United States
Department
of Agriculture

Forest
Service

**Eastern
Region**

R9-GM-ME
Report

November
2013

Green Mountain National Forest

Annual Monitoring and Evaluation Report

Fiscal Years 2012 & 2013

Spring Prescribed Fire – Manchester Ranger District

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Fiscal Years 2012 and 2013

Green Mountain National Forest

USDA Forest Service, Eastern Region
November 2013

This Annual Monitoring and Evaluation Report combines monitoring completed in fiscal years 2012 and 2013 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 2012 and 2013 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 SINCLAIR Digitally signed by JOHN SINCLAIR
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John A. Sinclair
Forest Supervisor
Green Mountain & 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 2012 and 2013 Annual Monitoring and Evaluation Report* documents the results of the monitoring accomplished during fiscal years 2012 and 2013 (October 1, 2011, to September 30, 2013). 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 2012 and 2013. 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 a unique desired future condition, 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 June 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 2012 and 2013 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.

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 of the GMNF.

Annual Monitoring and Evaluation Report Outline

This report is divided into five 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 provides a summary of on-going research and studies on the GMNF.
- Chapter 4 discusses adjustments or corrections to the Forest Plan.
- Chapter 5 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:

1. 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.
2. Forest Plan requirements (Chapter 4) selected to facilitate comparison between actual conditions and desired future conditions.
3. Questions derived from public comments which are particularly useful for monitoring public satisfaction with the resources and services provided by the GMNF.

2. Discussion of Monitoring

The following table (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	Forest Plan Goals 2-8, 12 and 13	1-5 Years

Resource Element		Monitoring Question(s)	Monitoring Driver	Frequency of Measurement
		components of the forest ecosystem?		
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

Forest Plan Implementation

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

Monitoring Driver: A quantitative estimate of performance comparing outputs and services with those projected by the 2006 Forest Plan.

Background: This monitoring element is used to determine if resource outputs for the GMNF are being accomplished as outlined in Appendix D of the Forest Plan. Appendix D, Table D-5 lists a summary of the proposed management practices estimated to occur over the first decade of Forest Plan implementation, as well as estimates of goods and services to be provided during the planning period.

Monitoring Activities: There were numerous outputs and services provided on the GMNF during fiscal years 2012 and 2013. These outputs are displayed in Table 2-2.

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. 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).

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.

Table 2-2: Estimated and actual outputs achieved in fiscal years 2012 and 2013; Forest Plan Appendix D, Proposed and Probable Practices.

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1)[1]	Actual Amount Achieved in Fiscal Years 2012 / 2013	Actual Amount Achieved since 2006	Average Amount Achieved per Year since 2006
Heritage Resource Protection[2]					
Inventories completed	Acres	2,000 to 4,000	200 / Unknown	46,890	6,698
New Sites Identified	Sites	10 to 40	Unknown / Unknown	140	20
New Sites Evaluated	Sites	2 to 7	1 / 1	29	4.1
Sites Monitored	Sites	30 to 60	Unknown / Unknown	270	38.6
Recreation Resources					
Trail Improvement	Miles	10 to 20	2 / 3	19	2.7
Trail Rehabilitation	Miles	200 to 400	116.8 / 0	116.8	16.7
Trail Maintenance	Miles	9,050	321.5 / 275.7	2,172.2	310.3
Wilderness Managed[3]	Areas	30 to 50	5 / 8	34	4.8
Roads Management					

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1)[1]	Actual Amount Achieved in Fiscal Years 2012 / 2013	Actual Amount Achieved since 2006	Average Amount Achieved per Year since 2006
Rights-of-Way Acquisition	Rights-of-Ways	40	0 / 0	4	0.6
Maintain Local Roads	Miles	100 to 200	106 / 73.4	618.2	88.3
Restore Local Roads	Miles	10 to 20	2 / 4.9	66.7	9.5
Reconstruct Local Roads	Miles	5 to 10	0 / 4.9	4.9	0.7
Construct Local Roads	Miles	0 to 5	0 / 0	0.1	0.01
Maintain Arterial and Collector Roads[4]	Miles	40 to 80	0 / 0	66.6	9.5
Decommission Local Roads	Miles	5 to 10	0 / 0.2	12.4	1.8
Vegetation Management					
Hardwood Selection Cuts	Acres	8,366	305 /157	1,584	226.3
Hardwood/Oak Shelterwood Regeneration	Acres	11,496	54 / 59	322	46
Hardwood/Oak Shelterwood Removal	Acres	3,240	0 / 0	91	13
Hardwood Clearcut	Acres	2,376	9 / 0	45	5
Hardwood/Oak Thin	Acres	9,000	108 / 235	788	112.6
Hardwood Stand Improvement	Acres	2,650	0 / 0	440	62.8
Softwood Shelterwood Regeneration	Acres	2,814	0 / 0	35	5
Softwood Selection Cuts	Acres	1,444	36 / 0	271	38.7
Softwood Clearcut	Acres	10	24 / 0	103	14.7
Softwood Thin	Acres	1,000	8 / 0	63	9
Softwood Stand Improvement	Acres	700	0 / 0	193	27.6
Softwood Planting	Acres	350	0 / 0	29	4.1
Release Softwood from Hardwoods	Acres	1,700	0 / 0	86	12.3
Clearcut Hardwoods for Softwoods	Acres	90	0 / 0	2	<1
Plant Softwoods for Conversion	Acres	500	0 / 0	0	0
Clearcut Aspen	Acres	146	0 / 14	14	2
Clearcut Hardwoods for Aspen Regeneration	Acres	725	11/ 14	110	15.7
Total Selection Cuts	Acres	9,810	383 / 287	2,027	289.6
Total Shelterwood Regeneration	Acres	14,310	62 / 76	382	54.6
Total Shelterwood Removals	Acres	3,240	21 / 0	112	16
Total Clearcut	Acres	3,347	52 / 48	287	41
Total Thin	Acres	10,000	152 / 277	941	134.4
Total Stand Improvement	Acres	3,350	168 / 122	1,025	146.4
Total Release	Acres	1,700	0 / 0	96	13.7
Total Planting	Acres	850	6 / 0	70	10
Hardwood Sawtimber Cut	MMBF[5]	110	1.5 / 1.1	6.8	1
Softwood Sawtimber Cut	MMBF	10	0.7 / 0.7	4.6	0.6
Combined Sawtimber	MMBF	120	2.2 / 1.8	11.4	1.6

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1)[1]	Actual Amount Achieved in Fiscal Years 2012 / 2013	Actual Amount Achieved since 2006	Average Amount Achieved per Year since 2006
Hardwood Roundwood Cut	MMBF	41	2.5 / 2	10.2	1.4
Softwood Roundwood Cut	MMBF	3	0.3 / 0.5	2.6	0.4
Combined Roundwood	MMBF	44	2.8 / 2.5	12.8	1.8
Total Timber Cut	MMBF	164	5 / 4.3	24.1	3.4
Monitor condition of sites and species under special forest product permits	Sites	All	All / All	All	All
Rare or Outstanding Ecological Resources					
Monitor known rare or outstanding ecological, biological, or geological features	Sites	All (129+)	19 / 18	125	17.8
Inventory for TES[5] species and rare or outstanding natural communities	Acres	4,000	TES plants: 1,913 / 3,370 Communities: 3,000 / 1,000	9,376.5	1,339.5
Prepare conservation plans for each rare or outstanding area	Sites	20	0 / 0	0	0
Establish Research Natural Areas	Sites	2	0 / 0	0	0
Wildlife, Fisheries, and Rare Plant Resources					
Protect known occurrences of TES[6] species	Sites	All	All plant and wildlife TES protected during project	All	All
Protect, and where feasible, improve or restore habitat conditions for TES[5] plants, and for TES animals of riparian and wetland habitats.	Sites	All	All plant and wildlife TES protected during project implementation	All	All
Protect important habitat sites for TES[5] bats	Hibernacula	All hibernacula	All hibernacula protected during project implementation per Forest Plan and ESA[7]	All	All
Protect important habitat sites for TES[5] bats	Roost and den trees	Adequate numbers of roost and den trees	TES bats are not summer habitat limited; known maternity areas protected during project implementation	All	All
Protect nesting TES[5] bird species from disturbance	Active nest sites	All	Extent unknown – review was by project. Forest actions complied with Migratory Bird Treaty Act	All	All

Activity or Practice	Unit of Measure	Estimated Amount (Decade 1)[1]	Actual Amount Achieved in Fiscal Years 2012 / 2013	Actual Amount Achieved since 2006	Average Amount Achieved per Year since 2006
Monitor known occurrences of TES[5] species	Sites / Populations	All	Populations of TES plants (including newly discovered): 62 / 47 RFSS wildlife monitoring was project-specific	724	103.4
Update conservation assessments for RFSS[8]	Species	All	None updated for RFSS plants or wildlife	None	None
Oak Released from Hardwoods, and Oak and Oak-Pine Habitat Restored/Improved	Acres	2,000	0 / 0	51	7.3
Mow Upland Wildlife Openings	Acres	2,000	See Habitat Note[9]		
Non-Commercial Clearcutting of Aspen and Paper Birch	Acres	2,000	See Habitat Note[9]		
Burn Upland Wildlife Openings	Acres	5,000	See Habitat Note[9]		
Burn Marshes	Acres	250	0 / 158	158	22.6
Other Wildlife Habitat Improvement	Acres	250	See Habitat Note[9]		
Stream Habitat Restored/improved	Miles	50	See Habitat Note[9]		
Lake Habitat Restored/Enhanced	Acres	10	See Habitat Note[9]		
Fish Habitat Monitored	Sites	80	17 / 10	155	22.1
Fish Passage Restored	Road Crossing	10	3 / Unknown	13	1.8

[1] These numbers represent the sum of annual activities in years 1 through 10 (2006 to 2015).

[2] Specific data regarding the number of heritage acres surveyed, sites monitored, and new sites inventoried were not fully captured during fiscal years 2012 and 2013. Approximately 6,000 acres of broad survey were noted for fiscal year 2012 and 10,000 acres of broad survey were noted for fiscal year 2013, however the amount of intensive field survey was not calculated for fiscal year 2013. Approximately 15 to 20 percent of sites were also noted to have been monitored at the transition between fiscal years 2011 and 2012 due to the impacts of tropical storm Irene, however it is not clear the exact number of sites and in which fiscal years they occurred.

[3] Wilderness managed to standard.

[4] Town jurisdiction roads accessing National Forest System land maintained through road cooperative agreements.

[5] Million board feet.

[6] Threatened, endangered, and sensitive (Regional Forester Sensitive Species) species.

[7] Endangered Species Act.

[8] Regional Forester Sensitive Species.

[9] Habitat Note: Available reporting data indicate that 200 acres of lake habitats were restored or enhanced in fiscal year 2012 and 200 acres in fiscal year 2013; 60 miles of stream habitats were restored or enhanced in fiscal year 2012 and 71 miles in fiscal year 2013; and 3,813 acres of terrestrial habitat were restored or enhanced in fiscal year 2012 and 3,881 acres in fiscal year 2013. However, these values do not differentiate between the GMNF and the FLNF, nor do they break out specific types of restoration or enhancement (e.g., between mowing upland openings and other wildlife habitat improvement).

Evaluation Question:

How do actual outputs compare to those projected in Forest Plan Appendix D, Proposed and Probable Practices, specific to timber offered and sold?

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

Monitoring Driver: A quantitative estimate of performance comparing outputs and services with those projected by the 2006 Forest Plan.

Background: This monitoring element is used to ensure timber sales offered and sold do not exceed the decadal allowable sale quantity provided in Appendix D, Tables D-2 and D-3 of the Forest Plan. Additionally, Appendix D, Table D-4 lists the estimated acreage of silvicultural practices used to work toward the vegetative and other multiple-use desired conditions and objectives over the first decade of Forest Plan implementation (2006 to 2015).

The Forest Plan, Appendix D, Table D-2 provides the average annual allowable sale quantity (ASQ) by decade. The average ASQ is the maximum amount of volume that may be offered and sold during a decade of Forest Plan implementation from land identified for timber management. During the first decade the average annual ASQ is 19.7 million board feet (MMBF) of timber volume. Average annual ASQ means that the amount of timber that may be sold on the Forest in a given year may exceed 19.7 MMBF as long as the decadal ASQ (197 MMBF) is not exceeded.

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:

Fiscal Year 2012

The GMNF offered and sold 4.89 million board feet (MMBF) or 7,931 hundred cubic feet (CCF) of sawtimber and pulpwood timber volume, roughly 20 percent of the Forest Plan ASQ annual average of 19.7 MMBF.

Fiscal Year 2013

The GMNF offered and sold 5.09 million board feet (MMBF) or 8,085 hundred cubic feet (CCF) of sawtimber and pulpwood timber volume, roughly 21 percent of the Forest Plan ASQ annual average of 19.7 MMBF.

Recommendations: Continue to monitor and seek ways to increase the annual timber sale capacity. The amount of timber sold and harvested each year remains well below the levels stated in the Forest Plan and averages less than 25 percent of the ASQ. Given the volume of timber sold since 2006, it would be prudent to conclude that the volume sold will not meet or approach the decadal ASQ limits. This reduced application of silviculture, subsequent stand improvement and stand establishment work results in reduced levels of outputs, goods, services and habitat conditions that would result from planned levels of timber management and harvest. The current five-year timber sale contract plan shows 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. While an increased level of timber harvesting is possible, actual timber volume sold for the decade is anticipated to be below the ASQ. The projected increase in volume sold by 2015 would result in an annual target roughly one third of ASQ.

Forest Service timber staff will continue to monitor the sale of timber and pulpwood. Staff will also continue to work internally and with regional agency level leadership to seek opportunities to increase annual timber offerings. The GMNF plans to increase volume sold by approximately 20 percent in fiscal years 2014 to 2016, from about five million board feet to six million board feet annually. Further increases in the size of the program are projected in future years, however the GMNF is not likely to reach 50 percent of ASQ by 2020.

Tables 2-3 and 2-4 compares the Forest Plan estimated annual acreage of silvicultural practices from 2006 to 2015 with actual acres accomplished during fiscal years 2012 and 2013.

Table 2-3: Estimated management practices, annual acres for decade 1 and actual acres in fiscal year 2012

Estimates of Management Practices	Annual Acres in Decade 1 Acres	Acres Completed Fiscal Year 2012	Percent of Estimated Annual Acres
Even-aged Regeneration Harvest	1,750	118	7
Even-aged Intermediate Harvest	1,324	70	5
Uneven-aged Harvest	981	363	37
Total Harvest	4,055	551	14

Table 2-4: Estimated management practices, annual acres for decade 1 and actual acres in fiscal year 2013

Estimates of Management Practices	Annual Acres in Decade 1 Acres	Acres Completed Fiscal Year 2013	Percent of Estimated Annual Acres
Even-aged Regeneration Harvest	1,750	109	6
Even-aged Intermediate Harvest	1,324	363	27
Uneven-aged Harvest	981	300	31
Total Harvest	4,055	772	19

Evaluation Question:

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

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

Monitoring Driver: Documentation of costs associated with carrying out the planned management prescriptions as compared with costs estimated in the Forest Plan.

Background: The cost of implementing the 2006 Forest Plan is based on current budgets for all program areas excluding timber outputs. The Forest Service at the Washington and Regional levels track some outputs related to Forest Plan implementation, otherwise known as targets, on a yearly basis. Cost of providing these outputs is estimated through GMNF program work plans.

Monitoring Activities: Table 2-5 displays the targets that were achieved on the Green Mountain and Finger Lakes National Forests in fiscal years 2012 and 2013, 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 2-5: Fiscal years 2012 and 2013 target accomplishments and estimated cost.

Target Activity	Amount Accomplished Fiscal Year 2012	Estimated Cost Fiscal Year 2012 ($)	Amount Accomplished Fiscal Year 2013	Estimated Cost Fiscal Year 2013 ($)
Inventory and Monitoring				
Annual required monitoring completed	n/a	102,599	Not Available	71,086
Inventory data collected or acquired to standard	62,326 acres	73,393	Not Available	96,871
Forest Planning				
Amendments completed	0	0	0	0
Facilities				
Forest administrative and other facilities maintained to standard	24 facilities	193,990	20 facilities	111,776
Recreation sites managed to standard	105 sites	126,745	110 sites	138,750
Hazardous Fuels				
Treated to reduce the risk of catastrophic wildland fire	207 acres	7,245	479 acres	51,253
Lands				
Land Acquisitions/adjustments	1,283 acres	65,619	Not Available	Not Available
Boundaries marked	17.8 miles	150,993	9 miles	152,779
Non-Recreation Special use permits administered to standard	77 permits	9,960	Not Available	Not Available
Non-Recreation Special use applications processed	28 applications	48,594	Not Available	Not Available
Rights of Way acquired	2 easements - acquired with a land acquisition	Covered in acquisition costs	0 easements	0
Vegetation and Watershed				
Forest vegetation established	482 acres	96,400	163 acres	32,600
Timber stand and genetic tree improvement	179 acres	35,800	122 acres	24,400
Treated annually for noxious weeds and invasive plants	996 acres	70,507	1083.1 acres	57,348
Soil and water resources improved	602 acres	Not Available	Not Available	Not Available
Wildlife, Fish and Threatened, Endangered and Sensitive Species				
Lake habitats restored or enhanced	200 acres	60,500	200 acres	26,000
Stream habitats restored or enhanced	60 miles	987,500[1]	71.2 miles	5,855,780[1]
Terrestrial habitats restored or enhanced	3,813 acres	371,476	3,881 acres	340,795
Recreation				
Heritage assets managed to standard	22 assets	27,907	n/a	n/a
Recreation site capacity operated to standard	481,799 persons at one time (PAOT) days	126,745	819,965 PAOT days	138,750
Number of interpretive and conservation education plans implemented	1 plan	60,000	1 plan	60,000

Target Activity	Amount Accomplished Fiscal Year 2012	Estimated Cost Fiscal Year 2012 ($)	Amount Accomplished Fiscal Year 2013	Estimated Cost Fiscal Year 2013 ($)
Recreation special use authorizations administered to standard	36 permits	46,506	Not Available	Not Available
Trails improved to standard	0 miles	0	3 miles	124,716
Trails maintained to standard	220 miles	165,632	300.7 miles	106,420
Wilderness Areas managed to standard	5 areas	95,034	8 areas	121,126
Roads				
Roads decommissioned	2.78 miles	14,511	0.2 miles	230,838
High clearance roads maintained	21.6 miles	14,167	7.6 miles	
Passenger car roads improved	2.1 miles	301,532	2.9 miles	
Passenger car roads maintained	59.74 miles	46,566	65.8 miles	
Lands covered by motor vehicle use map (MVUM) – includes development of the GMNF MVUM	408,972 acres	5,152	408,972 acres	n/a
Timber				
Timber volume sold	7,931 CCF[2]	512,926	8,246 CCF	727,000

[1] Includes replacement and repair to bridges and culverts resulting from tropical storm Irene.
[2] 100 cubic feet.

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: Continue to track Forest Plan implementation accomplishments and estimated costs to develop trend information that can improve efficiency and effectiveness.

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

Monitoring Driver: Forest Plan Management Area direction.

Background: The Forest Plan describes specific major emphasis, desired future conditions, and standards and guidelines for seventeen different management areas. Management activities are designed to move the resource conditions across the GMNF closer to the Forest Plan desired future conditions. It is important to track projects implemented annually to understand how well they are meeting Forest Plan objectives and moving management areas toward their respective desired future conditions.

Monitoring Activities: The total number of projects approved in fiscal years 2012 and 2013 to implement the Forest Plan is provided in Table 2-6 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 2-7 and Table 2-8.

Table 2-6: Number of projects approved for implementation in fiscal years 2012 and 2013.

National Environmental Policy Act – Level of Analysis	Fiscal Year 2012	Fiscal Year 2013
Record of Decision (EIS – Environmental Impact Statement)	1	0
Decision Notice (EA – Environmental Assessment)	0	1
Decision Memo (CE – Categorical Exclusion)	32	21
Total Projects Approved	33	22

Table 2-7: List of projects approved for implementation in fiscal year 2012.

