized trails?

*5.12.7 – What is the level of visitor satisfaction on the Forest (as measured by quality of experience and perception of crowding) at developed sites as well as in the backcountry?

5.13 - Scenery

*5.13.1 – How do different harvest methods affect the visual landscape over time? Does modeling accurately display scenic conditions on the landscape?

*5.13.2 – To what degree are Scenic Integrity Objectives being followed in our decisions?

5.14 – Socioeconomics

*5.14.1 –What is the economic role of the Forest in the region?

*5.14.2 – How do actual outputs and management activities compare with the estimated practices identified in Forest Plan Appendix B?

5.15 – Soils

*5.15.1 – Is soil compaction or displacement occurring as a result of Forest management actions (harvest prescribed fire, recreation management)? If so, are there indirect effects on forest productivity and/or forest health?

*5.15.2 – Is soil base cation depletion occurring? If so, are there indirect effects on forest productivity or forest health?

5.16 – Water Resources & Aquatic Species

5.16.1 – Are stream habitat restoration/improvement projects meeting objectives and increasing habitat complexity and fish productivity? Are AOP projects providing fish passage and stable stream beds through the crossings?

5.16.2 – What are the effects of recreation use and related infrastructure on water quality?

*5.16.3 – Are Forest Plan S&G's sufficient for protecting, restoring, or improving headwater stream ecosystems (riparian and aquatic)?

*5.16.4 – Are stream temperatures changing over time? Are fish communities changing with temperature changes?

5.16.5 – Is the Forest providing a range of fishing opportunities that meets fishing demand while identifying and protecting wild populations of brook trout?

*5.16.6 – Are watersheds fully functioning as ecological systems? Is watershed condition being maintained or improved?

*5.16.7 – Are Best Management Practices (BMPs) for soil and water being implemented? Are BMPs effective at preventing negative impacts to soil and water?

5.17 – Wild & Scenic Rivers

5.17.1 – Are developments and projects within the Wildcat Wild & Scenic River corridor consistent with the Wild and Scenic Rivers Act.?

5.18 – Wilderness

*5.18.1 – Is there a change in the number of incidents of improperly disposed of human litter and waste in Wilderness?

*5.18.2 – Over time is there a change in visitor use at Wilderness destinations?

*5.18.3 – Does the density and size of dispersed campsites in Wilderness meet set criteria?

*5.18.4 – Over time is there a change in visitor use on trails in Wilderness?

*5.18.5 – What is the level of visitor satisfaction in Wilderness (quality of experience and perception of crowding)?

5.19 – Wildlife

5.19.1 – Are population trends of low elevation breeding birds consistent with those projected under the Plan based on projected habitat changes?

5.19.2 – How has the amount and quality of habitat changed relative to the changes projected by the Plan?

*5.19.3 – What is the population trend of Bicknell's throughsh on the Forest?

5.19.4 – Are Canada lynx and gray wolf present as residents on the WMNF?

*5.19.5 – Where are woodland bats located on the Forest and what are their population trends?

5.19.6 – Are wood turtles continuing to persist on the WMNF?

5.19.7 – What is the population trend of sensitive butterfly species on the Forest?

5.19.8 – What is the population trend of breeding bald eagles on the WMNF?

5.19.9 – What is the population trend of loons on the Forest?

*5.19.10 – What are the effects of cliff-related recreation use on peregrine falcons and their nest success?

*5.19.11 – Where are vernal pools on the Forest located and are they continuing to provide suitable habitat?