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Green Mountain National Forest

Annual Monitoring and Evaluation Report

Fiscal Years 2014, 2015, and 2016



Calculating the diameter at breast height of a spruce tree.

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**Annual Monitoring and Evaluation Report
Fiscal Years 2014, 2015, and 2016**

Green Mountain National Forest

USDA Forest Service, Eastern Region
October 2021

This Annual Monitoring and Evaluation Report combines monitoring completed in fiscal years 2014, 2015, and 2016 for the Green Mountain National Forest Land and Resource Management Plan (Forest Plan) dated 2006. Monitoring and evaluation of forest plans is required by the National Forest Management Act and associated planning regulations at 36 CFR 219 dated September 30, 1982. The Green Mountain National Forest monitoring plan is described in Chapter 4 (Monitoring and Evaluation) of the Forest Plan. Monitoring consists of mandatory components found in every forest plan, as well as monitoring that is tailored to address specific Green Mountain National Forest resource concerns raised from public involvement and Forest Service interdisciplinary team review.

Approval

I have reviewed the *Green Mountain National Forest - Fiscal Years 2014, 2015, and 2016 Annual Monitoring and Evaluation Report* including its findings, conclusions, and recommendations. I conclude the report meets the intent of both the Forest Plan (Chapter 4) as well as the 1982 36 CFR 219 regulations.

John A. Sinclair
Forest Supervisor
Green Mountain and Finger Lakes National Forests

Date

1. Introduction

Monitoring and evaluation reporting is required by the National Forest Management Act and associated 1982 planning regulations (36 CFR 219.12(k)) to determine how well the Green Mountain National Forest (GMNF) Land and Resource Management Plan (Forest Plan) is being implemented. The *Green Mountain National Forest - Fiscal Years 2014, 2015, and 2016 Annual Monitoring and Evaluation Report* documents the results of the monitoring accomplished during fiscal years 2014 to 2016 (October 1, 2013, to September 30, 2016). The report describes monitoring items by resource category, provides data pertaining to the effects and effectiveness of Forest Plan management direction, and discusses various resource management efforts implemented during fiscal years 2014, 2015, and 2016. A major part of the report is to determine if the resource outputs, management costs, returns, and environmental objectives were achieved as envisioned in the Forest Plan.

Monitoring Plan

Chapter 4 of the GMNF Forest Plan (Monitoring and Evaluation, or Monitoring Plan) includes programmatic direction for monitoring and evaluating Forest Plan implementation. Chapter 4 defines the over-arching, strategic questions that must be addressed by the Forest Service through monitoring, including broad timetables and schedules for analysis and reporting.

In addition to direction for monitoring and evaluation, the Forest Plan describes the GMNF goals, objectives, and desired future conditions. The Forest Plan allocated land to different management areas, each with unique desired future conditions, major emphasis, and management direction.

Specifically, monitoring and evaluation provides a basis to determine:

- Whether Forest Plan implementation is achieving multiple resource goals, objectives, and desired conditions
- If application of standards and guidelines are effective in maintaining the productivity of the land
- If conditions or demands in the area covered by the Forest Plan have changed significantly enough to require a revision to the Plan

The Forest Plan may also be amended to adapt to new information and changed conditions identified through monitoring and evaluation efforts. Through this adaptive management approach, the Forest Plan is kept current.

Monitoring Implementation Guide

In addition to the programmatic direction provided in the 2006 Forest Plan, Forest Service staff completed the *Monitoring Implementation Guide* (also referred to as the Monitoring Guide) in 2007. The monitoring guide provides more specific procedural guidance to implement the monitoring strategy outlined in the Forest Plan. The guide contains specific monitoring elements, along with methods, protocols, and analytical procedures to be followed. The monitoring guide is a suite of monitoring activities used to help Forest Service staff understand and answer the Forest Plan monitoring questions. Based on information garnered through annual monitoring and evaluation reports, the monitoring guide has been updated to incorporate suggested changes since 2007. The annual monitoring and evaluation report for fiscal years 2014, 2015, and 2016 is based on the 2012 Monitoring Guide.

Annual Monitoring Schedule

The *Annual Monitoring Schedule* outlines monitoring items, time frames, roles, and locations for the upcoming year and is linked directly to both the 2006 Forest Plan and the Monitoring Guide. The Forest Service prepares and revises this schedule as necessary as part of the annual work planning process. Some monitoring items are performed or measured annually, whereas others are scheduled with different time intervals that are determined necessary or appropriate for timely and effective evaluation. The schedule was last updated in 2012.

Annual Monitoring and Evaluation Reports

Annual monitoring and evaluation (M&E) reports provide a forum for the review of current-year findings including:

- What monitoring activities were completed?
- What Forest Plan monitoring questions were addressed?
- How well did the monitoring address those questions?
- Do future monitoring activities need modification?

Comparison of results with those from previous years can identify trends and highlight where management is or is not achieving desired goals. It is during this annual review that Forest Service staff can determine if changes to the 2006 Forest Plan or the Monitoring Guide are necessary.

Annual M&E reports are prepared by an interdisciplinary team of Forest Service specialists that incorporate information gathered from various sources including partners, private citizens, and non-profit organizations. The Forest Service is grateful to the people who contribute their monitoring efforts and results and who take an interest in actively participating in the management GMNF.

Annual Monitoring and Evaluation Report Outline

This report is divided into three chapters:

- Chapter 1 is the introduction providing an overview of the monitoring program.
- Chapter 2 includes the detailed results of the monitoring and evaluation of elements specified in the Monitoring Plan, Guide and Schedule. Each element includes background information, a brief explanation of the monitoring activities and protocols, evaluation of monitoring results, and conclusions or recommendations.
- Chapter 3 is a list of the Forest Service staff that provided information for the report.

The activities and outputs monitored may be traced to one of three sources:

- The 1982 planning regulations associated with the National Forest Management Act (36 CFR 219 dated September 30, 1982) which outline specific activities and outputs to be monitored.
- Forest Plan requirements (Chapter 4) selected to facilitate comparison between actual conditions and desired future conditions.
- Questions derived from public comments which are particularly useful for monitoring public satisfaction with the resources and services provided by GMNF.

2. Discussion of Monitoring

Table 2-1 consists of elements from Tables 4.1-3 through 4.1-7 of the Forest Plan. It identifies the resource element, monitoring question and driver, and frequency of measurement that are discussed in this report.

Table 2-1. Resource areas, monitoring questions and drivers, and measurement frequency.

Resource Element		Monitoring Question(s)	Monitoring Driver	Frequency of Measurement
1	All	How close are actual outputs and services to projected outputs and services?	A quantitative estimate of performance comparing outputs and services with those projected by the 2006 Forest Plan.	Annual
2	All	How close are actual costs to projected costs?	Documentation of costs for carrying out the planned management prescriptions as compared with costs estimated in the Forest Plan.	Annual
3	All	To what extent have Objectives been attained?	Forest Plan Objectives	Annual
4	All	To what extent have Standards and Guidelines been applied?	Forest Plan Standards and Guidelines	Annual
5	All	What are the effects of management practices prescribed by the 2006 Forest Plan?	Forest Plan Management Area Guidance	Annual
6	Transportation System	Is the use of vehicles off roads causing considerable adverse effects on resources or other forest visitors; how effective are forest management practices in managing vehicle use off roads?	Regulation requirements (36 CFR) 295 that use of vehicles off roads shall be planned, implemented and monitored in order to protect resources and visitors from considerable adverse effects, promote public safety, and minimize conflicts with other NFS land uses of the NFS lands	Annual
7	Recreation	Is the quality of the Forest Service trail system and recreation facilities being improved through operation and maintenance?	Forest Plan Goal 12	Annual
8	Wilderness	To what extent is Wilderness managed to preserve its Wilderness character?	Forest Plan Goal 13	Annual
9	Wild, Scenic, and Recreational Rivers	To what extent are eligible Wild and Scenic Rivers managed to preserve their outstandingly remarkable values?	Eligible Wild, Scenic, and Recreational Rivers Management Area Guidance; Wild and Scenic Rivers Act 16 U.S.C. 1271-1287, October 2, 1968, as amended 1972, 1974-1976, 1978-1980, 1984, 1986-1994 and 1996.	Annual
10	Soil, Water, and Air	To what extent are air quality and atmospheric deposition affecting sensitive components of the forest ecosystem?	Forest Plan Goals 2-8, 12 and 13	1-5 Years

Resource Element	Monitoring Question(s)	Monitoring Driver	Frequency of Measurement
11	Soil, Water, and Air	To what extent are Forest Service management and restoration activities maintaining or improving soil quality?	Forest Plan Goal 3 1-5 Years
12	Soil, Water, and Air	To what extent is Forest management affecting water quality, quantity, flow timing, and the physical features of aquatic, fisheries, riparian, vernal pool, and wetland habitats?	Forest Plan Goal 4 1-5 Years
13	Wildlife: Management Indicator Species	To what extent are forest management activities providing habitat for MIS?	Forest Plan Goal 2, Maintain and restore quality, quantity, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals. Annual
14	Native and Desired Non-Native Species	To what extent are management activities contributing toward population viability for native and desired non-native species? To what extent do management activities contribute toward restoration and maintenance of habitat for native and desirable non-native species?	Forest Plan Goal 2 Variable
15	Vegetation	Are harvested lands adequately restocked according to Plan goals?	Lands are adequately restocked as specified in the Forest Plan. Annual
16	Insects and Disease	Are insect and disease levels compatible with objectives for maintaining healthy forest conditions?	Destructive insects and disease organisms do not increase to potentially damaging levels following management activities. Annual
17	Interpretation and Education	In what way is the Forest Service providing information and education opportunities that enhance the understanding of the GMNF?	Forest Plan Goal 19 Annual

Air

Evaluation Question: Air Particulate

Monitoring Question: To what extent are air quality and atmospheric deposition affecting sensitive components of the forest ecosystem?

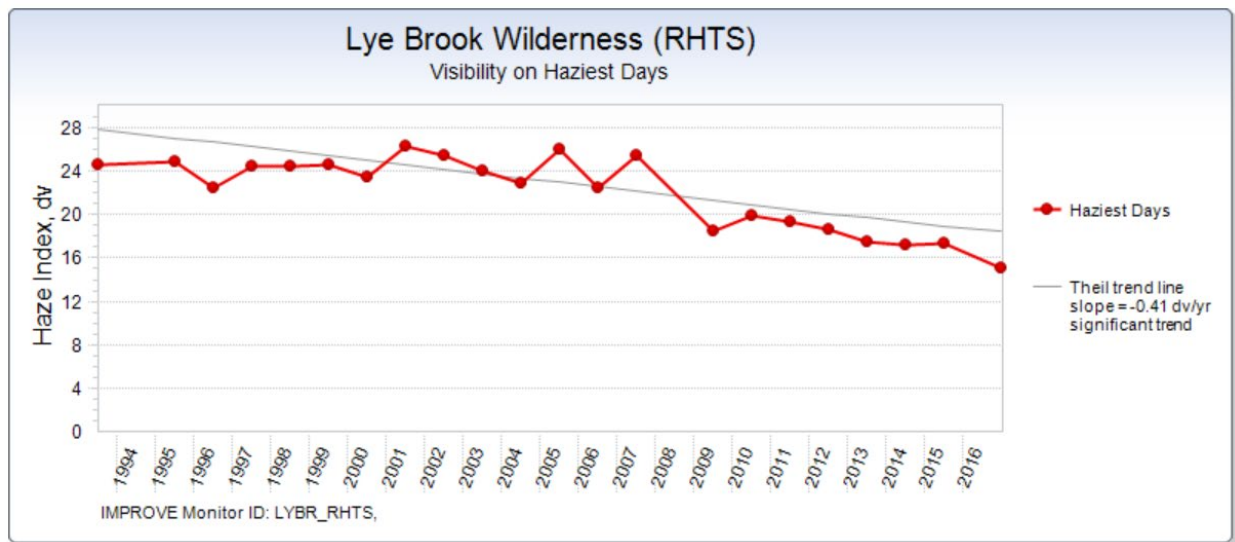
Detailed Monitoring Question: What is the composition of particles in the air, and how are the levels of particulates changing over time?

Monitoring Activities: GMNF staff monitors visibility, which is an Air Quality Related Value (AQRV), near GMNF Class I area which is the Lye Brook Wilderness area, as designated by the Clean Air Act Amendments of 1977.

To measure for the visibility AQRV, GMNF staff maintains an IMPROVE (Interagency Monitoring of Protected Visual Environments) site on Mount Snow, near the Lye Brook Wilderness Area. The IMPROVE site consists of an aerosol visibility monitor, measuring speciated fine particulate matter. On a national scale, managing for visibility impairment in Class I areas is being done, in part, due to the 1990 amendments to the Clean Air Act. The 1990 amendments noted numerous sources of air pollution were contributing to regional haze, which affects Class I areas. Regional haze is defined as visibility impairment caused by the cumulative air pollution emissions from numerous sources over a wide geographic area. Some of the common fine particulates that can impair visibility include sulfates, nitrates, organic material, elemental carbon (soot), and soil. The initial Regional Haze Rule was proposed by EPA in 1997 and was finalized in 1999. Under this rule, all states are required to submit implementation plans for improvement of visibility in Class I areas to EPA. The Forest Service has been active in reviewing these state implementation plans across the United States. GMNF staff have focused on reviewing the state implementation plans that have the greatest likelihood of affecting the air quality in the GMNF Class I area.

Evaluation and Conclusions: The IMPROVE site has been in operation since the 1990's. Figure 2-1 demonstrates how standard visual range has dramatically improved for the haziest 20 percent days at the Lye Brook IMPROVE site from 1993 through 2016 (FED 2021). Increased visibility, or standard visual range, is a direct result of less air pollution, or haze, being visible to the human eye and is measured using the term deciview. The deciview, a unit of measure of haze, or "haze index," is a measure of visibility derived from light extinction that is designed so that incremental changes in the haze index correspond to uniform incremental changes in visual perception, across the entire range of conditions from pristine to highly impaired. The haze index, in units of deciviews (dv), is calculated directly from the total light extinction. From 1993 to 2007, visibility on the haziest 20 percent days in Lye Brook Wilderness was in the range of about 22 to 26 dv, which is approximately the equivalent to a 25 to 40 km standard visual range. By 2016, the visibility on the haziest 20 percent days was 15 dv, or about 85 km standard visual range. This improvement over less than a decade more than doubled how far one can see on the haziest 20 percent days due to fewer particles/less pollution in the air.

Figure 2-1. Reductions in haze/speciated fine particulate matter at Lye Brook from 1993 to 2016 using the haze index, in deciview (dv) units.



The composition of particulates of pollutants which cause visibility degradation at the Lye Brook IMPROVE site is shown in Figure 2-2. The primary pollutant causing approximately 75 percent of this reduced standard visual range, or haze, on the 20 percent worst days, from 1993 to 2007 was ammonium sulfate. The precursor (sulfur dioxide emissions) that led to these levels of ammonium sulfate in the atmosphere above Lye Brook Wilderness Area has been reduced, in part, due to federal Clean Air Act requirements.

By 2016, ammonium sulfate levels had reduced dramatically at Lye Brook, and contributed to less than 40 percent of the reduced standard visual range. This helps to explain the improvements in air quality over the past decade.

Atmospheric deposition, as measured by wet precipitation, is measured in Bennington, VT, approximately 25 kilometers southwest of Lye Brook, by the City of Bennington and the State of Vermont. Figure 2-3 shows the change in acidity (measured as pH) for the years of 1993 through 2016. Acidity of wet deposition over this time has changed almost one pH unit, which means the wet precipitation is almost ten times less acidic in 2016 as compared to 1993 (NADP 2021). This data is similar to the data collected at the IMPROVE site as both data sets are showing improvements in air quality.

Figure 2-2. The composition of particulates of pollutants which cause visibility degradation at the Lye Brook IMPROVE site.

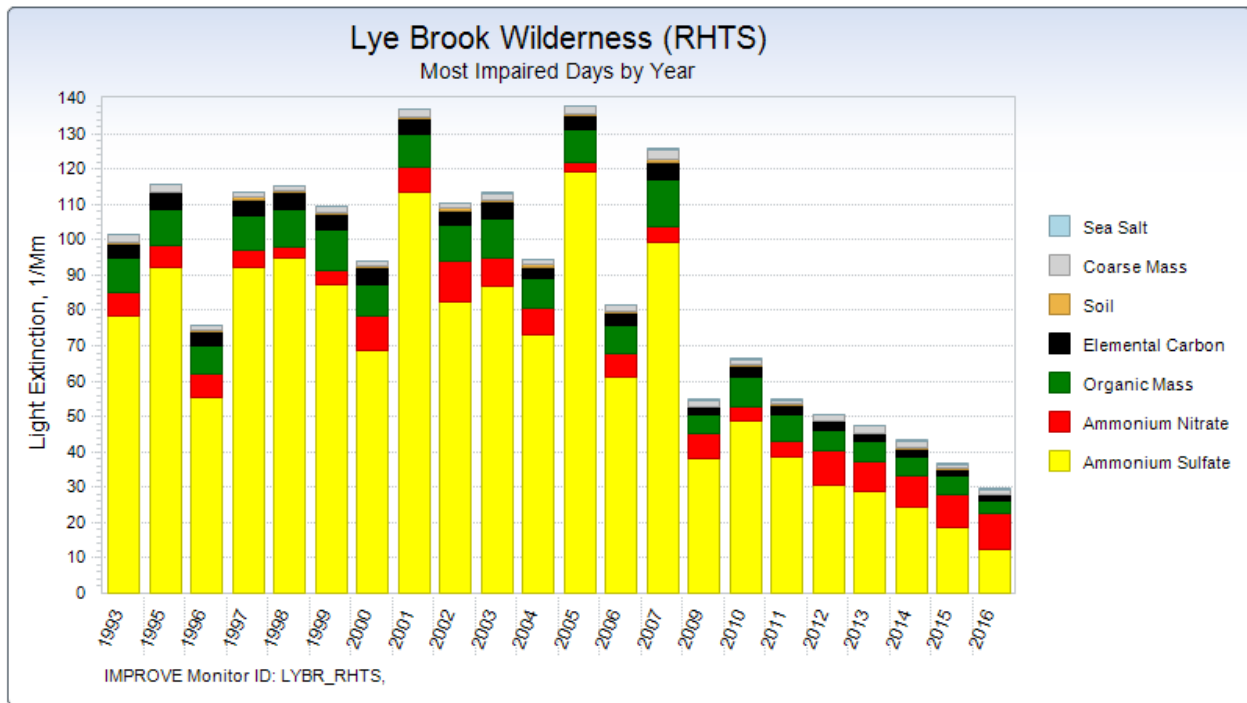
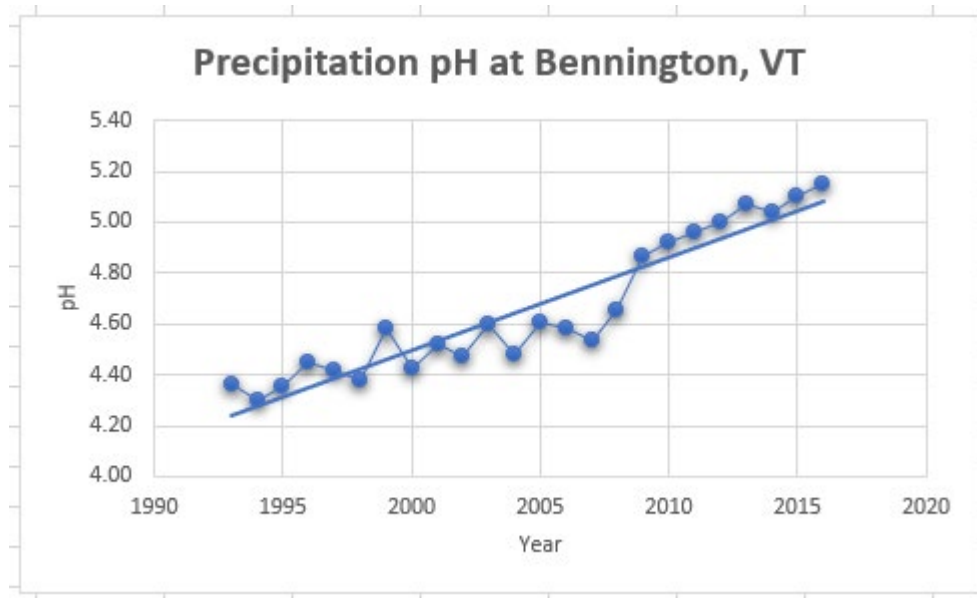


Figure 2-3. Annual volume-weighted mean concentrations in standard pH units for the NADP/NTN site in Bennington, VT.



Recommendations: Continue air particulate monitoring on the Forest as part of Federal rules requiring state and federal agencies to work together to improve visibility in Class I areas, such as Lye Brook Wilderness Area, so that natural background conditions are achieved by 2064.

This protocol does not address to what extent air quality and atmospheric deposition are affecting sensitive components of the forest ecosystem. Effects on sensitive components of forest ecosystems are addressed in several other monitoring questions.

Aquatic Ecosystems

Evaluation Question: Fish and Aquatic Organism Passage

Monitoring Question: To what extent have Standards and Guidelines been applied?

Detailed Monitoring Question: Are culvert rehabilitation projects resulting in improved fish passage at stream crossings? Are road construction and maintenance activities resulting in improved or replaced culverts designed to transport water, sediment, and debris, and allow free movement of resident aquatic life?

Monitoring Activities: Neither coarse filter surveys nor crossing-specific mark recapture or electrofishing was completed during the fiscal year period being considered. However, all stream crossing structure replacements were assessed and planned according to the U.S. Forest Service (USFS) Stream Simulation approach. This includes projects completed by partners off-Forest with agency funds to support increased connectivity of Forest fishery habitat to additional adjacent habitats.

Evaluation and Conclusions: Although no specific monitoring has been completed, the strength and effectiveness of the Stream Simulation approach along with casual observations by Forest staff indicate that crossings installed or upgraded using the Stream Simulation principals are sufficient for improving stream crossing structures' ability to allow for passage of fauna as well as water, sediment, and debris during high flows. During this monitoring period, 15 stream crossings (such as culverts or bridges) were restored or improved. In general, the direction in the Forest Plan including management area designations and standards and guides along with project-specific design features, mitigations, and best management practices appear to be ensuring that functionality of stream crossings is being maintained or improved on NFS lands within GMNF.

Quantitative monitoring may be unnecessary for answering this monitoring question, at least at the landscape level. The development of the [USFS Stream Simulation approach](#) along with the lengthy discussion included within the document are evidence that it is well known that poorly designed or maintained stream crossings lead to degradation of aquatic and riparian habitat connectivity as well as stream function. Because this research has shown that the effects of these practices are known, there is no need to select a monitoring question and indicators to verify such effects. Instead, monitoring could be focused on the presence and condition of stream crossing structures. This could more easily demonstrate impacts to or changes in stream habitat connectivity. Standardized or quantitative culvert surveys and fish population surveys, as currently specified in the Monitoring Guide, can help expand upon the understanding of how well or poorly a crossing structure may be functioning, but are likely not necessary to answer the specific monitoring question being posed. Other surveys, however, can help improve this understanding as well, such as the USFS Best Management Practices (BMP) Monitoring Protocols, Proper Functioning Condition assessment, or Multiple Indicator Monitoring.

Recommendations: It is suggested that the Forest Monitoring Guide be updated to primarily utilize qualitative, rapid assessments to answer the monitoring question, with additional surveys being used to supplement as needed or as available.

Evaluation Question: Fish Habitat and Stream Channel Stability

Monitoring Question: To what extent is Forest management affecting water quality, quantity, flow timing, and the physical features of aquatic, fisheries, riparian, vernal pool, and wetland habitats?

Detailed Monitoring Question: How are fish habitat and stream channels changing over time?

Monitoring Activities: Geomorphic assessment data were not collected or are not available for this period.

Evaluation and Conclusions: Although monitoring specific to this question according to the Forest Plan Monitoring Guide was not completed, there are additional indicators that help provide an understanding of Forest stream conditions. Water quality data from the same period generally describes stream systems that have functional and resilient conditions across the Forest. However, information related to the predominant ages of forest stands surrounding streams on the Forest supports an understanding that woody material recruitment into stream channels is likely still reduced relative to the potential of those habitats. A lesser volume of woody debris in streams is associated with decreased hydrologic and habitat complexity, altering responses to high flows and the quality of habitat to aquatic species. Forest Plan direction provides for a buffer around streams in which trees will be able to age and eventually be incorporated into stream processes over time. The Forest also occasionally performs or support activities that actively add woody material to streams to provide the associated instream functions.

As indicated in the fiscal year 2011 Monitoring and Evaluation Report, Fisheries Resource section, Level III monitoring is not likely to provide the best assessment of stream health at the Forest scale. Detailed Level III monitoring can help determine condition changes at a given site over time, but the Forest does not have the financial and technical capability, even with partner support, to adequately evaluate whether plan components are effective and appropriate and whether management is being effective in maintaining or achieving progress toward the desired conditions and objectives for the plan area based on stream geomorphic assessments.

Recommendations: Consider removing this monitoring question from the monitoring program or developing an alternative to address monitoring related to Forest-wide Goal 6 in the Forest Plan.

Aquatic Habitat**Evaluation Question: Sedimentation/Substrate Embeddedness**

Monitoring Question: To what extent have Objectives been attained?

Detailed Monitoring Question: Are substrate embeddedness and sedimentation levels within the range described in the Forest Plan and providing high quality spawning and rearing habitat for native fish species and macroinvertebrates?

Monitoring Activities: Ambient biomonitoring data collected by the State with support from the Forest during this period includes embeddedness and simplified substrate size information (Table 2-2). These data are not specific to riffle/ run or spawning habitat, but may provide some insight on stream bed conditions across the Forest during this monitoring period (Figure 2-4).

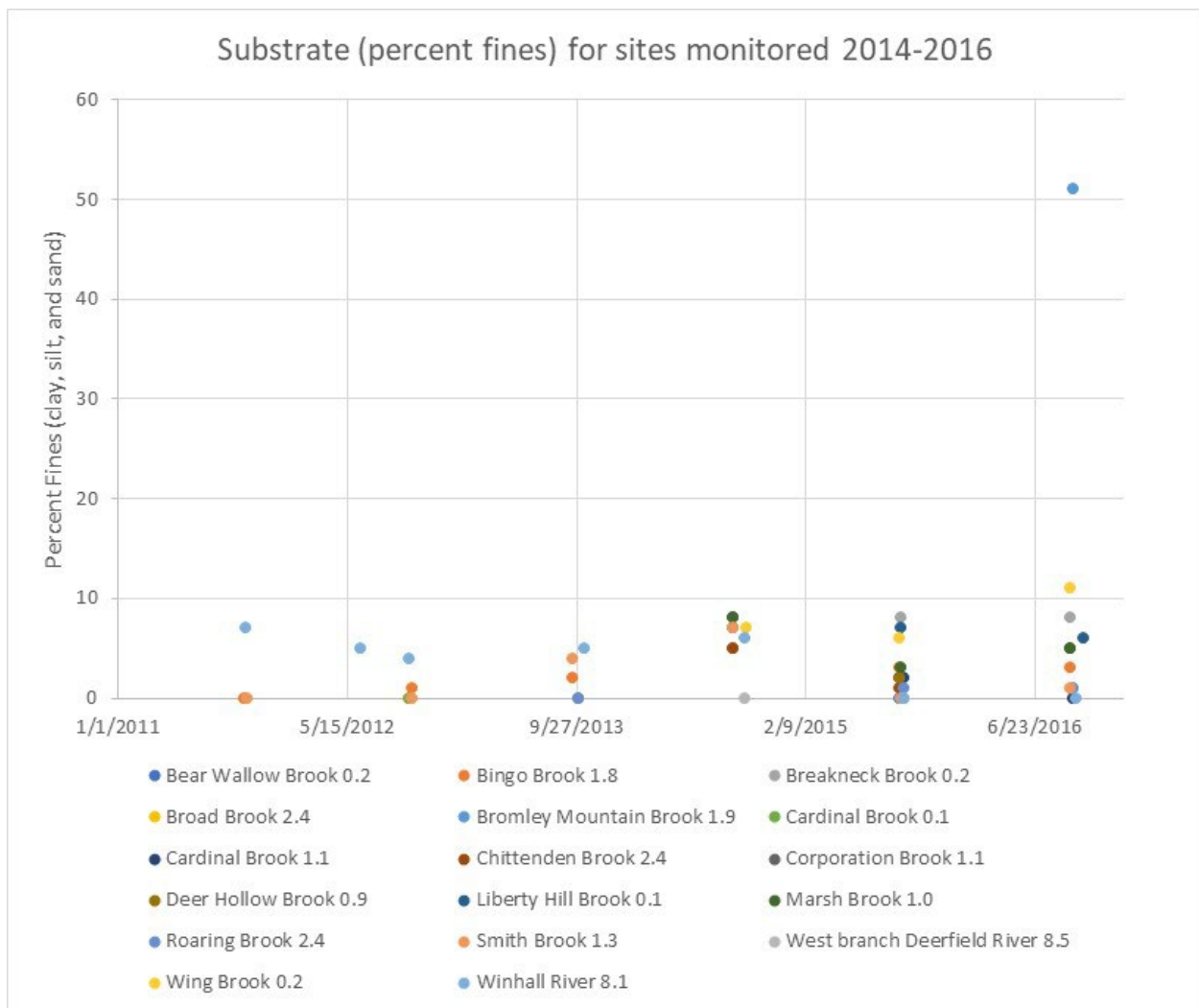
Table 2-2. Ambient biomonitoring data.

Stream	Date	% Fine	% Embeddedness
Bear Wallow Brook 0.2	8/31/2015	0	40
Bingo Brook 1.8	10/4/2011	0	60

Stream	Date	% Fine	% Embeddedness
Bingo Brook 1.8	10/2/2012	1	30
Bingo Brook 1.8	9/17/2013	2	15
Bingo Brook 1.8	9/4/2014	5	10
Bingo Brook 1.8	9/2/2015	3	20
Bingo Brook 1.8	9/8/2016	3	15
Breakneck Brook 0.2	9/4/2014	5	40
Breakneck Brook 0.2	9/3/2015	8	26
Breakneck Brook 0.2	9/7/2016	8	35
Broad Brook 2.4	9/26/2012	0	3
Broad Brook 2.4	10/1/2013	0	5
Broad Brook 2.4	9/9/2015	0	30
Broad Brook 2.4	9/14/2016	0	15
Bromley Mountain Brook 1.9	9/15/2016	51	65
Cardinal Brook 0.1	9/26/2012	0	10
Cardinal Brook 0.1	10/1/2013	0	5
Cardinal Brook 0.1	9/10/2015	0	20
Cardinal Brook 1.1	9/10/2015	2	23
Cardinal Brook 1.1	9/14/2016	0	30
Chittenden Brook 2.4	9/4/2014	5	5
Chittenden Brook 2.4	9/2/2015	1	28
Corporation Brook 1.1	9/4/2014	7	5
Corporation Brook 1.1	9/2/2015	2	26
Corporation Brook 1.1	9/8/2016	5	10
Deer Hollow Brook 0.9	9/2/2015	2	30
Liberty Hill Brook 0.1	9/4/2014	8	30
Liberty Hill Brook 0.1	9/3/2015	7	50
Liberty Hill Brook 0.1	10/7/2016	6	50
Marsh Brook 1.0	9/4/2014	8	40
Marsh Brook 1.0	9/3/2015	3	18
Marsh Brook 1.0	9/7/2016	5	30
Roaring Brook 2.4	10/1/2013	0	8
Roaring Brook 2.4	9/10/2015	1	15
Roaring Brook 2.4	9/14/2016	1	15
Smith Brook 1.3	10/11/2011	0	20
Smith Brook 1.3	10/2/2012	0	25
Smith Brook 1.3	9/17/2013	4	10
Smith Brook 1.3	9/4/2014	7	5
Smith Brook 1.3	9/3/2015	0	18
Smith Brook 1.3	9/8/2016	1	10
West Branch Deerfield River 8.5	9/30/2014	0	10
Wing Brook 0.2	10/2/2014	7	20
Wing Brook 0.2	9/2/2015	6	30

Stream	Date	% Fine	% Embeddedness
Wing Brook 0.2	9/8/2016	11	15
Winhall River 8.1	10/7/2011	7	5
Winhall River 8.1	6/12/2012	5	25
Winhall River 8.1	9/27/2012	4	10
Winhall River 8.1	10/15/2013	5	15
Winhall River 8.1	9/30/2014	6	25
Winhall River 8.1	9/9/2015	0	30
Winhall River 8.1	9/20/2016	0	15

Figure 2-4. Stream Substrate: Percent Embeddedness.



Evaluation and Conclusions: Monitoring results indicate that percent fines are almost exclusively below 10 percent, meeting the objective of percent fines less than 20 percent. The only exception is Bromley Mountain Brook 1.9 (51 percent in 2016). Additionally, only two sites exceeded the 50 percent embeddedness objective, Bingo Brook 1.8 (60 percent in 2011 just after Hurricane Irene, but between 15 and 30 percent from 2012 to 2016) and Bromley Mountain Brook 1.9 (65 percent in 2016). Aside from a

few outliers, these data seem to support that the direction in the Forest Plan including management area designations and standards and guides along with project-specific design features, mitigations, and best management practices appear to ensure that quality of fish spawning and rearing habitat is being maintained or improved on NFS lands.