Project Name	Location	NEPA Level	Project Description
American Chestnut Restoration	Rochester / Middlebury RDs	CE	Plant American chestnut at Fays Meadow for testing in collaboration with Forest Service Northern Research Station and The American Chestnut Foundation.
AOP Culvert Replacement	Forestwide	CE	Replace culverts on Forest Service roads damaged by tropical storm Irene.
Bucklin Trail (Appalachian Trail side trail) Relocation	Manchester RD	CE	Reroute about 1/2 mile of existing hiking trail to avoid stream riparian area.
Butternut Seed Orchard Spray	Rochester / Middlebury RDs	CE	Spot spray small amounts of glyphosate to minimize competition with existing butternut seedlings and prevent loss of orchard.
Catamount Trail - Pony Hill Reroute	Manchester RD	CE	Relocate approximately 400 feet of the Catamount Trail to avoid steep grade.
Cersosimo Logging Access Special Use Permit	Manchester RD	CE	Short term temporary permit to cross NFS land using 300 feet of an existing skid road to access private land for harvesting timber.
Cold River Appalachian Trail Relocation	Manchester RD	CE	Relocate about 2,500 feet of the Appalachian Trail between Gould Brook crossing and Upper Cold River Rd to address damage caused by tropical storm Irene.
Deerfield Wind Energy Development Special Use Permit	Manchester RD	EIS	Issue special use permit to construct, operation and maintain wind energy towers.
FT365 Spruce Peak South Snowmobile Trail Bridge Replacement	Manchester RD	CE	Replace snowmobile trail bridge over a tributary of the Winhall River, FT 365 Spruce Peak south/VAST F4 that was destroyed by tropical storm Irene.
FT379 Deerfield River Snowmobile Trail Bridge Replacement	Manchester RD	CE	Replace snowmobile trail bridge over the Deerfield River, FT 379 that was destroyed by tropical storm Irene.
FT385 (Corridor 7 snowmobile trail) Rake Branch Bridge Replacement	Manchester RD	CE	Replace bridge located on VAST corridor trail that spans the Rake Branch of the Deerfield River.
Happy Hill Privy (AT)	Rochester / Middlebury RDs	CE	Replace a privy along the Appalachian Trail in Norwich near the existing privy site.

Project Name	Location	NEPA Level	Project Description
IP Road (C7/FR341 snowmobile trail) Double Culvert Replace with Bridge	Manchester RD	CE	Replace damaged culverts with bridge on VAST Corridor 7 in Winhall on FR341.
Kelley Logging Access Special Use Permit	Manchester RD	CE	Issue special use permit to cross NFS land to access logging site on adjoining private land.
Kent Pond Overflow Spillway Access & Repairs	Rochester / Middlebury RDs	CE	Provide access to repair spillway damaged by tropical storm Irene.
Killington Town River Road Loop Trail	Rochester / Middlebury RDs	CE	Authorize through special use permit the construction of hiking trail that will be part of loop trail mostly on adjacent private/town land.
Lauzon and Sausville Access Special Use Permit	Manchester RD	CE	Issue special use permit to provide landowners access to inholdings within the Glastenbury Wilderness.
Leffert's Pond Area Trail Access and Restoration Project	Rochester / Middlebury RDs	CE	Designation of horse, snowmobile and catamount ski trail use in the Leffert's Pond area. Includes trail decommissioning and trail relocation work.
Minnie Baker Corridor 7 Snowmobile Connector	Rochester / Middlebury RDs	CE	Re-connect Corridor 7 and Minnie Baker snowmobile trails using existing old trails/roads on both federal and non-federal lands. Consists of 0.2 miles of new trail on National Forest System (NFS) land while closing the same amount where former connectivity was lost.
Moosalamoo National Recreation Area Campground Timber Management	Rochester / Middlebury RDs	CE	Manage vegetation and hazard trees within developed campgrounds through commercial timber harvest. Includes up to 1 acre of timber stand improvement near Silver Lake.
Moosalamoo Radio Repeater Shelter Replacement	Rochester / Middlebury RDs	CE	Replace radio repeater shelter at Mt. Moosalamoo site.
Non-winter Ski Area Special Events	Forestwide	CE	Covers all non-winter special events on Nordic and alpine ski areas under special use permit.
North Zone Catamount Trail Relocations	Rochester / Middlebury RDs	CE	The reroute includes parts of three separate trails (3 x-country ski routes that are part of the Catamount Trail system) to provide for trails that are more sustainable, less prone to erosion, easier to maintain & improve safety.
North Zone Vista Opening Maintenance	Rochester / Middlebury RDs	CE	Maintain vistas along existing trails.
Road Reconstruction Projects (FR45 & FR226)	Rochester / Middlebury RDs	CE	Reconstruct roads damaged by tropical storm Irene.
Roaring Branch Restoration	Manchester RD	CE	Address debris jam in Roaring Branch to reduce risk of breached berm and damage to downstream road & infrastructure.
South Wallingford Water Company Special Use	Manchester RD	CE	Issue special use permit for water treatment facility on NFS land.
State Route 100 Bridge Replacement Detour	Rochester / Middlebury RDs	CE	Issue not to exceed one-year permit to reroute outside of the road ROW to enable bridge replacement along VT-100.

Project Name	Location	NEPA Level	Project Description
Steam Mill Gravel Pit	Rochester / Middlebury RDs	CE	Develop and operate a gravel pit on NFS lands.
Warren Falls Parking Lot Expansion	Rochester / Middlebury RDs	CE	Address parking and access issues with expansion of parking area.
West Branch Tweed Bank Stabilization	Rochester / Middlebury RDs	CE	Provide short term access via a permit to private land along West Branch of the Tweed River to stabilize the bank from damage caused by tropical storm Irene.

Table 2-8: List of projects approved for implementation in fiscal year 2013.

Project Name	Location	NEPA Level	Project Description
White River Riparian Planting	North Half	CE	Plant trees and shrubs within 25 feet of a White River buffer.
Mountain Top Inn Trail Improvements	North Half	CE	Reconstruct and add additional waterbars, culverts and drainage ditches along existing trails. Includes short trail relocation.
Rikert Blue Bed & Brown Gate Trails/Catamount Trail Relocation	North Half	CE	Add two small segments of trail within the Rikert Nordic ski system to relocate Catamount Trail to periphery of the area.
Blueberry Hill Hogback Trail Ditch Repair	North Half	CE	Reconstruct 300-foot section of trail damaged by tropical storm Irene within the Blueberry Inn Nordic trail system including filing in ditch, repairing trail tread, installing five new culverts, & replacement of existing culvert.
Appalachian Trail Pomfret Relocation	North Half	CE	Relocate Appalachian Trail onto NFS land from private land. Construct about 750-foot section including culvert along Lottery Road.
Howard Hill and Biggs-Peters Vista Clearing	North Half	CE	Maintain existing vista openings along the Appalachian Trail corridor by hand tools, chainsaw & mowing.
Abbey Pond Trail Relocations	North Half	CE	Relocate about 0.4 mile of total trail segments to avoid wet area.
Eaton Mill, West Branch and Silver Lake North Developed Recreation Sites Decommissioning	North Half	CE	Decommission developed recreation sites for multiple reasons such as reducing deferred maintenance and addressing public safety.
Robert Frost Trail Improvements	North Half	CE	Install a raised boardwalk along existing trail footprint at Robert Frost Interpretive site to reduce safety and deferred maintenance concerns.
Chittenden Brook System Trail Improvements	North Half	CE	Replace in-kind bridge and existing culvert with bridge along the existing trail system.
Sugarbush In Road Trail Improvement	North Half	CE	Improve trail within the ski area near condominiums and base area.
Mountain Meadows Snowshoe Trail	North Half	CE	Construct a snowshoe trail within existing permit area.

Project Name	Location	NEPA Level	Project Description
Dorset/Peru Integrated Resource Project	South Half	EA	Multiple resource projects to improve forest health and wildlife habitat conditions, provide wood products, improve recreation opportunities, and restore soil and water quality.
Wilmington Water District Test Pits Special Use	South Half	CE	Short-term special use authorization to conduct test pits to determine suitability for additional water sources to supplement municipal water system.
Kelley Stand Road Flood Repairs	South Half	CE	Repair and reconstruct bridges and Kelly Stand Road (FH 6) bed damaged by tropical storm Irene.
FT385 (Corridor 7 snowmobile trail from FR 30 to FR58) Repairs	South Half	CE	Repair damage to trail resulting from tropical storm Irene. Includes bridge, culvert and trail tread replacement.
District-wide Apple Tree Maintenance	South Half	CE	Release existing apple trees from encroaching vegetation in 70 stands.
District-wide Upland Opening Maintenance	South Half	CE	Maintain existing permanent openings on 145 stands for a total of about 1,560 acres.
Rutland Airport Beacon Access Permit	South Half	CE	Provide temporary access across NFS land within the Appalachian Trail corridor) to upgrade existing towers and beacons around Rutland Airport.

Evaluation and Conclusions: There were a total of 55 projects approved for Forest Plan implementation in fiscal years 2012 and 2013. Although approved during this time period, some are ongoing and are anticipated to be completed in outyears. 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.

Evaluation Question:

Are standards, guidelines, and mitigation measures being implemented on projects consistent with Forest Plan and project National Environmental Policy Act (NEPA) direction? Are these measures effective at achieving the desired results? Are there other measures that could be more effective?

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

Monitoring Driver: Forest Plan Forest-wide and Management Area Standards and Guidelines.

Background: The Forest Plan states that forest-wide standards and guidelines (S&Gs) apply to all Forest areas for the purpose of protecting or managing forest resources. There are also S&Gs specific to each management area. Standards and guidelines are designed to achieve Forest Plan desired conditions, goals, and objectives. They are usually mitigation measures that minimize or negate the effects of a management action or land use. Additional design criteria and mitigation measures may be developed for

site specific projects during the environmental analysis process to further protect resources or lessen impacts.

Monitoring Activities: Forest Plan S&Gs and project specific design criteria and mitigation measures are monitored to determine if they have been implemented correctly and achieved the desired results. This level of monitoring is completed by resource specialists as they visit project sites throughout the year.

Forest Service staff also continued the process for interdisciplinary Forest Plan implementation field monitoring of projects in fiscal year 2013 during two days of site reviews (May 22 and May 23, 2013). The sites monitored were all located on the Rochester and Middlebury Ranger Districts and included the following completed and ongoing projects:

- Natural Turnpike Project
  - Cobb Hill North Stewardship where vegetation management for wildlife improvement was conducted including aspen clearcut, softwood clearcut, openings, thinnings and drumlog placement.
  - Snowmobile Trail Relocation where an existing snowmobile trail was relocated off of Forest Road 54 to reduce incompatible uses and long-term safety concerns between automobiles and winter recreation uses.
  - Cobb Hill South Timber Sale where a variety of vegetation treatments were conducted through a commercial timber sale, and also included wildlife opening conversion, site preparation for reforestation and non-native invasive plant treatment.
  - Skid Road Revegetation where a skid trail used for harvest activities was physically closed and revegetated.
- Tropical Storm Irene Repairs:
  - Townsend Brook Bridges Replacement
  - Corporation Brook Road Repairs
- Dutton Brook II Timber Sale ruts from completed harvest activities.
- Dutton Brook Large Woody Placement where habitat was restored in Dutton Brook.
- Catamount Trail Goshen Reroute where the Catamount Trail was relocated from its existing location along a power line right-of-way to provide a better and safer recreation experience.
- Butternut Seed Orchard where about 100 butternut seedlings were planted, and fence constructed to establish a butternut seed orchard at “Fays Meadow” adjacent to Forest Road 243.

Each project was evaluated using a set of questions designed to answer Forest Plan implementation monitoring questions.

Evaluation and Conclusions: The projects monitored during the interdisciplinary field visits were found to have Forest Plan S&Gs and project design criteria and mitigation measures implemented effectively. With a few exceptions noted below, they were also found to achieve their desired level of protection to resources. There were no needed modifications to S&Gs or other changes to Forest Plan components identified from routine monitoring efforts conducted by resource specialists or during the interdisciplinary site reviews.

Specific to the Townsend Brook Bridges Corporation Brook Road Repairs projects, it was noted continued monitoring was needed to ensure adequate revegetation on steep slopes and ditches occurs. Some areas do not have vegetation even though the areas were seeded and mulched in November. There was also concern regarding the time of year of construction and the use of heavy equipment. Continue to evaluate effectiveness and applicability of Soil, Water, and Riparian Area Protection and Restoration

Guidelines G-6 and G-7. Additionally, minor deviations from visuals guidelines were noted for shelterwood harvest within the Cobb Hill South timber sale, and fencing construction associated with the establishment of the Butternut Seed Orchard.

Recommendations: Continue to track the effectiveness of S&Gs, and make adjustments, when needed, to improve the performance of relevant Forest Plan S&Gs or project specific design criteria and mitigation measures. Work more closely with the Forest landscape architect or recreation staff to ensure better compliance with visuals resource Forest Plan Guidelines.

Evaluation Question:

Did any project require guideline deviation or a Forest Plan amendment to modify a standard? If so, what was the project? Which standard was changed, or which guideline required deviation? What was the rationale for the change or deviation?

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

Monitoring Driver: Forest Plan Forest-wide and Management Area Standards and Guidelines.

Background: The Forest Plan defines standards and guidelines (S&Gs) as management requirements that are applicable to all foreseeable situations. Deviation from standards require a site specific or programmatic Forest Plan amendment. Guidelines are management requirements that are applicable to most situations but can be modified at the project level. Deviation from a guideline does not require a Forest Plan amendment, but it does require that the rationale for deviation be disclosed in the project decision documents and analysis. The occurrences of deviations from S&Gs, and the reason for these deviations are tracked so that Forest Service staff can evaluate potential changes needed to the Forest Plan.

Monitoring Activities: The Deerfield Wind Project approved a special use permit in fiscal year 2012 to construct, operate, and maintain a commercial wind energy facility on NFS lands on the Manchester Ranger District in the Towns of Searsburg and Readsboro, Vermont. The Record of Decision approved a site specific non-significant Forest Plan amendment to modify the application of Standard S-2 for Soil, Water, and Riparian Area protection (Forest Plan, p. 20).

Evaluation and Conclusions: Soil, Water, and Riparian Area Protection and Restoration Standard S-2 requires a protective strip of predominantly undisturbed soil separating soil-disturbing activities from all water sources, with the purposes of protecting the soil's infiltration capacity and sediment filtering capabilities. The widths of the protective strips vary according to the percent slope between the disturbed area and the water source. According to the Forest Plan, Standard S-2 currently allows for soil disturbance by heavy construction equipment in a protective strip under just three specific circumstances.

The ROD determined Standard S-2 to be amended, since the project did not meet any of the conditions that will allow use of heavy construction equipment within the protective strips. This is a site-specific amendment only for Deerfield Wind Project and does not apply to implementation of any other GMNF project. The amendment was limited in application for from nine to eleven specific wetlands. For this amendment, there are no changes in goals, objectives, or outputs (goods and services) from the Forest Plan. Multiple-use goals and objectives for long-term land and resource management will not be affected. There are no adjustment of management area boundaries or management prescriptions. The location and size of the protective strips to be affected by the change is very small in relation to the overall GMNF.

Finally, allowing use of heavy construction equipment within the protective strips of these nine to eleven specific wetland areas will have no effect on any other management prescriptions.

Recommendations: None

Recreation

Evaluation Question:

What are the trends in the illegal use of vehicles 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?

Monitoring Driver: Regulatory 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 uses of National Forest System lands.

Background: There is a long-standing concern about the illegal use of motor vehicles on the GMNF. This is well documented in both the 1987 and the 2006 Forest Plans. In addition, this is a national issue that prompted a significant change in policy and direction regarding wheeled motorized vehicles. Though a substantial issue, the development of monitoring protocols is difficult due to the scattered nature of violations that often happen in remote areas at night and during time periods when there are few patrols available. It was decided to use existing protocols used by law enforcement personnel as the starting point for monitoring this activity. Additionally, site specific project analyses also document unauthorized vehicle use as part of the description of existing conditions.

Monitoring Activities: Monitoring continued in conjunction with routine law enforcement patrols and trail maintenance activities. As patrols and trail condition inventories document incidents or the issuance of violation notices, the records are entered into a database. Data are stored in the Law Enforcement and Investigation Management Attainment and Reporting System (LEIMARS). Retrieved data can be used to show some trends, though there are some limitations since the data is dependent on the availability of personnel.

Evaluation and Conclusions:

Fiscal Year 2012

There were 12 incident reports which involved summer off-highway vehicles (OHV) and one incident recorded involving an over-snow vehicle. This continues a trend of decreasing documentation of OHV use in recent years and appears to indicate that the illegal use of vehicles off roads is not causing considerable adverse effects on resources or other forest visitors. The Forest Service has been making a focused effort to include mitigation measures in site specific project decisions to deter unauthorized vehicles through public collaboration and education, and installation of signing and engineering controls such as gates, stiles and boulders. These efforts seem to be effective in managing illegal use of vehicles off roads.

Fiscal Year 2013

There were four incident reports of summer OHV use and one violation notice was issued for the illegal use of vehicles off roads. There were two violation notices issued for over snow vehicle use. This is a decrease from the total number of incidents documented in 2012, continuing the trend of decreased illegal use of vehicles off roads in recent years.

Recommendations: Work with all field going employees to emphasize the reporting of observations through official databases, so that summer OHV and over snow vehicle incidents are accurate. Work with Forest Service water and soils staff to add more qualitative data such as narratives based on site specific project analyses and monitoring.

Wilderness Areas

Evaluation Question:

How many wilderness areas are managed to national standards?

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

Monitoring Driver: Forest Plan Goal 13 and associated Objectives.

Background: There are eight wilderness areas on the GMNF: Bristol Cliffs, Breadloaf, Joseph Battell, Peru Peak, Big Branch, Glastenbury, Lye Brook and George D. Aiken.

In 2004, the Chief of the Forest Service created the 10 Year Wilderness Stewardship Challenge (10YWSC) that identified ten key elements that help define successful wilderness stewardship. These elements are:

1. Fire managers consider a full range of responses with the goal of restoring natural fire.
2. Invasive plants are successfully treated
3. Air quality trends are measured
4. Priority actions identified in a wilderness education plan are implemented
5. Opportunities for solitude or primitive and unconfined recreation are protected
6. Recreation site inventory is completed
7. Outfitter/guides model wilderness practices and communicate appreciation for wilderness values to clients
8. Adequate direction exists to protect wilderness character
9. Information needs are met
10. A baseline workforce is in place

Monitoring Activities: The Green Mountain National Forest received a 10YWSC grant to fund a summer Student Conservation Association (SCA) team of one crew leader and three interns. This team focused their efforts on the original six wilderness areas included in the 10YWSC which consist of Bristol Cliffs, Breadloaf, Big Branch, Peru Peak, Lye Brook and George D. Aiken wilderness areas.

Activities specific to the 10YWSC areas include:

Element 1

The Forest Plan permits Wildland Fire Use (WFU) in all eight of the designated wilderness areas on the Forest. The Northeast Forests Fire Management Plan (FMP) routinely includes direction for fire suppression activities within wilderness. The management direction in the Forest Plan and FMP provides fire staff the appropriate tools for addressing fire in wilderness. The FMP is continuously evaluated and discussed at fire team meetings that occur every three months.

Element 2

A Forest Service seasonal botanist assisted the SCA team with basic non-native invasive plant (NNIP) training. Non-native invasive plants related work was performed in six wilderness areas. George D. Aiken and Breadloaf remain free of NNIP. Mechanical treatment of NNIP was executed in Bristol Cliffs, Joseph Battell, Big Branch, and Lye Brook wilderness areas. Monitoring of past NNIP treatments was performed in Bristol Cliffs, Joseph Battell, Big Branch, Peru Peak and Lye Brook wilderness areas. The University of Vermont Land Stewardship Program inventoried the Glastenbury wilderness area for NNIP and none were found.

Element 3

Forest Service wilderness staff continues to work closely with the Forest Service Region 9 Air Specialist to establish monitoring indicators and collect data. The GMNF's Air Quality Value (AQV) Plan was completed in 2013. The plan demonstrated that Lye Brook, Glastenbury, and Peru Peak wilderness areas have long-term monitoring strategy and results reported scoring a maximum 10 points in the 10YWSC. Breadloaf and Joseph Battell wilderness areas have initial measurement and reporting of synoptic survey results scoring 4 points in the 10YWSC. All other wilderness areas scored 2 points for having a completed AQV plan.

Element 4

A Wilderness Education Plan for all GMNF wilderness areas was updated and fully implemented in fiscal year 2010. The plan was not updated during the fiscal year 2012 and 2013 period. Forest Service wilderness staff implemented certain sections of the plan. Most education is performed by the summer SCA team through field contacts.

Element 5

Forest Service wilderness staff monitor visitor use through maintaining trailhead register sheets, routine patrol and presence, and by completing the National Visitor Use Monitoring project every five years. These three sources of data provide information to monitor visitor trends and address concerns regarding opportunities for solitude and unconfined recreation. Monitoring has shown that in general, these opportunities are being sustained in GMNF wilderness areas, with the exception of a few popular sites during high visitor use times (holidays, weekends). See Monitoring Question "What are the status and trends of outstanding opportunities for unconfined recreation, solitude, and primitive recreation?" for more detailed information

Element 6

A recreation site inventory continues to be annually updated and exceeds the minimum requirements of the established protocol. All users made campsites have been entered into the National Forest Service Wilderness database called Infra-Wild. Wilderness users made campsites are also being incorporated into the GMNF corporate GIS database for spatial presentation on maps. No campsite monitoring was performed in fiscal year 2012. Glastenbury and Joseph Battell wilderness area campsite monitoring was completed in fiscal year 2013.

Element 7

Forest Service wilderness staff are routinely involved in reviewing applications for recreation special use permits for appropriateness of activities within wilderness. The staff provides valuable initial input into the application package about wilderness specific regulations and *Leave No Trace* practices for prospective applicants. The majority of special use permits issued in wilderness areas are on portions of the Appalachian Trail/Long Trail. The Green Mountain Club (GMC) monitors these permits for trip

planning purposes and for mitigating user conflicts. The GMC assists Forest Service staff with monitoring permitted activities through the seasonal Caretaker program.

Element 8

The Forest Plan provides adequate direction for managing GMNF Wilderness Areas. The Forest Plan serves as the primary local management document of the eight Wilderness Areas, therefore eliminating the need for any individual wilderness management plans.

Element 9

All wilderness management information is stored in the Forest Service corporate database referred to as Infra-Wild. Information regarding trailhead registers and field notes are recorded and stored locally for annual work planning and budgeting.

Element 10

Budget constraints continue to keep Forest Service staff below standard for the wilderness program. Efforts are ongoing to utilize volunteers and partners in assisting with wilderness management activities.

Evaluation and Conclusions: The Chief's 10YWSC provides a national framework in which to determine adequate Wilderness management actions. The data collected since 2006 will serve as a baseline in which to compare future monitoring and data collection efforts. The Bristol Cliffs, Breadloaf, Big Branch, Peru Peak and Lye Brook wilderness areas met the minimum 10YWSC standards in fiscal year 2012. All wilderness areas met the minimum 10YWSC standards in fiscal year 2013.

Recommendations: Additional presence in GMNF wilderness areas is paramount in accomplishing the Chief's 10YWSC. This can be done by volunteers, partner organizations and/or Forest Service staff.

Evaluation Question:

What are the status and trends of inholdings?

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

Monitoring Driver: Forest Plan Management Area direction.

Background: In total, there are eleven private land parcels affecting wilderness areas. These parcels are monitored more closely due to their possible negative impact to wilderness character. There are four inholdings (property fully surrounded by wilderness area) within the Lye Brook (2) and Glastenbury (2) wilderness areas. The other six parcels have at least one side of their property abutting wilderness area located in the Breadloaf (1) and Lye Brook (5) wilderness areas. Additionally, there is one life tenure special use permit for a camp in the Big Branch wilderness area. Of the 11 private parcels potentially affecting wilderness characteristics, five are developed with camps or other improvements while the remaining six are undeveloped.

Monitoring Activities: Monitoring of private parcels potentially affecting wilderness character is an important aspect of the core wilderness management program and is ongoing annually. Monitoring activities included checking property boundaries for potential encroachment onto National Forest System lands and access needs. Routine monitoring occurred in the Breadloaf wilderness area parcel, and the southern parcel along Bolles Brook in the Glastenbury wilderness area was visited by Forest Service staff to assess tropical storm Irene damage to the road accessing the two camps.

Evaluation and Conclusions: There were no issues with the Breadloaf wilderness area parcel. Forest Service staff agreed on terms and conditions for special use permits to provide the two landowners access within the Glastenbury wilderness area. The use of the minimum requirement analysis was used to determine the need and appropriate means to repair the existing access road. Two separate special use permits were issued to authorize long-term (10-year) access to the two separate private inholdings owned by 1) Eugene and Gloria Lauzon, and 2) Anthony and David Sausville, and Alfred Latour, Jr. in August 2012. The permits specified repairs to damage incurred from tropical storm Irene along the historic access road (formerly known as Forest Road 288), and long-term maintenance requirements.

Wilderness boundaries were confirmed in fiscal year 2010 for systematically monitoring each wilderness boundary once every 8 years. This represents an average of 28.4 miles of boundary monitoring per year. Total mileage of boundary monitored during fiscal years 2012 and 2013 includes 9.7 miles (3.6, 3.4, and 2.7 miles in the Bristol Cliffs, Joseph Battell, and Breadloaf wilderness areas, respectively). Additionally, boundaries adjoining roads, trail heads and private land are monitored more frequently whenever personnel are in the area. Roads monitored include Forest Road (FR) 273 (Breadloaf), FR 10 (Big Branch), Lower Notch Road (Bristol Cliffs), FR 21 (Peru Peak), and FR 74 (George D. Aiken).

Recommendations: Continue to annually monitor private parcels potentially affecting wilderness character and continue or establish relationships with the owners so that they are aware of the uniqueness of wilderness management regulations. Continue to include acquisition of these parcels a high priority. Due to insufficient Forest Service staff, it is recommended to monitor wilderness boundaries where there is a high risk of encroachment in lieu of the eight-year systematic boundary monitoring cycle adopted in 2010.

Evaluation Question:

What are the trends of selected biophysical conditions and processes sensitive to human threats? What are the trends of actions that control or manipulate the community of life in wilderness? What are the trends of human threats to natural conditions?

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

Monitoring Driver: Forest Plan Management Area direction.

Background: Forest Service wilderness staff has been working with the Forest Service Region 9 air specialist to determine Air Quality Related Values (AQRV) and sensitive receptors to set a baseline for monitoring biophysical conditions sensitive to human threats. Additionally, there has been increasing interest in using GMNF wilderness areas for research related to climate change.

Users made campsites are surveyed every five years. The user impacts of these sites are documented. New sites are entered into INFRA Wild and sites that are no longer used are deleted.

Monitoring Activities: Past and current AQRVs related monitoring associated with the Lye Brook wilderness area (also refer to the Air section for further information) include:

- National Atmospheric Deposition Program (NADP) monitoring site located in Bennington County.
- Through a cooperative agreement with the University of Massachusetts, the Forest Service has been monitoring ozone concentration and its effects on lichens using filtered and unfiltered growth chambers at a site five miles west of the Lye Brook wilderness area since 1989.

- Monitoring of Protected Visual Environments (IMPROVE) monitoring equipment (visibility) in place includes a nephelometer installed in 1992 and a particulate sampler installed in 1991, both on Mt. Equinox, which is approximately five miles west of the Lye Brook wilderness area. The IMPROVE site was moved to Mount Snow in December 2011.
- Background visibility monitoring with a camera installed near Branch Pond Road, just south of the Lye Brook wilderness area, since 1986 to document background visibility from May 1 to October 30.
- The Vermont Department of Forests, Parks and Recreation (VDFPR) is participating in the New England Forest health Monitoring Program, which monitors the effects of soil and air toxins on vegetation. Four one-acre plots were installed near Little Mud Pond in 1990 and measurements are scheduled annually, with foliage and soil sample extractions planned every fourth year. The VDRPR intends to maintain these plots indefinitely.
- The State of Vermont has monitored water quality in Bourn Pond, which has been identified as an AQRV four times a year since 1982.
- Since 2001 the USDA-Natural Resources Conservation Service has operated a Soil Climate Analysis Network (SCAN) station near the Lye Brook wilderness area. The SCAN site collects long-term data on weather, soil moisture, and soil temperature used to complement measurements of soil physical, chemical, and biological parameters at long-term soil monitoring site established nearby.

Other current monitoring activities related to wilderness areas include:

- The Forest Service and the Vermont Department Environmental Protection, Watershed Management Division collaborated to implement the GMNF Wilderness Air Quality Value (AQV) Monitoring Plan. Between the two agencies, they analyzed water chemistry for 10 streams sampled three time (spring, summer, and fall) in five wilderness areas (George .D. Aiken, Big Branch, Joseph Battell, Bristol Cliffs, Breadloaf).
- Fish surveys were conducted in all streams analyzed for the AQV Monitoring Plan by Forest Service fish and wildlife staff.
- Vermont non-game Natural Heritage Program surveyed Significant Ecological Sites for threatened and endangered species in the Breadloaf wilderness area. Determined the potential for *Polemonium vanbruntiae* (cliff-dwelling plant) occurrence.
- University of Vermont surveyed trails within the Breadloaf wilderness area for botanical resources and non-native invasive plant (NNIP) occurrence. They found only one location with NNIP present on the wilderness boundary along the Burnt Hill Trail.
- Student Conservation Association staff monitored non-native invasive plants at high potential entry points in all wildernesses such as hiking trails, along road boundaries and inholdings. They also monitored previously treated areas in Big Branch, Lye Brook, and Bristol Cliffs wilderness areas.

Evaluation and Conclusions: There is a need for existing monitoring data to be synthesized into a format that can be easily used to monitor trends and recommend future management actions.

Recommendations: Continue the existing monitoring efforts. Work with the University of Vermont, Vermont Monitoring Cooperative group to explore options to synthesize monitoring information related to wilderness areas. Closely monitor implementation of the GMNF Wilderness Air Quality Value Monitoring Plan and enter data on user made sites into INFRA Wild.

Evaluation Question:

What are the status and trends of the use of motorized equipment and mechanical transport?

Monitoring Question: To what extent is wilderness managed to preserve its wilderness character?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives.

Background:
With certain exceptions, the Wilderness Act of 1964 prohibits motorized equipment, structures, installations, roads, commercial enterprises, aircraft landings, and mechanical transport. Each potential activity to occur within wilderness is analyzed in a planning framework referred to as the Minimum Requirement Decision Guide (MRDG). The intent of the MRDG is to first determine whether the proposed activity is necessary within a wilderness area. If the proposed activity is determined to be necessary, then the MRDG analyzes the minimum action (or tool) necessary to complete the objectives of the proposed activity.

Monitoring Activities: The Forest Service in coordination with the Vermont Department of Fish and Wildlife re-authorized the use of a rotor-winged aircraft (helicopter) to stock native brook trout (*Salvelinus fontinalis*) in Bourn Pond (Lye Brook wilderness area) and Big Mud Pond (Peru Peak wilderness area) based on the MRDG completed in April 2012. As in previous years, the Forest Service staffed each pond during this activity to provide education to visitors and to monitor the impact of the visitor experience.

Access to private land inholdings in the Big Branch and Glastenbury wilderness areas has traditionally been by motorized vehicles including all-terrain vehicles (ATVs), snowmobiles, and automobiles. Access monitoring was limited to the parcels within the Glastenbury wilderness during fiscal years 2012 and 2013 with no signs of motorized vehicles outside of the permitted road. The SCA also noticed intrusions of ATV use at the southeastern border of Peru Peak wilderness area.

Evaluation and Conclusions: Forest Service fisheries staff stocked brook trout fry in Bourn Pond and Big Mud Pond during June 2012. Total flight time over these ponds was less than five minutes, while the total transport time over each wilderness was less than ten minutes. The time of year (early June) was originally selected to provide the least impact to wilderness visitors (black fly season, historic low use) and was validated by staff.

Natural populations of brook trout are unable to reproduce naturally in these ponds. It is unknown whether this is a natural occurrence or due to human effects of acid deposition from air pollution. Private inholding access will continue to be monitored to ensure that vehicles remain on their permitted routes through wilderness areas and ensure adequate access maintenance occurs.

Recommendations: Continue to utilize the MRDG planning framework to analyze future actions with motorized and mechanized equipment within wilderness areas. Monitor and document all authorizations in Infra-Wild database. Work closely with communities surrounding wilderness areas and Forest Service law enforcement staff to ensure proper process is followed during search and rescue missions.

Evaluation Question:

What are the status and trends of outstanding opportunities for unconfined recreation, solitude, and primitive recreation?

Monitoring Question: To what extent is wilderness managed to preserve its wilderness character?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives.

Background: The 1964 Wilderness Act, Section 2(c) states "*a wilderness has outstanding opportunities for solitude or a primitive and unconfined type of recreation*". The Forest Plan, Wilderness Management Area desired future condition states "*Recreation management will be towards the desired ROS class of Primitive. There will be little evidence of human development in wilderness management areas with several exceptions including trails, trail shelters, trail blazes, and limited trail signing that provides onsite guidance to visitors. Interaction between users will vary by wilderness, specific places within each wilderness, and season of use. In general, use will be concentrated around trail corridors and other popular features. Away from trails and in low-use wildernesses, evidence of, and interaction with, other users will be low. Facilities and designated campsites may be present when necessary to protect Wilderness values*".

Monitoring Activities: Forest Service wilderness staff maintains fifteen trail register boxes at various trail portals to designated wilderness areas where check in sheets are provided. Information recorded on these sheets includes date, number in party, destination, length of stay, and hometown/state of visitor. Records from multiple years are available for analysis of trail user trends. Staff also provides a uniformed presence where they document number in groups, destinations, and wilderness messages communicated to visitor. Forest Service staff also cooperate with the Green Mountain Club (GMC) to monitor groups requiring special use permits to utilize wilderness areas.

Evaluation and Conclusions: The 2005 National Visitor Use Monitoring (NVUM) data shows that on a scale of 1 to 10, where 1 indicates hardly anybody is there to 10 suggesting a sense of overcrowding, 100 percent of the respondents indicated 5 or below. The 2010 NVUM data shows that 20 percent of the respondents indicated 6 or 7. Additionally, NVUM 2005 showed 35 percent of respondents chose 1 and NVUM 2010 had no respondents indicate 1. The NVUM 2010 reveals that the number of wilderness visits doubled since 2005 from 62,000 to 127,000 while the total number of visits on the GMNF decreased from 2,656,000 to 2,153,000.

Numbers of hikers signing in at trail registers have remained consistent. However, this information cannot provide the number of visitors yearly because of the absence of the registration rate. It does provide a general trend in use of trails. In light of the 2010 NVUM results, there might be an indication that visitors to GMNF wilderness areas may start feeling the effects of crowding and may not be providing a sense of primitive and unconfined recreation.

Recommendations: Continue to monitor wilderness areas by monitoring user made sites and participating in the upcoming 2015 NVUM study. Continue to work closely with GMC staff to evaluate the groups use system to determine the carrying capacity of recreation sites in wilderness areas. Continue to monitor and screen for outfitter and guide use groups. Complete an encounter monitoring protocol and implement in the near future to better assess the interaction of wilderness visitors. Consider installing mechanical counters to better determine the number of users on trails and their distribution.

Evaluation Question:

What are the trends of physical evidence of modern human occupation or modification?

Monitoring Question: To what extent is wilderness managed to preserve its wilderness character?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives.

Background: The Long and Appalachian Trails, including their side trails, pass through the Lye Brook, Glastenbury, Peru Peak, Big Branch, Joseph Battell and Breadloaf wilderness areas. Evidence of human occupation or modification within these areas includes trail improvements (puncheon, waterbars, drain dips, stone steps, corduroy, and bridges) and trail shelters/tent platforms and associated privies. The Green Mountain Club (GMC) maintains a shelter caretaker program and a volunteer corps who provide general maintenance and support to the trail system.

The 2006 New England Wilderness Act designated just over 42,000 acres of new wilderness. The newly designated areas included non-conforming structures such as roads and a Forest Service maintained radio repeater site. There are approximately 11 miles of roads with 33 culverts located in the Breadloaf and Joseph Battell wilderness areas. The radio repeater is located on Philadelphia Peak within the Joseph Battell wilderness area.

Monitoring Activities: Forest Service wilderness staff worked in close coordination with the GMC to maintain the Long and Appalachian Trails within wilderness areas. Current infrastructure is evaluated while performing this work. In past years, illegal trail cutting has occurred in the Breadloaf, Joseph Battell, Big Branch and George D. Aiken wilderness areas. All sites were monitored during fiscal years 2012 and 2013 and no fresh cutting was observed. Forest Service staff continues to observe tree cutting at Bourn Pond in the Lye Brook wilderness area.

Evaluation and Conclusions: Forest Service and GMC staff continue to work together in determining the minimum tool necessary for completing trail and shelter maintenance activities. Forest Service wilderness staff continue to monitor non-conforming road structures within newly created wilderness from the 2006 NEWA.

Recommendations: Continue to work closely GMC staff when scheduling trail and shelter maintenance activities. Complete MRDGs prior to initiating any work within wilderness areas. Initiate public involvement and environmental analysis process to address the non-conforming structures within newly created wilderness areas as resources and staff are available. Continue to monitor illegal trail cutting in the Breadloaf wilderness area in the summer and in the fall as these trails are probably used for backcountry skiing. Increase Forest Service staff presence at Bourn Pond during the summer to encourage Leave No Trace Practices.

Visuals

Evaluation Question:

Is the GMNF being managed in accordance with the Forest Plan Visuals Standards and Guidelines (S&Gs) and are the Visuals S&Gs and any additional site-specific design criteria effective in helping to meet the Visual Quality Objectives (VQOs)?

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

Monitoring Driver: Forest Plan Goal 15 and associated Objectives.

Background: The GMNF continues to provide a high-quality scenic resource for residents and visitors. To some people the GMNF is seen as a natural appearing visual backdrop to their respective vantage points. To others the scenery is more intimate and offers a variety of environments from ski areas, wildlife viewing areas, trailside areas, and wilderness.

Monitoring Activities: The Forest Service landscape architect continued to monitor visual quality on the GMNF using visual quality objectives (VQO's) and Forest Service S&G's with the goal of maintaining and enhancing visual quality. In fiscal year 2012, monitoring emphasized review of the overall appearance of the GMNF and examined visual resource concerns for project planning and implementation. In fiscal year 2013, VQO monitoring focused on the projects visited during the May 2013 Forest Plan implementation interdisciplinary monitoring field trip on the Rochester and Middlebury Ranger Districts. Projects monitored included the Natural Turnpike vegetation management and snowmobile trail relocation sites, Catamount trail relocation, tropical storm Irene repairs, Dutton Brook large woody debris placement, and the establishment of the Butternut seed orchard. Most projects met VQOs, S&Gs and project specific mitigations. A need to evaluate visual guidelines for shelterwoods due to changes in the design of timber harvests for wildlife benefits and the need to work with the landscape architect in planning these projects was noted. The fencing around the butternut orchard was not located as specified in the project documents due to wet areas and the new fence location was not reviewed by the landscape architect. Mapping for the foreground of the Appalachian National Scenic Trail continued with analysis for development of the South of Route 9 integrated resource project.

Evaluation and Conclusions: The overall appearance of the GMNF continues to meet the VQOs as provided by the Forest Plan. Monitoring of vegetation management treatments showed that some design criteria and visual guidelines need to be reviewed and possibly revised to incorporate new approaches to shelterwoods and wildlife openings. Review and discussion of changes in project design with the landscape architect are important to ensure that VQOs are met.

Recommendations: Continue to monitor the visual resource for compliance with Forest Plan S&Gs. Look for opportunities for visual enhancement along roads, trails, and recreation sites as part of integrated resource project planning. Continue to work with vegetation management project planners during the implementation phase to aid in project designs that will meet VQOs.

Evaluation Question:

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

Monitoring Question: To what extent have Scenic Integrity Objectives been attained?

Monitoring Driver: Forest Plan Goal 15 and associated Objectives.

Background: In the late 1990's the Forest Service developed the Scenery Management System (SMS) which evolved from and was to replace the Visual Management System (VMS) developed in the 1970s. Forest Service Handbook direction approved in 2003 recommends the scenery inventory be updated to meet the Scenery Management System process prior to a forest plan revision. The Forest Service did not complete this inventory for the GMNF and did not convert to the SMS at the time of the 2006 Forest Plan revision. Forest Plan Goal 15 includes an objective to "Complete a transition from the current Visual Management System to the Scenery Management System."

Monitoring Activities: Forest Service staff began work on the transition from VMS to SMS in 1999 and resumed this work in 2007 after the Forest Plan revision was completed. The development of SMS for the GMNF has been delayed due to changes in staff and competing priorities.

Evaluation and Conclusions: The GMNF has not transitioned to the SMS and a Forest Plan amendment to incorporate SMS as a way to ensure application of the principles of landscape aesthetics, scenery management, and environmental design in project-level planning has not been completed.

Recommendations: The 2012 planning rule directives (36 CFR 219) require the Responsible Official to "*use the Scenery Management System (SMS) in all plan revisions to address scenic character and develop scenery-related plan direction unless the Responsible Official provides written justification and obtains concurrence from the Regional Forester*". Although under these directives the GMNF will have to transition to the SMS prior to the next Forest Plan revision, Forest Service staff should develop a plan to transition to the SMS as soon as practical.

Heritage

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

Monitoring Driver: Forest Plan Goal 16 and associated Objectives.

Background: Forest Service staff identified these needs during Forest Plan revision and has been addressing them incrementally since 2006.

Monitoring Activities: Some of the objectives were identified in the annual heritage program of work and included in the heritage work plans. These included substantial Section 110 and partnership activities, and continued work with Tribes.

Evaluation and Conclusions: Progress was made on many fronts such as numerous Section 110 ("Heritage outreach") activities; the renewal and expansion of the Cost Share Agreement with the Vermont Archaeological Society; site evaluation backlog was addressed tangentially by continuing improvement in the quality of information in the site database ("I-Web"); increased contact with Tribes with vested interests; and historic buildings management including rehabilitation work on the National Register of Historic Places-listed Stratton Mountain Fire Lookout Tower (implemented by long-term partners, the Green Mountain Club).

Recommendations: Continue with these activities and address site evaluation, curation and historic building needs as soon as possible.

Evaluation Question:

Have Heritage Resources across the GMNF been inventoried and protected?

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

Monitoring Driver: Forest Plan Goal 16 and associated Objectives.