Stream substrate monitoring is not likely to provide the best assessment of stream health at the Forest scale. Stream substrate can help determine condition changes at a given site over time, but the Forest does not have the financial and technical capability, even with partner support, to adequately evaluate whether plan components are effective and appropriate and whether management is being effective in maintaining or achieving progress toward the desired conditions and objectives for the plan area based on this monitoring technique.

Recommendations: Consider removing this monitoring question from the monitoring program or developing an alternative to address monitoring related to Forest-wide Goal 4 in the Forest Plan.

Evaluation Question: Water Temperature in Streams

Monitoring Question: To what extent is Forest management affecting water quality, quantity, flow timing, and the physical features of aquatic, fisheries, riparian, vernal pool, and wetland habitats?

Detailed Monitoring Question: Are summer water temperatures in upland streams suitable to maintain native fish species and have they changed over the planning period?

Monitoring Activities: Stream temperature data were collected using thermographs (i.e., continuous temperature loggers) in 2014, 2015, and 2016 (Table 2-3). The Forest Plan Monitoring Guide indicates that stream temperature would be assessed from the last week of May (assumed to be May 25) through the last week of October (assumed to be October 31). 39 sites were monitored in 2014 (four had data for the full monitoring period). 13 sites were monitored in 2015 (10 had data for the full monitoring period). 18 sites were monitored in 2016 (18 had data for the full monitoring period). The tables below indicate which streams had temperature data collected (broken out by year), the start and end date for data collection at a site within a year, whether data were collected for the entire monitoring period (i.e., May 25 through October 31 of a given year), the average maximum daily temperature for any days within the monitoring period, and the total number of days within the monitoring period with a maximum temperature greater than 70 degrees Fahrenheit. Note that the data below have not undergone a QA/QC process to ensure that data are representative of wet conditions (e.g., some values may represent air temperature rather than water temperature).

Table 2-3. Stream Temperature Data 2014 to 2016.

Site Name	Year	Start Date	End Date	Full Period (5/25-10/31)	Season Average Max	# Days w/ Max >70
Barney Brook	2014	6/1/2014	10/17/2014	No	55.6	0
Battenkill MS1	2014	6/30/2014	10/27/2014	No	62.8	6
Bear Wallow Brook	2014	5/2/2014	10/21/2014	No	55.3	0
Bingo Brook	2014	1/1/2014	7/14/2014	No	55.9	0
Bolles Control	2014	6/30/2014	10/27/2014	No	54.9	2
Broad Brook FS Boundary	2014	6/1/2014	11/5/2014	No	55.6	0
Broad Brook Upper	2014	6/1/2014	11/5/2014	No	52.9	0
Crazy John	2014	6/1/2014	11/5/2014	No	55.4	0

Site Name	Year	Start Date	End Date	Full Period (5/25-10/31)	Season Average Max	# Days w/ Max >70
Farnum MS1	2014	6/30/2014	12/31/2014	No	58.6	1
Flood Brook Above Hapgood	2014	1/1/2014	12/31/2014	Yes	57.4	0
Flood Brook Below Hapgood	2014	1/1/2014	10/20/2014	No	64.7	35
Flood Brook Sentinel	2014	1/1/2014	12/31/2014	Yes	60.2	5
George Brook	2014	5/2/2014	10/21/2014	No	54.8	0
Greendale Control	2014	7/1/2014	12/31/2015	No	59.2	2
Griffith Control	2014	7/1/2014	12/31/2014	No	56.6	0
Grindstone brook	2014	5/2/2014	10/26/2014	No	54.7	0
Grout Pond Outlet	2014	1/1/2014	13/31/14	Yes	68.1	83
Jenny Coolidge MS2	2014	7/1/2014	12/31/2015	No	57.4	0
Lost Pond	2014	11/7/2014	12/31/2014	No		
Mad Tom MS1	2014	7/4/2014	12/31/2014	No	54.9	0
McGinn	2014	7/1/2014	12/31/2014	No	56.6	0
Mettawee Headwaters	2014	7/4/2014	12/31/2014	No	54.9	0
Mettawee MS1	2014	6/1/2014	10/24/2014	No	60	0
Mettawee MS2	2014	6/1/2014	10/24/2014	No	64.8	25
Mt Tabor Contol	2014	7/1/2014	10/20/2014	No	59.5	4
North Branch Hoosic	2014	6/1/2014	11/5/2014	No	61.2	0
North Pond Outlet	2014	5/2/2014	7/6/2014	No	52.1	0
Nundge	2014	6/1/2014	11/6/2014	No	57.4	0
Outlet of Gilmore Pond	2014	5/2/2014	10/8/2014	No	59.4	0
Roaring Brook	2014	6/1/2014	11/6/2014	No	55.4	0
Smith Brook	2014	1/1/2014	7/14/2014	No	56.2	0
South Branch Deerfield	2014	6/1/2014	11/3/2014	No	55.1	0
Stamford Brook	2014	6/1/2014	10/27/2014	No	58.1	0
Tributary to Goshen Brook	2014	5/2/2014	10/26/2014	No	55.2	0
Utley MS1	2014	6/30/2014	12/31/2014	No	50.1	1
West Branch Deerfield AQV	2014	5/1/2014	11/6/2014	Yes	62.2	12
West Branch Deerfield FR73	2014	6/1/2014	11/6/2014	No	61.9	0
West Branch Deerfield Rt 100	2014	6/1/2014	11/3/2014	No	55.5	1
Winhall River	2014	1/1/2014	10/23/2014	No	60.6	4
Farnum MS1	2015	1/1/2015	12/31/2015	Yes	57.6	0
Flood Brook Above Hapgood	2015	1/1/2015	12/31/2015	Yes	58.3	0
Flood Brook Sentinel	2015	1/1/2015	12/31/2015	Yes	60.5	3
Greendale Control	2015	1/1/2015	12/31/2015	Yes	61	16
Griffith Control	2015	1/1/2015	10/22/2015	No	57.6	0
Jenny Coolidge MS2	2015	1/1/2015	12/31/2015	Yes	58.5	0
Lost Pond	2015	1/1/2015	10/22/2015	No	56.7	6
Mad Tom MS1	2015	1/1/2015	12/31/2015	Yes	56.4	0

Site Name	Year	Start Date	End Date	Full Period (5/25-10/31)	Season Average Max	# Days w/ Max >70
McGinn MS1	2015	1/1/2015	12/31/2015	Yes	56.5	0
Mettawee Headwaters	2015	1/1/2015	12/31/2015	Yes	55.6	1
Mt Tabor Contol	2015	1/1/2015	12/31/2015	Yes	60.3	7
Utley MS1	2015	1/1/2015	12/31/2015	Yes	58.6	0
Winhall River	2015	11/25/2015	12/31/2015	No		
Battenkill MS1	2016	1/7/2016	12/31/2016	Yes	64.9	40
Bolles Control	2016	1/1/2016	12/31/2016	Yes	56.4	0
Broad Brook FS Boundary	2016	1/7/2016	12/31/2016	Yes	57.4	0
Farnum MS1	2016	1/1/2016	12/31/2016	Yes	59.7	0
Flood Brook Above Hapgood	2016	1/1/2016	12/31/2016	Yes	59.2	0
Flood Brook Below Hapgood	2016	1/1/2016	12/31/2016	Yes	67.5	87
Flood Brook Sentinel	2016	1/1/2016	12/31/2016	Yes	61	10
Greendale Control	2016	1/1/2016	12/31/2016	Yes	61.1	3
Griffith Control	2016	1/1/2016	12/31/2016	Yes	58.3	0
Grout Pond Outlet	2016	1/7/2016	12/31/2016	Yes	68.1	92
Jenny Coolidge MS2	2016	1/1/2016	12/31/2016	Yes	59.1	0
Mad Tom MS1	2016	1/1/2016	12/31/2016	Yes	57	0
McGinn MS1	2016	1/1/2016	12/31/2016	Yes	57.6	0
Mettawee Headwaters	2016	1/1/2016	12/31/2016	Yes	56.9	0
Mt Tabor Contol	2016	1/1/2016	12/31/2016	Yes	61.5	11
Utley MS1	2016	1/1/2016	12/31/2016	Yes	59	1
West Branch Deerfield AQV	2016	1/1/2016	12/31/2016	Yes	64.6	62
Winhall River	2016	1/1/2016	12/31/2016	Yes	62	14

Evaluation and Conclusions: In 2014, the average of daily high temperatures across all sites with data for the full monitoring period ranged from 57.4 degrees Fahrenheit (F) on Flood Brook Above Hapgood to 68.1 degrees F at the Outlet of Grout Pond (average of 62 degrees F). For the same sites in 2014, the number of days exceeding 70 degrees F ranged from 0 to 83 (average of 25 days). Grout Pond Outlet, however, records the temperature of water flowing off the top of a lake/ reservoir and represents uncharacteristically high temperatures (68.1 degrees F and 83 days). Although these numbers are important for managing fish populations in this location and may warrant management considerations, they are not representative of overall conditions. Excluding this outlier, the average daily maximum temperatures is 59.9 degrees F (ranging from 57.4 to 62.2 degrees F) and the average number of days exceeding 70 degrees is 5.7 (ranging from 0 to 12).

In 2015, the average of daily high temperatures across all sites with data for the full monitoring period ranged from 55.6 degrees F on Mettawee Headwaters to 61 degrees F at Greendale Control (average of 58.3 degrees F). For the same sites in 2015, the number of days exceeding 70 degrees ranged from 0 to 16 (average of 2.7 days).

In 2016, the average of daily high temperatures across all sites with data for the full monitoring period ranged from 56.4 degrees F at Bolles Control to 68.1 degrees F at Grout Pond Outlet (average of 60.6 degrees F). For the same sites in 2016, the number of days exceeding 70 degrees ranged from 0 to 92

(average of 17.8 days). Grout Pond Outlet and Flood Brook Below Hapgood Pond, however, record the temperature of water flowing off the top of a lakes/ reservoirs and represent uncharacteristically high temperatures (68.1 degrees F and 92 days and 67.5 degrees F and 87 days, respectively). Although these numbers are important for managing fish populations in these locations and may warrant management considerations, they are not representative of overall conditions. Excluding these outliers, the average daily maximum temperature is 59.7 degrees F (ranging from 56.4 to 64.6 degrees F) and the average number of days exceeding 70 degrees is 8.8 (ranging from 0 to 62 days).

In general, stream temperature data indicate that stream temperature conditions conducive to fish population health are being maintained. The two sites with the highest temperatures are influenced by waterbodies that would be expected to influence water temperature, although management of these structures may be addressed to mitigate their influence on downstream temperatures. In at least one case (Hapgood Pond), the Forest is taking steps to identify possible options to improve water management at the site for both sediment and temperature impacts downstream. If not already addressed, it may be worth looking at conditions influencing temperature records at Battenkill MS1, Flood Brook Sentinel, Greendale Control, Mt Tabor Control, West Branch Deerfield AQV, and Winhall River to determine why so many days at these sites exceed 70 degrees. Consistent with the Forest Plan, GMNF staff should continue to make efforts to address discrete impacts to stream temperature while managing for overall watershed and stream function and health to allow for the greatest resiliency against the effects of climate change.

Although stream temperature is a critical metric for describing potential stress on fish populations, it may not be a useful leading indicator for the impacts of land use management on aquatic habitats. Except where certain discrete land uses are likely to impact stream temperature (such as decreased shading or degraded groundwater-surface water interaction processes), stream temperature will be primarily dictated by forces outside of the control of a land manager (such as weather and climate). Because of this, monitoring stream temperature may be useful to show seasonal, annual, decadal, or longer-term patterns in aquatic stream habitat and it may be useful in informing what fish species are likely to persist (or not) in a given stream segment or system. However, because any activity likely to measurably impact stream temperature would tend to be rare and occur at a large scale, it may not be particularly useful to monitor the impacts of most of the management activities permitted on stream temperature. However, stream temperature at certain sites potentially more sensitive to climate or long-term monitoring sites may be useful in interpreting the impacts that climate change may be having on the planning area.

Recommendations: While stream temperature may help address a different core monitoring plan element (such as measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area), consider removing this specific monitoring question from the monitoring program or developing an alternative to address monitoring related to Forest-wide Goal 4 in the Forest Plan.

Fire

Evaluation Question: Wildland Fire Use

Monitoring Question: What are the effects of management practices using fire as a resource tool?

Detailed Monitoring Questions: Did wildland fires managed for resource benefit and prescribed fires successfully meet objectives set forth in the Forest Plan and the Fire Management Plan? Did the fire function as a natural ecosystem process to restore and/ or maintain natural plant communities? Are the forests actively reintroducing fire into historically fire adapted landscapes?

Monitoring Activities: Both prescribed fire and wildland fire play a significant role as a natural ecosystem process in fire-adapted plant communities, currently on a small scale to maintain wildlife

openings and vistas. Not only does prescribed fire offer the ability for managers to set back the succession for wildlife and pollinator habitat but also promote response of some fire adapted rare plants when allowed to act as a natural ecosystem process on the landscape.

One wildfire met criteria to be managed for resource benefit through modified suppression tactics. French Knob fire on Manchester District was positioned atop of a rocky knob with difficult accessibility to fully suppress. While this fire was visible to surrounding communities and generated a strong response from volunteer fire departments, an exercise using Wildland Fire Decision Support System (WFDSS) made a case to manage the fire for resource benefit with consideration to firefighter exposure and safety. By doing so, firefighters were able to use Minimum Impact Suppression Tactics (MIST) and limit the amount of mineral soil handline through rocky, deep duff areas.

The fuels program has established a fire effects monitoring program with focus on fire adapted plant response from both prescribed fire and wildland fire. Measurements taken using Composite Burn Index – Burn Severity paired with ocular photo plots provide a way to illustrate effects to a given resource in wildlife openings.

Notable fire adaptation highlights from fire effects monitoring:

- 2014 fire effects monitoring of Grout Pond wildlife opening discovered a patch of rare Eastern blue-eyed grass (*Sisyrinchium atlanticum*) two months post-prescribed fire and subsequently verified by botanical survey in 2015. Previous surveys finding Eastern blue-eyed grass on site were 1894 and 1913. The populations surveyed in Grout Pond wildlife opening will continue to be monitored to further understand fire effects of this facultative wetland species.
- Post-wildland fire effects monitoring at the base of the Dome area on Manchester Ranger District found a positive plant response from the rare and uncommon Hay sedge (*Carex argyrantha*). Hay sedge was discovered by a Vermont State/Forest Service botanist who reported it to be only within the recent burn scar, pointing to this fire adapted landscape that had been void of fire (lightning or human ignitions) in recent years.

Evaluation and Conclusions: Often times constraints are placed on prescribed fire to protect a given resource under the assumption fire poses a risk and should be excluded. However, considering monitoring data across program areas should shine a light on fire as a natural process in areas with fire history or fire adapted plan communities to adjust resource protection standpoints. Complying with some standards and guidelines with such resource protection standpoints paired with the already restrictive small window of opportunity to implement prescribed fire poses challenges for fire to serve as an effective natural ecosystem process.

Recommendations: Wildlife, Ecology, Silviculture, Botany, Soils and Fire program managers and technicians should review big picture management of using fire as a resource tool for the existing small permanent wildlife openings.

The following Forest-wide standards and guidelines should be considered when revising the Forest Plan:

- 2.3.2 Soil, Water, and Riparian Protection and Restoration Standard S-2 - Protective strips activity and how prescribed fire may be applied.
- 2.3.5 Openings Guideline G-1 - Maximum of 100 feet around permanent openings should be managed to provide vertical diversity and gradual transitions between the opening and surrounding forest.
- 2.3.10 Fire Management Guideline G-1 - Fire planning should be integrated into all resource management plans to ensure treatment objectives utilize fire in an appropriate manner from both ecological and resource protection standpoints.

Evaluation Question: Hazardous Fuels

Monitoring Question: To what extent are fuels activities implemented?

Detailed Monitoring Question: How many total treated acres have been accomplished? How many treated acres are within one mile of the Wildland Urban Interface (WUI)? How many KP3 prescribed fire acres have been accomplished?

Monitoring Activities: Hazardous fuels activities are primarily intended to maintain wildlife openings and vistas through a combination of prescribed fire, chainsaw and brushsaw work. On occasion, prescribed fire will be utilized to manage non-native invasive plants however that takes substantial planning implementation across program areas to be successful. Other secondary hazardous fuel reduction includes but is not limited to mowing, mastication, and rearrangement of fuels through timber management. Approximately 1,100 acres were treated with prescribed fire during fiscal years 2014 to 2016. On average 400 acres were burned annually.

Reporting accomplishments through NRM FACTS spatial provides a look at the small burn units and illustrates the moderate complexity and excessive time of implementing safe prescribed fire with current restraints of Forest Plan standards and guidelines.

Evaluation and Conclusions: The GMNF fire and fuels program has been following best practices to meet Forest Plan standards and guidelines, however the amount of hazardous fuel accomplishment is impeded by multiple constraints.

Recommendations: None.

Forest Health

Evaluation Question: Increase of Destructive Insects and Diseases

Monitoring Question: Are insect and disease levels compatible with objectives for maintaining healthy forest conditions?

Detailed Monitoring Question: To what extent have destructive insects and disease organisms increased?

Monitoring Activities:

Fiscal Year 2014

A variety of monitoring activities are conducted at the State and Forest level by several different agencies and organizations. Forest staff review this data and cooperate with partners to assess forest health conditions, supplementing observations made during inventory and management activities. Monitoring efforts are summarized in Table 2-4.

Table 2-4. Fiscal year 2014 insect and disease monitoring.

Insect or Disease Agent	Organization & Date of Monitoring	Type of Monitoring Effort
Forest tent caterpillar, saddled prominent, gypsy moth, oak leaf tier, balsam wooly adelgid and dieback or mortality from beech bark disease, Septoria leaf spot, cankers and other unknown agents.	Vermont Department of Forests, Parks and Recreation - flown between July 30 th and August 29 th . Northeastern Area State & Private Forestry, Northeastern Area, USDA Forest Service – Durham Field Office (DFO), flown June 24 th , 2014.	Annual Aerial Detection Surveys of forest health conditions on Green Mountain National Forest.

Insect or Disease Agent	Organization & Date of Monitoring	Type of Monitoring Effort
Insects, disease or events harmful to sugar maple trees.	Northeastern Area State & Private Forestry, Northeastern Area, USDA Forest Service – Durham Field Office (DFO), May 9 & 14; June 24-25; and September 23-25, 2014.	Sugarbush surveys, on the ground field surveys, site visits.
Sugar maple general health and decline, tree health and pest populations.	Vermont Department of Forests, Parks and Recreation, University of Vermont, Forest Ecosystem Monitoring Cooperative.	Field surveys, long-term monitoring plots

The USFS Forest Health Protection Staff and Vermont Department of Forests, Parks and Recreation conduct aerial and ground surveys to detect forest damage, map late season defoliators and assess general forest conditions. A statewide aerial survey was flown between July 30th and August 29th. On June 24th, the Forest Service conducted aerial survey over GMNF. In 2014, 38,235 acres of forest damage were mapped statewide. This represents less than 1 percent of Vermont's forestland, and an 80 percent decrease from 2013. The non-native pest complex, beech bark disease, accounted for 36 percent of the area mapped. Major defoliating insects did not reach outbreak levels at the State or Forest level. White Pine Needle Damage was again widespread on GMNF, and an unexplained general decline of red pine was observed.

Forest Insect and Disease Conditions in Vermont 2014 is available at:

https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Forest_Health/Library/2014conditions.pdf.

Annual monitoring of maple tapping special use areas (Sugarbush leases) was completed by Forest Health Protection for 2014. There are six tapping sites located in 5 towns (Stockbridge, Pomfret, Wilmington, Mt. Tabor and 2 in Lincoln). The annual monitoring consists of six criteria: Two growing season site visits for visual inspection of conditions; pheromone trapping for damaging insects; insect egg mass surveys during outbreaks; taphole closure assessment; root starch reserve measurements; and using the Aerial Detection Survey to see if any damaging agents are active in the area around the sugarbushes.

In 2013, the state of Vermont detected damage during its Aerial Detection Survey from a native defoliator, saddled prominent (*Heterocampa guttivitta*). Over 12,000 acres of damage was mapped in the State. A program to monitor saddled prominent populations with the state of Vermont was developed that included the USFS Forest Health Protection providing coverage on Green Mountain Finger Lakes National Forests (GMFL). The sugarbush sites were selected as the monitoring sites on the Forest. The trap catches on the GMFL are well below those believed to indicate a viable egg density that will produce visible defoliation. Also, there was no evidence of feeding activity at the sites.

Sugar maple tree health, based on the amount of twig dieback, remained high in 2014, with 95 percent of trees rated as having dieback <15 percent on the 30 monitoring plots formerly part of the North American Maple Project (NAMP). Annual measurement of sugar maple forest stands is by the State of VT and University of Vermont to determine tree condition, trends and possible causes of sugar maple decline. The variation in within-season timing of measurements is assessed using same plot design as in the National Forest Health Monitoring Program (NFHM). Initially this effort was part of a cooperative monitoring program with other states and Canada, since 2002 Vermont has measured these plots independently for internal use.

Fiscal Year 2015

A variety of monitoring activities are conducted at the State and Forest level by several different agencies and organizations. Forest staff review this data and cooperate with partners to assess forest health conditions, supplementing observations made during inventory and management activities. Monitoring efforts are summarized in Table 2-5.

Table 2-5. Fiscal year 2015 insect and disease monitoring.

Insect or Disease Agent	Organization & Date of Monitoring	Type of Monitoring Effort
Forest tent caterpillar, saddled prominent, gypsy moth, oak leaf tier, balsam wooly adelgid and dieback or mortality from beech bark disease, Septoria leaf spot, cankers and other unknown agents.	Vermont Department of Forests, Parks and Recreation - flown July 16 - September 24. Northeastern Area State & Private Forestry, Forest Health Protection, USDA Forest Service, flown June 17th, 2015.	Annual Aerial Detection Surveys of forest health conditions on Green Mountain National Forest.
Insects, disease or events harmful to sugar maple trees.	Northeastern Area State & Private Forestry, Forest Health Protection, USDA Forest Service, May 9 & 14; September 24-25 and 29-30; and November 17-19.	Sugarbush surveys, on the ground field surveys, site visits.
Sugar maple general health and decline, tree health and pest populations.	Vermont Department of Forests, Parks and Recreation, University of Vermont, Forest Ecosystem Monitoring Cooperative.	Field surveys, long-term monitoring plots.

The USFS Forest Health Protection Staff and Vermont Department of Forests, Parks and Recreation conducts aerial and ground surveys to detect forest damage, map late season defoliators and assess general forest conditions. A statewide aerial survey was flown between July 16th and September 24th. On June 17th, the Forest Service conducted aerial survey over GMNF. In 2015, 128,391 acres of forest damage were mapped during statewide Aerial Detection Surveys. This represents less than 3 percent of Vermont's forestland, but an increase from 2014, when 38,235 acres were mapped. Beech bark disease and birch defoliation accounted for 28 percent and 20 percent, respectively, of the area mapped. Approximately 15,529 acres of damage were mapped throughout, and adjacent to GMNF. A total of 5,580 acres were mapped as white pine discoloration, 9,277 acres of frost damage in the northern hardwoods, 341 acres of balsam woolly adelgid mortality in fir, 249 acres of red pine mortality, and 82 acres of wind damage in spruce. Major defoliating insects did not reach outbreak levels at the State or Forest level.

Forest Insect and Disease Conditions in Vermont 2015 is available at:

https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Forest_Health/Library/2015%20I%26D%20C%20onditions%20Report%20final.pdf.

Annual monitoring of maple tapping special use areas (Sugarbush leases) was completed by Forest Health Protection for 2015. There are six tapping sites located in 5 towns (Stockbridge, Pomfret, Wilmington, Mt. Tabor and 2 in Lincoln). The annual monitoring consists of six criteria: Two growing season site visits for visual inspection of conditions; pheromone trapping for damaging insects; insect egg mass surveys during outbreaks; taphole closure assessment; root starch reserve measurements; and using the Aerial Detection Survey to see if any damaging agents are active in the area around the sugarbushes. Pheromone traps for forest tent caterpillar were deployed, as well as traps for saddled prominent. In 2015 there were no insect outbreaks, so egg mass surveys were not conducted.

Sugar maple tree health, based on the amount of twig dieback, remained high in 2015, with 95 percent of trees rated as having dieback <15 percent on the 30 monitoring plots formerly part of the North American Maple Project (NAMP). The frequency of thin foliage increased from 2014 with over 15 percent of overstory maples having greater than 25 percent foliage transparency. This increase is largely attributed to frost damage and dry conditions. Annual measurement of sugar maple forest stands is by the State of VT and University of Vermont to determine tree condition, trends and possible causes of sugar maple decline. The variation in within-season timing of measurements is assessed using same plot design as in the National Forest Health Monitoring Program (NFHM). Initially this effort was part of a cooperative

monitoring program with other states and Canada, since 2002 Vermont has measured these plots independently for internal use.

Fiscal Year 2016

A variety of monitoring activities are conducted at the State and Forest level by several different agencies and organizations. Forest staff review this data and cooperate with partners to assess forest health conditions, supplementing observations made during inventory and management activities. Monitoring efforts are summarized in Table 2-6.

Table 2-6. Fiscal year 2016 insect and disease monitoring.

Insect or Disease Agent	Organization & Date of Monitoring	Type of Monitoring Effort
Forest tent caterpillar, saddled prominent, gypsy moth, oak leaf tier, balsam woolly adelgid and dieback or mortality from beech bark disease, Septoria leaf spot, cankers and other unknown agents.	Vermont Department of Forests, Parks and Recreation - flown June 21 – August 23. Northeastern Area State & Private Forestry, Forest Health Protection, USDA Forest Service, flown June 23rd, 2016.	Annual Aerial Detection Surveys of forest health conditions on Green Mountain National Forest.
Insects, disease or events harmful to sugar maple trees.	Northeastern Area State & Private Forestry, Forest Health Protection, USDA Forest Service, May 16-18; June 20-22; and September 20-22, 2016.	Sugarbush surveys, on the ground field surveys, site visits.
Sugar maple general health and decline, tree health and pest populations.	Vermont Department of Forests, Parks and Recreation, University of Vermont, Forest Ecosystem Monitoring Cooperative.	Field surveys, long-term monitoring plots.

The USFS Forest Health Protection Staff and Vermont Department of Forests, Parks and Recreation (FPR) conduct aerial and ground surveys to detect forest damage, map late season defoliators and assess general forest conditions. On June 23rd, the Forest Service conducted an aerial survey over GMNF. An FPR survey covering the rest of the state, to map forest tent caterpillar defoliation and general forest conditions, was flown between June 21st and August 23rd. In 2016, 80,233 acres of forest damage were sketch mapped during statewide Aerial Detection Surveys. This represents less than 2 percent of Vermont's forestland, and a decrease from 2015, when 128,391 acres were mapped. White pine needle damage and hardwood defoliation by forest tent caterpillar accounted for 34 percent and 32 percent, respectively, of the area mapped. Approximately 11,223 acres of damage were mapped throughout, and adjacent to GMNF. The 2016 acreage was slightly down from the 15,529 acres mapped in 2015. A total of 10,677 acres were mapped as white pine discoloration, 477 acres of forest tent caterpillar defoliation in the northern hardwoods, and 69 acres of balsam woolly adelgid mortality in fir. White pine discoloration doubled from the 5,580 acres mapped in 2015. Populations of the native forest tent caterpillar increased dramatically, especially in north-central and northeastern Vermont, however defoliation on GMNF was less extensive.

Forest Insect and Disease Conditions in Vermont 2016 is available at:

https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Forest_Health/Library/2016%20Forest%20Insect%20%26%20Disease%20Conditions%20in%20Vermont.pdf.

Annual monitoring of the Special Use Areas used for Maple Tapping (Sugarbush leases) was completed by Forest Health Protection for 2015. There are six tapping sites located in 5 towns (Stockbridge, Pomfret, Wilmington, Mt. Tabor and 2 in Lincoln). The annual monitoring consists of six criteria: Two growing season site visits for visual inspection of conditions; pheromone trapping for damaging insects; insect egg mass surveys during outbreaks; taphole closure assessment; root starch reserve measurements; and using the Aerial Detection Survey to see if any damaging agents are active in the area around the

sugarbushes. Pheromone traps for forest tent caterpillar were deployed, as well as traps for saddled prominent. In 2015 there were no insect outbreaks, so egg mass surveys were not conducted.

Sugar maple tree health, based on the amount of twig dieback, remained high in 2016, with 95% of trees rated as having dieback < 15% on the 30 monitoring plots formerly part of the North American Maple Project (NAMP). Annual measurement of sugar maple forest stands is by the State of VT and University of Vermont to determine tree condition, trends and possible causes of sugar maple decline. The variation in within-season timing of measurements is assessed using same plot design as in the National Forest Health Monitoring Program (NFHM). Initially this effort was part of a cooperative monitoring program with other states and Canada, since 2002 Vermont has measured these plots independently for internal use.

Evaluation and Conclusions: Insect and disease levels at present do not impact the ability to maintain forested conditions and objectives, or outputs of forest products.

Fiscal Year 2014

Insect epidemics and resulting population numbers vary greatly from year to year, resulting from a combination of susceptible host habitats, favorable weather conditions, and previous year population levels. Individual tree mortality within mature stands increases as the forest ages. Currently harvest levels are at about 25 percent of annual Allowable Sale Quantity (ASQ) and average stand age is increasing. In 2014 there were no significant outbreaks detected from any major insect pests. Dieback from beech bark disease was the most extensive damage observed. The hemlock woolly adelgid (*Adelges tsugae*), has been positively identified in Vermont just south of GMNF and is considered a pest of concern. The emerald ash borer (*Agrilus planipennis*) was also discovered in Concord, NH in 2013 and is considered a pest of concern for the ash resource. Other non-native insects and diseases that have not yet been identified in Vermont include Asian longhorned beetle, winter moth, and the agents that cause oak wilt, thousand cankers disease, and sudden oak death. The sugarbush special use areas are in a generally healthy condition. There was a good growing season in 2014 with few major biotic or abiotic damage agents.

Fiscal Year 2015

In 2014 there were no significant outbreaks detected from any major insect pests. Dieback from beech bark disease was the most extensive damage observed. Hardwood foliage symptoms from abiotic factors such as drought and frost were somewhat widespread in 2015, but most hardwood insects and diseases remained at low levels. White pine needle damage and beech bark disease were again widespread on GMNF. Maple defoliators were the most commonly observed, including forest tent caterpillar and maple leaf skeletonizer. Reports of red pine mortality increased substantially in 2015, including an estimated 249 acres on GMNF. The sugarbush special use areas are in a generally healthy condition. 2015 had a good growing season with few major biotic or abiotic damage agents.

Fiscal Year 2016

In 2014 there were no significant outbreaks detected from any major insect pests. Dieback from beech bark disease was the most extensive damage observed. Hardwood foliage symptoms from abiotic factors such as drought were somewhat widespread in 2016. Hardwood defoliation increased somewhat in 2016. Maple defoliators were the most commonly observed, including forest tent caterpillar, maple webworm, and maple leaf skeletonizer. White pine needle damage and beech bark disease were again widespread on GMNF. Reports of red pine mortality continue at the state level. The sugarbush special use areas are in a generally healthy condition, despite drought conditions. Saddled prominent was not a major threat in 2016, but there was increased defoliation caused by maple trumpet skeletonizer, maple leaf cutter, and maple webworm.

Recommendations: Increasing red pine mortality on the Forest and in the northeast more broadly should be monitored and salvage opportunities should be evaluated. Forest staff should continue to monitor insect and disease activities, and review data from available aerial and ground detection monitoring

efforts. Monitoring of forest tent caterpillar should be prioritized given recent population increases. Staff should continue cooperation with VT Forest Parks and Recreation Department in surveying for invasive species and planning for response to new infestations. Staff should continue cooperation with USFS Forest Health Protection Staff in conducting inventories, surveys, testing pheromones, trapping and response activities.

No changes to monitoring and evaluation measurements, indicators or methodology are recommended.

Heritage

Evaluation Question: Heritage Resource Program Objectives

Monitoring Question: To what extent have Forest Plan Objectives been attained?

Detailed Monitoring Question: Have Heritage Resource program management objectives related to: backlogged site evaluations; meeting curation guidelines; developing a Geographic Information Systems (GIS) model for prehistoric site locations; increasing partnerships for Section 110 activities; consulting with State Historic Preservation Officers (SHPO) and Tribes; and incorporating heritage components into historic building management plans been addressed?