Background: There are hundreds of historic period archaeological sites on the GMNF. An accurate and comprehensive inventory of these sites has not been completed, but progress is made annually in small increments. The associated monitoring of these sites' condition over time has been informal.

Monitoring Activities: Specific data regarding the number of heritage acres surveyed, sites monitored, and new sites inventoried were not fully captured during fiscal years 2012 and 2013. Approximately 6,000 acres of broad survey were noted for fiscal year 2012 and 10,000 acres of broad survey were noted for fiscal year 2013, however the amount of intensive field survey was not calculated for fiscal year 2013. Approximately 15 to 20 percent of sites were also noted to have been monitored at the transition between fiscal years 2011 and 2012 due to the impacts of tropical storm Irene, however it is not clear the exact number of sites and in which fiscal years they occurred.

Evaluation and Conclusions: Comparing baseline site condition information (documented on Forest Service site forms) with the observed condition in the field demonstrates that a majority of the sites were in good (or at least unchanged) condition, but that numerous sites also would benefit from on-site vegetation management to mitigate the effects of encroachment.

Recommendations: Continue inventory and monitoring activities and make the monitoring effort more formal and rigorous.

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

Monitoring Driver: Forest Plan Goal 16 and associated Objectives.

Background: Most projects/undertakings on the GMNF have the potential to affect one or more heritage resource sites. Application of Standards and Guidelines (S&Gs), as well as project-specific design criteria or mitigation measures strives to protect these resources from disturbance or damage.

Monitoring Activities: Forest Service archaeologists monitored two projects on the GMNF: 1) Apple Orchard Timber Sale (Manchester Ranger District), and 2) Chandler Ridge Trail (Middlebury Ranger District). The Apple Orchard Timber Sale contained two historic sites which were subject to a "Stewardship Contract" treatment, but otherwise avoided; while the Chandler Ridge Trail (bike trail) contained an area sensitive to the presence for prehistoric sites which was to be buffered from any site re-location. Both site areas were re-located and inspected.

Evaluation and Conclusions: The condition of the sites within the Apple Orchard Timber Sale were as anticipated and, in fact, additional material was exposed and protected by the contractor. The sensitive

area of the Chandler Ridge Trail project was not, in fact, buffered as required, but the resulting re-route through the area did not cause any resource damage.

Recommendations: Continue using and monitoring Forest Plan S&Gs, and supplementing them with project specific design criteria and/or mitigation measures to ensure the preservation of cultural heritage resources. There is a need to re-emphasize to project implementers that site specific project mitigation measures are required protections, not suggestions or guidelines.

Air

Evaluation Question:

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

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

Monitoring Driver: Forest Plan Goal 5 and associated Objectives.

Background: The condition of air quality and the effects of forest management activities on air quality are characterized in the 2006 Forest Plan Final Environmental Impact Statement (FEIS), pages 3-41 to 3-47. To summarize this information:

- Air quality on the GMNF and in Vermont meets federal and state ambient air quality standards for all ambient air quality standards (particulates, carbon monoxide, lead, nitrogen dioxide, ozone and sulfur dioxides).
- Particulate matter in the air has reduced visibility from 111 miles to 60 miles on an average day in southern Vermont. Sulfate particles currently cause over 70 percent of the reduction in visibility. Under natural conditions, sulfates would cause about 10 percent of the visibility reduction.
- Ozone monitors show that Vermont currently meets the 1-hour and 8-hour ozone standards. However, concentrations are at or near the 8-hour standard which is a concern for human health and some forest vegetation.
- When compared to other parts of the country, the levels of atmospheric deposition (primarily sulfates and nitrates) in Vermont are considered low to moderate. Acid deposition is, however, a concern to the GMNF because of the forest's thin acidic soils and watershed with low acid neutralizing capacity.

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

To measure for the visibility AQRV, Forest Service staff maintains an IMPROVE (Interagency Monitoring of Protected Visual Environments) site near the Lye Brook Wilderness. The IMPROVE site consists of an aerosol visibility monitor. 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 the U.S. Environmental Protection Agency (EPA) in 1997 and was

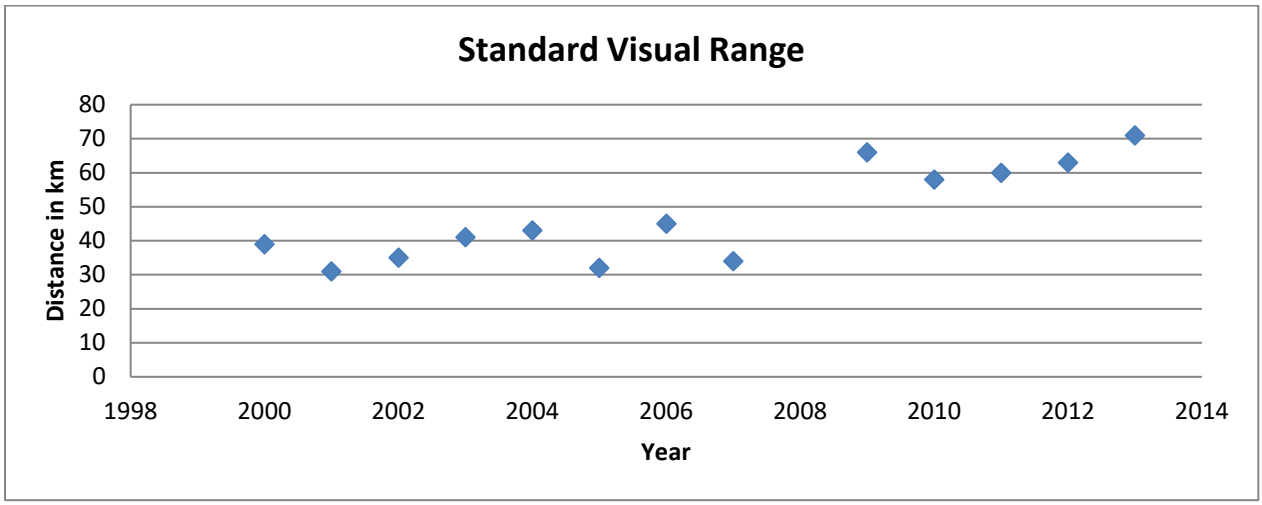
finalized in 1999. Under this rule, all states are required to submit implementation plans for improvement of visibility in Class I areas to the EPA. The Forest Service has focused on reviewing the state implementation plans that have the greatest likelihood of affecting the air quality in the Class I area on the GMNF.

The location of the IMPROVE site was relocated in December 2011. The former site at Little Equinox was no longer a viable option due to reduced reliability of electrical line power to this location. A new shed with IMPROVE equipment was installed on Mount Snow and became operational in December 2011. Mount Snow LTD cooperated and assisted with the installation of this new air quality monitoring shed.

In addition to the aerosol monitoring data from the IMPROVE site being used to document reduced air pollution due to the Clean Air Act, this data is also being used as part of a lichen monitoring study that was completed in the summer of 2013. Nationally, lichen monitoring has proved itself to be very valuable in tracking not only air pollutants, but also showing that there are measurable ecological effects due to air pollution. The concentrations of regulated emissions, such as sulfur and lead, have decreased in lichens in the Lye Brook wilderness area, in agreement with IMPROVE aerosol data. Despite improvements in air quality, preliminary review of the data shows that lichens are still hampered by pollution effects in the Lye Brook wilderness area. This lichen data is currently being reviewed in greater detail.

Evaluation and Conclusions: The IMPROVE site has been in operation since the 1990's. Baseline years for this site are considered to be the years 2000 to 2004, and the first comparison period is 2005 to 2009. Figure 1 shows how standard visual range has improved for the haziest 20 percent days at the Lye Brook wilderness area IMPROVE site. Increased standard visual range is a direct result of less air pollution, or haze, being visible to the human eye.

Figure 1[1]



The primary pollutant causing approximately 75 percent of this reduced standard visual range, or haze, on the 20 percent worst days, during the baseline years, was sulfate. The precursors that lead to these levels

[1] Increased Standard Visual Range, which corresponds directly to reduced levels of haze, at the Lye Brook Wilderness Area IMPROVE site calculated from collected aerosol data from 2000 through 2013. Note that 2008 does not have a corresponding value since data collection that year did not meet the rigorous standard collection requirements.

of sulfate in the atmosphere above Lye Brook Wilderness have been reduced due to federal Clean Air Act requirements.

Recommendations: Continue air quality monitoring on GMNF for the long-term.

Soil

Evaluation Question:

Were Forest Plan Standards and Guidelines (S&Gs) and mitigation measures implemented on selected projects, and to a lesser extent, were they effective in protecting the soil, water and wetland resources? Are soil quality standards met?

Monitoring Question: To what extent are Forest Service management and restoration activities maintaining or improving soil quality?

Monitoring Driver: Forest Plan Goal 3 and associated Objectives.

Background: The condition of soil quality on the GMNF and the effects of forest management activities on soil quality were characterized in the 2006 Forest Plan Final Environmental Impact Statement (FEIS), pages 3-22 to 3-32. To summarize this information:

- The general health of the soil, including soil quality, is good. Good soil quality means soils on the vast majority of acres on the GMNF are stable (not eroding), they have a protective, porous, and nutrient-rich cover of organic matter, and support productive forests.
- Soil health and quality are good due to two primary reasons. First, laws and regulations are followed which protect and enhance the soil resources. Second, only a small percentage of the GMNF is subject to soil-disturbing activities each year. On the vast majority of the GMNF, soil processes proceed unhindered from year to year. For example, over 50 percent of the GMNF is in management areas where no tree harvesting, road construction, recreation development, and other soil-disturbing activities are allowed.
- Small, scattered areas exist where soil quality is not good due to erosion, loss of organic matter, compaction, or slope stability. These areas are usually the result of historical management activities, natural disturbances, or a combination of both. We are continuously working to identify these areas, and where possible, improve soil quality through implementing watershed improvement projects.
- We are concerned about the potential long-term effects of acid deposition, toxins in the soil, and climate change on soil quality. We are not seeing measurable effects on productivity on middle and lower elevations of the GMNF, where nearly all soil-disturbing management activities occur.

Tree harvest activities have a high potential to impact soil, water, and wetland resources so harvesting continues to be the major monitoring emphasis. We are conducting long-term monitoring and cooperating with the Forest Service Northern Research station and academic institutions to continue to look for potential effects on soil/site productivity. Several questions remain about the interactions between forest soil, site productivity, forest health, atmospheric deposition, climate change, and other environmental influences.

Monitoring Activities:

1. *Soil, Water and Riparian Resource Monitoring in Harvest Areas*

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 following harvest), recreation construction and road maintenance projects, and special use permit sites to determine if S&Gs and site-specific project mitigation measures (from environmental analysis documents) were implemented and effective in minimizing soil erosion, stream sedimentation, and impacts to wetlands and water quality. This monitoring also helps determine whether Forest Plan Goals 3 and 4 are met. 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 the Forest Service soil scientist, soil technician, sale administrator, or hydrology technician. The Old Cemetery, Alpaca, and Snow Valley timber sales were monitored in 2012. The monitoring method consisted of a visual inspection of each project site.

2. *Soil Disturbance/Soil Quality Monitoring*

National Soil Quality Standards were abandoned in 2009, when emphasis shifted to implementing Soil Disturbance Monitoring (SDM) protocols to quantify soil disturbance at the local level, and eventually establish new Soil Quality Standards for the GMNF. Soil Disturbance Monitoring quantifies the degree, extent, distribution, and duration of soil disturbance in a project area and was conducted by the Forest soil scientist and her staff in 2012 and 2013. Parameters measured include soil compaction, loss of topsoil, change in soil structure, and presence of erosion. 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. Soil Disturbance Monitoring is also useful in determining whether Goals 3 and 4 of the Forest Plan are being met. This monitoring provides feedback to land managers on the impacts of management activities.

In addition, the Long-term Ecosystem Monitoring Project began in 2008 and was designed to track changes in soils and forest vegetation over 200 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. Soil samples were collected at five sites in 2002, 2007, and 2012. The results of the chemical analysis of the 2012 samples are expected in 2014, but from limited analysis, it appears that it is too early to draw conclusions.

3. *Stream Macroinvertebrate Monitoring*

Each year the Vermont Department of Environmental Conservation (VT DEC), Water Quality Division, Biomonitoring and Aquatic Studies Section conducts macroinvertebrate monitoring in selected streams on the GMNF in order to track long-term trends in biological integrity at fixed ecotype reference reaches called sentinel sites. Based on the monitoring data, each stream's biological integrity is determined by comparing its macroinvertebrate community composition to the statewide database of streams in reference condition. Reports documenting the results of biomonitoring were completed in 2011, 2012, and 2013.

Seven sites located on different streams were monitored in 2011. Four of these sites were chosen to evaluate the effects of past or future harvest activities. In 2012, Bingo and Smith Brooks and Winhall River were monitored as potential sentinel streams/rivers, in addition to three sites (Cardinal Brook, a tributary to Cardinal Brook, and Broad Brook) in the South of Route 9

Integrated Resource Project area to establish baseline conditions before planned management activities in the area. In 2013, Cardinal, Broad, Stamford, and Roaring Brooks in the South of Route 9 Integrated Resource Project area were monitored in addition to the three sentinel sites (Bingo and Smith Brooks, and Winhall River).

Evaluation and Conclusions:

1. *Soil, Water and Riparian Resource Monitoring in Harvest Areas*
   Forest Plan S&Gs and mitigation measures were implemented in the projects monitored and were effective in protecting the resources. The overall impacts to soil, water and wetland resources were small in magnitude, duration and extent. Erosion, stream sedimentation, and wetlands disturbance were rarely observed.

2. *Soil Disturbance/Soil Quality Monitoring*
   Monitoring focused on disturbances related to the harvesting of trees. The Forest Service soil scientist and her staff prepared a report entitled *Soil Disturbance: Bare Soil, Erosion, Compaction and Rutting* dated February 2013. Key findings in the report include:

   - Bare mineral soil was observed at 76 of 1,404 data points, or 5 percent of points. In addition, bare soil was observed for *at least one* data point in 48 percent of timber harvest operations (THOs). Most points with bare soil were on skid trails or haul roads. These features are a necessity for ground-based harvest operations. The effects of bare mineral soil on soil quality and functions are small, due to the limited extent of their occurrence in THOs.
   - No erosion was observed on 96 percent of the points. Of the remaining 4 percent of plots, sheet erosion (1/4 to 2 inches in depth) was observed on 45 points, and rill erosion (less than 6 inches deep) was observed on 12 points. No gully erosion was observed on data points. All data points with erosion were on skid trails. Erosion was most likely due to a lack of proper erosion control structures, skid trail use when the soils were wet, and/or road steep road grades. The effects of soil erosion on soil quality and functions in THOs are small, due to the very limited extent, and because these was no gully erosion.
   - Compaction was observed at 213 of the 1,404 soil data points where 85 percent of points had no compaction, and 15 percent of points had compaction to varying depths. Of the points with compaction, 59 percent had compaction to a maximum depth of 4 inches, 38 percent had compaction at 4 to 12 inches, and 3 percent had compaction at greater than 12 inches deep. Eighty-five percent of points with compaction occurred on skid trails. It is likely that compaction to a maximum depth of 4 inches will dissipate over the next decade, due to surface freezing and thawing, soil wetting and drying, root penetration, and organism activity.

     The extent of compaction was considered reasonable since skid trails are a necessary component of any ground-based harvest operation. However, landings and skid trails should be located and designed so they can be used repeatedly for future harvests to minimize the long-term spatial extent of soil compaction associated with these features.

   - Rutting was observed at 47 of the 1,404 soil data points, or 3 percent of the total points. Of these 47 points, 64 percent had ruts to a maximum depth of 6 inches, 25 precent had ruts from 6 to 12 inches, and 11 percent had ruts 12+ inches deep. Ninety-two percent of the 47 points fell on skid trails, and the soils were usually moist or wet. An important concern is that ruts on any slope, have the potential to form gullies causing erosion with the possibility of sediment reaching streams and other bodies of water. Whenever possible, it is best to smooth out ruts and install waterbars on access roads and trails immediately after use, to reduce the risk of gullying, and help rehabilitate the soil.

- Soil Disturbance Classes (SDC) were identified using a subset of the Soil Disturbance Monitoring protocols developed by the USDA-Forest Service. Disturbance Class 0 represents forested sites in a natural, undisturbed condition; Class 1 has minimal soil disturbance; in Class 2 soil disturbance is common; and Class 3 represents sites with highly disturbed soils. Eighty-five percent of soil data points fell in Class 0, 8 percent were in Class 1, 5 percent in Class 2, and 2 percent in Class 3. The higher levels of soil disturbance, Class 2 and 3, were clearly associated with skid trails where 91 percent of these points were located.

3. *Stream Macroinvertebrate Monitoring*

Highlights from the 2011 VT DEC macroinvertebrate community biometrics monitoring results which were not included in previous monitoring and evaluation reports include:

- Four sites, located on Blue Bank Brook, Blue Bank Brook Tributary #6, Dutton Brook, and Burnt Meadow Brook, were rated excellent.
- One site, located on Smith Brook, was rated very good.
- One site, located on Bingo Brook, was rated good to fair.
- One site, located on Winhall River, was rated fair.

The Winhall River site has been assessed nine times since 1992 and was consistently rated "excellent" for biological condition until 2011, after the flooding brought on by tropical storm Irene, when it was rated "fair." The storm caused catastrophic damage statewide, but especially in southern Vermont. The GMNF suffered extensive damage to roads, streams and riparian corridors. During sampling, the Winhall River was found to be highly scoured, and the banks seriously undercut and eroded. It had been deemed a reference site for streams and is included in the VT DEC's network of sentinel climate change monitoring sites. In 2011, the abundance was very low, decreasing from 2,518 in 2010 organisms to 2011, but the richness and occurrence of *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies) and *Trichoptera* (caddisflies) (EPT) remained high for the stream type. Even following the storm, embeddedness was rated as excellent and little silt was noted in the reach.

The Bingo Brook site rated "good to fair" was affected similarly to the Winhall River site by tropical storm Irene. The reach was rated "excellent" in 2003 and 2004 and subsequently decreased slightly in 2005 and 2009 to "very good" and "very good to good," respectively. In 2010, the macroinvertebrate community improved and was rated as "excellent." In 2011, the abundance was very low, resulting in a "good to fair" rating the lowest rating to date. Richness and EPT remained high; a good sign that full recovery of abundance can be expected. The functional group composition metric was high and showed continued improvement over previous assessments.

Four monitoring sites were located near active harvest areas in 2011: Blue Bank Brook, Blue Bank Brook Tributary #6, Dutton Brook and Burnt Meadow Brook. Even with the intensity of tropical storm Irene, the sites were found to be in "excellent" biological condition in 2011. All silvicultural activities are now concluded near these sites.

Table 2-9 provides the highlights of the 2012 and 2013 (combined) VT DEC macroinvertebrate community biometrics monitoring results.

Table 2-9: Fiscal years 2012 and 2013 macroinvertebrate community biometrics monitoring highlights.

Site Name	Date	Community Assessment
Bingo Brook	10/4/2011	Good to Fair
	10/2/2012	Very Good to Good
	9/17/2013	Excellent to Very Good
Smith Brook	10/11/2011	Very Good to Good
	10/2/2012	Very Good
	9/17/2013	Excellent to Very Good
Cardinal Brook Tributary # 1	9/26/2012	Very Good
Cardinal Brook	9/26/2012	Excellent
	10/1/2013	Excellent
Broad Brook	9/26/2012	Excellent
	10/1/2013	Excellent
Stamford Brook	10/2/2013	Excellent to Very Good
Roaring Brook	10/1/2013	Excellent to Very Good

Important highlights to note:

- Bingo Brook shows continued improvement in 2012 since tropical storm Irene. The storm resulted in significant scouring and decreased macroinvertebrate density.
- Smith Brook shows continued improvement in 2012 since tropical storm Irene, but density levels remain very low and have been since 2010. The occurrence of *Oligochaetes* (worms) dropped more than 4.5 percent between 2011 and 2012 indicating reduced sediment. This stream is still in recovery.
- Cardinal Brook Tributary #1 has a community with fewer sensitive *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies) and *Trichoptera* (caddisflies) (EPT) taxa probably because of the low pH and buffering capacity. *Ephemeroptera* are especially intolerant to low pH.
- Cardinal Brook scores excellent both years, but in 2013 there was a marked decline in density and species richness, reflecting a significant decline in *Diptera* (true flies) and a significant increase in *Ephemeroptera* and *Plecoptera*. The overall numbers of sensitive EPT taxa remained excellent. The cause of the fluctuation in metrics has not been determined yet, but the water quality is very dilute and the springtime low pH and lack of buffering capacity may contribute.
- Broad Brook scores excellent both years and all metrics exceed expectations, indicating a high quality water, low in nutrients with adequate pH levels.
- Stamford Brook scores well, but has low buffering capacity (alkalinity of 5 milligrams/liter) which can be a stressor to sensitive populations.
- Roaring scores well, but the stream is sensitive to acid deposition with an alkalinity of ~ 2 milligrams/liter. Species richness is very good and the EPT taxa dominate the sample. *Baetis tricaudatus* was especially high at over 30 percent of the community. Their presence in high numbers can be an indicator of frequent scour as it is typically a rapid colonizer and is able to recover quickly from a high flow event.

Recommendations:

- *Soil, Water and Riparian Resource Monitoring in Harvest Areas:* Continue similar monitoring in fiscal year 2014.

- *Soil Disturbance/Soil Quality Monitoring:* Continue similar monitoring in fiscal year 2014. Use these monitoring results to finalize soil quality standards for harvest areas.
- *Stream Macroinvertebrate Monitoring.* Continue similar monitoring in fiscal year 2014.

Fish

Evaluation Question:

Are Atlantic salmon populations being maintained and how are salmon parr and smolt production changing over time?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: Since the early 1980s, the Forest Service has been a cooperator in the inter-state, inter-agency effort to restore anadromous (sea-run) Atlantic salmon to historic habitats in the Connecticut River Basin. In 1987, the Forest Service became a formal member of the Technical Committee for the Connecticut River Atlantic Salmon Commission (CRASC). Forest Service fisheries biologists have been conducting salmon restoration activities since that time. One of these important activities is monitoring juvenile (parr and smolt) salmon populations in GMNF streams.

Approximately 15 streams in the White River and West River watersheds are monitored annually. The data are provided to the Connecticut River Atlantic Salmon Commission so an assessment of salmon production throughout the Connecticut River Basin can be made, and if necessary, management changes prescribed. A Forest Service objective is to enhance salmon populations through spawning, stocking, and habitat protection and restoration.

Monitoring Activities: The White River National Fish Hatchery located in Bethel, Vermont was badly damaged by tropical storm Irene in August 2011. This, in turn, had a major impact on the Connecticut River Atlantic Salmon Restoration program, specifically due to the severe reduction in the production of salmon fry. In the spring of 2012, due to the lack of fry availability, Forest Service fisheries staff was only able to stock salmon fry into seven streams. In August of 2012, 15 salmon streams were monitored to determine the survival of those fry stocked in the spring and those stocked in previous years (2010 to 2011). This monitoring was done by electrofishing, which is a standard technique for surveying fish populations. The data collected included basic stream characteristics (water temperature and conductivity); fish species present; and for salmonid species, length and weight of individuals captured. In the spring of 2013, the number of fry available to stock decreased even further, and Forest Service staff stocked 5 GMNF streams. Electrofishing was conducted on seven salmon streams, following the same procedure that was done in previous years.

Evaluation and Conclusions: Forest Service fisheries staff used the electrofishing survey data to complete population summaries for Atlantic salmon in fiscal years 2012 and 2013. The resulting estimated parr densities (number of parr per 100 square meters of habitat) were then used to determine the number of smolts that will migrate to the ocean during the springs of 2013 and 2014 (Table 2-10). For 2013, the estimated smolt densities in seven of the 15 streams surveyed in 2012 were higher than average; these seven streams were in the West River watershed. All the streams (six) in the White River watershed were below their historical averages. Of all streams, Farnum Brook had the highest smolt density. This was the highest density recorded for that stream for all years. The lowest density was in Hancock Branch, which has often had the lowest density recorded in any given year. Although the density results projected

for 2013 appear variable among the streams monitored, all densities fell within the expected range for each stream. Only seven streams were surveyed in 2013, which was the last year of salmon fry stocking. Estimated smolt densities for 2014 ranged from 0.1 to 2.5, and only one site (Robbins Branch) was above average. The West Branch White River was the only stream that had smolt densities below its long-term average and range; the remaining sites were within their respective ranges.

Table 2-10: Estimated Atlantic salmon smolt densities from GMNF streams in 2013 and 2014[1].

Stream	Range	Average	2013 Smolt Density (# per 100 square meter)[2]	2014 Smolt Density (# per 100 square meter)[3]
Burnt Meadow	1.1 – 9.8	4.1	3.6	Not assessed
Farnum	0.5 – 5.5	2.9	5.9	2.5
Flood	0.4 – 7.2	1.2	3.8	Not assessed
Greendale	0.5 – 4.5	1.4	1.8	0.5
Griffith	0.3 – 3.7	1.9	2.1	Not assessed
Jenny Coolidge	0.5 – 6.3	2.6	4.3	Not assessed
Jones	0.6 – 3.6	2.3	3.4	1.6
Mount Tabor	1.0 – 5.9	2.5	4.6	Not assessed
Utley	0.7 – 4.7	1.4	0.7	0.7
Bingo	0.3 – 2.4	0.6	0.6	Not assessed
Brandon	0.3 – 2.8	1.0	0.5	Not assessed
Hancock Branch	0.1 – 1.8	0.5	0.2	Not assessed
Robbins Branch	0.2 – 4.4	1.5	0.7	1.7
Michigan Branch	0.1 – 3.6	0.5	0.4	0.7
West Branch White River	0.3 – 4.9	1.0	0.3	0.1

[1] Estimates of smolts migrating to the ocean are based on 65 percent over-winter parr survival rate
[2] Based on 2012 parr
[3] Based on 2013 parr

Recommendations: Fiscal year 2013 was the last year of salmon fry stocking on the GMNF. Salmon are expected to be present in five GMNF streams through 2015 and possibly 2016. Monitoring of those streams for salmon will continue during the next few years as part of the monitoring for trout populations. Our involvement with salmon restoration in the future will be based on the future of the Connecticut River Atlantic Salmon Restoration program. In the short-term, Forest Service fisheries staff anticipate altering this evaluation question as focus changes to assessment of other fisheries issues and concerns on the GMNF.

Wildlife

Evaluation Question:

Do Indiana and eastern small-footed bats roost, forage, hibernate on the GMNF? Do they need protection or habitat management?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The Indiana bat (*Myotis sodalist*) is federally listed as an endangered species (see Appendix B, Table B-1). The eastern small footed bat (*Myotis leibii*) is listed as a Regional Forester

Sensitive Species (RFSS) dated December 2011 (see Appendix B, Table B-2). Beginning in 2006, populations of cave- and mine-hibernating bats in the northeastern United States experienced unprecedented mortality due to a disease condition identified as "white-nose syndrome" (WNS). As a consequence of WNS, little brown bats in Vermont declined by 75 to 99 percent, and northern long-eared bats declined by 93 to 99 percent state-wide. Indiana bats, eastern small-footed bats, and tri-colored bats also are susceptible and vulnerable to WNS, but these species have never been abundant or wide-spread in Vermont and documenting declines in abundance for these species is difficult. The little brown bat (*Myotis lucifugus*) and tri-colored bat (*Perimyotis subflavus*) are also listed as RFSS.

Monitoring Activities: Forest Service staff conducted vehicle-based acoustic surveys for bats along eight survey routes, each 25 to 30 miles in length. During fiscal year 2012, Forest Service staff also conducted site-specific acoustic surveys at 15 locations on the Manchester Ranger District specifically focused on northern long-eared bats. The Forest Service continued working cooperatively with state and federal agencies in monitoring and surveying bats on lands on and adjacent to the GMNF to gain a better understanding of bat movements and activities on National Forest System lands. The Vermont Fish and Wildlife Department is the lead agency for bat surveys and monitoring in Vermont.

Evaluation and Conclusions: No further evaluations or conclusions were made as the result of monitoring during fiscal years 2012 and 2013. The data were consistent with previous information gathered on and near the western boundaries of the GMNF.

Recommendations: Continue to participate in woodland bat survey and monitoring. Design monitoring efforts to better understand how, and where, woodland bats and the federally endangered Indiana bat use the Vermont landscape.

Evaluation Question:

Do gray wolves, eastern cougars, or Canada lynx occur on or near the GMNF?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The gray wolf (*Canis lupus*) and eastern cougar, or mountain lion (*Puma concolor couguar*) are federally listed endangered species, and the Canada lynx (*Lynx canadensis*) is federally listed as threatened (see Appendix B, Table B-1). There are only historical occurrence records for gray wolf, eastern cougar, and Canada lynx on the GMNF. These species are not known to occur on NFS lands and their presence as viable populations is unlikely in the foreseeable future.

Monitoring Activities: None

Evaluation and Conclusions: Not applicable

Recommendations: Not applicable

Evaluation Question:

Do we have bald eagles on/near the GMNF? Are they nesting? Are they nesting successfully? Do they need site-specific protection or habitat management?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The bald eagle (*Haliaeetus leucocephalus*) is listed as a Regional Forester Sensitive Species dated December 2011 (see Appendix B, Table B-2). Prior to 2006, there were no nesting bald eagles in Vermont. The greatest potential for nesting occurs in the Lake Champlain and Connecticut River valleys. In 2004 a group of partners including the USDI Fish and Wildlife Service, Vermont Fish and Wildlife Department and others began hacking young eagles at the Dead Creek Wildlife Management Area in the Champlain Valley. In 2006 a pair of bald eagles was confirmed nesters in the Connecticut River Valley. Since that time, bald eagles have successfully nested on several occasions in the Lake Champlain and Connecticut River valleys. Although bald eagles occasionally occur withing the boundaries of the GMNF, the Forest Service has no evidence suggesting that bald eagles have attempted nesting on NFS lands.

Monitoring Activities: Although the Forest Service did not conduct any surveys specifically targeting bald eagles in during fiscal years 2012 and 2013, there were several reported sightings of bald eagles on or immediately adjacent to the GMNF. It continues to appear as if the sightings are of transient birds, not nesting adults.

Evaluation and Conclusions: Given the visibility of the bald eagle to the general public and to agencies tasked with tracking populations of this species, it is likely that Forest Service staff will be made fully aware of any nesting eagles located on the GMNF. If and when this happens, a more site-specific analysis of the management guidelines for the area hosting the nesting pair would need to be evaluated.

Recommendations: No changes needed.

Evaluation Question:

What is the population trend of Bicknell's thrush on the GMNF and adjacent lands?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The Bicknell's thrush (*Catharus bicknelli*) is listed as a Regional Forester Sensitive Species dated December 2011 (see Appendix B, Table B-2). In the northeastern U. S. and southeastern Canada, Bicknell's thrush occupies a very restricted and fragmented breeding range in high-elevation (primarily above 3,000 feet), dense and stunted, spruce-fir forest (Krummholz) habitats, including several locations on the GMNF. Bicknell's thrush currently is recognized as one of the most at-risk passerine birds in eastern North America, largely due to loss of winter habitat in the Caribbean. Other threats to the species include loss of breeding grounds habitat from development of high-elevation areas for recreation and commercial uses, acid rain and other atmospheric deposition, and global climate change. Surveys

coordinated by the Vermont Center for Ecostudies (VCE) monitor the species' presence at numerous locations in the Northeast, including several sites on the GMNF.

Monitoring Activities: The primary monitoring program for Bicknell's thrush on the breeding grounds is "Mountain Birdwatch," which is organized and administered by VCE. Each year, Forest Service biologists and technicians cooperate with VCE conducting two Mountain Birdwatch surveys on Killington Peak. Volunteers conduct surveys on other peaks on or adjacent to NFS lands.

Evaluation and Conclusions: Populations of Bicknell's thrush continue to decline in the United States and on the GMNF. Current survey protocols are adequate in assessing the occurrence of nesting populations on the GMNF, and in conjunction with the wider effort of VCE population trends across the region are being tracked. The Conservation Strategy completed in fiscal year 2006 is invaluable in the guidance of management activities toward the protection and enhancement of Bicknell's thrush habitat.

Recommendations: Continue to assess specific project proposals in potential Bicknell's thrush habitat and assist VCE in their monitoring of known habitat on the GMNF.

Evaluation Question:

Do we have common loons on/near the GMNF? Are they nesting? Are they nesting successfully? Do they need protection or habitat management?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The common loon (*Gavia immer*) is listed as a Regional Forester Sensitive Species dated December 2011 (see Appendix B, Table B-2). The common loon population in Vermont has increased from a low of only seven known nesting pairs in 1983 to 70 nesting pairs in 2012, and 81 nesting pairs in 2013. Only a small portion of GMNF lakes and ponds are large enough to provide suitable nesting habitat for loons.

Monitoring Activities: The primary monitoring program for common loons in Vermont is "LoonWatch," a "citizen-science" program organized and administered by the Vermont Center for Ecostudies (VCE). Forest Service staff relies on monitoring efforts and results from LoonWatch and supports these efforts by participating in surveys at several various GMNF lakes and ponds. The annual effort includes about 200 volunteers surveying about 160 lakes and ponds.

Evaluation and Conclusions: Loon populations have been on an upward trend in part due to increased awareness, and site-specific protections throughout Vermont and the GMNF.

Recommendations: Continue to provide support to the Vermont Loonwatch program, and act on any recommendations they deem appropriate at site-specific locations on the GMNF.

Evaluation Question:

What are the population trends of wood turtle, Jefferson salamander, blue-spotted salamander, and four-toed salamander on the GMNF and adjacent lands? Do they need protection or habitat management?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The wood turtle (*Glyptemys insculpta*), Jefferson salamander (*Ambystoma jeffersonianum*), blue-spotted salamander (*Ambystoma laterale*), and four-toed salamander (*Hemidactylium scutatum*) are listed as Regional Forester Sensitive Species dated December 2011 (see Appendix B, Table B-2) that occur or could occur on portions of the GMNF. Monitoring activities for these species are conducted and archived primarily through the Vermont Reptile and Amphibian Atlas Project, which collects and disseminates data needed to make informed recommendations regarding the state status, state rank, and conservation of Vermont's reptiles and amphibians. The data gathered for this atlas is collected with the help of volunteers, collaborations with conservation organizations, and staff members from Middlebury College.

Monitoring Activities: The Forest Service did not conduct any surveys specifically targeting these herptile species during fiscal years 2012 and 2013. Forest Service staff did conduct annual stream inventories and continue to report sightings of these species. Forest Service staff also conducted informal surveys for herptiles and other species of interest in areas where management activities have been proposed as a priority.

Evaluation and Conclusions: At this point there is little information to evaluate. The Vermont Reptile and Amphibian Atlas shows that the wood turtle, Jefferson salamander, blue-spotted salamander, and four-toed salamander are generally located on the periphery of the GMNF at lower elevations.

Recommendations: Continue to survey and monitor sites for these species and increase the number of sites monitored each year as time and funds allow.

Evaluation Question:

What is the population trend of peregrine falcons on the GMNF and adjacent lands?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The peregrine falcon (*Falco peregrinus anatum*) is listed as a Regional Forester Sensitive Species dated December 2011 (see Appendix B, Table B-2). The peregrine falcon was extirpated in the eastern United States by the mid-1960s, primarily as a consequence of broad application of the pesticide DDT. From 1982 to 1987, 93 young falcons were released at 3 hack sites in Vermont: Mount Horrid, Marshfield Mountain, and White Rocks. In 1984, a territorial falcon pair reoccupied the cliffs of Mount Pisgah and returned the following year to nest successfully. Vermont's breeding population has since increased steadily, paralleling similar trends throughout much of the eastern United States. The peregrine falcon was removed from the federal endangered species list in 1999. In Spring 2005, the peregrine falcon was officially removed from the Vermont list of threatened and endangered species but remains on

the Regional Forester Sensitive Species list for the GMNF. From 2008 through 2013, there were 30 to 40 breeding pairs of peregrine falcons in Vermont. Audubon Vermont coordinates peregrine falcon monitoring and management efforts in partnership with the Vermont Fish and Wildlife Department, private and public landowners, and citizen scientists.

Monitoring Activities: Forest Service staff continues to monitor and protect peregrine falcon nest sites annually in collaboration with Audubon Vermont. Forest Service staff and volunteers surveyed and monitored five sites on the GMNF during fiscal years 2012 and 2013, and collaborated with volunteers and Audubon Vermont for monitoring additional sites adjacent to NFS lands. Forest Service staff continues to monitor the species and populations to assist in the state-wide and national efforts, and to assess the adequacy of Forest Plan guidance and the need for any additional protective measures.

Evaluation and Conclusions: Forest Service staff and volunteers identified territorial pairs, including pairs successfully fledging young. Population trends on the GMNF are consistent with the statewide trends.

Recommendations: Continue monitoring activities in coordination with efforts led by Audubon Vermont and provide protective mitigations where they are warranted.

Evaluation Question:

Do *odonate and lepidopteran*, listed as a Reginal Forester Sensitive Species, occur on the GMNF? What type of habitats do they occur in? Where on the Forest do they occur? Do they need protection or habitat management?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The Regional Forester Sensitive Species (RFSS) list was updated in December 2011 (see Appendix B, Table B-2). At the time of Forest Plan revision, available information suggested that the West Virginia white (*Pieris virginiensis*) is the only *lepidopteran* RFSS that could occur on the GMNF. The Vermont Center for Ecostudies (VCE) sponsored a Vermont butterfly survey during 2002 to 2007, maintaining results online. Survey results confirm that the West Virginia white likely occurs on the GMNF. Similarly, available information suggested that three *odonate* RFSS (dragonflies) could also occur on the GMNF: gray petaltail (*Tachopteryx thoreyi*), southern pygmy clubtail (*Lanthus vernalis*), and forcipate emerald (*Somatochlora forcipate*). The Vermont Nongame and Natural Heritage Program (VNNHP) does not keep records of its *odonate* species and additional distribution, and abundance data are not available.

Monitoring Activities: The Forest Service did not conduct any surveys specifically targeting these *lepidopteran* and *odonate* species during the last five years. There has been no organized monitoring or surveying by Forest Service partners other than the 2002 to 2007 Vermont Butterfly Survey coordinated by VCE.

Evaluation and Conclusions: Although no population or distribution data are available for RFSS *odonates*, each of these species occurs in riparian or wetland habitats. Forest Plan S&Gs are in place and require careful consideration of any activities that occur in these areas. Water quality has been increasing on the GMNF as evidenced by the fish and stream resource monitoring programs. The Forest Plan has

increased the protections of forested wetlands and seasonal pools, considered to be *odonate* prime habitat. As information becomes available about the abundance and distribution of the West Virginia white, Forest Service staff will incorporate that information into the analysis of management actions.

Recommendations: Continue to monitor and document reports of species and sightings. Encourage Forest Service biological staff to become more familiar with *odonate* and *lepidopteron* species.

Evaluation Question:

What are habitat trends for management indicator species? To what extent is Forest Service management accomplishing desired distribution of age class and habitat type as desired and outlined in Forest Plan objectives?

Monitoring Question: To what extent are forest management activities providing habitat for MIS?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: Management Indicator Species (MIS) are vertebrate or invertebrate species selected for monitoring habitat conditions on the GMNF because their population changes are believed to indicate the effects of management activities (36 CFR 219.19(a)(1)). In general, MIS focus on habitats subject to active structural manipulation, such as creation of temporary openings, regeneration of aspen or oak stands, or enhancement of riparian habitat. Habitat changes that take place through natural processes, like progression through the various seral stages of early successional habitat, will be assessed through the monitoring and evaluation program. Table 2-11 provides the MIS and associated habitat type as provided in the Forest Plan, Appendix C.

Table 2-11: Management Indicator Species linked habitat types.

Major issue or habitat	Management Indicator Species
Deer wintering habitat	White-tailed deer
Early successional habitat	American woodcock
Aspen-birch	Ruffed grouse
Oak-pine	Gray squirrel
Aquatic-riparian habitat	Brook trout

The Forest Plan strategy for conserving MIS consists of management direction including objectives for maintaining or improving MIS habitat. Monitoring will focus on the relationship between habitats provided on NFS lands and MIS population trends to the extent practicable in cooperation with the Vermont Fish and Wildlife Department. Population trends may be determined by a variety of methods considering best available science, including, but not limited to, data and analysis relating to habitat. The Forest Plan does not require MIS population monitoring.

Monitoring Activities: Forest Service staff continued working cooperatively with local volunteers, conservation organizations, and state and federal agencies to gather data for GMNF management indicator species following nationally accepted protocols particularly American woodcock, ruffed grouse, and brook trout. Forest Service biologists continue to provide guidance regarding opportunities to increase vegetative, age class, and structural diversity in conjunction with other projects on the GMNF.

Evaluation and Conclusions: Survey and monitoring protocols are effective; in that they are easy to follow, and they can and do provide information that can be duplicated each year. Monitoring protocols

however are limited in the amount of data they can provide, and results must be used in conjunction with other information gathered at state-wide and regional levels. Due to small sample sizes and other limitations associated with management indicator species data, statistically significant trends are very difficult to detect for the GMNF.

Recommendations: Continue to increase monitoring, evaluation, and partnerships with the goal of obtaining more and greater reliability of management indicator species population data.

Evaluation Question:

What are population trends of management indicator species (MIS)? To what extent are MIS responding to Forest Service management of suitable habitat?

Monitoring Question: To what extent are forest management activities providing habitat for MIS?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: Forest Service staff began monitoring indicator species in 1987. Collection of population data has been facilitated through the efforts of the local universities, Vermont Fish and Wildlife Department, and numerous volunteer groups and individuals. While it has proven difficult to consistently collect annual population data due to a variety of factors such as weather, staffing, and funding, Forest Service staff consistently collects some annual information about each of the management indicator species. This is especially true for American woodcock, ruffed grouse, and brook trout.