Monitoring Activities: For fiscal years 2014 to 2016, a total of 30 outreach and stewardship opportunities were conducted involving archaeological site tours, public presentations, excavations, and artifact analyses. Participants included members of the public, and partnerships with the Vermont Archaeological Society, the University of Vermont, and various historical societies. Student volunteers with the Vermont Youth Conservation Corps also assisted in stabilization efforts at the National Register of Historic Places (NRHP) listed Somerset School House in fiscal year 2016, to address deferred maintenance needs on the property.

Federal and State-recognized tribes were consulted on five projects during fiscal year 2014 and Tribal Historic Preservation Office (THPO) representatives with the Stockbridge Munsee Community were provided a guided tour of the proposed South of Route 9 Integrated Resource Project. Vermont Abenaki tribal members participated in a ceremony at the West Hill Cairns in fiscal year 2014 after repairs were made to one of the cairns due to vandalism. Tribal consultation data for fiscal years 2015 and 2016 were not readily available to include in this report, however the Vermont recognized El Nu, Nulhegan, Koasec, and Mississquoi Abenaki, and federally recognized Stockbridge Munsee Community continued receiving the GMNF Schedule of Proposed Actions for each fiscal year.

Backlogged site evaluations were not completed due to limited Heritage staff during this reporting period. Digitization efforts for hand plotted sites were conducted in fiscal year 2016 to re-locate and GPS sites for entry into a digital mapping system. The Vermont Division for Historic Preservation developed a GIS model for archaeological site locations which is now being used in conjunction with the Forest's Heritage GIS data to evaluate archaeologically sensitive locations.

Evaluation and Conclusions: The Forest met its Section 110 Heritage Program Managed to Standard (HPMtS) goals from the numerous outreach and stewardship projects conducted in fiscal years 2014 to 2016. Progress has been made in management of historic buildings by addressing deferred maintenance projects, however, there has been little to no progress in site evaluations.

Recommendations: The developmental need for a prehistoric site model has already been addressed by the State of Vermont and should be incorporated into future Section 106 review of Forest projects. Continued partnerships and outreach with local historical societies and the Vermont Archaeological Society is important for the recurring interest we receive from volunteer opportunities. Consultation

efforts with State and Federally recognized tribes need to continue and expand to ensure their project-specific concerns are being met and they are receiving Forest-wide representation.

Evaluation Question: Heritage Resource Site Protection

Monitoring Question: To what extent have Forest Plan Objectives been attained?

Detailed Monitoring Question: Have Heritage Resources across GMNF been inventoried and protected?

Monitoring Activities: Approximately 30,000 acres of broad scale inventory of cultural resources were conducted during fiscal years 2014 to 2016 for the South of Route 9 Integrated Resource Project, the West Branch and Liberty Hill timber sales, and the Robinson Integrated Resource Project (IRP). A walk over survey to inventory existing sites was conducted in fiscal year 2016 for the Robinson IRP. A minimum of three Priority Heritage Assets were visited during this reporting period and received updated conditions assessments as part of the HPMtS goals.

Cultural resources along West Hill and West Branch in the Rochester Ranger District were monitored in fiscal year 2016 to assess their condition and identify resources that would benefit from on-site vegetation and/or erosion management. In addition, maintenance activities occurred in fiscal years 2014 to 2016 at a total of 19 cemeteries to address vegetation encroachment and head stone damage repairs.

Evaluation and Conclusions: Cultural resource monitoring forms were prepared for each archaeological site identified during the monitoring surveys to highlight current or potential impacts to the resource, however the results of site-specific condition assessments were not readily available to address in this report. The condition assessments demonstrate which sites are in need of on-site vegetation or erosion management.

Recommendations: Continue to inventory and monitor cultural resources on a rotating schedule to mitigate or document adverse effects as they arise.

Evaluation Question: Heritage Resource Standards and Guidelines

Monitoring Question: To what extent have Forest Plan Objectives been attained?

Detailed Monitoring Question: Have heritage resources within the “Areas of Potential Effect” of GMNF-sponsored projects (undertakings) been protected and managed according to Forest Plan Standards and Guidelines?

Monitoring Activities: A number of projects were reviewed in accordance with Section 106 of the National Historic Preservation Act (NHPA) throughout fiscal years 2014 to 2016. These projects included but were not limited to: Special Use Permits, trail construction and relocations, bridge repair and replacements, wetland restorations, and timber sales. Projects with a determination of No Adverse Effect were protected from management activities through mitigations measures or exclusion boundaries. Mitigation measures were also added to a number of sites associated with the South of Route 9 IRP in fiscal year 2014. Monitoring of cultural resources associated with the Upper White River IRP were also conducted in fiscal year 2016 to evaluate the effectiveness of the mitigation measures that were put in place for site protection.

Evaluation and Conclusions: A review of project activities is necessary for compliance with the National Historic Preservation Act (NHPA) and allows for historic properties to be identified and mitigation measure applied prior to project implementation. Post-project monitoring efforts provide the

necessary data to confirm site protection mitigation measures were followed and provides opportunity to adjust mitigations needs for future projects to reduce potential effects to the resource.

Recommendations: Continue using Forest Plan-level Standards and Guidelines, and project-specific design criteria and/or mitigation measures to ensure the preservation of cultural resources. Working with project proponents before and after implementation will help ensure protection measures are met.

Human Dimensions

Evaluation Question: Partnerships Maintenance and Enhancement

Monitoring Question: To what extent have Forest Plan Objectives been attained?

Detailed Monitoring Question: Are partnerships active and effective on GMNF and are Forest Service personnel participating in partnership activities?

Monitoring Activities: Agreements with partners, such as challenge cost-share agreements and participating agreements, are recorded for the Green Mountain and Finger Lakes National Forests (combined) in the Natural Resource Management database, including partner cash, non-cash and in-kind contributions (Table 2-7). Reporting contributions from partner agreements is a consistent, accurate method for reporting contributions; however, it is recognized that this does not account for all annual volunteer hour contributions. Volunteer hours are reported inconsistently and there is no accurate way to depict annual volunteer contributions currently for GMNF. Similarly, there is no consistent data collection effort to document and quantify the number of partners engaged in any given year given many partners may informally collaborate with the GMNF outside of a signed agreement.

Table 2-7. Partner agreement contributions in New York and Vermont from fiscal years 2014 to 2016.

Fiscal Year	Non-Federal Contributions	Other Federal Contributions	State Contributions	Total
2014	\$501,960.30	\$95,111.59	\$0.00	\$597,071.89
2015	\$485,282.47	\$0.00	\$33,000.00	\$518,282.47
2016	\$222,699.69	\$210,000.00	\$0.00	\$432,699.69
Total	\$1,209,942.46	\$305,111.59	\$33,000.00	\$1,548,054.05

In addition to monitoring agreements, individual and group volunteer contributions were recorded over this monitoring period (Table 2-8).

Table 2-8. Volunteer contributions in New York and Vermont from fiscal years 2014 to 2016.

Fiscal Year	Number of Volunteers	Total Hours Contributed	Equivalent Fund Contribution	Percent of Full-Time Employee Contributed
2014	66	320	\$7,216.00	0.18
2015	26	5,054	\$116,595.78	2.81
2016	113	6,821	\$159,702.76	3.79
Total	205	12,195	\$283,514.54	6.78

Evaluation and Conclusions: Over the three-year period of fiscal years 2014 to 2016, partners contributed over \$1.5 million dollars to National Forest System management (Table 2-7), (USDA Forest Service, 2025b) and volunteers contributed the equivalent of \$283,514.54 and the equivalent human-power of 6.78 full-time employees (Table 2-8). The majority of the contributed funds (78 percent) are from non-federal contributions, such as non-profit matches. Other federal contributions make up 20

percent, for example an Air Force agreement supporting wildland fire operations, and state contributions make up 2 percent.

Partner contributions recorded in agreement data often reflect the ability of the Forest Service to fund an agreement, wherein the partner is required to make a substantial match, typically a minimum of 20 percent. When the Forest Service is able to contribute more funding into a challenge cost-share agreement, the resulting partner matching contributions rise. From fiscal years 2014 to 2016, the Forest Service projected wildfire suppression costs to be hundreds of millions of dollars over the available budget. As a result, funds from programs such as recreation and wildlife were necessary to cover the shortfall, limiting the available agreement dollars.

Recommendations: No changes are recommended.

Evaluation Question: Teacher Professional Development in Forest Stewardship

Monitoring Question: In what way is the Forest Service providing information and education opportunities that enhance the understanding of the GMNF?

Detailed Monitoring Question: Did teacher professional development in Forest stewardship occur?

Monitoring Activities: Number of teachers trained. Number of programs offered

Evaluation and Conclusions: Forest Service staff continue to provide teacher and student development and programming annually in an effort to educate the next generation of National Forest users. This work comes in several forms including outreach to schools and teachers and providing in-person programming delivered by Forest Service staff. In addition, an effort is made to provide agreement and funding opportunities and natural resource programming on an annual basis to cooperating partner organizations. Public education continues through multiple community events. It is estimated dozen programs are offered per year geared toward educating teachers, students, partners, and the public.

Recommendations: Continue to provide professional teacher development opportunities through the continuation of outreach programs and facilitate ideas that promote families and children to engage the natural world.

Evaluation Question: Payments to Towns

Monitoring Question: To what extent have Objectives been attained?

Detailed Monitoring Question: What was the amount paid to each GMNF town through PILT, 25% fund or Secure Schools. What type of communications have occurred on this topic with each town?

Monitoring Activities: There are two types of federal payments reaching municipalities that have NFS lands: 1) Payments in Lieu of Taxes; and 2) Public Law 106-393, Secure Rural Schools and Community Self-Determination Act of 2001, reauthorized in 2008. Payments in lieu of taxes funds are directed to towns, and the Public Law 106-393 funds are directed to school districts. See Appendix A for additional information on the federal payments and specific payment information for each GMNF town.

Evaluation and Conclusions: Towns are sent information regarding payments as soon as it is released.

Recommendations: Continue informing towns of the status of the Payment to Towns legislation as well as yearly appropriations.

Invasive Species Population

Evaluation Question: Non-native Invasive Species

Monitoring Question: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?

Detailed Monitoring Question: To what extent are non-native invasive species impacting other Forest resources?

Monitoring Activities: The impact of non-native invasive plants (NNIP) on GMNF has been monitored by surveying the extent of infestations in areas prioritized to protect, or in areas most likely to be sources of seeds or plant propagules that could be dispersed to areas to be protected. It also includes monitoring any treatments. All data was gathered using the USDA Forest Service Natural Resources Information System (NRIS) protocol, to be entered into the NRIS corporate database. All sites monitored provide baseline information that can be used during ongoing implementation of the Forest-wide Invasive Plant Control Project approved in 2010.

Botanical inventory occurred in the following locations:

Fiscal Year 2014

- 712.2 acres of federally designated Wilderness (trails into, roads next to, trailheads and parking lots for access) were surveyed for NNIP via the Student Conservation Association intern program (61.4 on the Middlebury District, 467.9 on the Manchester District, 182.9 on the Rochester District).
- 162 acres of wildlife openings were surveyed for both NNIP and rare plants (21 openings/152 acres on the Manchester District and 2 openings/10 acres on the Rochester District, included one visited in fiscal year 2015).
- 176 acres were inventoried for both NNIP and rare plants in the South of Route 9 Integrated Resource Project (IRP) area.

Fiscal Year 2015

- 648 acres were inventoried for both NNIP and rare plants in the Robinson IRP area.

Fiscal Year 2016

- 928 acres were inventoried for both NNIP and rare plants in the Robinson IRP area.
- 14.6 acres were inventoried for both NNIP and rare plants in the South of Route 9 IRP area.

By the end of the 2016 field season, there were 175 infestations documented to occur in or on the edges of federally designated Wilderness areas (including all infestations recorded prior to end of fiscal year 2016). Almost all infestations are small and located at trailheads, or on edges such as roads and rivers, versus Wilderness interior. The majority of what appear to be large infestations are actually smaller infestations for which polygons hand-drawn in NRIS misrepresent conditions on the ground.

Of the 23 wildlife openings inventoried, 11 (approximately half) were infested with NNIP. Ten of the 11 infested openings were along roads. Of the 12 openings in which no NNIP were found, seven were along roads. Being along a road makes an opening easier to maintain but may put it at greater risk of becoming infested with NNIP. This, in turn, will decrease the diversity of habitat and food available to wildlife.

By the end of fiscal year 2016, 372 infestations of NNIP were documented to occur with the Robinson IRP area (including all infestations recorded prior to fiscal year 2014); infestations are on both National

Forest System and private lands. Infestations consisted of Norway maple, goutweed, garlic mustard, wild chervil, Japanese and common barberry, narrowleaf bittercress, oriental bittersweet, autumn olive, burning bush, Morrow honeysuckle (or other non-native honeysuckles), purple loosestrife, wall lettuce, wild parsnip, Japanese knotweed, common buckthorn, multiflora rose, and common periwinkle. Of all these, wild chervil is most widespread. Most NNIPs occur along edges, such as roads, trails, and rivers, or along access points such as trailheads and parking lots. Very few occur in forest interiors. However, many of the species that are now primarily on the edges have the potential to establish in woods, given the opportunity. An example is garlic mustard; if it established in forest interiors, it would limit ground flora diversity, wildlife habitat, and tree regeneration.

Small infestations were treated by a combination of hand-pulling, digging, and spot herbicide applications in the following locations:

Fiscal Year 2014 (93.5 acres)

- Much of the work involved hand-pulling wild chervil on roadsides in the Natural Turnpike and Upper White River IRP areas.
- Herbicide and manual treatments occurred in the Dorset Peru IRP area.

Fiscal Year 2015 (208.8 acres)

- The largest portion of this was manual control of woody shrubs in the South of Route 9 IRP area using shovels and weed poppers.
- Hand-pulling wild chervil continued on roadsides in the Natural Turnpike and Upper White River IRP areas.

Fiscal Year 2016 (132 acres)

- Herbicide and manual treatments occurred in the Dorset Peru and South of Route 9 IRP areas.
- Hand-pulling wild chervil continued on roadsides in the Natural Turnpike and Upper White River IRP areas.
- In maintained openings along the Appalachian Trail, knapweed and several woody NNIP were treated using a variety of methods.
- A variety of methods were used to control miscellaneous small infestations on the north half of GMNF, including at trailheads and parking lots.

Evaluation and Conclusions: While monitoring (botanical inventories/surveys) indicated the extent of NNIP infestations, Forest Service staff does not currently have a means of quantifying the effect of NNIP on other resources. Monitoring protocols were otherwise efficient and easy to use and allowed the assessment of short-term effectiveness of treatments.

Hand-pulling wild chervil is effective for one season, but the seed bank regenerates the infestation in the following season. The management goal is to reduce the seed bank over time. Road grading, roadside mowing, and other road maintenance are also a continuing source of seed spread. Forest Service staff continue to coordinate with contacts handling road maintenance contracts, so that this source of seed spread is minimized in the future.

Woody NNIP treated with cut stump or foliar spot-sprayed herbicide is generally effective, though needs more than one treatment. Garlic mustard treated by any method regenerates the following season and will continue to do so until the seed bank is exhausted.

Monitoring shows it is never enough to treat infestations one or two times. The reasons for this vary; in some cases, the treatment method is simply not 100 percent effective, and in other cases the method might be effective, but there is an abundant NNIP seed source in the soil. It is also very difficult to prevent new

infestations that can arrive at a site by several means, including wind, rain, wild and domestic animals, and human activity of all kinds.

The Forest Plan (Goal 2) directs management to “maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals” (Forest Plan, p. 10). Project implementation has complied with this direction by having rare plant and non-invasive plant inventories completed in Wilderness, maintained wildlife openings, and South of Route 9 and Robinson IRP areas. Knowing what NNIP are present, along with what rare plants that need protection, allows the develop of effective treatment plans. Project implementation also has complied with Forest Plan direction (Pests, Diseases, and NNIP Species Standard S-1, p. 33) by incorporating information on the status and threat of invasive species in project development, analysis, and mitigation measures.

Recommendations: Despite NNIP control challenges, monitoring guide measures, indicators, and methodology appear to be working, although they only assess the extent of infestations and effectiveness of treatments, not the impact on other resources. Impact on other resources may be best assessed qualitatively by specialists who manage other resources. For example, a silviculturist may recognize reduced tree seedling regeneration in a forest heavily infested with garlic mustard, and a wildlife biologist may notice decreased habitat quality in a maintained opening infested with multiflora rose.

After several years of implementing the Forest-wide Invasive Plant Control Project, the Forest Plan standards and guidelines for NNIP (Forest Plan, Section 2.3.9, p. 33) seem more idealistic than realistic:

- Guideline G-1 emphasizes use of basic prevention measures, but is not clear on what these are, does not provide guidance on how to use them, or explain their value. This guideline would be more helpful if it referred the reader to the Best Management Practices (BMP) for the Eastern Region (available online at <https://www.fs.usda.gov/sites/nfs/files/legacy-media/r09/NNIS%20BMP%20-R9.pdf>) and recommended implementing the BMP most appropriate for the specific activities undertaken. It also may be useful if training is developed for all field-going staff, and the Forest Leadership Team develop and communicate expectations regarding prevention measures. In addition, it is recommended that each district have the ability to clean machinery in the field, including between sites.
- Guideline G-2 directs Forest Service staff to attempt to determine the source of infestation before treatment begins. While this sage advice (its goal is to prevent immediate reinfestation of a site after it is treated), it is often not possible. It is recommended the wording be changed to “To increase the likelihood of treatment success, if the source of an infestation can be identified, attempt to address it prior to treating the infestation”.
- Guideline G-2 encourages restoration of native communities where feasible, but does not define what that is, or how to go about developing restoration plans. It is recommended the wording be changed to “Include restoration, rehabilitation, or revegetation, as defined by Forest Service Manual 2070”.
- Guideline G-2 directs the herbicide/pesticide use only when other methods are ineffective, but monitoring shows the most suitable method is often very species-specific and is also influenced by time and budget. It is recommended that the wording be changed to “use the method most likely to be effective given the species, infestation characteristics, and available resources”.
- Guideline G-5 suggests prioritization of treatment actions, but that prioritization does not align with what is feasible on the ground. Realistically, the choice of treatments is based on the sources of funding available, the availability of staff to identify and carry out priorities, and the need to focus on response to proposed ground-disturbing projects. It is recommended the first and fifth bullets (prevention and early detection rapid response) remain, but be reordered so they are first and second, respectively. The last bullet (containing and controlling established infestations) should remain last, and the remaining three should be combined into one bullet that is referred to as “sites with high dispersal potential or sites we need to protect”.

Lands

Evaluation Question: Special Uses

Monitoring Question: To what extent have Forest Plan Objectives been attained?

Detailed Monitoring Question: Is the Forest improving its administration of existing authorizations?

Monitoring Activities: Data for special use permits is consolidated for the Green Mountain (Vermont) and Finger Lakes (NY) National Forests and is found in the Special Uses Database System (SUDS). Information for this report was obtained by pulling the fiscal year-end Administered to Standard report. SUDS contains six elements that can feed into determining if a permit is administered to standard: is the authorization current, are fees calculated, has a bill been issued, is insurance current, has the permit area been inspected on the appropriate schedule, and have performance evaluations been conducted on the appropriate schedule (Table 2-9).

Table 2-9. Special use permit authorization and Administered to Standard Report for the Green Mountain and Finger Lakes National Forests from fiscal years 2014 to 2016.

Monitoring Items	Fiscal Year		
	2014	2015	2016
Total Recreation Permit Authorizations	64	41	42
Recreation Authorizations to Standard	30	29	34
Percent Recreation Permits to Standard	47%	71%	81%
Total Lands Authorizations	111	110	105
Lands Authorizations to Standard	58	53	53
Percent Lands Permits to Standard	52%	48%	50%

Evaluation and Conclusions: The Forest is improving the administration of existing authorizations. Percent of recreation permits to standards has steadily increased since fiscal year 2014 while percent of land permits to standard has remained steady.

Recommendations: More dedicated Forest staff is needed to continue improving in the administration of special use authorizations.

Evaluation Question: Land Ownership Adjustment

Monitoring Question: To what extent have Forest Plan Objectives been attained?

Detailed Monitoring Question: To what extent has the GMNF land base been adjusted through purchase, exchange, transfer, interchange, boundary adjustment and donation?

Monitoring Activities Conservation partners, state and local colleagues, and interested citizens have provided tremendous assistance in identifying lands from willing sellers that would benefit the National Forest System. Land adjustment activities are recorded in the Landownership Adjustment Data System (LADS), including the acquisition of parcels, the donation of parcels to the federal government, the exchange of land, and the conveyance of land. The LADS system recorded five land adjustment activities for fiscal years 2014 to 2016 (Table 2-10).

Table 2-10. Land adjustment action for fiscal years 2014 to 2016.

Fiscal Year	Type of Case	Town	Tract #	Acres	Management Area	Notable features
2015	Purchase	Dorset	298	10.88	Escarpment	Consolidates public ownership; adjacent to Emerald Lake State Park
2015	Donation	Bristol	948	26.68	Diverse Forest Use	Secured additional access/ frontage on the New Haven River
2015	Purchase	Manchester	313	27.73	Diverse Forest Use	Healthy, well-managed forest; additional access from Manchester District Office
2015	Purchase	Dorset	307	78.94	Diverse Forest Use	Consolidates public ownership; deer habitat
2016	Purchase	Stamford & Pownal	317A, 317B	378.84	Diverse Backcountry	Conserves section of the Long and Appalachian Trails
Total Acres				523.07		

Evaluation and Conclusions: A total of 523.07 acres were added to the National Forest System land base. The major partner assisting in land acquisition was the Trust for Public Land in support of the Park Forestry acquisition of 378.84 acres. The information and collaboration gained from our partners and the willingness of local participation continues to highlight the importance of partnerships and community involvement.

Recommendations: Continue to work with partners, state entities and communities to help identify, evaluate, and subsequently acquire properties and secure rights of ways to accomplish land adjustment goals.

Program Management

Evaluation Question: Outputs Accomplished - Other Resources

Monitoring Question: How close are actual outputs and services to projected outputs and services?

Detailed Monitoring Question: How do actual outputs compare to those projected in Forest Plan Appendix D, Proposed and Probable Practices, specifically related to heritage, recreation, roads, vegetation, rare, ecological, wildlife, and fisheries resources?

Monitoring Activities: There were numerous outputs and services provided on GMNF during fiscal years 2014, 2015, and 2016. These outputs are displayed in Table 2-11.

Evaluation and Conclusions: All resource outputs and services are moving toward estimated total amounts for the first decade of Forest Plan implementation (2006 to 2015). Some activities such as heritage resource protection and threatened, endangered, and sensitive species inventory have already exceeded estimated amounts since 2006. Other activities will not reach estimated amounts if the annual accomplishments continue at current rates. Totals for all activities and practices accomplished by the end of 2015 should be used as a basis to determine where adjustments can be made to better achieve Forest Plan objectives during the second decade of Forest Plan implementation (2016 to 2025).

Table 2-11. Estimated and actual outputs achieved in fiscal years 2014, 2015, and 2016 (Forest Plan Appendix D, Proposed and Probable Practices).

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1) ¹	Actual Amount Achieved: Fiscal Year 2014	Actual Amount Achieved: Fiscal Year 2015	Actual Amount Achieved: Fiscal Year 2016
Heritage Resource Protection					
Inventoried Acres	Acres	2,000 to 4,000	Unavailable	Unavailable	Unavailable
New Sites Identified	Sites	10 to 40	Unavailable	Unavailable	Unavailable
New Sites Evaluated	Sites	2 to 7	Unavailable	Unavailable	Unavailable
Sites Monitored	Sites	30 to 60	Unavailable	Unavailable	Unavailable
Recreation Resources					
Trail Improvement	Miles	10 to 20	2	1	1
Trail Rehabilitation	Miles	200 to 400	73.6	3.5	38.2
Trail Maintenance	Miles	9,050	206.34	474.14	466.71
Wilderness Managed ²	Areas	30 to 50	8	0	0
Roads Management					
Rights-of-Way Acquisition	Rights-of-Ways	40	0	0	0
Maintain Local Roads	Miles	100 to 200	83.3	76.93	84.7
Restore Local Roads	Miles	10 to 20	0.2	0.3	3.4
Reconstruct Local Roads	Miles	5 to 10	0.2	0.3	3.4
Construct Local Roads	Miles	0 to 5	0	0	0
Maintain Arterial and Collector Roads ³	Miles	40 to 80	12.76	17.93	17.83
Decommission Local Roads	Miles	5 to 10	0	2.6	0
Vegetation Management					
Hardwood Selection Cuts	Acres	8,366	152	93	135
Hardwood/Oak Shelterwood Regeneration	Acres	11,496	78	0	0
Hardwood/Oak Shelterwood Removal	Acres	3,240	0	0	0
Hardwood Clearcut	Acres	2,376	30	0	52
Hardwood/Oak Thin	Acres	9,000	67	212	63
Hardwood Stand Improvement	Acres	2,650	118	19	29
Softwood Shelterwood Regeneration	Acres	2,814	0	13	0
Softwood Selection Cuts	Acres	1,444	0	76	38

¹ These numbers represent the sum of annual activities in years 1 through 10 (2006 to 2015).² Wilderness managed to standard.³ Town jurisdiction roads accessing National Forest System land maintained through road cooperative agreements.

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1) ¹	Actual Amount Achieved: Fiscal Year 2014	Actual Amount Achieved: Fiscal Year 2015	Actual Amount Achieved: Fiscal Year 2016
Softwood Clearcut	Acres	10	23	29	59
Softwood Thin	Acres	1,000	47	24	5
Softwood Stand Improvement	Acres	700	0	0	0
Softwood Planting	Acres	350	22	20	0
Release Softwood from Hardwoods	Acres	1,700	0	0	0
Clearcut Hardwoods for Softwoods	Acres	90	0	0	0
Plant Softwoods for Conversion	Acres	500	22	20	0
Clearcut Aspen	Acres	146	0	0	0
Clearcut Hardwoods for Aspen Regeneration	Acres	725	48	28	10
Total Selection Cuts	Acres	9,810	152	169	173
Total Shelterwood Regeneration	Acres	14,310	27	0	0
Total Shelterwood Removals	Acres	3,240	70	0	0
Total Clearcut	Acres	3,347	137	41	67
Total Thin	Acres	10,000	50	246	68
Total Stand Improvement	Acres	3,350	118	98	29
Total Release	Acres	1,700	0	98	101
Total Planting	Acres	850	22	20	0
Hardwood Sawtimber Cut	MMBF	110	1.2	1.3	0.5
Softwood Sawtimber Cut	MMBF	10	1.3	0.4	0.9
Combined Sawtimber	MMBF	120	2.5	1.7	1.6
Hardwood Roundwood Cut	MMBF	41	1.7	2.2	1.7
Softwood Roundwood Cut	MMBF	3	1.1	0.6	0.5
Combined Roundwood	MMBF	44	2.8	2.8	2.2
Total Timber Cut	MMBF	164	5.3	4.5	3.8
Monitor condition of sites and species under special forest product permits	Sites	All	All	All	All
Rare or Outstanding Ecological Resources					
Monitor known rare or outstanding ecological, biological, or geological features	Sites	All (129+)	12	4	5
Inventory for TES species and rare or	Acres	4,000	338 - plants	648 - plants	942.6 - plants

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1) ¹	Actual Amount Achieved: Fiscal Year 2014	Actual Amount Achieved: Fiscal Year 2015	Actual Amount Achieved: Fiscal Year 2016
outstanding natural communities					
Prepare conservation plans for each rare or outstanding area	Sites	20	0	0	0
Establish RNAs	Sites	2	0	0	0
Wildlife, Fisheries, and Rare Plant Resources					
Protect known occurrences of TES species	Sites	All	All TES wildlife and plant sites protected during project implementation	All TES wildlife and plant sites protected during project implementation	All TES wildlife and plant sites protected during project implementation
Protect, and where feasible, improve or restore habitat conditions for TES plants, and for TES animals of riparian and wetland habitats.	Sites	All	3 sites improved for 3 rare plants (TES & other). All TES wildlife and plant sites protected during project implementation	8 sites improved for 30 rare plants (TES & other). All TES wildlife and plant sites protected during project implementation	4 sites improved for 8 rare plants (TES & other). All TES wildlife and plant sites protected during project implementation
Protect important habitat sites for TES bats	Hibernacula	All hibernacula	All known hibernacula protected during project implementation	All known hibernacula protected during project implementation	All known hibernacula protected during project implementation
Protect important habitat sites for TES bats	Roost trees	Adequate numbers of roost trees	TES bats are not summer habitat limited; all known maternity areas protected during project implementation	TES bats are not summer habitat limited; all known maternity areas protected during project implementation	TES bats are not summer habitat limited; all known maternity areas protected during project implementation
Protect nesting TES bird species from disturbance	Active nest sites	All	Extent unknown – review was by project. Forest actions complied with Migratory Bird Treaty Act (MBTA).	Extent unknown – review was by project. Forest actions complied with MBTA.	Extent unknown – review was by project. Forest actions complied with MBTA.
Monitor known occurrences of TES species	Sites /Populations	All	38 out of 88 vascular TES plants (56 sites/populations) & 0 nonvascular plants. RFSS Wildlife monitoring was project-specific.	43 out of 88 vascular TES plants (62 sites/populations) & 0 nonvascular plants. RFSS Wildlife monitoring was project-specific.	30 out of 88 vascular TES plants (36 sites/populations) & 3 of 26 nonvascular plants (4 sites/populations). RFSS Wildlife monitoring was project-specific.
Update conservation assessments for RFSS	Species	All	0 for RFSS plants	0 for RFSS plants	0 for RFSS plants

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1) ¹	Actual Amount Achieved: Fiscal Year 2014	Actual Amount Achieved: Fiscal Year 2015	Actual Amount Achieved: Fiscal Year 2016
Oak Released from Hardwoods, and Oak and Oak-Pine Habitat Restored/Improved	Acres	2,000	0	0	5
Mow Upland Wildlife Openings	Acres	2,000	440.0	241.9	248.3
Non-Commercial Clearcutting of Aspen and Paper Birch	Acres	2,000	0	0	0
Burn Upland Wildlife Openings	Acres	5,000	0	0	0
Burn Marshes	Acres	250	0	158	0
Other Wildlife Habitat Improvement	Acres	250	1326.4	855.8	1082.9
Stream Habitat Restored/improved	Miles	50	38.8	18.9	75.9
Lake Habitat Restored/Enhanced	Acres	10	275.0	184.0	219.7
Fish Habitat Monitored	Sites	80	9	11	10
Fish Passage Restored	Road Crossing	10	7	4	4

Recommendations: Continue to monitor outputs and services to determine if there are shortcomings in services provided and/or if adjustments should be made to the estimated outputs due to budget constraints or a change in the need to produce these outputs. Review total outputs for the fiscal years 2006 to 2015 monitoring period to determine if changes are needed for estimated outputs during the second decade of Forest Plan implementation (2016 to 2025).

Evaluation Question: Costs of Plan Implementation

Monitoring Question: How close are actual costs to projected costs?

Detailed Monitoring Question: To what extent is the Forest Service providing a mix of products, services, and amenities?

Monitoring Activities: Table 2-12 displays the targets that were achieved on the Green Mountain and Finger Lakes National Forests in fiscal years 2014, 2015, and 2016, and the estimated cost for achieving that target. Information is presented as a collective report for both National Forests because the information is tracked regionally in a combined report.

Table 2-12. Fiscal years 2014, 2015, and 2016 target accomplishments and estimated cost.