Monitoring Activities: Forest Service staff continued working cooperatively with local volunteers, conservation organizations, and state and federal agencies to gather data for GMNF management indicator species following nationally accepted protocols particularly for American woodcock, ruffed grouse, and brook trout. Forest Service biologists continue to provide guidance regarding opportunities to increase vegetative, age class, and structural diversity in conjunction with other projects on the GMNF. This guidance is outlined in the Forest Plan and is transferred to each project's analysis area based upon the unique characteristics of the site and the opportunities each site provides.

Evaluation and Conclusions: Management indicator species survey data have been collected since the mid-1980's. Survey data was compiled and assessed in fiscal year 2001 to detect trends. Survey and monitoring protocols are effective in that they are easy to follow, and they can and do provide information that can be duplicated each year. Monitoring protocols, however, are limited in the amount of data they can provide, and results must be used in conjunction with other information gathered at state-wide and regional levels. The fundamental nature of management indicator species data, however, severely restrict the ability to draw robust or meaningful conclusions about the status or trends in their populations.

Recommendations: Continue to increase monitoring, evaluation, and partnerships with the goal of obtaining more and greater reliability of management indicator species population data.

Evaluation Question:

What differences exist between wildlife use of more or less remote areas of the GMNF? Within the remote areas, what differences exist between wildlife use of areas that undergo or prohibit habitat management?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: This question was established to quantify the establishment of the Remote Wildlife Habitat Management Area and also the proposal to add additional wilderness areas on the GMNF during Forest Plan revision. The first habitat-management activities proposed to take place in the Remote Wildlife Habitat Management Area are included in the *Dorset Peru Integrated Resource Project* (Decision Notice and Finding of No Significant Impact signed in February 2013). The first on-the-ground actions in the Remote Wildlife Habitat Management Area may take place in fiscal year 2015.

Monitoring Activities: There has been no specific monitoring focused on wildlife in remote areas, although a variety of monitoring efforts for some species do take place in remote areas, including Bicknell's thrush, common loons, and peregrine falcons.

Evaluation and Conclusions: At this time, no data are available to assess differences in habitat use in more or less remote habitats on the GMNF.

Recommendations: Increase monitoring, evaluation, and partnerships with the goal of obtaining more and greater reliability of remote wildlife habitat and population data.

Evaluation Question:

Are we retaining the best individual trees and snags? How do they persist/improve/degrade over time? How well did retained future trees and snags develop over time?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The Forest Plan contains objectives, and standards and guidelines for retention of wildlife reserve trees which include roost, nest, and den trees; cavity trees; snags; and fruit- or mast-producing trees and shrubs. Wildlife reserve trees also include patches of uncut trees retained within areas where harvest reduces basal area of the stand below 30 square feet per acre. Wildlife reserve trees are important for increasing the complexity of habitat structure, which, in turn, supports increased diversity of wildlife species.

Monitoring Activities: Conditions and requirements for the retention of appropriate numbers and distribution of wildlife reserve trees are included in timber marking guides for each individual timber sale. Forest Service staff verify these conditions are being met throughout the sale administration process. The Forest Service has not conducted any surveys specifically investigating the persistence, improvement, or degradation of wildlife reserve trees over time, or how well suitable wildlife trees or snags develop over

time. Informal observation suggests that suitable wildlife trees are abundant and well distributed across the GMNF.

Evaluation and Conclusions: Informal observation suggests that suitable wildlife reserve trees are abundant and well distributed across the GMNF.

Recommendations: Continue current policy for marking guides and sale administration regarding wildlife reserve trees.

Botanical Resources

Evaluation Question:

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The Regional Forester Sensitive Species (RFSS) list was updated in December 2011. Sensitive plant species tracked by Forest Service staff have been monitored periodically by the Forest Service, the Vermont Nongame and Natural Heritage Program (VNNHP), and volunteers, including those sponsored by the New England Plant Conservation Program (NEPCoP) and the New England Wildflower Society (NEWFS).

Currently, there are 88 vascular plants and 18 non-vascular plants on the GMNF listed as RFSS (see Appendix B, Table B-2). While VNNHP has a national database that records information about populations they track, and it includes most of the plants considered RFSS, they are no longer funded to enter data from rare plant populations on NFS lands. In 2007, the Forest Service introduced its own database, NRIS (Natural Resource Information System) TES (Threatened, Endangered, or Sensitive) Plants and Invasive Species for tracking all plant data gathered as result of inventory and monitoring activities, and it is now the place where all botanical data is entered. The VNNHP database and NRIS both store population data such as numbers of plants, their condition, flowering/fruiting, any management concerns or issues, and a general rank of the occurrence from A (excellent estimated viability) to D (poor estimated viability). In addition, NEPCoP monitors plant populations that have been identified at risk in New England, including several on the GMNF, and maintains a database of monitoring actions and needs. Coordination between NEPCoP and Forest Service staff continues to improve and reduce duplication of efforts.

Monitoring Activities: Forest Service staff continue to track sensitive plant listed as Regional Forester Sensitive Species (RFSS) and are discussed in the next monitoring element regarding non-native invasive plants. Monitoring protocols are consistent with USDA Forest Service Natural Resources Information System (NRIS) corporate database. Potential effects and mitigating measures needed to protect RFSS listed plant species are included in project specific environmental analysis documents.

Evaluation and Conclusions: None noted during the fiscal years 2012 and 2013 monitoring period.

Recommendations: Continue monitoring RFSS listed plants following Forest Service survey and monitoring protocol. There is still a need to continue developing a rare plant data monitoring form that works well for both the Vermont Nongame and Natural Heritage Program and the Forest Service.

Evaluation Question:

To what extent are non-native invasive species impacting other Forest resources?

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Background: The impact of non-native invasive plants (NNIP) has been monitored by surveying the extent of infestations in areas or sources of seeds or plant propagules that could be dispersed to areas considered important to protect. It also includes the results of treatment efforts, and in the future may include determinations of invasiveness. Up until 2011, monitoring efforts focused on surveying the extent of infestations in preparation for developing proposed invasive plant treatments across the GMNF. That effort led to the completion of the *Forest-Wide Non-Native Invasive Plant Control Project* environmental assessment and decision dated October 2011 authorizing various NNIP treatments methods as infestations are identified. Monitoring treatment effectiveness is an important aspect of the adaptive management approach included in the invasive plant control project.

Forest Service staff, contractors, interns, and volunteers have surveyed the extent of infestations along many trails, skid roads, and at trailheads, parking lots, and developed recreation sites (all are potential sources of seeds or other plant propagules for dispersal), as well as Special Areas, candidate Natural Research Areas, known TES (Threatened, Endangered, and Sensitive) species sites, along the main stems of the Batten Kill and White River and their tributaries, and in project sites. With the exception of riparian areas, roadsides, trailheads and parking lots, most sites surveyed have had few or no infestations of NNIP, and many infestations are small and isolated. Some species that were not expected to occur on the GMNF (because of high elevation or relatively low disturbance) have been found there. Riparian areas, especially the main stems of major rivers, are often found to have extensive NNIP infestations, especially Japanese knotweed. Roadsides, especially in the Upper White River valley, are heavily infested with wild chervil. All high elevation ponds have been surveyed for aquatic NNIP with negative results. Lower elevation ponds, such as Lefferts Pond, have infestations of purple loosestrife along their banks. In general, surveys of natural communities have focused on edges of habitats rather than interiors, such as woodland edge rather than deep into the woods, because edges tend to be more susceptible to infestation and are easier to access for surveys. Results of edge surveys can then suggest where to focus future surveys of habitat interiors.

Monitoring Activities: All data gathered during fiscal years 2012 and 2013 used the USDA Forest Service Natural Resources Information System (NRIS) protocol and has been recorded in the NRIS corporate database. All monitoring was completed between mid-May and late September.

Fiscal Year 2012

The following monitoring and related activities were completed:

- Forested stands within the South of Route 9 Integrated Resource Project area that were surveyed for rare plants were also surveyed for NNIP species.
- Wildlife openings that were proposed for maintenance were reviewed for NNIP species.

- Wild chervil that was reported from the Natural Turnpike Integrated Resource Project area in previous years was monitored again followed by a joint staff/volunteer day to hand-pull these plants along Forest Road 54.
- A cooperative weed management area (CWMA) in the Upper White River sub-watershed that was initiated in 2008 and has had a formal memorandum of understanding since 2010 had a paid coordinator who facilitated ongoing monitoring and collaborative control efforts. A University of Vermont lands crew monitored NNIP on over 20 roads and trails in this sub-watershed. This post-tropical storm Irene monitoring occurred to assess whether flood waters had moved NNIP species.
- Wild chervil control done previously along Forest Road 101 in the Upper White River Integrated Resource Project area was monitored.
- Sites for 62 populations of plants on the Regional Forester Sensitive Species (RFSS) list were monitored for NNIP species. An additional 29 populations of rare non-RFSS, on or near the GMNF, were also monitored for NNIP species.
- All RFSS populations in locations likely affected by tropical storm Irene were monitored along with NNIP species.
- Monitoring of treatment sites occurred to evaluate treatment efficacy.

Fiscal Year 2013

The following monitoring and related activities were completed:

- NNIP surveys of forested stands within the South of Route 9 Integrated Resource Project area continued.
- NNIP surveys of wildlife openings that were proposed for maintenance continued. A contract was awarded for monitoring 36 other wildlife openings across the Forest, recording NNIP species and rare plants.
- Twenty-two wildlife openings along the Appalachian Trail east of Route 4 were monitored for NNIP species and rare plants through a contract administered by the Appalachian Trail Conference.
- Wild chervil that was reported from the Natural Turnpike Integrated Resource Project area in previous years was monitored again followed by a joint staff/volunteer day to hand-pull these plants along Forest Road 54.
- Wild chervil control done previously along Forest Road 101 was monitored again followed by manual control.
- The cooperative weed management area (CWMA) in the Upper White River sub-watershed had a paid coordinator again who facilitated ongoing monitoring and collaborative control efforts.
- Sites for 47 populations of rare plants (Regional Forester Sensitive Species or other rare categories) were monitored for NNIP species. Seven high elevation ponds were also monitored for both rare plants and NNIP species. Monitoring was completed by Forest staff and volunteers.
- Monitoring of treatment sites occurred to evaluate treatment efficacy.

Evaluation and Conclusions: While monitoring during fiscal years 2012 and 2013 indicated the extent of NNIP infestations, Forest Service staff does not currently have a means of measuring the effect of NNIP species on other resources, nor do they usually have measurements of the same infestations over time indicating the level of species invasiveness. Monitoring protocols were otherwise efficient and easy to use. Monitoring treatment sites for efficacy illustrated that 1) many infestations will need more than

one year of treatment to be effective, and 2) better infestation data is needed for more efficient location of infestations to be treated, and more efficient monitoring.

Fiscal Year 2012

- Sixteen species of NNIP species were found in the South of Route 9 project area. Although forest edges are more infested than forest interiors, many forested stands are infested, as well. This suggests the potential for NNIP species to have an impact on forested resources in this area.
- Of the 146 wildlife openings proposed for maintenance, 20 openings (greater than 15 percent of the total) have infestations either in them or along access routes to them. In most cases, the infestations consist of more than one species.
- Repeat monitoring of wild chervil in the Natural Turnpike project area suggests that the infestation was still present. Given that it was well-established when first discovered in fiscal year 2007, it is not surprising that there would be a substantial seed bank contributing to its regrowth each year for a few years. Another volunteer wild chervil pulling event was held resulting in removal of wild chervil from over three miles of roadside.
- In the Upper White River project area, Forest Road 101 was determined to have a persistent infestation of wild chervil, most likely for the same reasons described for the Natural Turnpike project area. Manual removal was again accomplished by hand crews.
- Monitoring of roads and trails in the Upper White River CWMA area resulted in many more infestations being found than were thought to occur there; the most common species newly discovered was wild chervil. Monitoring of sites flooded during tropical storm Irene suggest that Japanese knotweed was one of the main NNIP species dispersed by the storm, especially in the valley bottom.
- Of the 91 total rare plant populations monitored, the majority was free of NNIP species, but a few have infestations at or nearby their sites; some infestations were tiny (one to a few stems) and were immediately hand-pulled. Within the South of Route 9 project area, however, there is a noticeable overlap between NNIP species and rare plants.

Fiscal Year 2013

- Thirty-three new infestations (of the same 16 species reported in fiscal year 2012) were documented in the South of Route 9 project area, although most were along edges and not quite on NFS lands. Monitoring continues to suggest the potential for NNIP species to have an impact on forested resources in this area.
- Preliminary results for the 36 wildlife openings proposed for maintenance indicate that several have some infestations of NNIP species.
- Of the 22 openings along the Appalachian Trail, 19 were infested with NNIP species. Most had infestations of more than one species, and the most common species were shrubby species like Morrow honeysuckle and common buckthorn.
- Of the 47 rare plant populations monitored, the majority were free of NNIP species, but a few have infestations at or nearby their sites; some infestations were tiny (one to a few stems) and were immediately hand-pulled. At the high elevation ponds that were monitored for rare plants and NNIP species, no aquatic NNIP species were found, but some terrestrial NNIP species were found along access routes.

Recommendations: The majority of the improvement recommendations documented in previous monitoring and evaluation reports are still recommended which is not unexpected given the persistence of NNIP species infestations once they are established. These recommendations are listed as follows:

- Continue monitoring for NNIP species in designated wilderness areas. Because they are minimally infested, infestations should be treated immediately so that they do not increase in size or spread to adjacent areas. Infestations on adjacent private land should be brought to the attention of the landowner, with the goal of a cooperative effort to control them. These small infestations are excellent places where early detection, if followed by rapid response, may result in complete control of infestations.
- Continue monitoring for NNIP species in proposed site-specific project areas. For any infestations found, NNIP species management plans should be developed. At this time, many small projects do not have field review, and efforts are focused more on NNIP species prevention.
- Continue annual wild chervil control, followed by monitoring on Forest Road 54. This may help prevent its spread in the Natural Turnpike project area and may also help protect nearby populations of the rare plant, Appalachian Jacob's ladder.
- Continue the coordinator for the Upper White River CWMA to facilitate monitoring and control of NNIP infestations.
- Continue to incorporate NNIP infestation surveys together with rare plant monitoring. Where NNIP species are found, these sites should be prioritized for treatment to prevent competition with the rare plant population.
- Conduct additional monitoring for NNIP species at ski areas; once all infestations are mapped, each ski area should work cooperatively with Forest Service staff to develop an overall NNIP infestation management plan.
- Continue implementation NNIP control using methods authorized by the Forest-Wide Non-Native Invasive Plant Control Project decision. IDIQ contracts should be developed to facilitate more efficient NNIP treatment contracts.

Timber

Evaluation Question:

Are lands adequately restocked according to stocking surveys?

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

Monitoring Driver: The National Forest Management Act requires that suitable timberlands are adequately restocked following harvest.

Background: The National Forest Management Act (NFMA) of 1976 requires all stand regeneration harvest activities on suitable timberlands that create forest openings be quickly reforested. For the GMNF, this requires that any harvest activity effectively beginning stand-origination is reforested within five years of the harvest event. This monitoring item helps to determine if the Forest Service is meeting the requirements of NFMA.

Monitoring Activities:

For natural regeneration survival examinations, all sampled sites were at least minimally stocked with acceptable seedlings or saplings to be considered moving towards reforestation certification. All stands receiving these plot samples have had even-aged and/or uneven-aged regeneration harvests. Restocking sampling work involves visiting harvested stands and observing the new regeneration using numerous 1/700 and 1/100 acre sized circular plots to count seedlings and saplings. A plot is considered stocked if at least one acceptable tree seedling or sapling occurs in it. The plot data is summed, and a percent of total stocking is determined for each stand.

Fiscal Year 2012

Forest Service staff completed 800 acres of first- and third-year evaluation (stocking) surveys in stands regenerated by harvest.

In first-year surveys, the new seedlings and saplings are developing as expected. Final third-year evaluation surveys were completed for recently harvested sites on the Manchester and Middlebury Ranger Districts and the results were reported in the FACTS data base. All units are fully stocked with new trees.

Fiscal Year 2013

Forest Service staff completed 169 acres of first-year evaluation (stocking) surveys in stands regenerated by harvest. The new seedlings and saplings are developing as expected. Final third-year evaluation surveys were completed on 241 acres for recently harvested sites on the Manchester and Middlebury Ranger Districts and the results were reported in the FACTS data base. All units are fully stocked with new trees.

Evaluation and Conclusions: Review of evaluation surveys completed in fiscal years 2006 to 2012 indicates that reforestation efforts underway continue to be sufficient to meet stocking certification for all units within the required timeframes. Monitoring protocols have been rigorously tested, certifications of successful reforestation have requisites, and procedures are detailed in the 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.

Recommendations: This monitoring item is on track and the results are not surprising for northern New England forests, where naturally regenerating stands are the norm. Continue to conduct first, third, and if necessary fifth year plantation survival evaluations to determine if survival and growth, especially of planted stock, is adequate following reforestation efforts and that adequate reforestation has been achieved on all other units of regeneration harvesting.

Special Forest Products

Evaluation Question:

How many and what special forest products (SFPs) do people gather? How many require permits, and how many permits were issued annually, for which products/species? How many requests for permits were denied? How many SFPs are being evaluated for permit requirement?

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

Monitoring Driver: Forest Plan Goal 8 and associated Objectives.

Background: The Forest Service currently issues permits for gathering of the following special forest products on the GMNF: maple sap, Christmas trees, boughs, saplings, seedlings, dead/down wood, miscellaneous sawtimber/pulp, and firewood.

Monitoring Activities: Currently, Forest Service staff monitors the quantity and type of Special Forest Products (SFPs) that had permits issued for gathering. In addition, the Forest Health Protection Program of the Forest Service's State and Private Forestry branch regularly monitors maple tapping areas to evaluate the health of maple trees and to determine if any adjustments to, or suspensions of, operations

are required. Table 2-12 provides SFPs issued for a variety of products during fiscal years 2012 and 2013. There were 568 and 643 permits issued in fiscal years 2012 and 2013, respectively.

Table 2-12: Fiscal years 2012 and 2013 Special Forest Product Permits

Product	Quantity Fiscal Year 2012	Quantity Fiscal Year 2013
Maple sap	6,027 taps	6,120 taps
Firewood	320 cords	358 cords
Christmas trees	432 trees	483 trees
Boughs	1 ton	0
Seedlings	0	0
Saplings	0	0
Miscellaneous	0	0
Fungi	200 pounds	400 pounds

Fiscal Year 2012

Maple Tapping: Forest Service staff monitored maple sap permit areas during the sugaring season in 2012, and no compliance issues were noted. Forest Health Protection (FHP) staff visited six maple sap permit areas to assess any impacts of tapping. 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. Forest Health Protection staff detected no significant incidence of forest pests at the sites, although pear thrips was evident at two sites and anthracnose was evident at all sites. Abiotic stressors, mainly storm events, were the major stressors in 2012 at these sites. The researchers suggested that monitoring of pear thrips may be beneficial, and that all of the sites should be available for tapping in fiscal year 2013.

Fiscal Year 2013

Maple Tapping: Forest Service staff monitored maple sap permit areas, and no compliance issues were noted. As in Forest Health Protection staff visited six maple sap permit areas to assess any impacts of tapping. Overall, the sugarbush areas continue to be 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. One measurement, taphole closure, is low at one site and will be monitored closely to see if it reflects a trend. Forest Health Protection staff detected no significant incidence of forest pests at the sites, including pear thrips which were noticeable in 2012. Forest tent caterpillar larval activity has not been detected for several years, and adult presence is at low levels. Although the year was generally wet from May through July, foliar disease levels were low. Saddled prominent, a native defoliator, was active in 2013, but not present at any of the sugarbushes. Abiotic stressors, mainly storm events, were the major stressors in 2013 at these sites. The researchers and others with the State of Vermont will deploy pheromone traps for saddled prominent in 2014, both at the sugarbushes being tapped and in other places across the state. They recommend that all of the sites should be available for tapping in fiscal year 2014.