Target Activity	Amount Accomplished Fiscal Year 2014	Estimated Cost Fiscal Year 2014	Amount Accomplished Fiscal Year 2015	Estimated Cost Fiscal Year 2015	Amount Accomplished Fiscal Year 2016	Estimated Cost Fiscal Year 2016
Inventory and Monitoring						
Annual monitoring	All items	Not available	All items	Not available	All items	Not available

Target Activity	Amount Accomplished Fiscal Year 2014	Estimated Cost Fiscal Year 2014	Amount Accomplished Fiscal Year 2015	Estimated Cost Fiscal Year 2015	Amount Accomplished Fiscal Year 2016	Estimated Cost Fiscal Year 2016
requirements completed						
Inventory data collected or acquired to standard	All items	Not available	All items	Not available	All items	Not available
Forest Planning						
Amendments Underway	0	\$ 0	0	\$ 0	0	\$ 0
Facilities						
Forest administrative and other facilities maintained to standard	21 facilities	\$ 26,987	21 facilities	\$ 535,902	19 facilities	\$ 138,184
Recreation sites managed to standard	112 sites	\$ 146,225	118 sites	\$ 150,345	118 sites	\$ 152,170
Hazardous Fuels						
Treated with prescribed fire to reduce the risk of catastrophic wildland fire	628 acres	\$ 67,196	780 acres	\$ 83,430	636 acres	\$ 68,052
Lands						
Land Acquisitions/ad justments	0 acres	\$ 0	144.23 acres	\$ 741,000	378.84 acres	\$ 295,000
Boundaries marked	16.7 miles	\$ 192,067	15.1 miles	\$ 228,864	14.9 miles	\$ 149,921
Non-Recreation Special use permits administered to standard	68 permits	\$ 93,075	62 permits	\$ 59,800	63 permits	\$ 88,581
Non-Recreation Special use applications processed	10 applications	\$ 21,965	18 applications	\$ 56,075	8 applications	\$ 65,000
Rights of Way acquired	0	\$ 0	0	\$ 0	0	\$ 0
Vegetation and Watershed						
Forest vegetation established	107 acres	\$ 21,400	700 acres	\$ 140,000	309 acres	\$ 61,800
Timber stand & genetic tree improvement	118 acres	\$ 23,600	98 acres	\$ 19,600	101 acres	\$ 20,200

Target Activity	Amount Accomplished Fiscal Year 2014	Estimated Cost Fiscal Year 2014	Amount Accomplished Fiscal Year 2015	Estimated Cost Fiscal Year 2015	Amount Accomplished Fiscal Year 2016	Estimated Cost Fiscal Year 2016
Treated annually for noxious weeds and invasive plants	1180.2 acres	\$ 107,615	1130.6 acres	\$ 68,267	659.9 acres	\$ 195,834
Range land vegetation improved	746 acres	\$ 30,093	1039 acres	\$ 32,209	1077 acres	\$ 31,771
Soil and Water resource acres improved	1,508 acres ¹	\$ 185,399 ²	1,113 acres	\$ 150,065 ³	160 acres	\$ 47,856 ⁴
Wildlife, Fish and Threatened, Endangered and Sensitive Species						
Lake habitats restored or enhanced	275 acres	\$ 11,350	188.2 acres	\$82,991	224.9 acres	\$9,028
Stream habitats restored or enhanced	43.37 miles	\$432,150	36.76 miles	\$1,383,515	79.32 miles	\$297,899
Terrestrial habitats restored or enhanced	5263.6 acres	\$272,412	5858.85 acres	\$253,356	4479.66 acres	\$489,521
Recreation						
Heritage assets managed to standard	Not available	Not available	Not available	Not available	Not available	Not available
Recreation site capacity operated to Standard	872,445 PAOT days	\$146,225	917,780 PAOT days	\$ 150,345	917,780 PAOT days	\$ 152,170
Number of interpretive and conservation education plans implemented	1 plan	\$60,000	1 plan	\$ 60,000	1 plan	\$60,000
Recreation special use authorizations administered to standard	32 permits	\$17,925	32 permits	\$ 5,093	38 permits	\$2,918
Recreation Special use applications processed	30 applications	Not reported	11 applications	Not Reported	16 applications	Not reported
Trails improved to standard	3 miles	\$108,210	3 miles	\$53,471	2 miles	\$49,764
Trails maintained to standard	211.3 miles	\$178,014	479.4 miles	\$196,889	471.7 miles	\$232,869

Target Activity	Amount Accomplished Fiscal Year 2014	Estimated Cost Fiscal Year 2014	Amount Accomplished Fiscal Year 2015	Estimated Cost Fiscal Year 2015	Amount Accomplished Fiscal Year 2016	Estimated Cost Fiscal Year 2016
Wilderness Areas managed to standard	8 areas	\$131,018	0 areas	\$92,856	0 areas	\$81,897
Roads						
Roads decommissioned	0 miles	\$181,089	2.6 miles	\$503,467	0 miles	\$387,500
High clearance roads maintained	16.6 miles		12.8 miles		22.61 miles	
Passenger car roads improved	0.2 miles		0.1 miles		1.0 miles	
Passenger car roads maintained	66.7 miles		64.13 miles		62.1 miles	
Lands covered by motor vehicle use map (MVUM) – includes development of the GM MVUM	408,972 acres		408,972 acres		408,972 acres	
Timber						
Timber volume sold	9,579 ccf ⁵	\$879,000	8,246 ccf	\$ 901,000	10,079 ccf	\$1,023,000

¹ Soil and Water Resources Improved acres were not reported specifically in fiscal year 2014, values represent affected zones from projects that would improve soil and water resource functioning.

² Reported cost was retrieved from Watershed Improvement Tracking (WIT) database and includes rough estimates and cost place holders that likely do not accurately reflect actual Forest expenditures for these projects.

³ Reported cost was retrieved from WIT and includes rough estimates and cost place holders that likely do not accurately reflect actual Forest expenditures for these projects.

⁴ Reported cost was retrieved from WIT and includes rough estimates and cost place holders that likely do not accurately reflect actual Forest expenditures for these projects.

⁵ CCF = hundred cubic feet; to convert CCF to thousand board feet (MBF) multiply by 0.62 (CCF x 0.62 = MBF).

Evaluation and Conclusions: Tracking costs of Forest Plan implementation activities provides program managers unit cost information that is helpful in the development of work plans and out-year planning. Over an extended period, tracking these costs can be used to develop management activity unit cost trend information enabling managers to make more informed decisions about the costs of management activities.

Recommendations: Consider removing this question from the monitoring program because monitoring project costs is not tied to any Forest Plan component and it does not provide enough meaningful or accurate information to warrant its retention.

Evaluation Question: Desired Future Condition

Monitoring Question: What are the effects of management practices prescribed by the 2006 Forest Plan?

Detailed Monitoring Question: What activities have occurred in management areas? How have these management actions helped to achieve the desired future condition of the management area? Have activities occurred that detract from the desired future condition of the management area?

Monitoring Activities: The total number of projects approved in fiscal years 2014, 2015, and 2016 to implement the Forest Plan is provided in Table 2-13 by the level of analysis required by the National Environmental Policy Act (NEPA). The list of projects approved for each fiscal year are provided in Table 2-14.

Table 2-13. Number of projects approved for implementation in fiscal years 2014, 2015, and 2016.

National Environmental Policy Act – Level of Analysis	FY 2014	FY 2015	FY 2016
Record of Decision (EIS – Environmental Impact Statement)	0	0	0
Decision Notice (EA – Environmental Assessment)	0	2	0
Decision Memo (CE – Categorical Exclusion)	20	12	12
Letter To the File (CE – Categorical Exclusion)	12	8	4
Supplemental Information Report	3	4	1
Total Projects Approved	35	26	17

Table 2-14. List of projects approved for implementation in fiscal years 2014, 2015, and 2016.

Project Name (alphabetical order)	Location ¹	NEPA Level ²	FY Approved	Project Description
2016 Rainbow Gathering	Mid RD	LTF	2016	Authorize national Rainbow gathering along FR10 over July 4 weekend.
Appalachian Trail/Long Trail Lottery Road Drainage	Man RD	LTF	2014	Construct drainage ditch along a 170-foot stretch of the Appalachian Trail to remove water from the trail tread during the wet season.
Aquatic Organism Passage Culvert Replacement	Roc/Mid RD	LTF	2014	Replace 9 total culverts along FR59, FR35 and FR97.
AT/LT Clement Shelter Road Connector	Roc RD	LTF	2014	Construct and use 600 ft. temporary trail while Sargent Brook Bridge is constructed.
Bingo Brook Large Wood Placement	Roc RD	DM	2016	Place large woody debris along Bingo Brook.
Blueberry Lake Project SIR	Roc RD	SIR	2015	Construct parking area on east side of road for mountain bike trailhead area near Blueberry Lake.
Bodette and Cannon Road Access Special Use	Roc/Mid RD	DM	2015	Issue 2 permits to provide 1) access to private land inholding; and 2) access for harvest operations.
Bolles Brook Watershed Restoration	Mid RD	DM	2016	Rehabilitate trails and roads in the Glastenbury Wilderness. Includes adding existing trails to the system.
Boyden Brook Road Decommission, Watershed Restoration	Roc RD	EA and SIR	2015	Decommission and restore segment of Boyden Brook Road (FR49) damaged by 2008 flood & again from Irene.

Project Name (alphabetical order)	Location¹	NEPA Level²	FY Approved	Project Description
and Snowmobile Trail Relocation				
Boyden Brook Trail Relocation	Roc RD	DM	2016	Relocate Boyden Brook Trail (FT 749) across NFS and private land to restore north-south snowmobile trail corridor closed since 2008 storm.
Bromley Beginner Glade Skiing	Man RD	DM	2014	Addition of 3 new trails within glade area.
Bromley Logging Access SUP Reissue	Man RD	SIR	2015	Reissue permit to use National Forest System (NFS) road and landing to harvest private land inholding. Permit not to exceed 1-year..
Camp Timber Salvage	Mid RD	DM	2016	Salvage blowdown timber from summer 2014 storm.
Canty Trail Relocation	Mid RD	LTF	2014	Relocate trail from GMC easement (with private landowner issues) to NFS land.
Catamount Trail Brewers Corner Relocation	Roc RD	SIR	2014	Relocate a portion of the Catamount Trail damaged during TS Irene.
Chittenden Brook Yurt Special Use	Roc RD	LTF	2014	Authorize less than 1-year trial permit to allow yurt rental at the Chittenden Brook campground.
Cow Mountain Pond Trail Relocation Special Use	Roc RD	DM	2016	Issue 5-year permit to authorize trail on legacy tract in town of Granby, Vermont.
District-wide and Appalachian Trail (AT) Corridor Permanent Opening Maintenance	Roc/Mid RD	DM	2014	Maintain existing open areas on multiple sites across the Rochester/ Middlebury districts and AT corridor.
Fat Bike Trails Designation	Roc/Mid RD	LTF	2016	Designate existing trails for fat bike use during winter months only.
Forest-wide Timber Stand Improvement	Forest-wide	DM	2014	Conduct Timber Stand Improvement work on multiple stands across the National Forest.
FR71 Winter Sports Cabin Decommissioning	Man RD	LTF	2015	Deconstruct and burn existing winter sports cabin.
FT326 Deerfield Ridge Managed Use	Man RD	LTF	2015	Designate trail management objectives for the Deerfield Trail including removal of snowmobiling as a managed use.
FT385 Redfield Brook Bridge Replacement	Man RD	LTF	2015	Replace temporary skidder bridge with permanent bridge along VAST trail.
Gale Sugarbush Expansion - SUP Modification	Mid RD	DM	2016	Expand Sugarbush by adding 12 acres to existing permit.
Gilmore Mountain Aspen Project	Mid RD	EA	2015	Create early successional aspen habitat..
Goshen Dam Bridge Replacement	Mid RD	LTF	2014	Relocate trail from GMC easement (with private landowner issues) to NFS land.

Project Name (alphabetical order)	Location¹	NEPA Level²	FY Approved	Project Description
Green Mountain Power Powerline Relocation Special Use - West Hill Road	Man RD	DM	2014	Powerline relocation.
Grouse Lane Trail Construction	Mid RD	SIR	2016	SIR to the Dorset Peru IRP EA/DN to relocate mountain bike trail from original proposed location.
Hapgood Nature Trail Improvements	Man RD	DM	2015	Conduct trail improvements including replace existing bridges and provide some trail reroutes north of Hapgood Pond.
Hapgood/Utley Mountain Bike Designation	Mid RD	LTF	2016	Designate and reroute 5.6 miles of cross-country ski trail and Forest Road 46 for mountain bike use.
Horse and Bike Trail Designations in Woodford/ Somerset Areas	Man RD	LTF	2014	Designated existing snowmobile trails and roads for horse/bike use.
Invasive Plant Control (IPC) SIR	Forest-wide	SIR	2014	GMNF IPC EA/DN to review new glyphosate risk assessment and to consider control efforts on non-NFS lands where FS funding is used.
Killington Bike Trails	Roc RD	DM	2015	Designate and construct approximately 15 miles of mountain bike trail loop system.
Killington Parking Lot	Roc RD	DM	2016	Construction of Sherburne Trails parking lot.
Lightfoot & Jenks Logging Access Special Use	Man RD	LTF	2015	Provide access for logging private land through a not to exceed 1 year permit.
Marks Private Road SUP	Mid RD	DM	2016	Issue private road access to private land inholding.
Michigan Brook, Middle Branch Middlebury River, Sparks Brook LWD	Roc/Mid RD	DM	2014	Placement of large woody debris in streams to create and enhance fish habitat.
Mount Snow Long John Trail Widening	Man RD	SIR	2015	Review 2010 Decision Memo for Northern Long-Eared Bat federal listing.
Mount Snow Mountain Bike Trail No. 4 Relocation	Man RD	DM	2014	Relocate existing mountain bike trail to provide intermediate level experience using more sustainable route.
Mount Snow Transmission Line ROW Maintenance	Man RD	LTF	2015	Cut trees and branches along transmission line Right-of-Way going up mountain within ski trail.
New England Wilderness Act (NEWA) Road Restoration Project	Roc/Mid RD	DM	2014	Closure and restoration of roads within newly designated wilderness (Battell and Broadloaf). Roads will be restored to a landscape level.
Norske Trail Relocation	Mid RD	DM	2015	Relocate small segment of existing trail and remove bridge from Breadloaf Wilderness.

Project Name (alphabetical order)	Location¹	NEPA Level²	FY Approved	Project Description
North Zone Green Mountain Power SUP	Mid RD	DM	2015	Combined: Ripton-Lincoln Rd line extension, Robert Frost relocated buried line, and Downville Rd. line upgrade.
Old Job Trail Relocation	Man RD	DM	2014	Relocate section of Old Job trail away from Lake Brook.
Outfitter Guide SUP	Forest-wide	DM	2014	Issue permit for outfitter guide requests for multiple year use.
Pinnacle Lodge SUP Reissuance	Man RD	DM	2014	Reissue existing permit with no changes to the scope of use.
Potekhen Log Landing Special Use	Man RD	LTF	2014	Permit to use existing landing to log adjacent private land. Owner has ROW across newly acquired NFS.
Potekhen Private Land Access	Man RD	LTF	2015	Reissue permit to use existing landing for harvest operations.
Prospect Mountain Homologated Racecourse	Man RD	DM	2014	Permit to authorize use of trails for a 5 km homologated race course - includes 0.4 km of new trail.
Rochester Ranger District Wellness Trails	Roc RD	DM	2016	Designate 2.6 miles of hiking trail adjacent to the Rochester office.
Shrewsbury Town Highway Bridge Replacement Special Use	Roc RD	LTF	2014	Permit for use of NFS lands ROW along TH in Shrewsbury to replace bridge damaged from tropical storm Irene.
Snow Valley C7 Snowmobile Trail Relocation	Man RD	DM	2015	Relocate snowmobile trail from private land partially onto NFS land.
Somerset TH1 Bridge Repair SUP	Man RD	LTF	2014	Issue not to exceed 1 year special use permit to repair bridge abutments along Rake Branch. Need access across & placement of settling pond on NFS lands.
SR 73 Bridge Replacement SUP	Roc RD	LTF	2014	Issue temporary not to exceed 1 year special use permit for construction of bridge crossing. Use of NFS lands for access, staging and slope reduction.
Sugarbush Communication Line and Slide Brook Access	Roc RD	LTF	2014	Install new communication line along lift corridor, and removal of trees to improve safe approach to tree skiing areas.
Sugarbush Valley House Lift Replacement	Roc RD	DM	2014	Replace existing chairlift requiring new lift line and trail widening.
Sugarbush Well Development Special Use	Roc RD	DM	2016	Authorize water well for development associated with Sugarbush homeowner community.
Trial Backcountry Ski	Roc/Mid RD	DM	2016	Designate 4 trial backcountry ski project areas.
Tunnel Brook Trail Relocation	Roc RD	DM	2014	Move section of the existing trail to a more sustainable location and issue 2 permits to allow private access across NFS lands.

Project Name (alphabetical order)	Location ¹	NEPA Level ²	FY Approved	Project Description
Vermont State House Holiday Tree	Roc RD	LTF	2015	Provide 40-50 foot balsam fir holiday tree for Vermont State House in Montpelier. Specific location of tree not yet determined.
West Branch White River Restoration	Roc RD	DM	2014	Restore segment of river damaged by gravel mining operations following tropical storm Irene. Includes placement of large woody debris & boulders, planting of trees/shrubs, & CCC's Camp site maintenance.
West Hill Road Bank Stabilization Project	Roc RD	LTF	2016	Repair and reconstruction of mass slope failure of large bank supporting West Hill Road.
Wilmington Water District Spring Development SUP	Mid RD	DM	2016	Special use authorization for existing water sources that are part of the Wilmington water source. Includes existing facilities since 1991 plus new spring sources.
Woodford SnoBusters Groomer Access Trail Special Use Reissue	Man RD	DM	2015	Reissue permit for 20-year period to Vermont Association of Snow Travelers (VAST) club to use 800' trail for groomer from private building to FR74.
Woodford SnoBusters Recreation Events Special Use Reissue	Man RD	DM	2015	Reissue 5-year permit to VAST club to hold annual hot dog roast and special people ride events.

¹ Man RD = Manchester Ranger District; Roc RD = Rochester Ranger District; Mid RD= Middlebury Ranger District; Roc/Mid RD = Rochester and Middlebury Ranger Districts

² EA = Environmental Assessment; DM = Categorical Exclusion – Decision Memo; Categorical Exclusion – Letter to the File; SIR = Supplemental Information Report

Evaluation and Conclusions: There were a total of 70 projects approved for Forest Plan implementation in fiscal years 2014, 2015, and 2016. An additional 8 project decisions were reviewed with supplemental information reports. All projects were designed and found to be consistent with Forest Plan direction including goals, objectives, and forest-wide and management area standards and guidelines. Collectively, these projects have moved existing conditions toward desired future conditions according to each management area direction where they are located.

Recommendations: Continue management activities that improve the desired future condition for all management areas and are designed to reach plan objectives. Look for opportunities to increase Forest Plan implementation in all management areas. Continue to monitor progress in reaching desired future conditions.

Rare Plants Population

Evaluation Question: Regional Forester Sensitive Species (RFSS) Plant Population Trends

Monitoring Question: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?

Detailed Monitoring Question: What are the population trends for sensitive plants on GMNF? To what extent is management sustaining or enhancing habitat conditions for populations?

Monitoring Activities: The RFSS list was updated in fiscal year 2012 and now includes 88 vascular and 18 nonvascular plant species (Appendix B, Table B-2). Monitoring data collected for each rare plant population stored in NRIS TESP-IS, the Forest Service corporate database for botanical data, includes: 1) number of ramets or genets, 2) percent reproductive, 3) spatial extent of population, 4) number of populations of a species, and 5) ranked condition of populations. At times the available taxa list in NRIS does not keep up with species tracked; data for those taxa are stored in a spatial layer, called “Rare Plants not in NRIS”.

In addition, the GMNF botany program and the state Vermont Natural Heritage Inventory (VNHI) program informally share one staff member. Data collected by that person for any rare plant populations either monitored or newly discovered on GMNF is entered into the VNHI spatial database and given back to the Forest Service in an updated GIS layer once a year. This shared data management benefits the state by keeping them informed about rare plant trends on GMNF, and it benefits the Forest Service since labor-intensive data entry occurs as part of state work. Monitoring efforts by fiscal year are listed below, and monitoring trends for each species are summarized in Appendix B, Table B-3. Uncommon or rare non-RFSS plants newly found or monitored will be evaluated for inclusion on the RFSS list during the planned fiscal year 2017 list update.

Fiscal Year 2014

- 38 out of 88 vascular plants (56 sites/populations) monitored
- No nonvascular plants monitored
- 40 uncommon or rare non-RFSS vascular plants monitored

Fiscal Year 2015

- 43 out of 88 vascular plants (62 sites/populations) monitored
- No nonvascular plants monitored
- 29 uncommon or rare non-RFSS vascular plants monitored

Fiscal Year 2016

- 30 out of 88 vascular plants (36 sites/populations) monitored
- 3 of 26 nonvascular plants (4 sites/populations) monitored
- 18 uncommon or rare non-RFSS vascular plants monitored

In addition to monitoring known populations of RFSS, botanical inventory is undertaken to search for new populations, either in response to proposed ground-disturbing projects, or to learn more about habitats we are responsible for managing. In fiscal years 2014 to 2016 botanical inventory for rare plants occurred in the following locations, and simultaneously included inventory for non-native invasive plants:

Fiscal Year 2014

- 162 acres of wildlife openings (21 openings/152 acres on the Manchester District and 2 openings/10 acres on the Rochester District, including one visited in FY15).
- 176 acres in the South of Route 9 Integrated Resource Project (IRP) area.

Fiscal Year 2015

- 648 acres in the Robinson IRP area.

Fiscal Year 2016

- 928 acres in the Robinson IRP area.
- 14.6 acres in the South of Route 9 IRP area.

Eight of the wildlife openings inventoried had new populations of RFSS found, and another eight had new populations of other rare or uncommon vascular plants found. In the South of Route 9 IRP area, 21

RFSS and 26 other uncommon or rare plant species were found, most of them new populations of which we were not previously aware. In the Robinson project area, populations of four RFSS were found, in addition to monitoring the several species already known from Mt. Horrid.

The results of monitoring efforts during this monitoring period are shown in Appendix B, Table B-3.

Evaluation and Conclusions: The Forest Plan (Goal 2, page 10) directs the Forest Service to “maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals”. Forest-wide Standards and Guidelines for Rare and Unique Biological Features (Forest Plan, p. 30) require a periodically updated list of all threatened, endangered, and sensitive species (Standard S-2) and investigate all project sites for threatened, endangered, and sensitive species (Standard S-1). Monitoring shows management activities are meeting Forest Plan Goal 2 and following standards by having rare plant and inventories completed in maintained wildlife openings, and in the Robinson and South of Route 9 IRP areas. Forest Plan direction is also followed by monitoring known rare plant occurrences on a cyclical basis; formerly aimed for a five-year cycle, but as the botany program of work has increased, switched to a seven-year cycle for terrestrial plants, and a ten-year cycle for aquatic plants in remote high elevation ponds.

In addition to monitoring existing occurrences and inventorying for new ones, non-native invasive plant (NNIP) treatments benefitted RFSS or other rare plants that occur in three maintained wildlife openings along the Appalachian Trail; along two roads in the Upper White River IRP area and two roads in the Natural Turnpike project area; along the New Haven River; in the South of Route 9 IRP area; along the Robert Frost Trail, along a road in Mt. Tabor; and along a skid trail in the Dorset-Peru IRP area. Acres of treatments are listed in the Non-native Invasive Species monitoring item section.

After three years of monitoring activities for plants on the RFSS list, trends are as follows:

- 49 vascular and 2 nonvascular plant species are apparently stable, or in some cases increasing.
- 21 vascular and 12 nonvascular plant species are unable to be assessed, because no populations were monitored in the past three years.
- 10 vascular plant species are apparently declining. Of these:
 - Butternut trees (*Juglans cinerea*) occur in many places on GMNF and are known to be dying from the butternut canker; there is little we can do to change the course of that disease.
 - Three rock talus or cliff-dwelling species may be suffering from drought as a result of hot dry summers.
 - Two species have simply not been seen in decades, i.e., there is no real change in the past few years.
 - Two species tend to increase and decline with changes in hydrology, often brought on by beaver activity.
 - For the remaining two, there is no hypothesis for the decline.
- Three species are vulnerable due to small population sizes.
- Two species are likely on the list by mistake.
 - In one case, it appears the wrong variety of a species may have been put on the list.
 - In another case, the species report was likely a misidentification.
- Three species have uncertain trends.
 - For two, some populations may be expanding while others are apparently missing.
 - For the third, identification is problematic, making it difficult to assess trends.
- In fiscal year 2015, the botany program staff attended a week of training in moss ecology and identification, with the goal of being better prepared to monitor the nonvascular species added to the 2012 updated RFSS list. After discussing Forest botany program needs with the moss experts providing the training, it became apparent that the majority of the nonvascular RFSS are not only

difficult to properly monitor, monitoring their habitat would most likely be the best indicator of their status. For this reason, all the nonvascular plants on the RFSS list will be evaluated to be for removal from the list in the fiscal year 2017 update.

Recommendations: Species-specific recommendations are provided in Appendix B, Table B-3. Educational signing is needed to protect RFSS that occur on cliffs and under overhangs on Mt. Horrid, where recreation is disturbing plants. Non-native invasive plants are gradually moving closer to many RFSS and need to be controlled. Five RFSS have either not been seen in decades or are believed to have been inappropriately added to the list and need to be evaluated for removal from the list. Another three are turning out to be quite common and need to be evaluated for removal from the list. There is an ongoing need to cultivate partnerships with local volunteers, colleges, or other organizations who might be able to support the monitoring program.

In the Forest Plan standards and guidelines for NNIP (Section 2.3.9, page 33), Guideline G-1 emphasizes use of basic prevention measures. If this guideline were better implemented, it might be possible to reduce the potential effect of NNIP on RFSS. It is recommended that training be developed for all field-going staff, and that the Forest Leadership Team develop and communicate expectations regarding prevention measures. In addition, it is recommended that each Ranger District be able to clean machinery in the field, including between sites.

Recreation

Evaluation Question: Visual Quality Objectives (VQO's)

Monitoring Question: To what extent have Objectives been attained?

Detailed Monitoring Question: Is the Forest being managed in accordance with the visuals standards and guidelines found in the Forest Plan and are the visuals standards and guidelines and any additional site specific design criteria effective in helping to meet the VQOs (Visual Quality Objectives)?

Monitoring Activities: Annual monitoring trips provide the opportunity to review project implementation and adherence to Forest Plan Visual Quality standards and guidelines as well as project-specific design criteria and mitigations. During the monitoring trips, resource staff determine if the VQOs were met and if not met, discuss what could have been done to achieve VQO and/or what could be done toward meeting VQO.

Additionally, ongoing field reviews identify visual concerns from project implementation and major storm events as well as opportunities to enhance visual resources.

Evaluation and Conclusions: Based on available documentation, annual monitoring trips did not identify any projects that failed to adhere to VQOs.

Recommendations: Continue to monitor the visual resource for compliance with Forest Plan standards and guidelines. Seek opportunities for rehabilitation following major storm events as well as opportunities for visual enhancement along roads, trails and recreation sites.

Evaluation Question: Scenic Integrity Objectives (SIO's)

Monitoring Question: To what extent have Objectives been attained?

Monitoring Question: Has the Forest transitioned from the current Visual Management System to the Scenery Management System?

Monitoring Driver: Forest Plan Goal 15 and associated Objectives.

Monitoring Activities: The transition to managing for scenic integrity objectives from using the Visual Management System to the Scenery Management System (SMS) has not been completed.

Evaluation and Conclusions: Competing priorities and inadequate staff and skills have delayed the transition to the SMS.

Recommendations: Forest Service staff should continue to explore opportunities, including the Enterprise Program, to transition to the SMS as soon as practical.

Evaluation Question: Recreation Visitor Satisfaction

Monitoring Question: To what extent have objectives been attained?

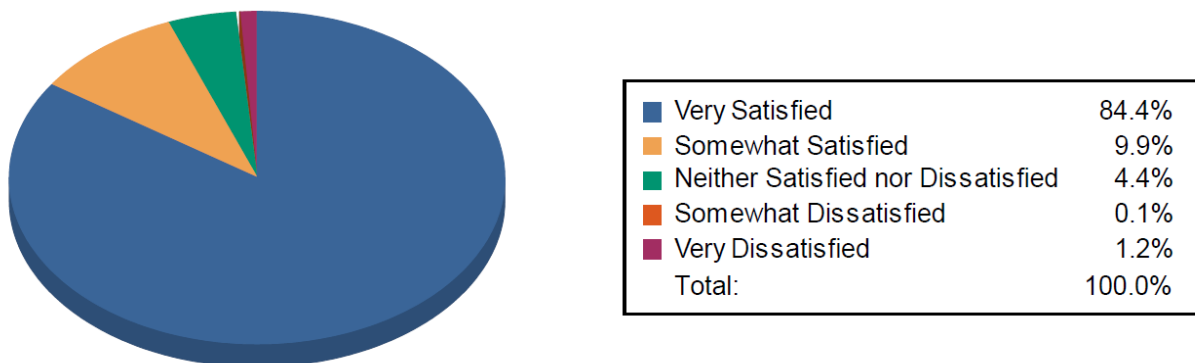
Detailed Monitoring Question: Are we providing high quality recreation services that meet the expectations of the public?

Monitoring Activities: The National Visitor Use Monitoring (NVUM) program provides reliable information about recreation visits to national forest system managed lands at the national, regional, and forest level. The NVUM program has two concurrent goals. First, to produce estimates of the volume of recreation visitation to National Forests and Grasslands. Second, to produce descriptive information about that visitation, including activity participation, demographics, visit duration, measures of satisfaction, and trip spending connected to the visit. Specific NVUM protocols, terminology, limitations, data, annual reports, and other information is available at: <https://www.fs.usda.gov/about-agency/nvum/>

National Visitor Use Monitoring (NVUM) data is collected and reported on a five-year cycle. To assess visitor satisfaction, recreation visitors were asked through the NVUM program to provide an overall rating of their visit to the national forest, on a 5-point Likert scale, ranging from not important to very important. Visitors rated both the importance and performance (satisfaction with) of these elements.

Evaluation and Conclusions: Based on 2015 NVUM data, the majority of visitors (84.4 percent) to the Green Mountain National Forest report that they are “very satisfied” with their overall National Forest experience (Figure 2-5).

Figure 2-5. Percent of National Forest Visits by Overall Satisfaction Rating.



In respect to providing high-quality recreation services, NVUM monitoring looks at the satisfaction elements most readily controlled by managers. These are aggregated into four categories: developed facilities, access, services, and visitor safety and the site types sampled are aggregated into three groups:

developed sites (includes both day use and overnight developed sites), dispersed areas, and designated Wilderness. The “Percent Satisfied Index (PSI)” identifies the proportion (%) of elements and sites with a numerical rating of 4 or 5, equivalent to the percent of all recreation customers who are satisfied with agency performance. The agency’s national target for this measure is 85 percent. Table 2-15 displays the aggregate PSI scores for the GMNF.

Developed recreation sites met user expectations to a very high degree with satisfaction indices showing between 89.8 and 98.3 percent satisfaction rate with developed facilities, access, services and feeling of safety. Visitors to undeveloped areas on GMNF feel that access and the feeling of safety also met their expectations very well (90.6 and 95.8 percent, respectively); however, visitors to undeveloped areas are less satisfied with developed facilities (77.5 percent) and services (82 percent). Visitors to Congressionally Designated Wilderness had expectations met for developed facilities (95.7 percent), services (85.5 percent) and the feeling of safety (97.8 percent); however, visitor satisfaction dropped below the agency’s national target of 85 percent to 80.7 percent for access to Wilderness in the GMNF.

Table 2-15. Percent Satisfied Index¹ scores for aggregate categories from 2015 survey data.

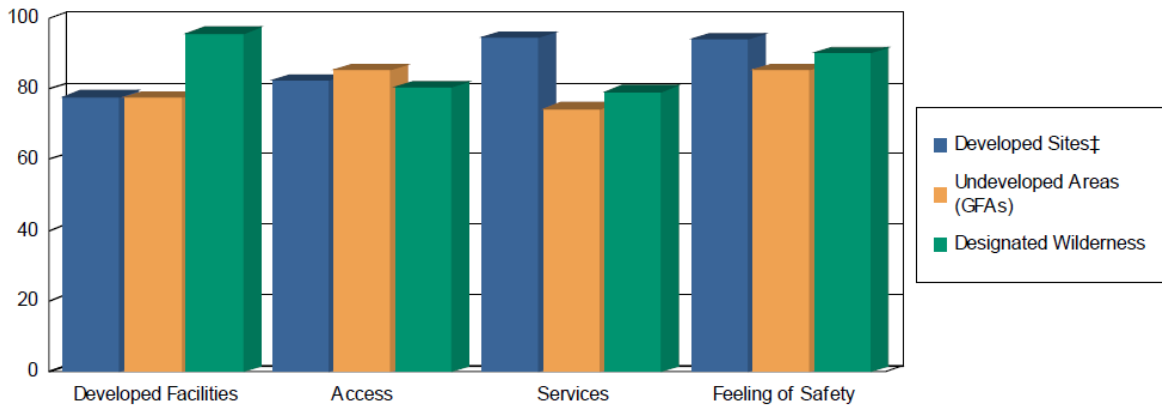
Satisfaction Element	Satisfied Survey Respondents (%)		
	Developed Sites ²	Undeveloped Areas	Designated Wilderness
Developed Facilities	89.8	77.5	95.7
Access	89.8	90.6	80.7
Services	96.0	82.0	85.5
Feeling of Safety	98.3	95.8	97.8

¹ This is a composite rating. It is the proportion of satisfaction ratings scored by visitors as good (4) or very good (5). Computed as the percentage of all ratings for the elements within the sub-grouping that are at or above the target level, and indicates the percent of all visitors that are reasonably well satisfied with agency performance.

² This category includes both Day Use and Overnight Use Developed Sites.

The NVUM results also identify the proportion of satisfaction ratings in which the numerical satisfaction rating for a particular element is equal to or greater than the importance rating for that element, known as the “Percent Meet Expectations (PME)”. This indicator tracks the congruence between the agency’s performance and customer evaluations of importance. The idea behind this measure is that those elements with higher importance levels must have higher performance levels. Lower scores indicate a gap between desires and performance. Figure 2-6 shows all scores rated above 70 percent suggesting there is no significant gap between public desires and agency performance. Additional details from the NVUM results indicate that PME scores would increase if efforts focused on improving: 1) restroom cleanliness in overnight developed recreation areas; and 2) parking lot conditions serving as access to wilderness.