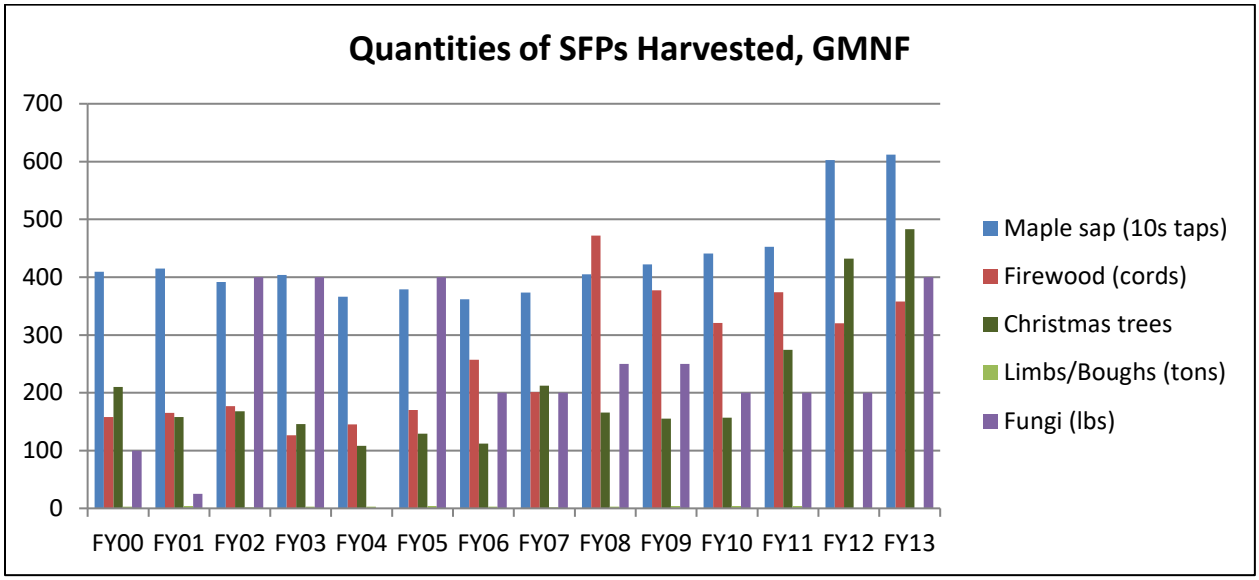
Fiscal Years 2012 and 2013

Mushroom Gathering: The Forest Service worked with Marla Emery of the Northern Research Station and a local mushroom gatherer to establish a sustainable commercial mushroom-gathering product plan for the GMNF. As part of this effort, we collaborated on monitoring methods to detect and evaluate potential impacts of commercial mushroom gathering. The initial product plan is similar to the existing plan established for personal use permits in terms of quantities allowed (up to 1,000 pounds across all

permits in a calendar year). One permit for commercial gathering was sold in fiscal year 2013, with very limited amounts of harvesting resulting.

Evaluation and Conclusions: During fiscal years 2012 and 2013 the steady trend upward in numbers of permits and quantities of some products since the 2006 plan revision continues (see Figure 2). The trend in increased permits, as has been the case all along, is due to large increases in gathering of firewood, Christmas trees, and maple sap.

Figure 2



Firewood: While the long-term average for firewood permits is 106 permits annually, the average number of permits over the past three years is 145 permits, and the average since 2007 is 140 permits. This increase is also reflected in the number of cords of wood sold annually, with the long-term average at 259 cords, the last three years' average at 351 cords, and the average since 2007 at 346 cords. In fact, Figure 2 shows the recent annual amount of firewood sold is generally twice as much as the years prior to 2008 with the 2000 to 2007 average of 155 cords compared to the 2008 to 2013 average of 370 cords. While it was likely that the initial 2008 increase in firewood use was related to the economic collapse at that time, it seems that a greater level of use has not declined since then. This could be attributed to the increase in efficient woodstoves, the increased emphasis on local sources of energy, and a ready and inexpensive supply of available firewood on the GMNF, among other possible causes. A press release in 2011 about firewood permits on the National Forest may have contributed to maintaining the publics' awareness of this opportunity.

The increase in firewood requests that began in 2006 and peaked in 2008 appears to have stabilized around an average of 140 permits and 350 cords, with some variation of 20 to 30 cords in any given year. The Forest Service is actively evaluating opportunities for additional firewood harvesting to meet demand. Several factors support the sustainability of this increased use, including 1) timber harvesting on the 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 the GMNF.

Christmas Trees: The requests for Christmas tree permits continue to rise dramatically since 2011, although the rate of the rise is declining. Christmas tree permits have increased by 74 percent in 2011, by

58 percent in 2012, and by 12 percent in 2013. Compared to the long-term average of 208 permits since 2000, the numbers of permits have about doubled over the past three years (396 permits) and have increased by 29 percent since 2007 (268 permits). Christmas trees are sold in December of the calendar year preceding the fiscal year, which runs from October through the following September; for example, trees purchased in fiscal year 2011 were purchased in December of 2010. Based on a news report in 2010, it appears that the spike in fiscal year 2011 may have been related to a low supply of available trees from traditional Christmas tree vendors in fall of 2010. Several vendors had decreased their orders for 2010 due to poor sales in December 2009, probably associated with the recession. In addition, a press release about National Forest Christmas tree sales from the White Mountain National Forest in 2010, which also mentioned the GMNF, was picked up by a regional newspaper. This was followed by additional press releases by the GMNF in the fall of 2011 and 2012. The rise in Christmas tree sales has slowed but still continues. It is not clear if permits issued will stabilize at a new higher level or eventually decrease to historical lower levels.

The increase in Christmas tree sales has the potential to continue for a number of years for at least two reasons. First, the supply of young softwood trees continues to increase as hardwood forests growing on sites start to see more abundant softwood seedlings and saplings establish in these stands. Second, while the worst of the economic recession has ended, local residents will likely continue to purchase the relatively lower-cost National Forest Christmas tree permits. We anticipate that any additional levels of harvest will be sustainable because in terms of absolute numbers it is a very small amount of total small softwood trees available and will not make a detectable difference in forest composition across the 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, the Forest Service added a new maple sap permittee through a land acquisition with a pre-existing sap removal permit. The Forest Service decided that it had enough staff to oversee this new area in addition to other existing permits, and Forest Health Protection staff evaluated the area to ensure it was healthy enough for sap removal. With the addition of this sixth permittee, tap numbers have risen to over 6,000. We expect that tap levels will fluctuate around this new level or will increase slightly as younger maple trees in existing permitted sugarbushes grow larger and can accommodate new or additional taps. Since 2007, there have been very few compliance issues. Based on annual evaluations of permitted sugarbushes, this use appears to be sustainable at current levels, and could probably be expanded if determined adequate oversight can be provided for additional new permit areas.

Other Uses: Since 2005, requests for special forest products other than firewood, Christmas trees and maple sap at levels requiring permits have been very limited. Requests for mushrooms and boughs have been stable around the same average since 2000 (see Figure 2) 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, we anticipate commercial and non-commercial mushroom gathering at the maximum levels to be sustainable into the future.

There have been no requests for any historically gathered products other than firewood, Christmas trees, maple sap, boughs, and fungi since 2004 or earlier. The Forest Service continues to allow the types of historical gathering which have occurred within the GMNF over the last 25 years (such as those listed in Table 2-12) and is open to gathering of other similar products. The following SFPs have been identified as being of concern in terms of sustainable harvesting: ginseng, ladyslippers, wild leeks, fiddleheads, sweetgrass, and black ash. Occasionally the Forest Service receives queries about gathering products such as ginseng, leeks, and fiddleheads, as well as other plants. Ginseng is a protected plant on the

GMNF and so we do not allow its gathering. Leeks, fiddleheads, and other plants not protected by the Forest Service or State of Vermont are gathered in small quantities for personal use, but do not require a permit. Although not tracked, the queries we get for them are infrequent with perhaps one or two per year on average. The Forest Service does not currently permit collection of larger quantities of the SFPs of concern, although it may in the future. The agency is interested in working collaboratively with gatherers to identify SFPs of interest to local communities, and to create sustainable gathering plans for these products.

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

Rare Features

Evaluation Question:

To what extent are rare and outstanding biological, ecological, or geological features on the GMNF being protected, maintained, or enhanced? To what extent are ecological types on the Forest represented within the ecological reference area network? To what extent do ecological types recognized on the Forest accurately represent the diversity of ecosystems and potential natural vegetation on the Forest?

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

Monitoring Driver: Forest Plan Goal 7 and associated Objective.

Background: The significant ecological features to be monitored and evaluated for this question are listed in Table 3.11-6 of the Forest Plan Final Environmental Impact Statement for the revised Forest Plan (see Appendix C). The primary emphases of monitoring to address this question during plan implementation will be (1) to evaluate these significant ecological features in terms of quality and disturbances, and (2) to maintain them at their current level of quality or higher. This may mean controlling incursions of non-native invasive species and all-terrain vehicles, and it could mean using prescribed fire to maintain a natural disturbance regime. Monitoring will occur before and after any management activities to determine if actions contributed to or detracted from composition, structure, and function of the sites in relation to their values.

A monitoring schedule was established in fiscal year 2006 in which on average 12 significant sites are visited every year, and every site is visited at least once every 5 years. Sites in which concerns are identified may be revisited more frequently. Monitoring measurement indicators include number of conservation actions, ranked condition of the sites (A-D ranks based on Natural Heritage Program [NHP] methodology), and number of acres surveyed for rare or outstanding features.

Monitoring Activities: Every year, Forest Service staff visit and monitor several sites with special features. At each site the condition and quality of the site and/or rare plant populations are documented. In general, because these sites have been inventoried and evaluated in the past, recent field 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 Service ecologist then incorporates these notes into site reports and/or rare plant reporting forms that are prepared during the winter months.

Fiscal Year 2012

Eighteen sites with special features were monitored including:

1. Big Mud Pond
2. Blue Ridge Fen
3. Bourne Pond
4. Branch Pond
5. Bristol Cliffs
6. Chandler Ridge
7. Dana Hill
8. Gilmore Pond
9. Leicester Hollow
10. Lincoln Gap
11. Lost Pond
12. Mount Horrid
13. Skylight Pond
14. Stamford Stream Wetland Complex
15. Stratton Mountain
16. Texas Falls
17. Thendara Camp Fen
18. Winhall River Headwaters Flowage

Sites were monitored by a combination of Forest Service biology, botany, ecology, and wilderness staff as well as Vermont Natural Heritage Inventory staff.

The following are highlights of this monitoring:

- Several rare plants were either relocated or newly found at Blue Ridge Fen, Winhall River Headwaters Flowage, Bristol Cliffs, Texas Falls, and Lincoln Gap.
- Bicknell's thrush was relocated at Stratton Mountain.
- The natural community integrity of most sites monitored appears to be well-preserved. Non-native invasive plants (NNIPs) were removed at Skylight and Branch Ponds. Impacts associated with illegal off highway vehicle (OHV) use at Thendara Camp Fen are being discussed as part of the South of Route 9 Integrated Resource Project. Natural disturbances such as moose-created openings (Blue Ridge Fen) and microburst-created openings (Winhall River Headwaters Flowage) were also noted. Forest Service staff will follow up on issues of concern over the next few years.
- The reconstruction of the Leicester Hollow and Chandler Ridge trails to address flood damage and create mountain bike opportunities was completed in 2012. Impacts to the Special Areas were well mitigated so that the integrity of the natural communities was protected. No concerns were noted along either the portion constructed in 2011 or in 2012.

Forest Service wilderness staff visited and monitored several sites within the Joseph Battell, Breadloaf, Bristol Cliffs, Glastenbury, Big Branch, Peru Peak, George D. Aiken, and Lye Brook wilderness areas during fiscal year 2012. Ponds and cliff sites within these wilderness areas are popular camping areas and some, like Bourn Pond, get frequent visitors. Forest Service wilderness staff clean up trash and camping debris and return the sites to a relatively natural condition. Staff also check these areas for non-native invasive plants.

In addition to the routine cleaning and maintenance in wilderness areas, Forest Service staff noted the following issues or actions in association with special features within wilderness areas:

- A deer blind was removed from Skylight Pond area in the Breadloaf wilderness area, and a deer stand and blind were removed from the Bristol Cliffs wilderness area, which was identified in 2011 by special area monitors.
- Illegal trails continue to be maintained into Lost Pond in the Big Branch wilderness area.
- A well-established campsite was noted at Big Mud Pond in the Peru Peak wilderness area.
- No illegal cutting was noted at Mount Horrid within the Joseph Battell wilderness area.

Fiscal Year 2013

Eighteen sites with special features were monitored including:

1. Beebe Pond
2. Big Mud Pond
3. Bourne Pond,
4. Branch Pond
5. Bristol Cliffs
6. Elephant Mountain
7. Farr Peak
8. Fifield Pond
9. Gilmore Pond
10. Little Mud Pond
11. Little Pond
12. Lye Brook Headwaters/Ponds Plateau
13. Middlebury Gap
14. Moses Pond
15. Mount Horrid
16. Mud Pond (Peru)
17. Skylight Pond
18. Stamford Meadows

Sites were monitored by a combination of Forest Service biology, botany, ecology, and wilderness staff as well as Vermont Natural Heritage Inventory staff.

The following are highlights of this monitoring:

- Forest Service staff initiated the 10-year monitoring of high elevation ponds on the GMNF. Unlike in previous years where this work was contracted, the Forest Service decided to invest in training and equipping botany staff to survey for and identify aquatic plants. Six ponds (Big Mud, Little Mud, Mud (Peru), Fifield, Beebe, and Moses) were monitored in 2013, with the remainder to be monitored in 2014. Rare plants were relocated at all ponds, and new rare species were identified at Little Mud Pond and Mud Pond in Peru. Non-native invasive plants were noted along the access routes to Big Mud and Moses Ponds, and along the shoreline at Beebe Pond. Heavy moose browsing and nearby substantial windthrow were noted at Little Mud Pond. While camping was generally noted at some ponds, there were few threats identified to the integrity of these ponds from human uses in the vicinity.

- The natural community integrity of most other sites monitored appears to be well-preserved. No threats were identified at Elephant Mountain, Farr Peak (a new site identified as having a significant occurrence of old red spruce-yellow birch forest), or Lye Brook Headwaters/Ponds Plateau, and both upland sites appear to have areas with old growth characteristics. Stamford Meadows has a blind and dock constructed along the shore, as well as user-maintained trails leading to and from it, but these do not appear to be currently threatening the wetland and the use appears limited. No non-native invasive plants were identified at any of these sites.
- Forest Service ecology and recreation staff visited Branch Pond to investigate the level of use and disturbance associated with shoreline camping. Heavy cutting in some places was evident, but it was unclear the extent to which this was leading to negative impacts on aquatic habitat. The aquatic habitat of this pond will be monitored in 2014 or 2015, and at that time we will have three sample dates with which we can start to evaluate trends.

Forest Service wilderness staff visited and monitored several sites within the Joseph Battell, Breadloaf, Bristol Cliffs, Glastenbury, Big Branch, Peru Peak, George D. Aiken, and Lye Brook wilderness areas during fiscal year 2013. Ponds and cliff sites within these wilderness areas are popular camping areas and some, like Bourn Pond, get frequent visitors. Forest Service wilderness staff clean up trash and camping debris, and return the sites to a relatively natural condition. Staff also check these areas for non-native invasive plants.

In addition to the routine cleaning and maintenance in wilderness areas, Forest Service staff noted the following issues or actions in association with special features within wilderness areas:

- Illegal trails continue to be maintained into Little Pond in Glastenbury Wilderness.
- Illegal cutting was noted at Middlebury Gap in Breadloaf Wilderness
- Vandals spray-painted rocks at Mount Horrid; some of the paint was cleaned up by wilderness staff.

During fiscal years 2012 and 2013, Forest Service staff conducted an assessment of a landscape south of Route 9 in the towns of Pownal, Stamford, and Readsboro. Forest Service staff visited this area several times during these years to gather resource information, including an evaluation of potential rare or outstanding ecological features. Approximately 4,000 acres of this landscape was field reviewed over these two years in search of such features. An area known as “The Dome” in Pownal was identified as a significant ecological area, having an area of dry oak forest and woodland more typical of the central Appalachians than of Vermont.

Evaluation and Conclusions: Monitoring over the past two years was successful due to the increased number of people monitoring these sites. Forest Service botanical, wildlife, and fisheries staff completed much of the monitoring, while the Vermont Natural Heritage Inventory and Forest Service wilderness staff also contributed.

Over the past two years Vermont Natural Heritage Inventory (VNHI) staff 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 Vermont that was not analyzed during the revision of the Forest Plan. 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.

Since 2007, 82 percent of the special areas tracked by Forest Service staff on the GMNF have been monitored. Continued cooperation between the GMNF ecology and other programs, individuals, and VNHI staff will make it 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 does reduce the number of new sites monitored each season. In some cases, Forest Service staff has 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, and so the monitoring cycle has been adjusted to 10 years for that site.

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 monitoring since 2006 suggest that impacts to the integrity of ecologically significant sites and features are most often associated with recreational uses or natural disturbances. A stronger relationship between Forest Service recreation, law enforcement, and ecology staff is important to effectively mitigate some of these impacts. The Forest Service 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, and most notable at Branch Pond. 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 2014 there are plans to conduct another round of monitoring at this pond and several others. 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 and recreation programs continue 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 annually monitor around 12 sites with significant ecological features on the GMNF with help from VNHI staff and available Forest Service biological, botanical, and wilderness staff. Prioritize monitoring on the 11 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 tree 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 development of new integrated resource projects, 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 Vermont Department of Forests, Parks, and Recreation staff 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 staff to update the identification and mapping of significant ecological features present on the GMNF, coordinate future monitoring efforts, and share monitoring data.

Continue to work with Forest Service 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.

Insects and Disease

Evaluation Question:

Are insect and disease levels compatible with objectives for maintaining forest conditions?

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

Monitoring Driver: Forest Plan Forest-wide and Management Area Standards and Guidelines.

Background: This monitoring item helps track trends in insect and disease (I&D) activity on the Forest. Monitoring of I&D pathogens can be employed to determine when, how much, and what kinds of management actions, if necessary, should take place to prevent or suppress undesirable I&D agents. As the GMNF provides a portion of host material for a variety of I&D agents found within Vermont, this monitoring element is best undertaken in a more "landscape" context with adjacent landowners, municipalities, and local, state and federal monitoring organizations. For instance, monitoring of emerging I&D agent threats, such as the emerald ash borer and Asian longhorned beetle, both exotic insect pests, has become a national monitoring effort. In these cases, early detection efforts are the combined focus of forest research and management organizations at the state, federal and university levels.

In fiscal years 2012 and 2013, Forest Service staff continued efforts to share information about the spread of non-native pests with the public and partners. Public contacts, information and identification posters, bumper stickers, refrigerator magnets, displays of Asian longhorned beetle (ALB), emerald ash borer (EAB), hemlock wooly adelgid (HWA) insects and damaged wood were used at public venues and trade shows to help explain the threats. Emerald ash borer kits and education materials were secured and used as needed when meeting with the public and selling firewood permits. All Forest Service district offices currently have these materials. Additionally, updated displays were created at the Forest Headquarters in Rutland, Vermont and district offices.

Monitoring Activities: Table 2-13 shows a listing of insects and diseases tracked, the dates of the surveys and the monitoring efforts used during fiscal years 2012 and 2013. An annual I&D aerial monitoring effort was again undertaken on the GMNF, organized, and completed by the Northeastern Area, State and Private Forestry and the Vermont Department of Forests Parks and Recreation (VFPR). Staff from VFPR conducted surveys in our campgrounds and other areas at risk from EAB, other insects and invasive plants.

Table 2-13: Insect and disease tracking during fiscal years 2012 and 2013.

Insect or Disease Agent	Organization & Date of Monitoring	Type of Monitoring Effort
Forest tent caterpillar, gypsy moth, oak leaf tier, balsam wooly adelgid and dieback or mortality from Beech bark disease, Septoria leaf spot, cankers and other unknown agents	Northeastern Area State & Private Forestry, Northeastern Area, USDA Forest Service – Durham Field Office (DFO), Flown by VT DFPR June 14-15, 2012; and June 18-19, 2013	Annual Aerial Detection Surveys of forest health conditions on the Green Mountain National Forest.
Insects, disease or events harmful to sugar maple trees	Northeastern Area State & Private Forestry, Northeastern Area, USDA Forest Service – Durham Field Office (DFO), June 20 and 29, and December 12-14, 2012; and July 1-3, September 26-27, November 18-20, 2013	Sugarbush surveys, on the ground field surveys, site visits.
Heterobasidion root disease	DFO Forest Pathologists, visited the GMNF on October 2011 to identify Heterobasidion root disease	Ground survey of red pine and Norway spruce stands was done. Samples collected. Some stands were already cut and some are planned to be cut in current/future timber sales.

Fiscal Year 2012

Durham Field Office (DFO) - Forest Health Protection staff continued to monitor GMNF Sugarbush Special Use Permit areas. Visual inspections for forest tent caterpillar (FTC) and other insect activity were conducted, and pheromone traps were deployed. Root samples and taphole closure were also collected. There was no FTC larval activity in any of the permit areas, and no noticeable defoliation occurring. There was a small amount of scattered feeding on one site, which was characteristic of pear thrips. The foliar disease anthracnose was present at the sites; however, the level was significantly less than previous years, and the somewhat dry summer appears to have provided some relief from that pathogen. From a biotic stressor standpoint, trees on all the sites appeared generally healthy. The taphole closure rates are also within range for normal closure for healthy sugarbushes. Overall, the sugarbush permit areas are in a healthy condition. Measures collected indicate a forest capable of maintaining itself while providing products such as maple syrup. No significant incidence of forest pests was evident. Several neighboring stands had reportable pests. Abiotic stressors, mainly storm events, were the major stressors.