Figure 2-6. Percent Meets Expectations Scores.



‡ This category includes both Day Use and Overnight Use Developed Sites.

Recommendations: No significant changes to recreation management and maintenance should be taken based on monitoring evaluation and conclusions; however, opportunities to improve restroom cleaning at overnight sites and to improve the condition of parking lots that serve as access to Congressionally-designated wilderness should be considered to narrow the gap between public desires and agency performance. Recreation staff should continue to use NVUM data collection to help inform future decisions in addition to assessing and implementing site-specific improvement plans and maintenance to improve visitor satisfaction.

Evaluation Question: Recreation Visitor Satisfaction

Monitoring Question: Is the Forest providing recreation equity to serve diverse publics?

Detailed Monitoring Question: Is there disproportionate utilization of recreation resources by demographic?

Monitoring Activities: This monitoring compares data from the U.S. Forest Service National Visitor Use Monitoring (NVUM) program conducted on the Green Mountain and Finger Lakes National Forests to 2010 U.S. Census data in order to examine whether there is disproportionate utilization of recreation resources on NFS lands.

National forest visitation data for racial and ethnic minority and non-minority user groups was obtained from the NVUM program (USDA Forest Service 2018a, b and c). Visitor inventories are conducted on a five-year cycle; the most recent datasets from 2005, 2010 and 2015 were utilized for this study. The NVUM data was then compared with 2010 demographic data obtained from the U.S. Census Bureau (US Census Bureau 2010) for Massachusetts, New York, Vermont, and the United States. The difference between NVUM (percent Forest Visitor Minority) and U.S. Census (percent Minority) was computed.

Evaluation and Conclusions: It is important to discuss a limitation associated with this analysis before discussing the results. The comparison between U.S. Census and NVUM datasets considered Census populations from the national average as well as Census populations from the three states representing the majority of NVUM responders: Massachusetts (approximately 10 percent of responders); New York (approximately 10 percent of responders); and Vermont (approximately 50 percent of responders); however, national forest visitation estimates represent all visitors regardless of the distance they traveled.

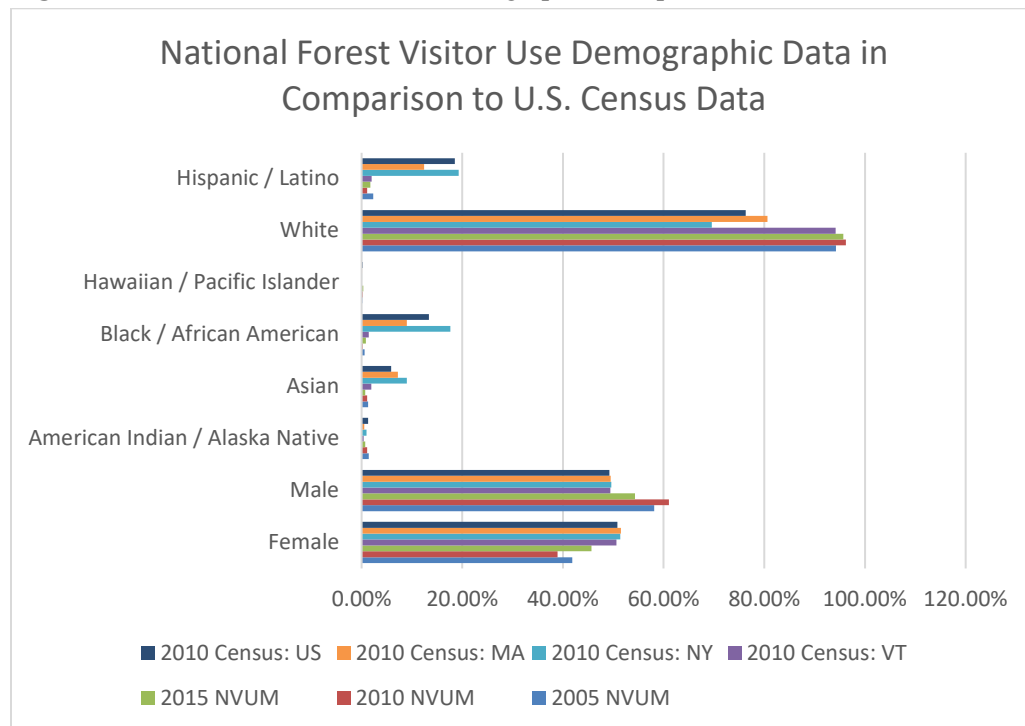
Results suggest an inequity gap wherein racial minorities are not utilizing Green Mountain and Finger Lakes National Forests’ recreation opportunities at the same rate as their white counterparts (Figure 2-6). The percent of NVUM responders reporting as Black/African American, Asian, and Hispanic/Latino are consistently below Census population percentages for Massachusetts, New York, Vermont and the United States with the exception of 2005 Hispanic/Latino NVUM responders exceeding the percentage of Vermont Census data (2.32 percent Hispanic/Latino NVUM responders and 2 percent Hispanic/Latino Vermont population by Census) (USDA Forest Service 2018a, b and c and US Census Bureau 2021). National Visitor Use Monitoring responders identifying as female gender also showed National Forest visitation estimation percentages below Census data (Table 2-16).

Table 2-16. National Visitor Use Monitoring (NVUM) percent visitation by reported gender in comparison to 2010 U.S. Census Bureau data from the national average as well as census populations from the three states representing the majority of NVUM responders.

Gender	2005 NVUM	2010 NVUM	2015 NVUM	2010 Census: VT	2010 Census: NY	2010 Census: MA	2010 Census: US
Female	41.85%	38.94%	45.67%	50.60%	51.40%	51.50%	50.80%
Male	58.15%	61.06%	54.33%	49.40%	49.60%	49.50%	49.20%

Figure 2-7 shows the percentage of National Visitor Use Monitoring (NVUM) responders reporting by gender and race/ethnicity in comparison to U.S. Census Bureau 2010 data population percentages for Massachusetts, New York, Vermont and the United States (three states representing the majority of NVUM responders).

Figure 2-7. National Forest Visitor Demographic Comparison to U.S. Census Data.



Recommendations: The results from this study suggest there is disproportionate utilization of forest recreation opportunities for many racial and ethnic minority groups, demonstrating the need for the Forest Service to identify and evaluate strategies that would enhance greater racial and ethnic inclusion in

outdoor recreation. There is also a need to better refine measures to encourage diversity and inclusivity in local decision-making and planning processes to best serve all our publics and to sustain future relevance of the agency (Flores, et al 2018).

Evaluation Question: Trail Maintenance

Monitoring Question: Is the quality of the Forest Service trail system being improved through operation and maintenance?

Detailed Monitoring Question: Is the amount of deferred maintenance on the GMNF trail system being reduced?

Monitoring Activities: This monitoring measures total deferred maintenance divided by total system trail miles for GMNF; however, annual reports for fiscal years 2014, 2015, and 2016 were not generated to capture snapshots in time of the deferred maintenance and National Forest Trail System miles during this monitoring period.

Evaluation and Conclusions: Not available.

Recommendations: Ensure annual reports are generated to capture deferred maintenance and trail mileage data for future reporting efforts.

Evaluation Question: Recreation Facility Maintenance

Monitoring Question: To what extent have Objectives been attained?

Detailed Monitoring Question: Is the Forest reducing deferred maintenance on developed recreation facilities and sites? Is the Forest increasing the number of recreation facilities that are maintained to standard?

Monitoring Activities: This monitoring measures percent managed to standard and trends; however, annual reports for fiscal years 2014, 2015, and 2016 were not generated to capture snapshots in time of the deferred maintenance and the number of recreation facilities managed to standard during these years.

Evaluation and Conclusions: Not available.

Recommendations: Ensure annual reports are generated to capture deferred maintenance on developed recreation facilities and the number of recreation facilities managed to standard for future reporting efforts and trend data.

Evaluation Question: Trends in Trail Partnerships

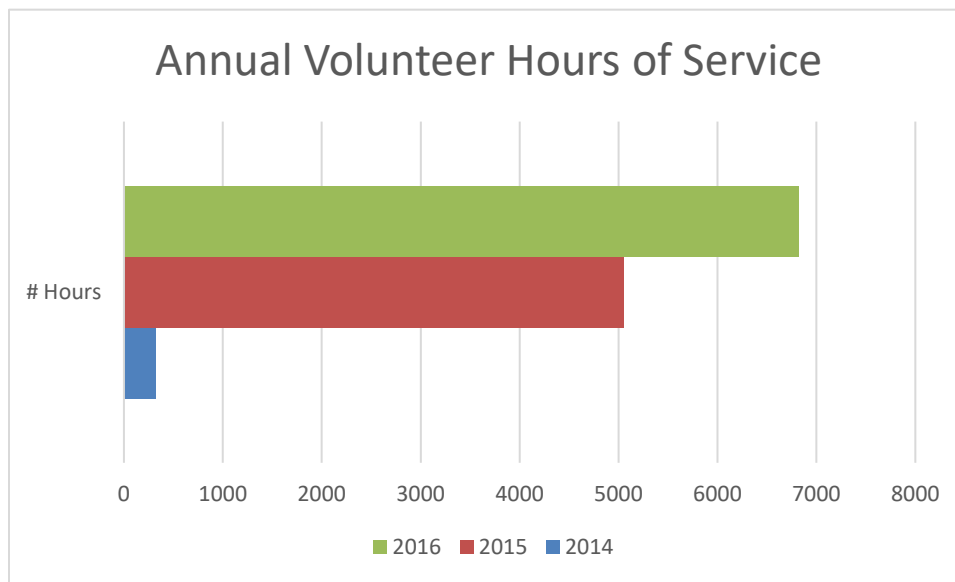
Monitoring Question: To what extent have Objectives been attained?

Detailed Monitoring Question: How well is the Forest using partnerships to assist in the operations and maintenance of the Forest trail system?

Monitoring Activities: Forest Service staff and partners collect volunteer data annually, including: demographic figures, total volunteer numbers, hourly contributions, and more. This data is compiled and reported nationally through the Volunteer and Services Reporting system for both individual and group volunteers on the Green Mountain and Finger Lakes National Forests.

Evaluation and Conclusions: Figure 2-8 depicts annual volunteer contributions (total hours) over the three-year period from fiscal years 2014 to 2016. Annual volunteer contributions rose sharply from 320 total hours in 2014 to 6,821 hours in 2016. The reason for this trend is unclear but could be the result of increased Forest Service partner/volunteer engagement as well as improved reporting. Additionally, several large projects were implemented in 2016; these projects had consistent social media presence with organized volunteer events resulting in an outpouring of volunteer support.

Figure 2-8. Annual Volunteer Contributions (Hours) on the Green Mountain and Finger Lakes National Forests.



Recommendations: A Volunteer Program Coordinator is needed to expand volunteer recruitment, training, management, and reporting.

Evaluation Question: Effects of Vehicle Use Off Roads

Monitoring Question: Is the use of vehicles off roads causing considerable adverse effects on resources or other forest visitors; how effective are forest management practices in managing vehicle use off roads?

Detailed Monitoring Question: What are the trends in the illegal use of vehicles off roads?

Monitoring Activities: Between 2014 and 2016, monitoring of off-road vehicle use continued in conjunction with routine law enforcement patrols. Off-road vehicle use includes summer off-highway vehicles (OHVs), including all-terrain vehicles (ATVs) and utility terrain vehicles (UTVs), as well as winter over-snow vehicles (snowmobiles). As patrols and trail condition inventories document incidents or the issuance of notices of violation, the incidents are recorded and entered into the Law Enforcement and Investigation Management Attainment and Reporting System (LEIMARS) database. Retrieved data can be used to show trends; however, the number of incidents fluctuates depending on the availability of law enforcement and forest protection officer personnel.

Evaluation and Conclusions: This monitoring measures the change in law enforcement incidents and violations utilizing data entered over the ten-year period of 2006 to 2016 for the Green Mountain and Finger Lakes National Forests. Figures 2-9 and 2-10 show trends and provide baseline quantitative data to which monitoring can be added annually. Data are separated into “incidents” (includes warnings and visual identification of a violation) and “violations” where somebody receives a citation for the infraction.

The data shows an overall decreasing trend from 2006 to 2016 for OHV incidents and violations. The reasons for this trend is unclear, but could be the result of: 1) a decreased field presence of law enforcement personnel; 2) better understanding from the public due to improved education, signing and barrier control efforts; 3) increased partner collaboration to help address unauthorized use and to better align public demand for snowmobile and off-highway vehicle trails with approved and designated National Forest System trails. In addition, the Forest Service has been making a focused effort to include mitigation measures in all of its projects to deter unauthorized vehicles through public collaboration and education, and installation of signing and engineering controls such as gates, stiles and boulders.

The data shows no discernible trend in snowmobile incidents and violations for the period 2006 to 2016. This is likely the result of varying levels of law enforcement personnel, including Forest Protection Officers, and fluctuating capacity to provide weekend snowmobile patrols on GMNF.

Figure 2-9. Law Enforcement Incidents and Violations for Off-Highway Vehicles between 2006 and 2016.

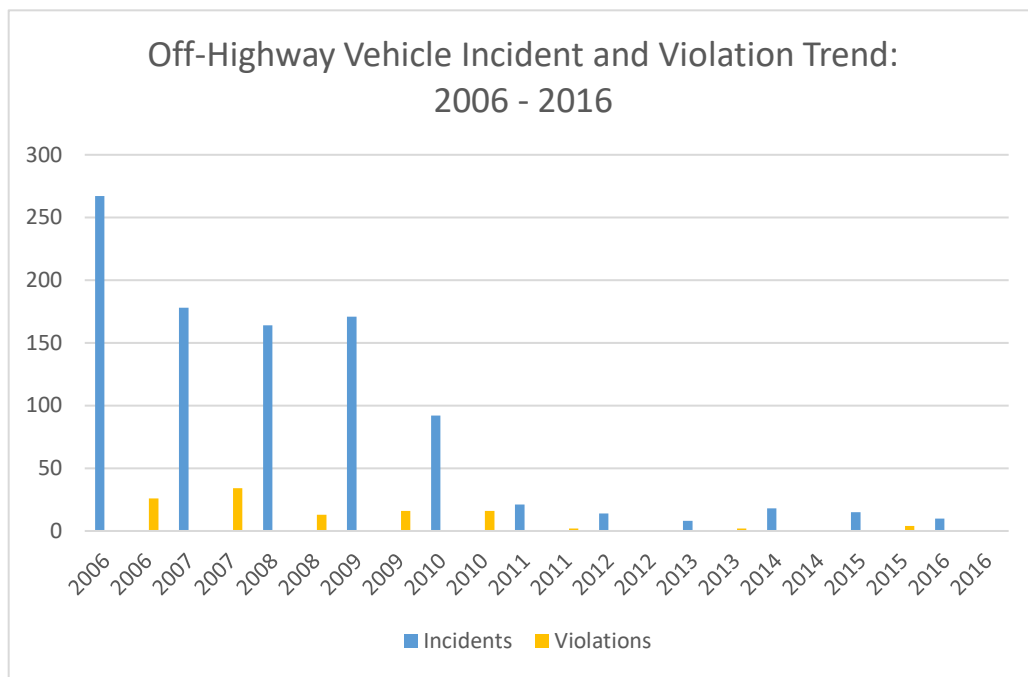
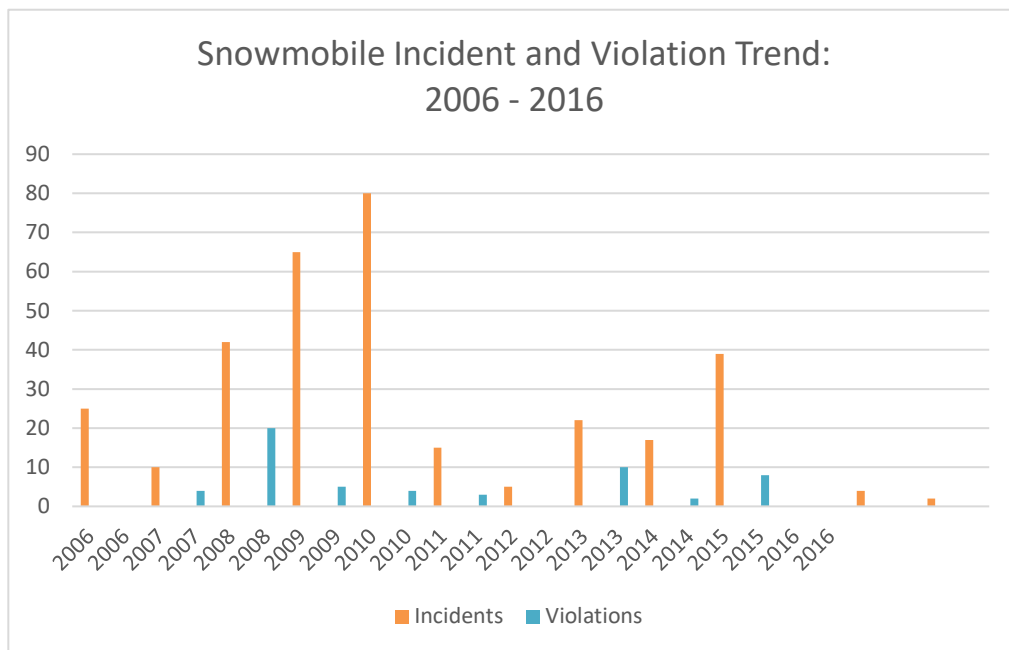


Figure 2-10. Law Enforcement Incidents and Violations for Over-Snow Vehicles from 2006 to 2016.

Recommendations: Continue to work with law enforcement to refine methods of collecting and analyzing data so that summer off-highway vehicle and over-snow vehicle incidents are accurate and mapped with GIS, including distinguishing between incidents in Vermont and New York. Add more qualitative data such as narratives based on site specific project analyses and monitoring. Increase patrol and presence in areas with repetitive violations and install travel management barriers to deter repetitive, unauthorized use.

Soils

Evaluation Question: Soil and Water Standard and Guidelines, Mitigation Measures, and Soil Quality Standard Compliance

Monitoring Question: To what extent have Standards and Guidelines and Mitigation Measures been applied? How often are BMPs implemented and effective?

Detailed Monitoring Question: Were Soil and Water S&Gs, mitigation measures, and BMPs implemented on selected projects, and were they effective in protecting the soil, water and wetland resources?

Monitoring Activities:

1) Soil, Water and Riparian Resource Monitoring in Harvest Areas

In fiscal years 2014, 2015, and 2016, soil monitoring activities measured the implementation and effectiveness of Forest Plan Standards and Guidelines (S&Gs) designed to control erosion, prevent sedimentation, protect wetlands, and maintain soil and water quality. Periodic visits were made to active timber sale areas (during and after harvest), recreation, construction, and road maintenance projects, and special use permit sites to determine whether Forest Plan S&Gs and mitigation measures were implemented and effective in minimizing soil erosion, stream sedimentation, and impacts to wetlands and water quality. This monitoring also helps determine whether Goals 3 and 4 of the Forest Plan are being achieved. These goals direct the Forest Service to maintain the ecological functions of the soil, and

maintain or restore aquatic, riparian, and wetlands habitats. Soil ecological functions include the ability of the soil to store water, provide a substrate for plant growth, filter pollutants, and store carbon.

Monitoring was completed by Forest Service soil scientists, soil technicians, and timber sale administrators. Tree harvest activities have a high potential to impact soil, water, and wetland resources, so harvesting continues to be the major emphasis of the monitoring program. Old Cemetery, Schoolhouse #3, Old Manchester, Mad Tom, Upper White, Texas Stewardship, and Cobb Hill South timber sales were monitored for adherence to Forest Plan Standards and Guidelines in fiscal year 2014. Cook Brook, Upper White, and Old Cemetery sales were monitored in fiscal year 2015. Texas Stewardship, Grouse Stewardship, Pumphouse, Old Cemetery, and Cook Brook were monitored in Fiscal year 2016. The monitoring method consisted of a visual inspection of each project site.

2) Soil Disturbance/Soil Quality Monitoring

Forest Soil Disturbance Monitoring (FSDM) quantifies the degree, extent, distribution, and duration of soil disturbance in a project area (USFS 2009). Parameters measured include occurrence of bare soil, compaction, erosion, and rutting due to vehicle traffic. Conclusions can be drawn from this data regarding the effects of the disturbance on soil productivity and soil functions, based on the scientific literature. For example, extensive compaction, erosion, or loss of topsoil usually indicates reductions in soil productivity and function. FSDM is also useful in determining whether Goals 3 and 4 of the Forest Plan are met. FSDM provides feedback to land managers on management activities impacts.

In addition, an ongoing long-term soil quality monitoring project began in 2008, and the Long-term Ecosystem Monitoring Project (LEMP) was designed to track changes in soils and forest vegetation over 50 years. This monitoring will provide insight into if/how soils change in response to factors such as atmospheric deposition, climate change, and non-native invasive species.

Forest Soil Disturbance Monitoring was conducted in fiscal years 2015 and 2016, focusing on disturbance related to harvesting trees. No soil disturbance monitoring was conducted in fiscal year 2014, before the protocol was widely adopted. Forest staff monitored 18 timber sale payment units with varied harvest prescriptions, including improvement, single tree/group selection, shelterwood, thinning, clearcut, and permanent wildlife openings. Permanent opening data is noted separately as these units represent less than 3 percent of GMNF managed forestland, where the desired future condition is open meadow, not to regenerate forested stands, which reduces long-term soil productivity. They tend to be more severely disturbed across all measured parameters.

3) Stream Macroinvertebrate Biomonitoring

Stream ambient biomonitoring measures the present and long-term biological integrity of streams and other waterbodies. Sites are monitored before logging activities to establish the baseline or “reference condition” of the aquatic biota, and again after logging, to detect effects from harvest- and road-related discharges, or other activities within the watersheds. Several high-quality streams within GMNF were selected for long-term monitoring, or “sentinel monitoring,” to determine biotic and abiotic changes that can alter a waterbody in the absence of most anthropogenic stressors.

Each year, the Vermont Department of Environmental Conservation (VT DEC), Water Quality Division, Biomonitoring and Aquatic Studies Section, partners with Forest Service staff to monitor macroinvertebrates on GMNF to track long-term trends in biological integrity in fixed reaches called sentinel sites. Based on the monitoring data, each stream’s biological integrity is determined by comparing its macroinvertebrate community composition to the VT DEC statewide database of streams in reference condition. Additional water chemistry parameters such as pH, alkalinity, nitrogen, phosphorus, aluminum, chloride, turbidity, color, and conductivity are also tested to aid in water quality monitoring.

Between ten and fifteen stream sites were sampled each in fiscal years 2014, 2015, and 2016. Macroinvertebrates, physical habitat, and water quality measures were recorded. Physical habitat measurements include wetted and bank-full width, depth, water velocity (flow), water temperature, weather conditions, substrate composition (using both observational and pebble count techniques), substrate embeddedness, silt rating, canopy cover, and stream bank condition. Ambient water quality parameters measured directly include dissolved oxygen (DO), specific conductivity (a measurement of dissolved ions), water temperature, and stream pH. Parameters analyzed in the Vermont Agriculture and Environmental Laboratory (VAEL) include alkalinity, turbidity, nutrients, and a suite of cations, anions, and metals.

Reports documenting the results of biomonitoring completed in this monitoring period are stored at the Green Mountain and Finger Lakes National Forests Supervisor's Office in Mendon, VT.

4) Green Mountain National Forest Wilderness Stream Sampling

From fiscal years 2014 to 2016, ten streams within five GMNF wilderness areas were sampled for water chemistry in the spring, summer, and fall, in partnership with the State of Vermont's Watershed Management Division (WSMD). Project goals were to create a baseline of water chemistry data for GMNF wilderness streams, and to determine whether they have been adversely affected by air pollution. This report summarizes 3 years of water quality data and includes recommendations for future management of these wilderness lands and waterbodies. A 2014 report provides detailed information on background, locations and methods (Pembrook 2015).

Ten GMNF streams located in five wilderness areas were sampled from fiscal years 2014 to 2016 by VTDEC and GMNF staff. Each year, water chemistry was collected in the spring, summer and fall. Macroinvertebrates were collected at least once, except at North Pond outlet. Two approaches were used to determine whether the streams were adversely affected by air pollution: (1) calculating the base cation surplus, and (2) evaluating their acid status based on pH, alkalinity and color.

Evaluation and Conclusions:

1) Soil, Water and Riparian Resource Monitoring in Harvest Areas

Forest Plan S&Gs and mitigation measures protecting resources within harvest areas were usually met and were effective in protecting the resources. Overall impacts to soil, water, and wetland resources were small in magnitude, duration, and extent. Erosion, stream sedimentation, and wetland disturbance were not often observed. In the instances requiring improvement, all related to timber skid road and haul road construction, use, and maintenance, further damage to resources was avoided through communication with harvest contractors and corrective action.

2) Soil Disturbance/Soil Quality Monitoring

During fiscal years 2015 and 2016, 13 timber sale units, totaling 267 acres, were monitored post-harvest (Figure 2-11). Those units were cut 1 to 3 years prior, during fiscal years 2013 to 2015. Units monitored were in the Nordic, Dorset-Peru, and Upper White River Integrated Resource Project Areas.

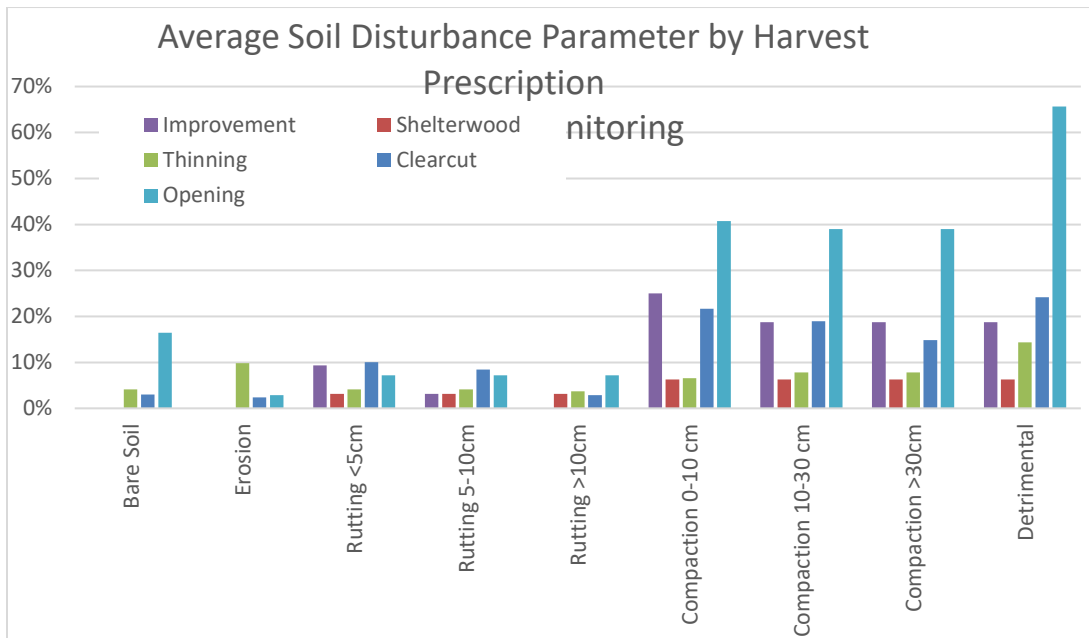
Bare mineral soil was observed at 4 percent of points, mostly on skid trails. Sheet and rill erosion were observed on 3 percent of the points, typically on skid trails. No gully erosion was observed. Erosion occurrence was higher in soils with moderate to severe erosion hazard ratings and was worse in areas without proper erosion control structures, where skid trails were used when soils were wet, and on steep road grades. The effects of the observed bare soil and erosion on soil quality and functions in timber harvest operations are small, due to the limited extent of their occurrence.

Of the units monitored, excluding permanent openings, compaction less than 10 centimeters (4 inches) deep was observed at 14 percent of points. Thirteen percent of the units had compaction 10 to 30 centimeters (4 to 12 inches) deep, and 12 percent had compaction at greater than 30 centimeters (12+ inches) deep. Compaction in all three depth classes occurred on approximately 40 percent of soil data points in units converted to permanent wildlife openings. Compaction is most prevalent on skid trails and roads. It is likely that compaction to a depth of 10 centimeters will dissipate over the next decade, due to surface freezing and thawing, soil wetting and drying, root penetration, and organism activity (Martin 1988; Donnelly et al. 1991). Effects of deeper compaction on forest soils can be assumed to persist for several decades (Miller et al. 2004). In timber harvest units, where forest productivity is critical to meet management goals, compaction levels are below the acceptable threshold level of 15 percent.

Rutting less than 5 centimeters (2 inches) deep was observed at 7 percent of points. Five percent had ruts up to ten centimeters (4 inches) deep, and 3 percent had ruts 20 centimeters (8 inches) or deeper. Ruts occurred mainly on skid trails, with higher concentrations on poorly drained soils. An important concern is that ruts on any slope have the potential to form gullies, with the possibility of sediment reaching streams and other bodies of water. Ruts were generally smoothed and water bars installed on skid roads and trails immediately after use, reducing the risk of gullying and helping rehabilitate the soil.

Soil Disturbance Classes (SDC) were identified using the FSDM protocols developed by the USDA-Forest Service (Dumrose et.al. 2009). Disturbance Class 0 represents forested sites in a natural, undisturbed condition; Class 1 has minimal soil disturbance; Class 2 soil disturbance is moderate; and Class 3 represents sites with highly disturbed soils. Excluding permanent openings, 15 percent of soil data points fell in Class 0 after harvest, 70 percent in Class 1, 11 percent in Class 2, and 4 percent in Class 3. Classes 2 and 3 were associated with skid trails.

Figure 2-11: Rate of soil disturbance varies by harvest prescription.



“Detrimental” disturbance occurs where long-term soil productivity and tree regeneration is decreased. Points with bare soil, erosion, compaction over 10 centimeters (4 inches) deep, or rutting over 10 centimeters deep are considered detrimental. Detrimental disturbance occurs more often on skid roads and varies by harvest prescription. Of the units monitored in fiscal years 2015 and 2016, 24 percent of all data

points collected had detrimental soil disturbance. Excluding wildlife opening creation, which made up 42 of the 267 acres monitored, or 16 percent of the acres, only 14 percent of data points had detrimental disturbance.

In the three monitored units converted to permanent wildlife openings, 63 percent of points had detrimental disturbance. This treatment tends to have much higher rates of detrimental soil disturbance than other harvest prescriptions. Reductions in long-term soil productivity are expected in permanent upland openings, where the land is managed to produce herbs and shrubs rather than trees. Permanent wildlife openings made up 8 percent, or approximately 365 out of 4,500 total acres planned for harvest in the Nordic, Dorset-Peru, and Upper White River Integrated Resource Projects combined. Because 16 percent of the acres monitored were openings, they represent a disproportionate majority compared to the IRPs, increasing the rate of overall detrimental disturbance found to 24 percent. No quantitative threshold for detrimental soil disturbance was established for these projects.

Chemical analysis of Long-term Ecosystem Monitoring Project soils collected from 2008 to 2031 will serve as the baseline for soil status going forward. This represents the first three rounds of sampling.

3) Stream Macroinvertebrate Monitoring

Macroinvertebrate stream health ratings use an assemblage of biometrics to determine the biological integrity for each site. These include species density and richness as well as several other technical parameters (full details available in the VTDEC Biomonitoring report). Highlights of the fiscal years 2014 to 2016 VT DEC macroinvertebrate stream health monitoring ratings include:

Fiscal Year 2014

- Marsh, Wing, Winhall rated “excellent”
- Breakneck, Chittenden rated “excellent to very good”
- Bingo Brook, Smith, West Br. of the Deerfield rated “very good”
- Corporation rated “very good to good”
- Liberty Hill rated “good to fair”

Fiscal Year 2015

- Bear Wallow, Broad, Cardinal 0.1, Cardinal 1.1, Roaring, Winhall rated “excellent”
- Bingo, Breakneck, Broad, Chittenden, Corporation, Deer Hollow, Smith rated “very good”
- Liberty Hill, Marsh, and Wing were all rated “good”

Fiscal Year 2016

- Liberty Hill Brook 0.1 was the only site with a failing B(2) water quality assessment of “Fair-Poor.” It was sampled three consecutive years and continues its pattern of very low density. The physical habitat is highly embedded - a substrate-modifying factor of concern. This very high gradient reach fails to flush out depositional material before settling, incasing cobble and boulders, and destroying prime macroinvertebrate habitat.
- Breakneck Brook 0.2, Bromley Mt Brook (Mill Trib. #6) at River Mile 1.9, and Corporation Brook 1.1 rated “Good.”
- Broad Brook 2.4 rated “Very Good”
- Cardinal Brook 1.1, Marsh Brook 1.0, Roaring Brook 2.4, Wing Brook 0.2, and Bingo Brook rated “Excellent-Very Good”
- Smith Brook 1.3, Winhall River 8.1 rated “Excellent”

Overall, GMNF water quality is high. Nitrogen and phosphorus content are generally low, with seasonal spikes during spring snow melt. Winhall River and Cardinal Brook have high phosphorus levels that may warrant further monitoring. pH is near neutral for most sites, with seasonal lows occurring in spring. Alkalinity, a parameter used to determine sensitivity to acidification, is generally low. Half of the streams monitored are sensitive to acidification, with alkalinity levels near 10mg/L or below. These same streams had high aluminum, indicative of acidification. Chloride is also generally low in all streams except two affected by nearby road salt runoff. Turbidity values are low for all streams, under 1 NTU for all but 2 streams, indicating high quality, clear water.

The macroinvertebrate and water quality data collected during fiscal years 2014 to 2016 shows that these GMNF streams are continuing to improve since tropical storm Irene hit in 2011. Streams monitored for the South of Route 9 IRP will be monitored again after harvest operations, planned to begin in 2020.

4) Green Mountain National Forest Wilderness Stream Sampling

After three years of sampling, based on overall averages and seasonal means, a baseline of water chemistry has been established for the ten wilderness streams. Future monitoring can reference this baseline to determine if changes have occurred in acid status, nutrients, or color.

Overall, the ten GMNF wilderness streams sampled are cold-water, dilute, and low in pH, alkalinity, base cation and nutrient concentrations. They are in small forested watersheds with steep slopes that tend to provide little buffering capacity through bedrock or soils. They receive higher levels of nitrate and sulfate deposition than lower elevations or those located farther to the north. Mean water chemistry values from fiscal years 2014 to 2016 are presented in the GMNF Air Quality Related Values Wilderness Stream Sampling Program Report, available upon request. Despite a USGS report on headwater streams noting that streams in the southern Green Mountains and Taconics have higher median nitrate concentrations than the background estimate, the GMNF wilderness streams tend to have concentrations lower than the background concentrations for all parameters. This highlights the health and biological importance of these undisturbed, forested watersheds.

Using base cation surplus levels, a method used to determine a stream's resistance to acidification, seven of the ten streams samples were identified to be "prone or potentially prone" to acidification. Base cations are critical micronutrients required for the growth of plants and animals. They provide buffering against acid inputs such as those contributed by atmospheric deposition. Due to acid loading and the limited buffering capacity within the bedrock and soils, these streams have low or moderate levels of base cations and a limited ability to buffer the atmospheric transport and deposition of sulfur and nitrogen oxides. Despite the sensitivity of these streams, none sampled during fiscal years 2014 to 2016 were considered acidified (Figure 2-12).

Spring Base Cation Surplus values 2014-2016

Stream Name	Spring Base Cation Surplus values (ueq/L)		
	2014	2015	2016
Bear Wallow Brook	73.2	57.52	50.57
George Bk	64.0	42.49	55.40
Gilmore Pond Outlet	65.7	51.72	48.02
Goshen Brook trib 2	116.1	130.66	91.85
Grindstone	39.7	47.19	40.76
Lost Pond Brook	56.0	46.58	46.72
McGinn Brook	518.9	449.50	418.49
North Pond Outlet	160.6	153.56	133.57
Smith Brook	52.5	41.02	36.63
West Branch Deerfield	32.8	25.55	25.62

Base Cation Saturation	Acidification Category
<60 ueq/L	Prone to acidification
60-75 ueq/L	Potentially prone to acidification
>75 ueq/L	Not acidified

Streams considered acidified or prone to acidification are incapable of buffering the toxic form of aluminum (inorganic monomeric aluminum) which is harmful to aquatic organisms.

Figure 2-12. Base Cation Surplus Levels as Indication of Stream's Resistance to Acidification.

Sulfur, phosphorus, nitrogen, aluminum, and chloride were assessed in all streams sampled. Overall, levels were low to moderate and fell at or below expected levels. These are positive characteristics of healthy, undisturbed, forested watersheds in this ecological setting, recovering from higher levels of atmospheric deposition common before 1980 and the establishment of the Clean Air Act.

These GMNF wilderness streams are similar to other streams along the spine of the Appalachian Mountains with recent long term water chemistry improvements due to the reduction of atmospheric pollutants and acid deposition (Argue, Pope, and Dieffenbach, 2012). The biggest threat to GMNF wilderness streams may be climate change, due to the physiological impacts to aquatic biota from increasing temperatures, and an increasing frequency of large and scouring rain events like Tropical Storm Irene. Huge rain events wash away fine materials like silt, sand, and small gravel from stream beds and decrease habitat stability in smaller streams (VTDEC, 2016). Increases in water temperature negatively impact macroinvertebrate species diversity and reduce or eliminate temperature-sensitive species such as brook trout (Raleigh 1982, Meehan and Bjornn 1991). Additionally, stream and lake phosphorus concentrations are on the rise nationwide, especially in undeveloped catchments, such as these wilderness streams (Stoddard et al, 2016). This is a concern, as the atmospheric transport of particulate phosphorus was long considered negligible in New England. However, it may in fact be a leading cause of reported phosphorus increases to Vermont's oligotrophic lakes.

Recommendations:

1) Soil, Water and Riparian Resource Monitoring in Harvest Areas:

Continue similar monitoring in fiscal year 2017, with increased focus on sensitive soils, biomass harvest, clearcut and seed tree prescriptions, summer harvests, and winter thaws, where soil disturbance is expected to be most pronounced.

2) Soil Disturbance/Soil Quality Monitoring:

Continue similar monitoring with a larger data set, including multiple units per harvest prescription, and increase focus on sensitive soils, biomass harvest, and summer harvests, where soil disturbance is expected to be highest.

3) Stream Macroinvertebrate Monitoring

Continue to sample GMNF streams annually to create baseline data and monitor long-term trends in aquatic communities. Select sites that are expected to undergo future disturbances, or currently experiencing stressors (i.e. silviculture, sedimentation due to roads or logging, temperature, acidification, geomorphic instability, high flow events, and land use activity, etc.).

Continue to sample the GMNF streams Smith, Bingo and the Winhall River that are now part of VTDEC's established Sentinel Stream Monitoring Network. These Very High Quality Waters are generally free of most disturbance.

Measure aluminum levels at sites with pH higher than 6 or alkalinity higher than 10 mg/L. Spring aluminum values are likely to reach toxic levels on the streams where water quality approaches these thresholds during spring snowmelt. Several of the streams assessed in this report are at least sensitive to episodic acidification including the Winhall, the Cardinals, Bear Wallow, Roaring Brook and Smith.

4) Green Mountain National Forest Wilderness Stream Sampling

Monitoring wilderness streams relatively unimpacted by anthropogenic influences provides an excellent mechanism to isolate specific drivers of watershed health. A baseline of water chemistry data on ten streams in five wilderness areas has been established, the majority of which are acid-sensitive and recovering from decades of atmospheric deposition. To track their status and trends in the future:

1. Conduct chemical monitoring at all 10 sites, in summer, every other year, including base cations, alkalinity, DOC, total phosphorus, and monomeric aluminum at West Branch Deerfield.
2. Conduct biological monitoring every 5 years, starting in 2021, to monitor changes and impacts from acid deposition, climate change, and nutrient responses.

Terrestrial Wildlife Population

Evaluation Question: Threatened, Endangered, and Sensitive Bats

Monitoring Question: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?

Detailed Monitoring Question: Are management actions adequately protecting ecological conditions required by threatened, endangered, and sensitive (TES) bat species known to occur on National Forest System lands?

Monitoring Activities: Indiana bat (*Myotis sodalists*) is a federally listed endangered species. Eastern small-footed bat (*Myotis leibii*), little brown (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), and tri-colored bat (*Perimyotis subflavus*) are identified as sensitive species (listed as Regional Forester Sensitive Species as of December 2011).

Anabat surveys were conducted in fiscal years 2014 to 2016, but the data has never been completely synthesized. This data could be used to determine presence of an individual at the sampling location. Mist net surveys have not been completed during these years. With white nose syndrome (WNS) on the landscape it is unlikely that mist netting will occur until species rebound from their population losses.

Evaluation and Conclusions: All projects must comply with Endangered Species Act consultation requirements prior to implementation to ensure Indiana bat protection. All site-specific project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. Anabat survey results do not adequately

address this monitoring question posed for protecting ecological conditions required for TES bats on the landscape. Evaluating the effectiveness of Forest Plan Standards and Guidelines, and project specific design criteria and mitigation measures are a better indicator to determine if management activities are protecting TES bats. Any surveys short of pretreatment and post treatment units would not provide detailed answer for the monitoring question. With current directions based on WNS and population declines, mist netting without a specific biological purpose is unlikely to occur.

Recommendations: Consider changing this monitoring question to “Have TES bats continued to use the landscape post-WNS?”.

Evaluation Question: Peregrine Falcon

Monitoring Question: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?

Detailed Monitoring Question: What is the population trend of peregrine falcons on the National Forest System lands and adjacent lands?

Monitoring Activities: Audubon Vermont coordinates peregrine falcon monitoring and management efforts in partnership with the Vermont Department of Fish and Wildlife, private and public landowners, and citizen scientists across Vermont. GMNF staff and citizen scientists (volunteers) monitor known and possible nesting cliffs on GMNF and on adjacent land. The monitoring period for falcons begins in late winter, when falcons migrate back to cliff sites, and continues through the fledging of chicks in mid-summer. During fiscal years 2014 to 2016, five falcon sites were monitored each year. Observers documented if falcons were present; if and when they successfully nested; and how many chicks survived to fledging. There are two GMNF cliff sites that are accessed by hiking trails. Both of those trails have seasonal closures, which are critical to protecting falcons from human disturbance.

Evaluation and Conclusions: American peregrine falcon (*Falco peregrinus anatum*) is identified as a sensitive species (listed as Regional Forester Sensitive Species as of December 2011). All site-specific project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. Vermont has experienced steady population growth of peregrine falcons. Peregrine falcon nest site monitoring and protection are critical to sustaining the falcon population in Vermont. Of the five GMNF falcon sites monitored during this monitoring period, between two to four nests each successfully fledged at least one young each year. Two GMNF cliff trails were closed to human visitors, and during observation periods, these trails were monitored for violation of the closures. Collaborating with Audubon Vermont and the Vermont Fish and Wildlife Department on monitoring has been essential to understanding the dynamics of falcon nesting on GMNF. By following the current Forest Plan standards and guidelines, GMNF has been able to contribute to the sustainability of the Vermont falcon population

Recommendations: The documentation, monitoring, and protection of peregrine falcons on GMNF needs to continue, and any negative impacts to falcon activity, including nesting, needs to be evaluated. Given the vulnerability of falcon nesting to predation, weather events, and human disturbance, assessing success of individual nests is important to ensure the viability of falcons on the GMNF. Monitoring will also provide information on potential threats, such as environmental contaminants, that will be important state-wide in the future.

Evaluation Question: Bicknell's Thrush

Monitoring Question: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?

Detailed Monitoring Question: What is the population trend of Bicknell's thrush on the National Forest System lands and adjacent lands?

Monitoring Activities: Bicknell's thrush is considered one of North America's most rare and vulnerable songbird species due to limited habitat for breeding and significant habitat loss on its wintering grounds. Regionally, Bicknell's thrush populations have been declining across New England for many years. This species' breeding habitat includes dense and stunted balsam fir-red spruce forests found at high elevations (>2800 feet), which on GMNF mostly occur along the spine of the Green Mountains. The Vermont Center for Ecostudies (VCE) is the primary monitor of Bicknell's thrush breeding activity. Mountain Birdwatch (MBW) is the monitoring project for Bicknell's thrush and nine other bird species that breed in montane habitats across New England and in parts of the Catskill and Adirondack Mountains. The MBW project engages numerous volunteers to conduct bird surveys along designated routes at fixed locations that are surveyed every year. Each route is surveyed once each June, when Bicknell's thrushes can be detected by sight and sound in their breeding habitat. Each route typically covers six sample points; individual birds are counted by species, and any nesting data are collected. There are ten established routes on GMNF, primarily on the Long Trail and/or the Appalachian Trail from Glastenbury Mountain north to Mt. Ellen.

Evaluation and Conclusions: Bicknell's thrush (*Catharus bicknelli*) is identified as a sensitive species (listed as Regional Forester Sensitive Species as of December 2011). All site-specific project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. During fiscal years 2014 to 2016, Bicknell's thrush was monitored on GMNF at the majority of designated sites in the Mountain Birdwatch project. Not all sites were surveyed each year due to weather and availability of surveyors. Bicknell's thrush numbers held steady from 2014 to 2016 at surveyed GMNF sites, which is similar to the results from the rest of the state. However, this three-year monitoring period is a short timeframe for analyses; a long-term data set is necessary for studying Bicknell's thrush population trends. The Mountain Birdwatch project has provided valuable data to assess regional trends of Bicknell's thrush populations and to assess habitat conditions across the species' range. In particular, these data have been used to evaluate possible breeding habitat fragmentation, which could be caused by human infrastructure and mountain recreation.

Recommendations: No changes to the design or methodology of data collection for Bicknell's thrush are currently needed. Because GMNF is the largest conservator of Bicknell's thrush habitat in Vermont and supports approximately 30.6 percent of the Vermont Bicknell's thrush population (Hill and Lloyd, 2017), GMNF staff should continue to partner with VCE and remain part of their regional study of Bicknell's thrush population dynamics, breeding habitat availability, and habitat selection.

Evaluation Question: Common Loon

Monitoring Question: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?

Detailed Monitoring Question: Do we have common loons on/near the National Forest System lands? Are they nesting? Are they nesting successfully? Do they need protection or habitat management?

Monitoring Activities: Common loons are monitored across the state by the Vermont Center for Ecostudies (VCE) biologists and by public volunteers. Additional technical support is provided by the Vermont Fish and Wildlife Department. Monitoring includes watching loons and collecting data on loon distribution, abundance, nesting success, and chick survival. Common loons are also monitored through a VCE-sponsored citizen science annual event called Loonwatch, which provides data for determining a statewide population estimate, and includes information on breeding and territorial pairs and presence of non-breeding loons. Ponds, lakes and reservoirs on GMNF are included in both of these monitoring

efforts. GMNF staff contribute to data collection for loons by participating in Loonwatch and by monitoring loon activity when visiting water bodies on the Forest.

As part of loon nest monitoring, VCE assesses the level of protection needed from human disturbance on nests on each water body. Where a loon nest is prone to human disturbance, predation from terrestrial animals, and/or affected by fluctuating water levels (on regulated lakes), VCE provides a nesting raft as an alternative to natural nest sites. On GMNF, two nesting rafts are used, and additional protection for each raft is provided through the placement of warning sign buoys.

Evaluation and Conclusions: Common Loon (*Gavia immer*) is identified as a sensitive species (listed as Regional Forester Sensitive Species as of December 2011). All site-specific project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. The number of nesting loons in Vermont has risen steadily over the last 30 years and their success in raising chicks has contributed to higher numbers of returning adult loons to the state. Consequently, as loons have expanded their distribution across the state, GMNF has experienced an increase in the number of loons as nesting pairs, territorial pairs, and individuals that either occupy or visit Forest bodies of water. A small number of Forest lakes and ponds have successfully produced loon chicks over the years, however, during this monitoring period on GMNF, two new loon nesting sites were recorded, and chick survival was high for all GMNF nests (at least a chick per nest, which is above the state average). Fifteen chicks survived from twelve successful nests. There were also individual adult loons observed during this period, which indicated the possibility for the presence of more territorial pairs in the future.

Recommendations: Given the increasing human use of the Forest landscape, particularly with visitors' increasing interest in accessing remote and secluded water bodies, common loons will continue to need monitoring to ascertain and promote their nesting success. Also, as loons expand their distribution on GMNF, current and potential nesting bodies of water could be impacted by the regulation of water levels at hydroelectric facilities. Consequently, GMNF staff should continue to partner with and follow recommendations by VCE on monitoring loon distribution, nesting success, and protection on NFS lands.

Evaluation Question: Threatened, Endangered, and Sensitive Herptiles (wood turtle, Jefferson and blue-spotted salamanders)

Monitoring Question: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?

Detailed Monitoring Question: What are the population trends of wood turtle, Jefferson salamander, blue-spotted salamander, and four-toed salamander on National Forest System and adjacent lands? Do they need protection or habitat management?

Monitoring Activities: Monitoring for sensitive herptile species on GMNF is done mostly through a variety of conservation partners, including the Vermont Center for Ecostudies (VCE), the Vermont Fish and Wildlife Department, and the Vermont Reptile and Amphibian Atlas Project. Biologists from these organizations administer various herptile data collection projects, all of which engage citizen scientists to contribute data to state-wide and regional data sets. The GMNF has not conducted any specific surveys targeting herptile species, however, GMNF staff has contributed data to the Vermont Herp Atlas and to VCE's Vernal Pool Mapping Project and Atlas of Life. In the spring of fiscal year 2014, a student from the Community College of Vermont surveyed vernal pools in a small area in the southern part of the Rochester-Middlebury Ranger District. His findings were added to the VCE vernal pool data set. In general, GMNF biologists and technicians conduct informal herptile surveys while completing reviews of proposed Forest projects. Table 2-17 includes data from the Vermont Herp Atlas for GMNF and areas surrounding the NFS lands.

Table 2-17. Sensitive herptile species documented presence on GMNF and surrounding lands.

Species	Documented on Forest	Documented Off Forest	Previous 3 Years
Blue-spotted salamander	0	100	37
Four-toed salamander	0	28	34
Jefferson salamander	0	16	37
Wood turtle	4	107	63

Evaluation and Conclusions: Blue-spotted Salamander (*Ambystoma laterale*), Four-toed Salamander (*Hemidactylium scutatum*), Jefferson Salamander (*Ambystoma jeffersonianum*), and Wood Turtle (*Glyptemys insculpta*) are identified as sensitive species (listed as Regional Forester Sensitive Species as of December 2011). All site-specific project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. Based solely off these data it is hard to ascertain an accurate picture of the population and population trend because of yearly influence of weather, precipitation, survey effort, and other factors that could cause numbers to be inflated or deflated. By looking at the data provided, it would appear that wood turtle and blue-spotted salamander populations were down or declining but four-toed and Jefferson salamander populations were up. From data included in these data sets and informal in-house surveys, GMNF biologists are aware of significant habitats on the Forest that support a variety of herptile species. These species are only mentioned once in the Forest Plan as examples of species that may live in or utilize seasonal pools. In general, these species have been adequately protected through project specific design criteria and mitigation measures by minimizing impacts to the ecosystems they utilize.

Recommendations: These species are important to us based on their identification during the RFSS process. To further strengthen knowledge of species' use of GMNF, more formal surveys should be conducted, particularly emphasizing location and use of vernal pools.

Vegetation

Evaluation Question: Outputs Accomplished - Volume and Acres of Timber Offered and Sold

Monitoring Question: How close are actual outputs and services to projected outputs and services?

Detailed Monitoring Question: How do actual outputs compare to those projected in Appendix D, Proposed and Probable Practices, specifically related to timber offered and sold?

Monitoring Activities: Forest Activity Tracking System (FACTS) and Timber Sale Accounting (TSA) reports were used to monitor timber offered and sold along with the type of timber harvesting practices used to implement the Forest Plan.

Evaluation and Conclusions: The Forest Plan average annual Allowable Sale Quantity (ASQ) is the maximum amount of timber volume that may be offered and sold during Decade 1 (2006 to 2015), expressed on an annual basis. The annual average ASQ for GMNF is 19.7 million board feet (MMBF). The annual amount of timber sold may exceed 19.7 MMBF as long as the decadal ASQ (197 million board feet) is not exceeded. Table 2-18 displays the volume of timber offered and sold for fiscal years 2014 to 2015 compared to the annual average and decadal ASQ. The amount of timber sold annually for 2014 to 2016 remains well below the average annual ASQ with each year totaling less than a third of the allowable limit. There has been a total of 50 MMBF of timber sold from 2006 to 2015 which represents Decade 1 of Forest Plan implementation. This is 25.4 percent of the decadal ASQ (197 MMBF). The low harvest levels inhibit management ability to meet other objectives such as those related to habitat, age class, or composition.

Table 2-18. Timber volume offered and sold for fiscal years 2014 to 2016.

Fiscal Year	Timber Volume Offered and Sold (MMBF)	Percent of Annual Average ASQ (19.7 MMBF)	Percent of Decadal ASQ (197 MMBF) of Total Harvest Since 2006
2014	5.93	30	34.4
2015	6.25	32	25.4
2016	6.24	32	3.2 ¹

¹ Fiscal year 2016 is the start of Decade 2 which resets the 197 MMBF decadal ASQ.

Table 2-19 displays the actual acres harvested in 2014, 2015, and 2016 compared to Forest Plan estimated annual management practices (Forest Plan, Appendix D, Table D-4). The amount harvested each year is well below the estimated acres for each management practice. The current five-year timber sale contract plan anticipates an increase in the volume of timber sold each year over the next five years, however these increases are subject to budget and staffing limitations.

Table 2-19. Actual acres for fiscal years 2014 to 2016 compared to Forest Plan estimated management practices.

Estimates of Management Practices	Annual Acres in Decade 1 ¹	Acres Harvested by Fiscal Year			Percent of Annual Acres by Fiscal Year		
		2014	2015	2016	2014	2015	2016
Even-aged Regeneration Harvest	1,750	302	41	67	17	2	4
Even-aged Intermediate Harvest	1,324	168	442	198	13	33	15
Uneven-aged Harvest	981	152	169	173	15	17	18
Total Harvest	4,055	622	652	438	15	16	11

¹ 10-year average of Decade 1 acres from Forest Plan, Appendix D, Table D-4.

Recommendations: The Forest Service should continue to monitor outputs related to timber volume offered and sold and seek opportunities to increase these outputs. No changes to monitoring and evaluation measurements, indicators or methodology are recommended at this time.

Evaluation Question: Rare or Outstanding Natural Areas

Monitoring Question: To what extent have Forest Plan Objectives been attained?

Detailed Monitoring Question: To what extent are rare and outstanding biological, ecological, or geological features on the GMNF being protected, maintained, or enhanced?

Monitoring Activities: Rare or uncommon natural communities recognized as significant are listed in Appendix C, Table C-1). Every year, GMNF staff visit and monitor several sites with special features. At each site staff collect field notes addressing the condition and quality of the site and/or rare plant populations. In general, because these sites have been inventoried and evaluated in the past, notes highlight distinctive features, new information that had not previously been collected (for instance, GPS coordinates of special features), and changes in size, disturbance levels, and conditions of the surrounding landscape. The Forest Ecologist then incorporates these notes into site reports and/or rare plant reporting forms that are prepared during the winter months.

Fiscal Year 2014

A total of 11 sites with special features were monitored, including Bryant Mountain Hollow, Burnt Mountain, Gilmore Pond, Big Mud Pond, Bourn Pond, Branch Pond, Downer Glen, Grout Pond, Little Pond, Little Rock Pond, and Wallingford Pond. The following are highlights of this monitoring:

- Intense browse noted at Bryant Mountain Hollow. Need for thinning failed 1990s shelterwood cut to release RFSS plants.
- NNIP removed at Burnt Mountain. Heavy deer browse noted.
- Signs of illegal OHV at Little Pond
- NNIS identified and removed at Little Rock Pond
- Issues with camping and illegal ATV use were noted at Wallingford Pond

Though the GMNF Wilderness program was limited in capacity, Student Conservation Association (SCA) staff visited Bristol Cliffs, North Pond, Gilmore Pond, and Little Pond. They noted autumn olive at Bristol Cliffs trailhead (Forest Road 404).

In addition, Vermont Natural Heritage Inventory (VNHI) staff visited the following sites: Bryant Mountain, Bryant Mountain Hollow, Middlebury Gap, Monastery Mountain, Burnt Mountain, Bristol Cliffs, Bald Mountain, Mount Moosalamoo, Dorset Mountain, Dorset Cave, Downer Glen, Jenny Coolidge Brook Wetland, Little Rock Pond, Wood-Benn Knoll, Lost Pond Bog, Elbow Swamp, Downer Glen, and Texas Falls. The following are highlights of VNHI's notes:

- Suggestion for a Special Botanical Area designation for the old forest on Monastery Mountain.
- Hemlock stand on Monastery Mountain is a particular conservation priority since at the coldest and highest extent of hemlock range they are likely to be especially resilient to the hemlock woody adelgid.

Fiscal Year 2015

A total of 4 sites with special features were monitored: Beaver Meadows and Abbey Pond, Branch Pond, Mt. Horrid, and Bourn Pond. The following are highlights of this monitoring:

- Heavy moose browse was noted at Abbey Pond.
- Some threats noted from current recreational use at Mt. Horrid
- Visitor use monitoring completed by GMC caretaker, UVM collaboration, and SCA at Bourn Pond.

There are no records of the GMNF Wilderness Program or SCA monitoring of or work in Ecological Special Areas within designated Wilderness.

In addition, Vermont Natural Heritage Inventory (VNHI) visited the following sites: The Dome, South End Esker, Guernsey Brook, Green Mountain Ridge Site, Mount Tabor Work Center Swamp, Gifford Woods, Lincoln Brook, Rattlesnake Point, Elephant Mountain, and Dow Pond. The following are highlights of VNHI's notes:

- Elbow Swamp: small area of Giant Reed in the black spruce woodland bog and the red spruce-cinnamon fern swamp which appears to be the invasive subspecies – recommended to remove this infestation before it impacts the swamp and bog.
- Invasive plants should be monitored and removed if possible at Mount Tabor Work Center Swamp.

Fiscal Year 2016

A total of 4 sites with special features were monitored: Monastery Mountain, Grout Pond, Little Pond, and Stamford Meadows. The following are highlights of this monitoring:

- Illegal cutting for backcountry skiing at Monastery Mountain.

- GMC implemented Bolles Brook Watershed Partnership project at Little Pond: enhanced barrier off snowmobile trail, removed culvert, added trail to pond on the NFST, hardened water access.
- Several visits to Stamford Meadows for South of Rt 9 IRP.

In addition, GMNF Wilderness staff monitored the area around Gilmore Pond and Monastery Peak.

- A route flagged with pink survey ribbon was found near Gilmore Pond. The flagging was removed and an incident report was submitted to the LEO.
- Several large areas of cut understory (for backcountry skiing) were found on Monastery Peak. Wilderness staff followed up with the District Ranger and LEO.

Finally, Vermont Natural Heritage Inventory (VNHI) visited the Elephant Mountain site.

Evaluation and Conclusions: Ecology and Wilderness programs were limited in capacity (key positions vacant) during this monitoring period. This impacted both the amount of site monitoring and record keeping.

VNHI over the past several years has been both increasing its numbers of visits to sites that haven't been monitored recently and updating its mapping information on significant natural communities based on new state-wide inventory information. There is now a substantial amount of new information on sites of ecological significance in the State that was not analyzed during Forest Plan revision. While in the past the State has focused its efforts on rare and uncommon natural communities, over the past few years the focus has started to include important and high-quality examples of more common natural communities like Northern Hardwood Forest and Montane Yellow Birch-Red Spruce Forest. Some of the significant examples of these communities occupy hundreds to thousands of acres and occur in and out of protected management areas. The agency has not yet analyzed or developed a strategy for maintaining the quality and integrity of these sites in the context of forest management.

Reviving cooperation between the ecology program and other Forest programs, individuals, and VNHI will make it more likely that most existing and new sites will be monitored within 10 years of their last visit, and some will be monitored on the 5-year monitoring cycle identified for these areas. Some sites have received repeated visits to relocate rare plants or to respond to natural disturbances or proposed activities, which can reduce the number of new sites monitored each season. In some cases, GMNF staff have adjusted monitoring cycles to reflect level of concern: for instance, there are plans to monitor the Mount Tabor Work Center Swamp more frequently as it has portions dominated by ash and may be particularly vulnerable to emerald ash borer. In another case, Lye Brook Headwaters is so remote and inaccessible that it is unlikely to be impacted by human use or non-native invasive plants, so the monitoring cycle for this site has been adjusted to 10 years.

Protocols continue to be effective. The monitoring continues to demonstrate the importance of gathering precise GPS coordinates for special features and rare plant populations so they can be relocated efficiently. Compiling, maintaining, and updating the data gathered during these monitoring efforts continues to be a challenge. Coordinating among individual monitors could also be improved to avoid duplication and leverage the capacity of program areas and organizations to conduct monitoring more strategically based on complementary skills.

Results of the past seven years of monitoring suggest that impacts to the integrity of ecologically significant sites and features are most often associated with recreational uses. A stronger relationship between recreation, law enforcement, and ecology staff is important to effectively mitigate some of these impacts. The agency has been relatively successful at mitigating these impacts through cooperation between staff areas. Impacts of recreation use on special area integrity are particularly notable at

waterbodies. The level of tree-cutting and user-created campsites has increased steadily over the past 30 years, as noted by monitoring over that time period. In fiscal year 2022, GMNF staff plans to conduct another round of monitoring at several ponds, including Branch Pond. Upon completion of that monitoring, the agency hopes to develop a plan to reduce the impacts of this use on the integrity of this important high elevation pond. The ecology, recreation, and wilderness programs have turned over personnel, but mutually desire to strive toward a close working relationship so that management of recreation use within these special areas can support their ecological integrity.

Recommendations: Continue to monitor around 12 sites with significant ecological features on GMNF with help from VNHI and available biological, botanical, and Wilderness crews. Prioritize monitoring on the remaining sites that have not been monitored since 2006 and completing the high elevation ponds surveys. Focus additional monitoring on sites that are or may be affected by management activities, or are suffering from unauthorized uses such as illegal trails and cutting. Once all sites have been visited at least once since 2006, evaluate the existing and new information on significant ecological features to determine if monitoring objectives and cycles should be changed. During integrated resource project planning, continue to evaluate what is known of significant ecological features in the project areas, and determine if additional conservation measures are required.

Work with VNHI and VT Department of Forests, Parks, and Recreation to develop forest management considerations within large matrix significant natural communities that fall outside of established protected areas and within lands suitable for timber harvesting.

Work with VNHI to update the identification and mapping of significant ecological features present on GMNF, coordinate future monitoring efforts, and share monitoring data.

Continue to work with Recreation staff to plan actions to mitigate issues raised during special area monitoring, particularly at Branch Pond, Little Pond, Thendara Camp Fen, Stamford Stream Wetland Complex, and Rattlesnake Cliffs/Silver Lake. Prioritize potential actions and then seek funding and partnerships to implement them.

Evaluation Question: Stocking Level

Monitoring Question: Are harvested lands adequately restocked according to Plan goals?

Monitoring Question: Are lands adequately restocked within five years of a regeneration harvest or site preparation activities?

Monitoring Activities: Monitoring protocols and procedures are well established and are consistent with Forest Service Handbook (FSH 2409.17, Silvicultural Practices). Reforestation success is measured on new plantations or harvested stands in years one, three, and five (if needed) following the planting or other regeneration effort. Successful reforestation is assured when new stands are certified as “free to grow” by year five. Stocking surveys are conducted using 1/700 and 1/100 acre sized circular plots on which all seedlings and saplings are tallied. A plot is considered stocked if at least one acceptable tree seedling or sapling occurs is found. The plot data is summarized providing the total stocking percentage for each stand. Stocking surveys were conducted for all stands harvested with even-aged and/or uneven-aged regeneration methods. Survey results were reported in the FACTS database.

Fiscal Year 2014

Forest Service staff completed first year evaluation (stocking) surveys for all stands regenerated through timber harvesting and final third year evaluation surveys were completed on 793 acres. All units were

certified as fully stocked. For natural regeneration survival examinations, all sampled stands were stocked adequate, acceptable seedlings or saplings to be considered moving towards reforestation certification.

Fiscal Year 2015

Forest Service staff completed first year evaluation (stocking) surveys for 496 acres regenerated through timber harvesting and final third year evaluation surveys were completed on 820 acres. All units were certified as fully stocked. For natural regeneration survival examinations, all sampled stands were stocked adequate, acceptable seedlings or saplings to be considered moving towards reforestation certification.

Fiscal Year 2016

Forest Service staff completed first year evaluation (stocking) surveys for 280 acres regenerated through timber harvesting and final third year evaluation surveys were completed on 310 acres. All units were certified as fully stocked. For natural regeneration survival examinations, all sampled stands were stocked adequate, acceptable seedlings or saplings to be considered moving towards reforestation certification.

Evaluation and Conclusions: Review of evaluation surveys completed during the monitoring period indicates that reforestation efforts underway continue to be sufficient to meet stocking certification for all units within the required timeframes.

Recommendations: Continue to conduct first, third, and if necessary fifth year stocking surveys to certify reforestation of all planted and naturally regenerated stands.

Evaluation Question: Sustainability of Special Forest Product Gathering

Monitoring Question: To what extent have Objectives been attained?

Detailed Monitoring Question: What types and quantities of special forest products are being gathered annually that require a permit? What products are not allowed to be gathered, and what products are being evaluated for gathering at levels requiring a permit (commercial or personal use)? What products are being gathered at levels that may be unsustainable.

Monitoring Activities: The GMNF monitors the quantity and type of permitted special forest products. In addition, the Forest Health Protection Program of the Forest Service's State and Private Forestry branch regularly monitors the maple tapping areas to evaluate the health of the maple trees and to determine if any adjustments to, or suspensions of, operations are required. Illegal tree cutting and removal is tracked annually on GMNF. Often this is related to illegal firewood removal, although it also includes cutting trees around campsites as well as the occasional theft of valuable timber. Firewood removal is monitored during regular patrols conducted by Law Enforcement and Forest Protection Officers. Table 2-20 shows the special forest product permits issued by product for fiscal years 2014 to 2016.

Table 2-20. Special forest product permits issued in fiscal years 2014 to 2016.

Product	Quantity		
	Fiscal Year 2014	Fiscal Year 2015	Fiscal Year 2016
Maple sap	6,519 taps	7,267 taps	8.855 taps
Firewood	461 cords	495 cords	351 cords
Christmas trees	306 trees	195 trees	442 trees
Boughs	1 ton	1 ton	0
Seedlings	0	0	0
Saplings	0	0	0

Product	Quantity		
	Fiscal Year 2014	Fiscal Year 2015	Fiscal Year 2016
Miscellaneous	0	840 pounds	840 pounds
Fungi	400 pounds	200 pounds	200 pounds

Fiscal Year 2014

GMNF staff monitored maple sap permit areas, and no significant compliance issues were noted. Forest Health Protection (FHP) staff visited six maple sap permit areas to assess any impacts of tapping. The annual monitoring consists of six criteria: Two growing season site visits for visual inspection of conditions; pheromone trapping for damaging insects; insect egg mass surveys during outbreaks; taphole closure assessment; root starch reserve measurements; and using the Aerial Detection Survey to see if any damaging agents are active in the area around the sugarbushes. Overall, the sugarbush areas are in a healthy condition. Health indicators including root starch and taphole recovery indicated that all sites were healthy, and that maple sap harvest continues to be sustainable at these sites. FHP staff detected no significant incidence of forest pests at the sites.

Fiscal Year 2015

GMNF staff monitored maple sap permit areas and no compliance issues were noted. FHP staff visited six maple sap permit areas to assess any impacts of tapping. Overall, the sugarbush areas continue to be in a healthy condition. Pheromone traps for forest tent caterpillar were deployed, as well as traps for saddled prominent. In 2015 there were no insect outbreaks, so egg mass surveys were not conducted.

Fiscal Year 2016

GMNF staff monitored maple sap permit areas, and no compliance issues were noted. FHP staff visited six maple sap permit areas to assess any impacts of tapping. Overall, the sugarbush areas are in a healthy condition. Pheromone traps for forest tent caterpillar were deployed, as well as traps for saddled prominent. There were no insect outbreaks, so egg mass surveys were not conducted.

Evaluation and Conclusions: The number of maple tapping and fuelwood permits issued annually has steadily increased since Forest Plan revision. Christmas tree permits have also generally increased. Permits for other products are stable at relatively low levels. Although overall permits have been increasing over time, permit numbers appear to have leveled off and become more variable during fiscal years 2014 to 2016.

Firewood

Firewood permit numbers began to increase in fiscal year 2006 and then leveled off between fiscal years 2008 and 2013. During this time an average of 140 permits were issued for an average of 350 cords. Permit numbers increased in fiscal years 2014 and 2015, reaching 491 cords before dropping back to 351 cords in fiscal year 2016. GMNF staff continues to evaluate opportunities for additional firewood harvesting to meet demand. Several factors support the sustainability of this increased use, including (1) timber harvesting on GMNF is well below the Allowable Sale Quantity established in the 2006 Forest Plan; (2) the focus of firewood harvesting is on readily accessible dead and down trees; and (3) an increasing abundance of dead and dying trees due to the increasing age of the forests within GMNF.

Christmas Trees

The requests for Christmas tree permits rose dramatically between fiscal years 2010 and 2013, however the permit numbers stopped rising in fiscal year 2014 and have become more variable. Demand for permits seems to vary based on economic conditions and retail Christmas tree prices. Press releases and the extent to which they receive exposure also varies from year to year and appears to affect demand.

The availability of young softwood trees continues to increase as hardwood forests growing on sites more suited for softwood trees start to see more abundant softwood seedlings and saplings establish in these stands. It is anticipated that harvest will be sustainable because in terms of absolute numbers it is a very small amount compared to the numbers of small softwood trees available and will not make a detectable difference in the composition of GMNF or the ability to meet composition objectives. In areas with moderate numbers of softwood saplings, they generally occur in amounts of 100 to 300 trees per acre. Cumulatively therefore, the levels of Christmas tree harvesting occurring over the past seven years on average have been affecting less than 2 acres per year, distributed across the entire GMNF.

Maple Sap

Maple sap is sold by the tap. The number of taps sold on average prior to fiscal year 2012 was around 4,000 taps per year, with some minor fluctuations associated with permittees deciding not to tap in a given year. In fiscal year 2012 for the first time in 15 years, a new maple tapping permit was issued. This permit was added through a land acquisition where tapping was a pre-existing use. Forest Health Protection staff evaluated the area prior to tapping to ensure that there were no forest health concerns. With the addition of this sixth permittee, tap numbers rose to over 6,000. From fiscal years 2014 to 2016, the number of taps has continued to increase as existing permits expand. Since 2007, there have been very few compliance issues on maple tapping permit areas. The addition of additional maple tapping areas would be limited primarily by administrative capacity.

Other Products

Since 2005, requests for special forest products other than those noted above at levels requiring permits have been very limited. Requests for mushrooms and boughs have been stable at 0 to 1 permit per year since 2000, with no noticeable increases. Commercial mushroom gathering has not exceeded the long-term average for non-commercial mushroom gathering, although this may increase in the future. Given the limits placed on quantities, it is anticipated commercial and non-commercial mushroom gathering at the maximum levels to be sustainable in the future. In fiscal year 2015 a product plan was added to allow for one permit to collect wild apples.

There have been no other requests for any historically gathered products other than firewood, Christmas trees, maple sap, boughs, wild apples, and fungi since 2004 or earlier. The types of historical gathering which have occurred within the Forest over the last 25 years is still allowed (those listed above in Table 2-20) and is open to gathering of other similar products. The following special forest products have been identified as being of concern in terms of sustainable harvesting: ginseng, ladyslippers, wild leeks, fiddleheads, sweetgrass, and black ash. Occasionally GMNF staff receive queries about gathering products such as ginseng, leeks, and fiddleheads, as well as other plants. Ginseng is a protected plant on GMNF. Leeks, fiddleheads, and other plants gathered in small quantities for personal use do not require a permit. Quantities collected for personal use are not monitored.

Recommendations: Continue to seek opportunities to collaborate with the Northern Research Station and gatherers on the development of strategies for sustainable harvesting of special forest products on GMNF, including those that are of concern such as wild leeks and fiddleheads. Continue to work with mushroom gatherers on monitoring metrics and protocols associated with sustainable management of this use.

Water

Evaluation Question: Forest-wide Water Quality Monitoring

Monitoring Question: To what extent is Forest management affecting water quality?

Monitoring Question: What is the existing status of water quality on the GMNF, and how are our management activities affecting water quality?

Monitoring Activities:

Fiscal Years 2014 to 2016 Wilderness Stream Sampling

Vermont Agency of Natural Resources - Department of Conservation (VT DEC) conducted field and lab water quality analysis at 10 sites on GMNF to serve as a proxy for air quality values in designated wilderness areas. Field analysis included pH, conductivity, and temperature. Lab analysis included pH, gran alkalinity, conductivity, chloride, sulfate, nitrate, calcium, magnesium, sodium, potassium, aluminum, silica, phosphorus, and nitrogen. The general characterization of the water quality at these sites included in the report from the VT DEC is as follows:

“The GMNF wilderness streams tend to have concentrations lower than the background concentrations for all parameters.

Overall, the ten GMNF wilderness streams sampled are cold-water, dilute, and low in pH, alkalinity, base cation and nutrient concentrations. They are in small forested watersheds with steep slopes that tend to provide little buffering capacity through bedrock or soils. Located along the southern spine of the Green Mountains, they receive higher levels of sulfate deposition than lower elevations or those located farther to the north.”

In addition to the water quality parameters described above, the study assessed biological indicators in the form of macroinvertebrate species present. The macroinvertebrates indicated that water quality was good or better at all sites where an assessment could be completed.

Fiscal Years 2014 to 2016 Stream Biomonitoring

VT DEC conducted field and lab water quality analysis at a total of 17 sites on GMNF (10 in 2014, 15 in 2015, and 12 in 2016 with some overlap from one year to the next). Monitoring at these sites included macroinvertebrates. Nearly all sites sampled in this period rated good or better based on macroinvertebrate assemblages in the most recent sampling. One site in 2016 rated as “fair-poor”. Monitoring also included substrate size (i.e., pebble counts), physical habitat parameters (i.e., embeddedness, silt rating, canopy, moss, algae), and chemical measurements (i.e., temperature, pH, alkalinity, conductivity, color, dissolved oxygen, turbidity, chloride, nitrate/ nitrite, nitrogen, phosphorus, sulfate, aluminum, calcium, iron, magnesium, potassium, sodium, hardness, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, and lead).

Evaluation and Conclusions: The results of the biological, physical, and chemical monitoring depict a broad picture of healthy streams with limited or no input of pollutants from local sources, although sensitivity to remote sources (e.g., combustion-related pollutants) varies from site to site. Erosion and deposition were highlighted at some sites through the monitoring reporting, but there wasn’t an indication that this was resulting in persistent water quality issues. In general, this reporting indicates that Forest Plan direction including management area designations and standards and guides along with project-specific design features, mitigations, and best management practices are conserving high water quality on NFS lands within GMNF.

Several sites monitored from fiscal years 2014 to 2016 have been monitored multiple times going as far back as 1994. There is discussion in the reporting from VT DEC that longer term monitoring sites seem to demonstrate recovery from stressors as a result of broader environmental improvements related to the Clean Air Act. Long-term analysis of biological and chemical parameters may provide some insight into changes related to regional and national trends related to air quality and shifts in climate and continued monitoring for current parameters should likely be continued.

Recommendations: No specific changes are being proposed at this time, but current monitoring parameters may not be the most effective at characterizing the effects of local land management on water quality. Forest Service staff should consider whether more qualitative assessment of point source and non-point source pollutants would be more appropriate for certain water quality parameters and whether

other qualitative or quantitative assessments of upland, riparian, and wetland habitat functioning would be more appropriate for chemical and physical parameters that are limited more by habitat functioning than by pollutant-generating activities.

Evaluation Question: Forest-wide Water Quality Monitoring

Monitoring Question: To what extent are environmental stressors and Forest management affecting water quantity and flow timing?

Detailed Monitoring Question: What is the existing status of water quantity and flow timing on National Forest System lands, and how are our management activities affecting them?

Monitoring Activities: Water quantity and flow timing data were not collected or are not available for the fiscal years 2014 to 2016 monitoring period. Data available from the USGS stream gaging network are minimal in the area and not representative of stream flow and timing issues that may influence management of streams on GMNF.

Evaluation and Conclusions: Although data were not collected for this indicator, Forest Service staff did not permit any activities that were likely to degrade processes related to stream flow quantity or timing. Such activities could include large-scale conversion of land use and land cover types (e.g., forested lands to agricultural lands) or installation of a dam. During this monitoring period, no dams were removed which would restore more natural processes related to stream flow quantity and timing.

Recommendations: The Forest Service should consider removing this question and related indicator(s) from the monitoring plan. Monitoring stream discharge (quantity and timing) on GMNF is not within the financial and technical capability of Forest Service staff, even with assistance from partners. Given the Forest's capacity for monitoring stream discharge, this monitoring question does not appear to be well suited to helping decide whether related Forest Plan direction is appropriate, whether management is meeting the Forest Plan objectives, or what impacts climate change may be having on forest resources.

Related indicators such as regional precipitation and temperature patterns may be appropriate in addressing the climate-related core monitoring element, but are not likely useful in determining whether plan components are effective and appropriate and whether management is being effective in maintaining or achieving progress toward the desired conditions and objectives for the plan area.

Wild and Scenic Rivers

Evaluation Question: Wild and Scenic Rivers

Monitoring Question: To what extent are eligible Wild and Scenic Rivers managed to preserve their outstandingly remarkable values?

Detailed Monitoring Question: Are management activities within the eligible National Wild & Scenic River management area consistent with the Outstandingly Remarkable Values for which each river segment was determined eligible?

Monitoring Activities: Monitoring for consistency with managing Wild and Scenic Rivers to preserve each river's outstandingly remarkable values occurs through National Environmental Policy Act (NEPA) review of proposed actions for activities that may be occurring within the Eligible Wild & Scenic River Management Area. All activities proposed in the Eligible Wild & Scenic River Management Area were consistent with Forest Plan direction for maintaining the attributes making each river eligible for future designation.

Annual monitoring trips also provide the opportunity to review project implementation and adherence to Forest Plan standards and guidelines as well as project-specific design criteria and mitigations. During the monitoring trips, resource staff review preservation of the outstandingly remarkable values associated with eligible Wild, Scenic and Recreation Rivers and discuss if not preserved, what could have been done differently and/or what could be done to retain eligibility.

Evaluation and Conclusions: Available documentation, annual monitoring trips, field reviews, and NEPA decisions did not identify any projects that failed to preserve the outstandingly remarkable values for eligible Wild, Scenic and Recreation Rivers.

Recommendations: Continue to ensure cots project activities are consistent with managing eligible Wild and Scenic Rivers to preserve each river's outstandingly remarkable values. Continue to conduct field monitoring of eligible river segments as time allows.

Wilderness

Evaluation Question: Wilderness Areas Managed to Standard

Monitoring Question: To what extent have Objectives been attained?

Monitoring Question: How many wilderness areas are managed to national standards?

Monitoring Activities: In 2014, under the Ten Year Wilderness Stewardship Challenge (10YWSC), five of the eight designated Wilderness areas on the GMNF met the National Standards. The 10YWSC was an initiative by the Forest Service launched in 2004 with the goal of bringing all wilderness areas to a defined level of stewardship by the 50th anniversary of the Wilderness Act in 2014.

In 2015, the national Wilderness program adopted the Wilderness Stewardship Performance (WSP) protocol at which time, the 8 GMNF Wilderness areas did not meet the National Standard. The WSP contains metrics used by the Forest Service to track management accomplishments in designated wilderness areas, with each national forest selecting ten core elements annually. The WSP framework aims to measure the Forest Service's effectiveness in preserving wilderness character by tracking management actions, such as implementing invasive species plans. Examples of WSP elements include Wilderness Character Baseline, Education, Invasive Species, Air Quality, Recreation Sites, and Trails. A possible 10 points per 10 elements are possible in WSP following the WSP guidebook. A wilderness is considered to meet national standard and "meet baseline performance for preserving Wilderness character" when it achieves 60 WSP points.

For each of the eight GMNF wilderness areas, the following elements were selected and monitored annually with point values achieved as identified:

Big Branch Wilderness: FY14 = 59 points, FY15 = 20 points, FY16 = 18 points

- Element (E) 2 - Air Quality Values
- E3 - Recreation Sites
- E4 - Agency Management Actions
- E5 - Opportunities for Solitude
- E6 - Cultural Resources
- E7 - Outfitters & Guides
- E8 - Workforce Capacity
- E9 - Education
- E10 - Wilderness Character Baseline

Breadloaf Wilderness: FY14 = 66 points, FY15 = 18 points, FY16 = 16 points

- E1 - Air Quality Values

- E2 - Water
- E3 - Recreation Sites
- E4 - Trails
- E5 - Agency Management Actions
- E6 - Opportunities for Solitude
- E7 - Outfitters & Guides
- E8 - Workforce Capacity
- E9 - Education
- E10 - Wilderness Character Baseline

Bristol Cliffs Wilderness: FY14 = 57 points, FY15 = 16 points FY16 = 16 points

- E1 - Invasive Species
- E2 - Air Quality Values
- E3 - Water
- E4 - Recreation Sites
- E5 - Agency Management Actions
- E6 - Opportunities for Solitude
- E7 - Outfitters & Guides
- E8 - Workforce Capacity
- E9 - Education
- E10 - Wilderness Character Baseline

George D. Aiken Wilderness: FY14 = 66 points, FY15 = 6 points, FY16 = 12 points

- E1 - Air Quality Values
- E2 - Water
- E3 - Recreation Sites
- E4 - Motorized Equipment / Mechanical Transport Use Auths
- E5 - Agency Management Actions
- E6 - Opportunities for Solitude
- E7 - Opportunities for Primitive and Unconfined Recreation
- E8 - Workforce Capacity
- E9 - Education
- E10 - Wilderness Character Baseline

Glastenbury Wilderness: FY14 = 72 points, FY15 = 26 points, FY16 = 16 points

- E1 - Air Quality Values
- E2 - Recreation Sites
- E3 - Trails
- E4 - Agency Management Actions
- E5 - Opportunities for Solitude
- E6 - Cultural Resources
- E7 - Outfitters & Guides
- E8 - Workforce Capacity
- E9 - Education
- E10 - Wilderness Character Baseline

Joseph Battell Wilderness: FY14 = 59 points, FY15 = 16 points, FY16 = 16 points

- E1 - Air Quality Values
- E2 - Water
- E3 - Recreation Sites
- E4 - Non-Compliant Infrastructure
- E5 - Agency Management Actions
- E6 - Opportunities for Solitude
- E7 - Outfitters & Guides
- E8 - Workforce Capacity

- E9 - Education
- E10 - Wilderness Character Baseline

Lye Brook Wilderness FY14 = 65 points, FY15 = 28 points, FY16 = 16 points

- E1 - Invasive Species
- E2 - Air Quality Values
- E3 - Recreation Sites
- E4 - Agency Management Actions
- E5 - Opportunities for Solitude
- E6 - Cultural Resources
- E7 - Outfitters & Guides
- E8 - Workforce Capacity
- E9 - Education
- E10 - Wilderness Character Baseline

Peru Peak Wilderness: FY14 = 72 points, FY15 = 26 points, FY16 = 18 points

- E1 - Air Quality Values
- E2 - Water
- E3 - Recreation Sites
- E4 - Trails
- E5 - Agency Management Actions
- E6 - Opportunities for Solitude
- E7 - Outfitters & Guides
- E8 - Workforce Capacity
- E9 - Education
- E10 - Wilderness Character Baseline

Evaluation and Conclusions: Under the 10YWSC protocol, GMNF was meeting the National Standards. The adoption of a new monitoring system in 2015, and the time investment to select and learn new monitoring requirements, resulted in an inability to meet the WSP national standards due to competing workforce demands and a lack of dedicated wilderness staff. Specifically, the GMNF Wilderness Program Manager position was vacant during the 2014 to 2016 monitoring period. Overall, the goals, objectives, standards and guidelines and desired conditions outlined in the 2006 Forest Plan were followed and met during fiscal years 2014 to 2016, however the National Standards were not achieved during this period.

Recommendations: Increase the Wilderness program workforce to continue with WSP monitoring including Wilderness Character Monitoring (WCM). WCM trends can be tracked every 5 years after the baseline assessments reports are developed.

3. List of Preparers

Table 3-1 provides the Forest Service monitoring team that collected, evaluated, or compiled data for the fiscal years 2014, 2015, and 2016 Annual Monitoring and Evaluation Report:

Table 3-1. Preparers of the fiscal years 2014 - 2016 Annual Monitoring and Evaluation Report.

Name	Position or Resource
Jay Strand	Monitoring Team Leader/Forest Planner
Holly Knox	Recreation Program Manager/Public Services Staff Officer
Suzanne Gifford	Ecologist
Gregory Flood	Wildlife Biologist
Dan McKinley	Fisheries Program Manager
John Mccann	Watershed Program Manager
Angie Quintana	Soil Scientist
Jeffrey Tilley	Silviculturist
MaryBeth Deller	Botanist
Steven Pytlik	Recreation Planner/Wilderness Coordinator
Karen Bucher	Archaeologist and Heritage Resource Specialist
Lindsay Rae Silvia	Fire and Fuels Technician
Ralph Perron	Air Quality Specialist
Tami Schroeder	Realty Specialist
Brian Austin	Engineer
Ethan Ready	Public Affairs Officer

Appendix A: Payments to Towns

There are two types of federal payments reaching municipalities that have National Forest System (NFS) lands: 1) Payments in Lieu of Taxes (PILT); and 2) Public Law 106-393, Secure Rural Schools and Community Self-Determination Act of 2001, reauthorized in 2008. Payments in lieu of taxes funds are directed to towns, and the Public Law 106-393 funds are directed to school districts.

Payments in Lieu of Taxes

Generally, federal lands may not be taxed by state or local governments unless they are authorized to do so by Congress. Since local governments are often financed by property or sales taxes, the inability to tax the property values or products derived from the federal lands may significantly affect local tax bases. Instead of authorizing taxation, Congress created various payment programs designed to make up for lost tax revenue.

Under current federal law, local governments are compensated through various programs for losses to their tax bases due to the presence of most federally owned land. The most widely applicable program, while run by the Bureau of Land Management, applies to many types of federally owned land, and is called "Payments in Lieu of Taxes" or PILT.

The level of PILT payments is calculated under a complex formula which considers figures such as acres of eligible lands, population, and previous year payments from other federal agencies. The PILT, made in or around October, is indexed by the inflation rate and set by federal law.

Table A-1 shows PILT payments and entitlement acres for Vermont towns and counties. Each town can receive additional PILT dollars if they contain other federal lands, such as National Park Service or Army Corps of Engineer lands. Not all federal acres within towns are entitled to PILT payments.

Table A-1. Vermont Payments in Lieu of Taxes (PILT) and acreage for fiscal years 2014 to 2016.

Government Unit ¹	2014 PILT Payment	2014 Entitlement Acres ²	2015 PILT Payment	2015 Entitlement Acres ²	2016 PILT Payment	2016 Entitlement Acres ²
ARLINGTON TOWN	\$10,803	4,191	\$10,677	4,191	\$10,874	4,191
BARNARD TOWN	\$7,919	650	\$7,734	650	\$7,830	650
BENNINGTON COUNTY	\$47,988	26,718	\$48,782	26,718	\$50,354	26,718
BENNINGTON TOWN	\$3,529	1,369	\$3,488	1,369	\$3,552	1,369
BRANDON TOWN	\$227	88	\$225	88	\$228	88
BRIDGEWATER TOWN	\$3,157	1,225	\$3,122	1,225	\$3,178	1,225
BRISTOL TOWN	\$14,458	5,609	\$14,291	5,609	\$14,623	5,636
CHITTENDEN TOWN	\$75,910	29,449	\$75,030	29,449	\$76,409	29,449
CLARENDON TOWN	\$0	30	\$0	30	\$0	30
DANBY TOWN	\$0	3	\$0	3	\$0	3
DORSET TOWN	\$14,301	5,548	\$14,135	5,548	\$14,628	5,638
DOVER TOWN	\$13,182	5,114	\$13,030	5,114	\$13,269	5,114
GOSHEN TOWN	\$19,753	7,663	\$19,524	7,663	\$19,882	7,663
GRANBY TOWN	\$4,372	1,696	\$4,322	1,696	\$4,400	1,696

Government Unit ¹	2014 PILT Payment	2014 Entitlement Acres ²	2015 PILT Payment	2015 Entitlement Acres ²	2016 PILT Payment	2016 Entitlement Acres ²
GRANVILLE TOWN	\$37,967	14,729	\$37,527	14,729	\$38,217	14,729
HANCOCK TOWN	\$51,262	19,887	\$50,668	19,887	\$51,600	19,887
HARTFORD TOWN	\$2,928	1,136	\$2,894	1,136	\$2,947	1,136
HARTLAND TOWN	\$1,599	620	\$1,579	620	\$1,609	620
JAMAICA TOWN	\$4,844	1,879	\$4,787	1,879	\$4,876	1,879
KILLINGTON TOWN	\$5,217	2,024	\$5,157	2,024	\$5,251	2,024
LANDGROVE TOWN	\$2,096	813	\$2,071	813	\$2,109	813
LEICESTER TOWN	\$6,960	2,700	\$6,879	2,700	\$7,005	2,700
LINCOLN TOWN	\$27,968	10,850	\$27,644	10,850	\$28,152	10,850
LONDONDERRY TOWN	\$1,809	702	\$1,788	702	\$1,821	702
MANCHESTER TOWN	\$13,871	5,381	\$13,710	5,381	\$14,032	5,408
MENDON TOWN	\$7,808	3,029	\$7,717	3,029	\$7,860	3,029
MIDDLEBURY TOWN	\$8,035	3,117	\$7,952	3,121	\$8,097	3,121
MOUNT HOLLY TOWN	\$8,736	3,389	\$7,956	3,389	\$8,793	3,389
MOUNT TABOR TOWN	\$44,148	25,491	\$40,528	25,491	\$44,775	25,491
NORWICH TOWN	\$1,732	672	\$1,578	672	\$1,744	672
PERU TOWN	\$44,052	17,090	\$40,123	17,090	\$44,343	17,090
PITTSFIELD TOWN	\$19,680	7,635	\$17,925	7,635	\$19,810	7,635
POMFRET TOWN	\$3,320	1,288	\$3,024	1,288	\$3,342	1,288
POWNA TOWN	\$10,581	4,105	\$9,637	4,105	\$10,651	4,105
READSBORO TOWN	\$23,823	9,242	\$21,698	9,242	\$23,980	9,242
RIPTON TOWN	\$57,148	22,170	\$52,049	22,170	\$57,523	22,170
ROCHESTER TOWN	\$30,615	11,877	\$27,884	11,877	\$30,816	11,877
RUPERT TOWN	\$690	268	\$629	268	\$696	268
RUTLAND COUNTY	No Data	No Data	No Data	No Data	\$15,098	5,819
SALISBURY TOWN	\$9,792	3,799	\$8,919	3,799	\$9,857	3,799
SEARSBURG TOWN	\$18,772	7,707	\$17,097	7,707	\$18,715	7,707
SHAFTSBURY TOWN	\$5,044	1,957	\$4,594	1,957	\$5,077	1,957
SHREWSBURY TOWN	\$5,751	2,231	\$5,238	2,231	\$5,789	2,231
SPRINGFIELD TOWN	\$521	202	\$474	202	\$524	202
STAMFORD TOWN	\$30,556	11,854	\$27,830	11,854	\$30,757	11,854
STOCKBRIDGE TOWN	\$2,297	891	\$2,091	891	\$2,312	891

Government Unit ¹	2014 PILT Payment	2014 Entitlement Acres ²	2015 PILT Payment	2015 Entitlement Acres ²	2016 PILT Payment	2016 Entitlement Acres ²
STRATTON TOWN	\$37,023	18,003	\$33,720	18,003	\$37,080	18,003
SUNDERLAND TOWN	\$56,234	21,816	\$51,218	21,816	\$56,604	21,816
THETFORD TOWN	\$2,519	977	\$2,294	977	\$2,535	977
TOWNSHEND TOWN	\$2,555	991	\$2,326	991	\$2,571	991
WALLINGFORD TOWN	\$24,320	9,435	\$22,151	9,435	\$24,480	9,435
WARDSBORO TOWN	\$8,050	3,123	\$7,332	3,123	\$8,103	3,123
WARREN TOWN	\$18,181	7,053	\$16,559	7,053	\$18,300	7,053
WASHINGTON COUNTY	No Data	No Data	No Data	No Data	\$0	37
WEATHERSFIELD TO	\$2,863	1,111	\$2,608	1,111	\$2,883	1,111
WESTON TOWN	\$23,261	9,024	\$21,186	9,024	\$23,414	9,024
WILMINGTON TOWN	\$4,263	1,654	\$3,883	1,654	\$4,292	1,654
WINDHAM COUNTY	\$17,470	9,644	\$16,352	9,644	\$18,310	9,644
WINDSOR COUNTY	\$9,565	3,418	\$8,701	3,418	\$10,600	3,799
WINHALL TOWN	\$40,735	15,803	\$40,263	15,803	\$41,003	15,803
WOODFORD TOWN	\$66,038	25,619	\$65,273	25,619	\$66,472	25,619
WOODSTOCK TOWN	\$1,431	555	\$1,414	555	\$1,440	555
TOTAL	\$1,019,729	416,314	\$1,009,992	416,318	\$1,045,492	422,699

¹ Not all towns listed are within the National Forest Proclamation boundary, however they still receive PILT payments based on the presence of other federal lands within their boundaries.

² Entitlement acres are those lands that were not tax exempt (such as owned by state or local government) prior to when the land was conveyed to the United States.

Secure Schools Act

Table A-2 provides the payments to Vermont towns by county in fiscal years 2014, 2015, and 2016. Note that the acres for PILT payments are not the same as for SRS payments; PILT is distributed to “Entitlement Acres,” SRS is distributed for all NFS land acres.

The Secure Rural Schools (SRS) and Community Self-Determination Act of 2001 (Secure Schools Act) was reauthorized for four years in 2008. This law was promulgated by Congress to restore stability and predictability to the annual payments made to states and counties containing NFS lands for the benefit of schools and roads. Prior to the passage of the Secure Schools Act, these payments were based upon income generated by the USDA Forest Service, typically through timber sales. As this timber sale-related income fluctuated and generally waned, communities that relied on the annual payments for the support of their schools suffered from a lack of funding stability and predictability to the detriment of their educational systems. The Secure Schools Act severs the tie between rural school funding and timber sale income to offer rural school systems continual, level funding.

Table A-2. Secure Rural Schools payments by Vermont town/county for fiscal years 2014, 2015, and 2016.

Town by County	Fiscal Year 2014		Fiscal Year 2015		Fiscal Year 2016	
	Payment Amount	Acres	Payment Amount	Acres	Payment Amount	Acres
Addison County						
Bristol	\$4,909.35	5,609	\$4,381.25	5,636	\$2,503.01	5,636
Goshen	\$6,707.14	7,663	\$5,956.97	7,663	\$3,403.22	7,663
Granville	\$13,035.30	14,893	\$11,577.34	14,893	\$6,614.14	14,893
Hancock	\$17,406.36	19,887	\$15,459.52	19,887	\$8,832.02	19,887
Leicester	\$2,363.21	2,700	\$2,098.89	2,700	\$1,199.10	2,700
Lincoln	\$9,930.74	11,346	\$8,820.02	11,346	\$5,038.88	11,346
Middlebury	\$2,811.35	3,212	\$2,496.91	3,212	\$1,426.48	3,212
Ripton	\$19,421.22	22,189	\$17,249.02	22,189	\$9,854.36	22,189
Salisbury	\$3,325.12	3,799	\$2,953.22	3,799	\$1,687.18	3,799
Bennington County						
Arlington	\$3,053.58	4,191	\$2,906.60	4,191	\$1,853.31	4,191
Bennington	\$997.46	1,369	\$949.45	1,369	\$605.39	1,369
Dorset	\$4,177.80	5,734	\$4,039.14	5,824	\$2,575.45	5,824
Glastenbury	\$19,466.79	26,718	\$18,529.86	26,718	\$11,815.04	26,718
Landgrove	\$595.27	817	\$566.62	817	\$361.29	817
Manchester	\$3,991.28	5,478	\$3,817.21	5,504	\$2,433.94	5,504
Peru	\$12,488.24	17,140	\$11,887.19	17,140	\$7,579.52	17,140
Pownal	\$2,990.92	4,105	\$2,846.96	4,105	\$1,827.22	4,132
Readsboro	\$6,733.74	9,242	\$6,409.65	9,242	\$4,086.93	9,242
Searsburg	\$5,615.34	7,707	\$5,345.07	7,707	\$3,408.13	7,707
Shaftsbury	\$928.97	1,275	\$884.26	1,275	\$563.82	1,275
Stamford	\$8,636.85	11,854	\$8,221.16	11,854	\$5,396.32	12,203
Sunderland	\$15,930.15	21,864	\$15,163.45	21,864	\$9,668.54	21,864
Winhall	\$11,592.06	15,910	\$11,034.14	15,910	\$7,035.60	15,910
Woodford	\$19,822.35	27,206	\$18,869.00	27,207	\$12,031.28	27,207
Rupert	\$122.40	168	\$116.52	168	\$74.29	168
Essex County						
Granby	\$2,107.07	1,696	\$1,642.25	1,696	\$748.14	1,696
Rutland County						
Brandon	\$61.99	88	\$60.01	88	\$38.19	88
Chittenden	\$20,743.73	29,449	\$20,083.57	29,449	\$12,781.16	29,449
Mendon	\$2,349.16	3,335	\$2,274.40	3,335	\$1,447.42	3,335
Mt Holly	\$2,387.20	3,389	\$2,311.22	3,389	\$1,470.86	3,389
Mt Tabor	\$17,955.74	25,491	\$17,384.30	25,491	\$11,063.34	25,491
Pittsfield	\$5,378.06	7,635	\$5,206.90	7,635	\$3,313.66	7,635
Wallingford	\$6,286.73	8,925	\$6,086.65	8,925	\$3,873.54	8,925
Danby	\$2.11	3	\$2.05	3	\$1.30	3
Washington County						
Warren	\$4,489.14	7,202	\$4,409.79	7,202	\$3,203.41	7,202

Town by County	Fiscal Year 2014		Fiscal Year 2015		Fiscal Year 2016	
	Payment Amount	Acres	Payment Amount	Acres	Payment Amount	Acres
Windham County						
Dover	\$3,834.45	5,114	\$3,805.19	5,114	\$2,393.28	5,114
Jamaica	\$869.76	1,160	\$863.12	1,160	\$542.86	1,160
Londonderry	\$327.66	437	\$325.16	437	\$204.51	437
Stratton	\$13,498.56	18,003	\$13,395.54	18,003	\$8,425.16	18,003
Wardsboro	\$2,341.61	3,123	\$2,323.74	3,123	\$1,461.52	3,123
Wilmington	\$1,240.16	1,654	\$1,230.70	1,654	\$774.05	1,654
Windsor County						
Rochester	\$7,669.92	11,880	\$7,257.63	11,880	\$4,628.60	11,880
Stockbridge	\$573.31	888	\$542.49	888	\$345.98	888
Weston	\$5,826.04	9,024	\$5,512.87	9,024	\$3,515.87	9,024

Appendix B: Threatened, Endangered and Sensitive Species (Fauna and Flora)

Table B-1 lists federally listed threatened and endangered wildlife species specific to the Green Mountain National Forest per the Endangered Species Act during the fiscal years 2014 to 2016 monitoring period.

Table B-1. Wildlife species listed as threatened or endangered under the Endangered Species Act with current or historic occurrence in Vermont and on National Forest System lands.

Common Name	Scientific Name	ESA Status	Status on GMNF
Gray wolf	<i>Canis lupus</i>	Endangered	Historic only
Eastern mountain lion	<i>Puma concolor cougar</i>	Endangered	Historic only
Canada lynx	<i>Lynx canadensis</i>	Threatened	Historic only
Indiana bat	<i>Myotis sodalis</i>	Endangered	Current

Table B-2 lists the Green Mountain National Forest Regional Forester Sensitive Species (fauna and flora) dated December 2011.

Table B-2. Species listed on the Regional Forester Sensitive Species List (fauna) specific to Green Mountain National Forest.

MAMMALS		INVERTEBRATES - INSECTS	
<i>Myotis leibii</i>	Eastern Small-footed bat	<i>Lanthus vernalis</i>	Southern Pygmy Clubtail
<i>Myotis lucifugus</i>	Little Brown Myotis	<i>Cicindela ancocisconensis</i>	Appalachian Tiger Beetle
<i>Myotis septentrionalis</i>	Northern Myotis	<i>Pieris virginiensis</i>	West Virginia White
<i>Perimyotis subflavus</i>	Tri-colored Bat	<i>Somatochlora forcipata</i>	Forcipate Emerald
BIRDS		<i>Tachopteryx thoreyi</i>	Gray Petaltail
<i>Catharus bicknelli</i>	Bicknell's Thrush	<i>Williamsonia lintneri</i>	Ringed Boghaunter
<i>Cistothorus platensis</i>	Sedge Wren	NON-VASCULAR PLANTS	
<i>Euphagus carolinus</i>	Rusty Blackbird	<i>Isopterygiopsis pulchella</i>	Isopterygiopsis Moss
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	<i>Atrichum crispum</i>	Atrichum Moss
<i>Gavia immer</i>	Common Loon	<i>Bucklandiella microcarpa</i> (= <i>Racomitrium heterostichum</i>)	Rachomitrium Moss
<i>Haliaeetus leucocephalus</i>	Bald Eagle	<i>Cephaloziella elachista</i>	
AMPHIBIANS		<i>Frullania bolanderi</i>	
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander	<i>Hamatocaulis vernicosus</i>	Hamatocaulis Moss
<i>Ambystoma laterale</i>	Blue-spotted Salamander	<i>Harpanthus scutatus</i>	
<i>Hemidactylium scutatum</i>	Four-toed Salamander	<i>Hygrohypnum subeugyrium</i>	Hygrohypnum Moss
REPTILES		<i>Meesia triquetra</i>	Meesia Moss
<i>Glyptemys insculpta</i>	Wood Turtle	<i>Metzgeria crassipilis</i>	
INVERTEBRATES - BIVALVES		<i>Pohlia annotina</i>	Pohlia Moss
<i>Alasmidonta varicosa</i>	Brook Floater	<i>Pohlia bulbifera</i>	Pohlia Moss
<i>Lasmigona compressa</i>	Creek Heelsplitter	<i>Pohlia elongata</i> var. <i>elongata</i>	Elongate Pohlia Moss

NON-VASCULAR PLANTS	
<i>Pohlia sphagnicola</i>	Pohlia Moss
<i>Polytrichastrum</i> (=Polytrichum) <i>longisetum</i>	Polytrichum Moss
<i>Scapania paludicola</i> var. <i>paludicola</i>	
<i>Sematophyllum</i> <i>marylandicum</i>	Maryland Sematophyllum Moss
<i>Sphagnum pulchrum</i>	Sphagnum

PLANTS	
<i>Agrostis mertensii</i>	Arctic Bentgrass
<i>Arabis drummondii</i> (syn = <i>Boechera stricta</i>)	Drummond's Rockcress
<i>Arceuthobium pusillum</i>	Eastern Dwarf-mistletoe
<i>Asclepias exaltata</i>	Poke Milkweed
<i>Aureolaria pedicularia</i>	Fernleaf Yellow False Foxglove
<i>Blephilia hirsuta</i>	Hairy Woodmint
<i>Botrychium oneidense</i>	Bluntlobe Grapefern
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	New England Northern Reed Grass
<i>Cardamine parviflora</i> var. <i>arenicola</i>	Sand Bittercress
<i>Carex aestivalis</i>	Summer Sedge
<i>Carex aquatilis</i> var. <i>aquatilis</i>	Water Sedge
<i>Carex argyrantha</i>	Hay Sedge
<i>Carex backii</i>	Rocky Mountain Sedge
<i>Carex bigelowii</i>	Bigelow's Sedge
<i>Carex foenea</i>	Dryspike Sedge
<i>Carex haydenii</i>	Cloud Sedge
<i>Carex lenticularis</i>	Shore Sedge
<i>Carex michauxiana</i>	Michaux's Sedge
<i>Carex oligosperma</i>	Fewseed Sedge
<i>Carex schweinitzii</i>	Schweinitz's Sedge
<i>Carex scirpoidea</i>	Bulrush Sedge
<i>Ceratophyllum</i> <i>echinatum</i>	Prickly Hornwort
<i>Clematis occidentalis</i> var. <i>occidentalis</i>	Purple Clematis
<i>Collinsonia canadensis</i>	Canada Horse-balm
<i>Conopholis americana</i>	Squaw-root
<i>Cryptogramma stelleri</i>	Fragile Rockbrake

PLANTS	
<i>Cynoglossum</i> <i>virginianum</i> var. <i>boreale</i>	Northern Wild Comfrey
<i>Cypripedium</i> <i>parviflorum</i> var. <i>pubescens</i>	Greater Yellow Lady's- slipper
<i>Cypripedium reginae</i>	Showy Lady's-slipper
<i>Desmodium</i> <i>paniculatum</i>	Panicledleaf Ticktrefoil
<i>Desmodium perplexum</i>	Perplexed Ticktrefoil
<i>Diplazium pycnocarpon</i>	Glade Fern
<i>Draba arabisans</i>	Rock Whitlow-grass
<i>Dryopteris filix-mas</i>	Male Fern
<i>Eleocharis intermedia</i>	Matted Spikerush
<i>Eleocharis olivacea</i> v. <i>olivacea</i> (=E. <i>flavescens</i> v. <i>olivacea</i>)	Bright Green Spikerush
<i>Eleocharis ovata</i>	Ovate pikerush
<i>Equisetum pratense</i>	Meadow Horsetail
<i>Eupatorium purpureum</i> (=Eutrochium <i>purpureum</i>)	Sweet Joe-pyeweed
<i>Galium kamtschaticum</i>	Boreal Bedstraw
<i>Glyceria septentrionalis</i>	Floating Mannagrass
<i>Hackelia deflexa</i> var. <i>americana</i>	Northern Stickseed
<i>Helianthus strumosus</i>	Harsh Sunflower
<i>Hieracium venosum</i>	Rattlesnakeweed
<i>Huperzia appalachiana</i>	Appalachian Clubmoss
<i>Isotria verticillata</i>	Large Whorled Pogonia
<i>Juglans cinerea</i>	Butternut
<i>Juncus trifidus</i>	Highland Rush
<i>Lespedeza hirta</i>	Hairy Lespedeza
<i>Lespedeza violacea</i>	Violet Lespedeza
<i>Littorella uniflora</i> (=L. <i>americana</i>)	American Shoregrass
<i>Lobelia siphilitica</i>	Great Blue Lobelia
<i>Mimulus moschatus</i>	Muskflower
<i>Muhlenbergia uniflora</i>	Bog Muhly
<i>Myriophyllum farwellii</i>	Farwell's Water-milfoil
<i>Nyssa sylvatica</i>	Blackgum
<i>Panax quinquefolius</i>	American Ginseng
<i>Peltandra virginica</i>	Green Arrow-arum
<i>Phegopteris</i> <i>hexagonoptera</i>	Broad Beechfern
<i>Physostegia virginiana</i>	False Dragon-head

PLANTS	
<i>Pinus rigida</i>	Pitch Pine
<i>Platanthera orbiculata</i>	Lesser Roundleaved Orchid
<i>Polemonium vanbruntiae</i>	Bog Jacob's-ladder
<i>Potamogeton bicipulatus</i>	Snail-seed Pondweed
<i>Potamogeton confervoides</i>	Algae-like Pondweed
<i>Potamogeton hillii</i>	Hill's Pondweed
<i>Prenanthes trifoliolata</i>	Gall of the Earth
<i>Pyrola chlorantha</i>	Greenflowered Wintergreen
<i>Pyrola minor</i>	Snowline Wintergreen
<i>Quercus muehlenbergii</i>	Chinquapin Oak
<i>Ranunculus pennsylvanicus</i>	Pennsylvania Buttercup
<i>Rhodiola rosea</i>	Roseroot Stonecrop
<i>Sanicula canadensis</i>	Canadian Blacksnakeroot
<i>Saxifraga paniculata</i>	White Mountain Saxifrage
<i>Scheuchzeria palustris ssp. americana</i>	American Scheuchzeria
<i>Selaginella apoda</i>	Meadow Spike-moss
<i>Selaginella rupestris</i>	Ledge Spike-moss
<i>Sisyrinchium angustifolium</i>	Pointed Blue-eyed-grass
<i>Sisyrinchium atlanticum</i>	Eastern Blue-eyed-grass
<i>Solidago patula</i>	Roundleaf Goldenrod
<i>Solidago simplex ssp. randii</i>	Rand's Goldenrod
<i>Solidago squarrosa</i>	Squarrose Goldenrod
<i>Stellaria alsine</i>	Bog Chickweed
<i>Symphyotrichum prenanthoides</i>	Crooked-stem Aster
<i>Trillium cernuum</i>	Whip-poor-will Flower
<i>Utricularia resupinata</i>	Northeastern Bladderwort
<i>Vaccinium uliginosum</i>	Alpine Blueberry
<i>Woodsia glabella</i>	Smooth Woodsia

Table B-3. Species listed on the Regional Forester Sensitive Species list (flora) specific to the Green Mountain National Forest (species with an asterisk were added to the list in fiscal year 2012, species with a superscripta are aquatic). NM = no monitoring.

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
<i>Agrostis mertensii</i> (=A. borealis) Arctic bentgrass (1)	NM	Not found	NM	Not found in many years	Reevaluate whether to keep on RFSS list during planned list update in FY17
<i>Arabis drummondii</i> (=Boechera stricta) * Drummond's rock- cress (3)	NM	1 of 3 monitored; population a bit smaller and less extensive than 2010, all at trail edge, lots of seedlings.	1 new site found, making a total of 3 sites	With one missing and one new one found; the species appears more or less stable on GMNF	Site not monitored (and not found in 2011) needs to be searched for again by 2018; monitor the site that's slightly smaller by 2022.
<i>Arceuthobium pusillum</i> * Eastern Dwarf- mistletoe (3)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
<i>Asclepias exaltata</i> Poke milkweed (7)	1 of 7 populations monitored; found to be more extensive	Same, though just portion on private land	NM	Some populations small, stable, but not reproducing. Others expanding	Keep on 7-year monitoring cycle; consider whether future canopy opening might be useful
<i>Aureolaria pedicularia</i> var. <i>pedicularia</i> Fernleaf yellow false-foxglove (1)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
<i>Blephilia hirsuta</i> Hairy woodmint (7)	1 of 7 monitored, discovered to have been weed whacked	1 of 7 monitored; found to be more extensive than thought; 1 new site found	New site discovered to be misidentified	Variable; more or less stable	Provide education about rare plants, though no idea who weed whacked
<i>Botrychium oneidense</i> * Blunt-lobed grapefern (4)	1 new site found, bringing total to 4 populations	NM	NM	Thought to be stable	1 population still needs identity confirmed; populations tiny; keep on 7-year monitoring cycle
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i> New England northern reed grass (1)	NM	NM	NM	Apparently stable	Keep on 7-year monitoring cycle; only one small population on GMNF

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
Cardamine parviflora (= C. parviflora var. arenicola) Small-flower bitter-cress (5)	1 new tiny population found	1 new population found; plants all senesced, mostly due to drought; total populations now 5	NM	Apparently stable	Keep track of whether future dry conditions are too much for this species
Carex aestivalis Summer sedge (7)	NM	1 of 7 monitored; identity uncertain because vegetative	1 of 7 monitored; apparently stable	Apparently stable	Keep on 7-year monitoring cycle
Carex aquatilis var. substricta Water sedge (3)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
Carex argyrantha Hay sedge (6)	1 new site found	New site from FY14 revisited and found to be more extensive but also browsed by deer	NM	Assumed stable	Keep on 7-year monitoring cycle; be aware that this species declines as shade develops
Carex backii Rocky mountain sedge (4)	NM	3 of 4 sites monitored; 1 stable, 1 slightly declined	1 site observed to be still present, no data recorded	Apparently stable	Keep on 7-year monitoring cycle
Carex bigelowii ssp. bigelowii Bigelow sedge (1)	NM	NM	Monitored: stable/increasing	Stable/increasing	Continue educating hikers
Carex foenea (=aenea) Bronze sedge (4)	1 of 4 sites monitored, plants not found	NM	NM	Declining despite open conditions	Keep on 7-year monitoring cycle; be aware that this species declines as shade develops
Carex haydenii Cloud sedge (many)	2 new sites found with large populations	NM	NM	Increasing	Reevaluate whether to keep on RFSS list during FY17 list update
Carex lenticularis Shore sedge (7)	1 new site found, bringing total to 8, though some only near, not on, GMNF	NM	NM	Assumed stable	Keep on 7-year monitoring cycle
Carex michauxiana Michaux sedge (5)	Monitored 1 of 5 sites; not found; habitat might not still be suitable.	Monitored at 2 of 5 sites; stable to increasing	NM	Apparently stable	Keep on 7-year monitoring cycle

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
<i>Carex oligosperma</i> * Few-seeded sedge (4)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
<i>Carex schweinitzii</i> Schweinitz's sedge (2)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
<i>Carex scirpoidea</i> Bulrush sedge (1)	NM	Monitored partially; apparently stable	NM	Assumed stable	Keep on 7-year monitoring cycle
<i>Ceratophyllum echinatum</i> Prickly hornwort (1)	NM	NM	NM	Unable to assess	Keep aquatic species on a 10-year monitoring cycle (not prioritized, since near but not on GMNF land)
<i>Clematis occidentalis</i> var. <i>occidentalis</i> (= <i>verticillaris</i>) (3)	NM	1 of 3 sites monitored; not flowering, subject to trampling	NM	Vulnerable to decline	Site that's decline is immediately adjacent to GMNF; work with landowners to protect if possible
<i>Collinsonia canadensis</i> Canada horsebalm (1)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
<i>Conopchis americana</i> Squaw-root (5)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
<i>Cryptogramma stelleri</i> Steller's cliffbrake (5, 2 may not be GMNF)	1 of 3 on GMNF monitored	1 of 3 on GMNF monitored	1 of 3 on GMNF monitored	Stable but vulnerable to disturbance by climbers	Consider educational signs at 1 or 2 sites
<i>Cynoglossum virginianum</i> var. <i>boreale</i> (1)	NM	NM	NM	Assumed missing	Reevaluate whether to keep on RFSS list during FY17 list update
<i>Cypripedium parviflorum</i> var. <i>pubescens</i> Large yellow lady's-slipper (9)	1 site of 9, with a few subpopulations mostly found	2 of 9 monitored, 1 not found, other found	1 of 9 monitored and found in different location	Trend uncertain	Keep on 7-year monitoring cycle
<i>Cypripedium reginae</i> Showy lady's-slipper (6)	1 of 6 monitored and stable/increasing	1 of 6 monitored and declining	1 of 6 monitored and found to be increasing	Mix of ups and downs; likely species is stable on GMNF	Keep on 7-year monitoring cycle; consider canopy opening for site that's declining
<i>Desmodium paniculatum</i> Paniculate tick-trefoil (4)	1 of 4 monitored and stable	Different part of same site revisited	Different part of same site revisited	Apparently stable	Keep on 7-year monitoring cycle

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
Desmodium perplexum* Perplexed tick-trefoil (2)	1 of 2 sites monitored and stable	Different part of same site revisited	Different part of same site revisited	Apparently stable	Keep on 7-year monitoring cycle
Diplazium pycnocarpon Glade fern (4)	1 of 4 sites monitored and only found much larger subpopulation	NM	NM	Apparently stable	Keep on 7-year monitoring cycle
Draba arabisans Rock whitlow-grass (4)	NM	2 of 4 monitored: 1 with uncertain identity was confirmed, another is declining	NM	Uncertain	Keep on 7-year monitoring cycle
Dryopteris filix-mas Male fern (4, though not all on NFS land)	1 site monitored, but no details available	1 site monitored and expanding	NM	Apparently stable	Keep on 7-year monitoring cycle
Eleocharis intermedia Matted spikerush (4 sites)	NM	NM	1 of 4 sites monitored; no plants found despite being a low-water year.	Possibly declining	Keep on 7-year monitoring cycle, but go sooner if there's a good low-water year
Eleocharis olivacea (=E. flavescens var. olivacea) * Capitate spikerush or olive spikerush (1)	NM	NM	Not found where previously located, but site not flooded due to beaver activity	Possibly declining	Keep monitoring to see if site changes or plants move elsewhere
Eleocharis ovata Ovate spike-rush (10, not all on GMNF)	1 of 9 monitored and doing well	NM	2 of 9 monitored: 1 not found, 1 doing well & moving around	Probably stable; plant locations change as hydrology changes	Keep on 7-year monitoring cycle
Equisetum pratense Meadow horsetail (1)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
Eupatorium purpureum Sweet joe-pye weed (5)	1 of 5 monitored: subject to deer browse pressure	New sub-populations found	New subpopulation s found	Apparently stable/increasing	Keep on 7-year monitoring cycle
Galium kamschaticum Boreal bedstraw (6, 1 may not be GMNF)	NM	1 monitored and not found; believed to be historical	2 monitored and thriving	Apparently stable/increasing	Keep on 7-year monitoring cycle

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
<i>Glyceria septentrionalis</i> * Floating mannagrass (2)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
<i>Hackelia deflexa</i> var. <i>americana</i> Northern stickseed (1)	NM	Monitored and thriving; closure order for nearby falcons appears to be benefitting plants	NM	Apparently increasing	Keep on 7-year monitoring cycle
<i>Helianthus strumosus</i> Pale-leaved sunflower (2)	1 site monitored: identity uncertain	2nd site monitored: identity uncertain	NM	Lots of plants, but identity easily confused, may or may not include any of the rare species	Keep track of taxonomic research on this species.
<i>Hieracium venosum</i> * Rattlesnakeweed or rattlesnake hawkweed (5)	1 of 5 sites monitored and expanding	NM	NM	Apparently stable	Keep on 7-year monitoring cycle
<i>Huperzia appalachiana</i> Appalachian fir-clubmoss (2)	NM	1 site monitored and not found; considered historical	NM	Apparently now limited to 1 site; possibly declining	Keep the remaining site on 7-year monitoring cycle
<i>Isotria verticillata</i> Large whorled pogonia (3 sites, 1 just off GMNF)	The site just off GMNF was harvested in varied treatments, and <i>Isotria</i> 's response to harvest was studied.	Same site: some types of harvest benefit this species, facilitating flowering	Same site: some types of harvest benefit this species, facilitating flowering	Apparently stable/increasing	Consider opening canopy at other sites
<i>Juglans cinerea</i> Butternut (many)	NM	1 site monitoring; 18 trees still living; site previous data unknown	NM	Species is declining range-wide due to butternut canker, for which we have no known cure. Populations are not prioritized for monitoring.	Monitor sites when in the vicinity.

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
Juncus trifidus Highland rush (1)	NM	Same two plants on cliff top are present. Plants at cliff base missing. Rock climbing/outlook use adjacent, and plants at very high risk of disappearing in 5 to 20 years.	NM	Vulnerable to downward trend.	Educational signing is needed to keep recreational use away from plants. Monitor to see if signs help.
Lespedeza hirta Hairy bush-clover (1 & 1 just off GMNF)	1 site monitored: new plants found	2 sites monitored: plants abundant	1 site monitored; plants abundant	Apparently stable	Monitor all sub-populations and set up a matrix that makes it easy to track sub-population size from year to year.
Lespedeza violacea* Violet bush-clover (2)	1 site monitored: new plants found	NM	NM	Apparently stable	Keep on 7-year monitoring cycle
Littorella americana (= Plantago Americana, Littorella uniflora) a American shore-grass (3)	1 site monitoring and doing well; 1 new site found, bringing total to 3 sites	NM	Monitored the 3rd site; found perhaps 100 ramets; found rooted for the first time	Apparently stable; previous data did not quantify	Monitor by boat to get full extent of populations. Consider means of redirecting swimmers away from plants at Grout Pond.
Lobelia siphilitica* Great blue lobelia (1)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
Mimulus moschatus* Musk flower (several)	1 new site found	1 monitored and stable; 1 new on GMNF, 3 new nearby	NM	Apparently increasing, though some small populations have previously disappeared	Reevaluate whether to keep on RFSS list during planned list update in FY17
Muhlenbergia uniflora Fall dropseed muhly (several)	3 new sites found	NM	NM	Apparently increasing	Reevaluate whether to keep on RFSS list during planned list update in FY17
Myriophyllum farwellii Farwell's water-milfoil (3)	2 of 3 sites monitored; 1 not found, the other had 100's of plants	NM	Identity of plants found during FY14 monitoring was confirmed	Assumed stable where found	Keep on 7-year monitoring cycle

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
Nabalus trifoliolatus (=Prenanthes trifoliolata) Three-leaved rattlesnake-root (several)	1 monitored and stable; 1 new population and 1 new subpopulation found	1 monitored and had expanded; 1 new	NM	Apparently increasing	Reevaluate whether to keep on RFSS list during planned list update in FY17
Nyssa sylvatica* Black gum or Tupelo (2)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
Panax quinquefolius Ginseng (many)	1 site monitored and not found	6 sites monitored: 2 new populations; 2 new subpopulations and 1 missing subpopulation	2 sites monitored: 1 not found; 1 stable, but NNIP a concern	More or less stable, with patches disappearing but some new ones showing up, but all patches small	Keep on 7-year monitoring cycle, but pay closer attention to those near trails that may be vulnerable to harvest; control NNIP
Peltandra virginica Green arrow-arum (2)	NM	NM	NM	Unable to assess	Keep on 7-year monitoring cycle
Phegopteris hexagonoptera (=Thelypteris hexagonoptera) Broad beech fern (6)	NM	1 new site found, bringing total to 6: 70 plants, no previous data	NM	Thought to be stable or increasing	Keep on a 7-year monitoring cycle
Physostegia virginiana False dragon-head or obedience (1)	NM	NM	NM	Unable to assess	Keep on a 7-year monitoring cycle
Pinus rigida Pitch pine (6)	2 sites monitored; trees doing well	NM	1 new site found, bringing total to 6 sites	Assumed stable	Keep on a 7-year monitoring cycle
Platanthera orbiculata Round-leaved orchis (8+)	1 monitored and not found	1 monitored and not found	1 monitored and not found	Apparently declining	Search again for those that are missing; monitor others more frequently; seek to understand difference between varieties
Polemonium vanbruntiae Appalachian Jacob's ladder (many)	5 sites monitored; most robust, but some subpopulations not found	NM	1 site monitored and doing well; 2 new sites found; moose browse may be a concern	Apparently stable or increasing; many more subpopulations or populations have been found over the years	Keep on a 7-year monitoring cycle; monitor moose browse

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
Potamogeton bicupulatusa Snail-seed pondweed (1)	1 subsite monitored	2nd subsite monitored	NM	Assumed stable; no quantitative data provided	Keep aquatic species on a 10-year monitoring cycle
Potamogeton confervoidesa Tuckerman's pondweed (10)	4 sites monitored: 1 not found, 2 thriving, 1 not quantified	NM	NM	Approximately stable	Keep aquatic species on a 10-year monitoring cycle
Potamogeton hillia Hill's pondweed (1, may not be on GMNF)	NM	NM	NM	Unable to assess	Keep aquatic species on a 10-year monitoring cycle
Pyrola chlorantha (=virens) Green pyrola (2 historical)	NM	NM	NM	Unable to assess	Reevaluate whether to keep on RFSS list during planned list update in FY17, since not found in many years
Pyrola minor Lesser wintergreen (2 historical)	NM	NM	NM	Unable to assess	Reevaluate whether to keep on RFSS list during planned list update in FY17, since not found in many years
Quercus muehlenbergii Chinkapin oak (1)	1 site searched and not found; determined to have likely been a misidentification	NM	NM	Not likely to occur on GMNF	Reevaluate whether to keep on RFSS list during planned list update in FY17, since likely to have never been found there
Ranunculus pensylvanicus* Pennsylvania buttercup or bristly crowfoot (2)	NM	NM	NM	Unable to assess	Keep on a 7-year monitoring cycle
Rhodiola (=Sedum) rosea Roseroot stonecrop (1)	NM	Monitored; overall stable to increasing, but 1sub- site likely to be at risk from camping/caving/climbing; drought also a concern	NM	Stable, but at risk	Educational signing needed
Sanicula canadensis var. grandis* Canadian black-snakeroot (1?)	NM	NM	NM	This variety may have been put on RFSS list by mistake	Reevaluate whether to keep on RFSS list during planned list update in FY17, since likely the wrong variety to be tracking (may not occur here)

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
<i>Saxifraga paniculata</i> (=aizoon) ssp. <i>Neogaea</i> White mountain saxifrage (1)	NM	Monitored and apparently stable	NM	Stable	Keep on 7-year monitoring cycle
<i>Scheuchzeria palustris</i> ssp. <i>americana</i> Pod-grass (4)	NM	NM	NM	Unable to assess	Keep on a 10-year monitoring cycle, since only occurs in wetlands associated with high-elevation ponds, which are on a 10-year cycle
<i>Selaginella apoda</i> * Meadow spike-moss (1)	NM	NM	NM	Unable to assess	Keep on a 7-year monitoring cycle
<i>Selaginella rupestris</i> Rock spikemoss (3)	NM	1 searched for extensively and not found	Another site searched for and not found; determined that search site not where population was originally found	Declining/uncertain	Search correct site
<i>Sisyrinchium angustifolium</i> Pointed blue-eyed grass (7, though some with questionable identity)	NM	2 sites monitored: 1 may be declining, 1 trend unknown; 1 new site found	NM	Uncertain; small populations could be vulnerable	Verify identity at sites where uncertain so better able to assess viability on GMNF
<i>Sisyrinchium atlanticum</i> Eastern blue-eyed grass (1)	1 new (or old historical) site found, but identity not confirmed	Identity confirmed from the new site	NM	Unable to assess	Keep on a 7-year monitoring cycle.
<i>Solidago patula</i> Roundleaf goldenrod (3)	NM	NM	1 monitored and abundant	Assumed stable	Keep on a 7-year monitoring cycle
<i>Solidago simplex</i> ssp. <i>randii</i> var. <i>monticola</i> * Rand's goldenrod (4)	1 new site found	2 sites monitored and found; apparently stable	NM	Apparently stable/increasing	Keep on a 7-year monitoring cycle
<i>Solidago squarrosa</i> Stout goldenrod (3)	1 monitored, but no thorough count	1 monitored and increasing in size	1 monitored; small population	Apparently stable/possibly increasing	Keep on a 7-year monitoring cycle

Species	FY 2014 Monitoring Results	FY 2015 Monitoring Results	FY 2016 Monitoring Results	Trend	Recommended Action
Stellaria alsine Bog chickweed (5+)	2 new sites found: 1 small, 1 large	1 large new site near GMNF; 1 small historical site relocated	1 large new site found, and another new site found but with unconfirmed identity	Stable or increasing	Keep on a 7-year monitoring cycle; pay attention to road ditching and salting near one population
Symphotrichum prenanthoides* Crooked-stem aster (2)	NM	2 large new subpopulations found, close to GMNF	1 large new site found	Increasing	Keep on a 7-year monitoring cycle; evaluate whether these roadside populations are naturally occurring
Trillium cernuum* Nodding trillium or whip-poor-will flower (1)	NM	NM	Population relocated after having not been found in several years	Apparently stable	Keep on a 7-year monitoring cycle
Utricularia resupinata Northeastern bladderwort (1)	1 site monitored and apparently increasing in size	NM	NM	Increasing	Keep aquatic species on a 10-year monitoring cycle
Vaccinium uliginosum Alpine bilberry (1)	NM	NM	1 site monitored and stable; mountain top stewards trying to delineate and protect	Stable	Keep on a 7-year monitoring cycle; check to see if delineation successful
Woodsia glabella Smooth woodsia (1)	NM	1 site monitored and declining; threatened due to camping/climbing/caving	NM	Declining	Educational signing needed

Appendix C: Rare or Uncommon Natural Communities

Table C-1 shows the rare or uncommon natural communities recognized as significant as listed in the Green Mountain National Forest - Land and Resource Management Plan (Forest Plan) Final Environmental Impact Statement, Table 3.11-6.

Table C-1. Rare or uncommon natural communities recognized as significant.

Site Name	Forest Plan Management Area Designation
Manchester Ranger District	
Beebe Pond	Ecological Special Area
Big Branch	Wilderness
Big Mud Pond	Wilderness
Bourn Pond	Wilderness
Branch Pond	Ecological Special Area
Colebrook Trail Swamp	Escarpment
Devil's Den	White Rocks National Recreation Area
Downer Glen	Wilderness
Fifield Pond	White Rocks National Recreation Area
French Hollow	Ecological Special Area
Glastenbury Mountain	Wilderness Study Area
Green Mountain Ridge	White Rocks National Recreation Area
Griffith Lake	White Rocks National Recreation Area
Grout Pond	Ecological Special Area
Little Mud Pond	Wilderness
Little Pond	Wilderness Study Area
Little Rock Pond	White Rocks National Recreation Area
Lost Pond Bog	Wilderness
Lye Brook Headwaters	Remote Backcountry
Lye Brook Ledge	Wilderness
McGinn Brook	Wilderness
Moses Pond	Diverse Forest Use
Mt. Tabor Work Center Swamp	Ecological Special Area
Peabody Hill	Ecological Special Area
Somerset Fen	Ecological Special Area
Stamford Meadows	Ecological Special Area
Stamford Stream Wetland Complex	Ecological Special Area
Stratton Mountain	Ecological Special Area
The Burning	Wilderness
Thendara Camp Fen	Ecological Special Area
Wallingford Pond	White Rocks NRA
West of Mt. Tabor	Wilderness
West River Headwater Cove	Diverse Forest Use

Site Name	Forest Plan Management Area Designation
White Rocks	White Rocks National Recreation Area
Winhall River Headwater Flowage	Wilderness/Remote Backcountry
Rochester and Middlebury Ranger Districts	
Beaver Meadows and Abbey Pond	Ecological Special Area
Blue Ridge Fen	Candidate Research Natural Area
Breadloaf Mountain	Wilderness
Bristol Cliffs	Wilderness/Escarpment
Bryant Mountain	Escarpment
Bryant Mountain Hollow	Ecological Special Area
Burnt Mountain	Escarpment
Chandler Ridge	Escarpment
Crystal Brook Glacial Kettle	Wilderness
Dutton Brook Swamp	Ecological Special Area
Elephant Mountain	Ecological Special Area
Gilmore Pond	Wilderness
Hat Crown/Silent Cliff	Wilderness
Leicester Hollow	Eligible Scenic River
Lincoln Ridge	Alpine Subalpine Special Area
Middlebury Gap	Wilderness Study Area
Monastery Mountain	Wilderness Study Area
Mount Abraham	Alpine Subalpine Special Area
Mount Moosalamoo	Escarpment
Mt. Horrid	Candidate Research Natural Area
Mt. Roosevelt to Mt. Wilson	Wilderness
North Pond	Diverse Backcountry Forest
Rattlesnake Point	Ecological Special Area
Skylight Pond	Wilderness
Texas Falls	Ecological Special Area
The Cape	Research Natural Area

Appendix D: Literature Cited

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