Surveys were conducted in Pownal, Vermont in conjunction with the State of Vermont, to determine the extent of a recently discovered hemlock wooly adelgid (HWA) infestation on town property. Surveys were also conducted on hemlock stands on NFS lands in the vicinity.

Fiscal Year 2013

Maple tapping site visits, and visual inspections for FTC, and other insect activity were conducted, and pheromone traps were deployed and retrieved. Root samples and taphole closure were also collected. There was no evidence of major insect activity. No FTC larval activity was detected in any of the permit areas. Despite above average precipitation from May through July, the foliar disease load at the permit sites were surprisingly low. The taphole closure rates are also within the range for normal closure for healthy sugarbushes and root starch levels were acceptable. Overall, the sugarbush permit areas are in a healthy condition. Measures collected indicate a forest capable of maintaining itself while providing products such as maple syrup. No significant incidence of forest pests was evident. Several neighboring stands had reportable pests. Abiotic stressors, mainly storm events, were the major stressors.

Evaluation and Conclusions: 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. In fiscal year 2012, there were no significant outbreaks detected from any major insect pests. Hemlock wooly adelgid (HWA) is a species of concern on the Forest. A new HWA infestation was found on non-NFS lands in Pownal, Vermont, however monitoring of hemlock stands in the vicinity revealed no infestations on the GMNF. Overall, most of the damage throughout Vermont was dieback from beech bark disease and defoliation due to pear thrips, anthracnose, and frost. Individual tree mortality within mature stands increases as the forest ages.

As in fiscal year 2012, there were no significant outbreaks detected from any major insect pests in fiscal year 2013. Most of the damage throughout Vermont was dieback from beech bark disease and defoliation due to pear thrips, anthracnose, and frost. The HWA was positively identified in Vermont just south of NFS lands and is considered a pest of concern for the GMNF. The EAB was also discovered in Concord, New Hamphsire in 2013 and is considered a pest of concern for the ash resource on the GMNF.

Recommendations: No suppression actions should be taken at this time. Insect and disease levels at present do not impact the ability to maintain forested conditions and objectives or outputs of forest products. Continue to monitor insect and disease activities with annual aerial and ground detection monitoring efforts. Continue cooperation with the Vermont Department of Forest Parks and Recreation in surveying for invasive species and planning for response to invasive species. Continue cooperation with Durham Field Office - Forest Health Staff in conducting inventories, surveys, testing pheromones, trapping and response activities. Continue to address forest health issues during development of future integrated resource projects.

Fire

Evaluation Question:

How many wildfires were suppressed with no reportable accidents/injuries or damage to private property? How many acres of private property burned from fires with ignition on Forest Service land?

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

Monitoring Driver: Forest Plan Goal 21 and associated Objectives.

Background: Wildfires are suppressed in a manner that protects firefighter safety and avoids damage to private property.

Monitoring Activities: Four wildland fires were reported on the GMNF in fiscal year 2012. These fires burned a total of 6.75 acres. Four wildland fires were reported on the GMNF in fiscal year 2013. These fires burned a total of 15 acres. No injuries associated with firefighting were reported and no private property was burned.

Evaluation and Conclusions: Based on vegetation conditions and observed fire weather conditions, fire preparedness and other fire management actions were adequate and consistent with the level of risk.

Recommendations: Although fire risk is low, fire staffing and other preparedness actions should be continuously monitored during fire season. Discussions with Volunteer Fire Departments continue to be important to communicate Forest Service goals for fire management.

Evaluation Question:

To what extent have hazardous fuels been reduced?

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

Monitoring Driver: Forest Plan Goal 21 and associated Objectives.

Background: A hazardous build-up of fuels can increase the risk of spread for wildfires that start in their vicinity. Prescribed burning and some mechanical treatments (such as using a brush saw, mower, or masticator) can help to reduce these fuels. In addition, some treatments that are implemented to achieve other resource management objectives, such as timber harvesting or wildlife habitat improvement, can have a secondary benefit of reducing hazardous fuels.

Monitoring Activities: Table 2-14 shows the trend of prescribed fire and mechanical treatments over the past eleven years. During fiscal years 2012 and 2013, 207 acres and 475 acres, respectively were treated with prescribed fire to meet GMNF objectives. It should be noted the methodology to determine mechanical treatment accomplishment has not remained consistent over the years due to differing objectives and funding sources.

Table 2-14: Prescribed fire and mechanical treatment trends from fiscal years 2003 to 2013.

Treatment (Acres)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Prescribed Burn	388	409	204	0	112	113	203	196	103	207	475
Mechanical Treatment	296	306	0	96	228	20	40	0	90	0	0
Total Acres	684	715	204	96	340	133	243	196	193	207	475

Fire Regime Condition Classes, both pre- and post-treatment observations were made for all treatments with primary or secondary hazardous fuels objectives. Post treatment observations showed a move to an improved condition class, and all treatments were reported in Forest Activities Tracking System (FACTS).

Evaluation and Conclusions: All hazardous fuel treatments were initially effective. Hazardous fuels treatments also provided secondary benefit objectives, which included ecosystem restoration, and wildlife habit maintenance and improvement by way of returning wildlife openings to early successional habitat.

Recommendations: Continue the use of prescribed fire as a vital tool for the reduction of hazardous fuels to maintain wildlife habitat, for timber stand improvements, and to restore and enhance ecosystems. Mechanical treatment should also supplement prescribed fire treatments to effectively reduce larger diameter woody vegetation that may not be fully treated using only prescribed fire.

Evaluation Question:

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

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

Monitoring Driver: Forest Plan Forest-wide Standards and Guidelines 2.3.10 - Fire Management.

Background: The two most common resource management objectives for prescribed burns in fiscal years 2012 and 2013 were to maintain forest openings and apple orchards for wildlife habitat and to reduce hazardous fuel loadings. Specifically, the objectives as expressed in the prescribed burn plans most commonly aimed to 1) reduce fuel loading within the unit by 40 to 90 percent of 1 and 10 hour fine fuels and by 20 to 60 percent of 100 and 1000-hour fuels (common for most wildlife openings); or 2) scorch or kill 40 to 80 percent or more of invading woody vegetation consisting of shrubs and seedling/sapling sized trees. These burn objectives help to reach resource objectives to eventually promote an increase of native grasses and forbs to cover approximately 90 percent of the unit by repeated prescribed fire treatments, maintaining an open grass like conditions.

Monitoring the effectiveness of prescribed burns helps support decisions to use fire to meet certain objectives during the planning process.

The current GMNF monitoring program lacks definition and consistency and may be inadequate to support the planning process for prescribed burn treatments. Use of FIREMON is too labor intensive and costly so there is a need for simpler methods that are more directly relevant to management objectives.

Goals for Monitoring:

1. Each prescribed burn plan will identify specific objectives that are measurable and a monitoring plan that addresses the effectiveness of the burn in meeting those objectives.
2. Fire should work with other resource areas for monitoring the success of those objectives which fall within other resource areas. Additional side effects may also need to be monitored (for example fire is primarily responsible for establishing protocols for fuels objectives; wildlife would measure success if the primary reason is wildlife habitat improvement. If the objective is fuels, wildlife still may need to measure the effects on wildlife.)
3. Monitoring methods will be practical and in accordance with complexity of the objectives.
4. Monitoring must be cost and labor efficient.
5. The monitoring approach to field-based data collection and data analysis may involve methods tiered to magnitude of the burn.

If the primary objective for the burn is the reduction of hazardous fuels, the need for fuels reduction and level of risk is explained during the NEPA planning process. Also developed during the planning process is the explanation of what current conditions exist in the unit and the desired condition for fuels specific to the hazard. Objectives relating to fuel reduction should answer the following questions: 1) how much fuel do we expect one burn to reduce; 2) are subsequent burns needed; 3) how long after the burn will conditions be maintained; and 4) what will the reduction be by percentage or by total amount?

Monitoring Activities: In order to measure success of these burns, the Forest Service burn boss and other fire management staff perform periodic observational field trips to inspect the site of each burn unit. Most often photographs are taken and filed, to be reviewed with pre-burn photographs and observations that will be taken at sites in the future. During fiscal years 2012 and 2013, Forest Service fire management staff kept a daily log for each prescribed burn including observations on the day of the burn before, during and directly after burning activities. There is also a report form that includes records for "Test Fire" and "Prescribed Fire Results" specific to each objective. The weather and fuel moistures before and during the burn are recorded along with fire behavior for the test fire and main burn operations. This captures the burn boss and fire effects monitors' notes related to achieving objectives.

Monitoring focuses on measuring pre- and post-dead fuel accumulations as well as examining fire's effects on reducing woody encroachment (mortality). For example, immediately following a prescribed

fire, the burn boss can survey the entire unit and estimate the percentage of fine fuel consumption compared with what they observed earlier in the day, prior to the burn. Similarly, 10-hour fuel reductions can be observed. This report is detachable from the burn plan file and can be stored and revisited for future monitoring activity, which can also be recorded on the same form. Photo points can be stored with the form with locations and notes included. Site disturbance, establishment of certain species and the eventual restoration of certain species will likely be revisited and recorded in subsequent reviews of the unit.

Monitoring level protocol is determined during the planning stage of the burns based on the objectives for that unit (Table 12-15). Post monitoring forms are used for every level of monitoring. More than one level of monitoring may apply depending on funding and labor availability as well as discretion of the fire managers and other resource advisors.

Table 12-15: Prescribed fire monitoring levels.

Level	Explanation
1: Ocular Estimates	Fire manager walks around the unit both before and after the burn and gets a feel for success of the burn. Records and files qualitative observations on monitoring forms.
2: Photo Points	Establish locations for repeatable "before and after" photos from the same exact perspective and cardinal direction. Number of photos per acre need to be determined. Photos are filed with the qualitative report.
3: Transects	Transects are used to measure certain elements before and after the burns. The transect measures the element that best describes the success of the objective. (example: 10 randomly located 100 foot transects to measure surface fuels before and after burning that shows a reduction in fuels and fire risk).
4: Plot Data	Establish locations for repeatable "before and after" plots within the unit and measure certain ecological elements. These can include vegetation and fuels. Options: Use FireMon methods or parts of the FFI system and file and analyze within the national database in addition to local project folders. Use FSVeg data and stand exam methods to measure key attributes.

Evaluation and Conclusions:

- It isn't possible to measure every effect related to prescribed burning. It will be necessary to choose specific key elements relating to objectives and other important or sensitive variables.
- Preconditions need to be identified and measured at a similar level to post conditions, for comparison.
- Post conditions will likely need to be measured at intervals following the burn. Intervals should be determined based on objective and attributes being measured.
- Due to the nature of the GMNF burn program and planning process, adaptive management will likely be tied to monitoring which strengthens the need for a robust monitoring program. It is also likely the monitoring program itself will be subject to adaptive management as we learn what works through trial and error.

Recommendations: Discuss ways to refine the monitoring program. Determine answers to the following questions:

- How do we determine the level of monitoring needed?
- How can we best work with other resources to share monitoring costs and labor when objectives overlap?

- How do we determine objectives that are specific enough to measure and which elements will show success of our burns?
- How many photos, transects or plots are needed and how do we determine details for data collection?
- How can we efficiently tie our monitoring into our already busy schedules?
- Do we have the time and funding and if not, how do we make it work?
- Will it work to pay contractors?
- Can we partner with other organizations?
- Would we be able to work with an academic program or organize volunteers?
- Is it possible to seek expertise from Forest Service research branch to determine effective monitoring protocol and implementation?

Develop an integrated monitoring group (with interdisciplinary resources represented such as soils, fire/fuels, and wildlife) to conduct pre-, post-, and day of prescribed burn fire effects monitoring to ensure Best Management Practices and resource objectives are being met.

Evaluation Question:

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

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

Monitoring Driver: Forest Plan Management Area direction.

Background: Wildland Fire Use (WFU) consists of the management of naturally ignited fire to achieve predetermined vegetative management objectives. The Forest Service has not yet used this tool on the GMNF and has instead suppressed all wildland fires. The main objectives of using WFU includes restoring fire to its natural role in the ecosystem, such as allowing natural ignitions to burn without suppression in wilderness areas, as well as to maintain the viability of fire-adapted vegetation communities such as oak. Objectives are accomplished in a manner that remains consistent with the safety of people, property, and other resources.

Monitoring Activities: No wildland fires were managed for resource objectives.

Evaluation and Conclusions: Not applicable

Recommendations: Not applicable

Partnerships, Information and Education

Evaluation Question:

Are partnerships active and effective on the GMNF and are Forest Service personnel participating in partnership activities?

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

Monitoring Driver: Forest Plan Goal 18 and associated Objectives.

Background: Partnerships and collaboration are essential throughout all levels of the Forest Service. Forest Service staff has worked with partners to achieve social, economic, and ecological goals. Each year, we continue relationships with existing cooperators and develop new ones. This collaboration has resulted in increased public service and improved land stewardship, both which enhance the Forest Service's effort to meet desired conditions. This overview will share information on both formal agreements and informal cooperative efforts. Information is presented as a collective report for the Green Mountain and Finger Lakes (GMFL) National Forests as the information is tracked regionally in a combined report.

Monitoring Activities: The Forest Service uses many types of agreements to document work with other organizations and entities. Each of these has specific Congressional legal authority and requirements. The appropriate instrument depends on what the partnership will accomplish, who will benefit, and who is providing funds. The Forest Service must have appropriate statutory authority prior to entering into any agreement, which could result in the use, obligation, or other commitment of any Forest Service resources.

During fiscal years 2012 and 2013, the Forest Service worked with many partners or partnership groups. Much of the trail and resource maintenance, conservation and education efforts and wildlife conservation programs and projects would not be possible without the help of our many valuable partners. Partners include individuals, non-profit agencies, other federal and state agencies, profit organizations, and universities and colleges.

Partnership Agreements

A total partnership value to the GMFL National Forests of $3,655,804 was realized in fiscal year 2012. There were 53 new agreements and 44 modifications to existing agreements processed. The Forest Service obligated $2,150,448 to partners to complete agreed upon projects, provided $526,954 in support to those projects, and received $415,441 in value directly from the partners in cash, materials, and labor.

A total partnership value to the GMFL National Forest of $5,036,294 was realized in fiscal year 2013. There were 19 new agreements and 62 modifications to existing agreements processed. The Forest Service obligated $4,343,544 to partners to complete agreed upon projects, provided $213,803 in support to those projects, and received $257,216 in value directly from the partners in cash, materials, and labor.

Contributions went to a variety of partners for the work they provided to support the GMNF. Cooperative labor and funding were provided by both the Forest Service and partners to support law enforcement efforts, roads maintenance, wildlife habitat improvement, watershed restoration, trail improvements, visitor information and recreation.

Volunteer Agreements:

There were 685 volunteers providing 62,262 hours of service at an appraised value of $1,356,704, and 13,373 volunteers providing 16,597 hours of service at an appraised value of $367,457 to the GMFL National Forests for fiscal years 2012 and 2013, respectively.

Evaluation and Conclusions: Formal and informal agreements with state, county, local and other federal agencies, and non-profits can increase the amount of management and educational activities that occur on the GMNF. Partnerships also increase the ownership that these organizations have in the

GMNF. These agreements also provide GMNF staff with an opportunity to contribute to the work valued by partner organizations.

Recommendations: Continue working with existing partners and volunteers and cultivate new partners and volunteers where there is an interest from partner groups and a potential benefit to the GMNF and nearby communities.

Evaluation Question:

How many agreements for fire management have been developed and maintained with outside partners?

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

Monitoring Driver: Forest Plan Goal 18 and associated Objectives.

Background: The Forest Service aims to develop a cooperative fire protection agreement with the Volunteer Fire Departments and organizations in each of its surrounding towns within the GMNF. These agreements set the framework for responding to wildfires on NFS land and sharing resources when needed.

A Master Cooperative Wildland Fire and Stafford Act Response Agreement exists among the Forest Service (GMNF and Northeast Area State & Private Forestry), the State of Vermont Department of Forests, Parks and Recreation, USDOI Fish and Wildlife Service and the USDOI National Park Service. This cooperative fire protection agreement allows for the sharing of resources for a wide range of fire and all-hazard related management activities. An annual operating plan is updated and reviewed by all parties each year.

The Forest Service also has an agreement with the Northeastern Forest Fire Protection Compact, which includes New York, New England States, northeastern Provinces of Canada and the other local federal fire management agencies.

The Eastern Region of The Nature Conservancy and the GMNF have a Memorandum of Understanding (MOU) for cooperative fire protection and prescribed burn training and resource sharing. Albany Pine Bush Preserve Commission in New York State, and the GMFL National Forests have a cooperative fire protection agreement that was created and signed in fiscal year 2010 to allow for the sharing of resources during wildfire or prescribed fire.

Monitoring Activities: Agreements require current template format and updates every 5 years along with an annual operating plan. The Forest Fire Management Officer tracks the expiration date of each agreement in a table and contacts volunteer fire departments when the agreement needs to be updated. The Volunteer Fire Departments review changes and updates to the agreement. This process ensures that the Forest Service and the Volunteer Fire Departments are both familiar with the terms of the agreements and they are operating on national standards for cooperative fire protection

Evaluation and Conclusions: In fiscal year 2010, the Forest Service contacted 33 towns bordering the GMNF and provided them a draft cooperative fire protection agreement for review. There were 14 agreements signed by the end of fiscal year 2011. There were 10 more agreements signed by the end of fiscal year 2012. The remaining agreements were still in draft form and under review by their respective fire departments by the end of fiscal year 2012. The status of the draft agreements was unknown by the end of fiscal year 2013.

Recommendations: Partnership agreements provide valuable services that help the Forest Service achieve desired management objectives. It is essential that agreements and annual operating plans be kept current. If Volunteer Fire Departments or towns do not respond to the draft agreements, each should be contacted by phone or in person to encourage the review of the agreement and eventual finalization.

Evaluation Question:

Did teacher professional development in Forest stewardship occur?

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

Monitoring Driver: Forest Plan Goal 19 and associated Objectives.

Background: As described in the 2006 Forest Plan, the role of the GMNF includes emphasis on playing an increasingly important educational role. The aim is to provide people with a clearer understanding of the origins of the natural resources they use in everyday life to develop a greater conservation ethic and sense of personal responsibility for their actions.

Monitoring Activities: In alignment with the role of the GMNF, three professional development opportunities occurred in fiscal year 2012. Specifics on these opportunities are provided here:

A Forest For Every Classroom: New England Partnership builds capacity in teachers in forest stewardship and using public lands as living classrooms.

Location: Green Mountain National Forest since 1999, and White Mountain National Forest in New Hampshire since 2006.

Project Summary: The *A Forest For Every Classroom* creates a forest stewardship program to build capacity in teachers in (forests) place-based education. They learn about forests, ecology, stewardship of forests including public land management challenges, citizenship, place-based learning, service learning, and using public lands as outdoor classroom.

Innovation: *A Forest for Every Classroom* stands out in the education landscape of Vermont and New Hampshire as a collaboration of federal, state, non-profit organizations with common missions and visions around conservation, public lands and especially forests in the Northeast. The partners "adopt" 15 to 20 teachers every year and help them teach students to love nature, forests, their communities, and take ownership in their environment.

In fiscal year 2012, partners worked with approximately 35 alumni at various events, school programs and through leadership opportunities. An online newsletter kept 125 alumni apprised of different forestry-and place-based education activities in the region.

In fiscal year 2013, partners worked with approximately 35 alumni at various events, school programs and through leadership opportunities. An online newsletter kept 125 alumni apprised of different forestry-and place-based education activities in the region. An eight day course consisting of professional development for 20 educators was also conducted.

Vermont Envirothon: The envirothon is one of the most successful partnerships in Vermont. The goal of the *Vermont Envirothon* program is not only to teach environmental concepts and realities, but also to instill an understanding of the ecological and community factors that are involved in environmental decisions and actions. The program sets up a different environment challenges each year as well as teach basic concepts in soils, forestry, aquatic environment and wildlife. Students also learn decision-making, problem solving, team-building and communications skills.

The Forest Service participates in this annual event sponsored by the Vermont Association of Conservation Districts. Other participants include the Vermont Agency of Natural Resources (Fish & Wildlife Department, Department of Environmental Conservation/Watershed Management Division and the Wetlands Program, and Department of Forests Parks and Recreation), USDA (Natural Resources Conservation Service), Lamoille County Conservation and Rutland National Resource Conservation Districts, the Society of Soil Scientists of Northern New England, various regional planning commissions, and other environmental organizations and businesses.

For 20 years, the *Vermont Envirothon* has been challenging young minds to consider conservation, stewardship and environmental issues that affect their schools, community, country and the world. High-school aged students become empowered as they work through the multi-faceted study of the environment and many go on to college and study natural resource-based careers. After college, some come back to the agencies that they learned about during their experience with the Vermont *Envirothon*.

Teachers who coach the *Vermont Envirothon* have stated that the learning curve of their students in this program jumps because they better understand, from field experiences with the *Vermont Envirothon* program, why they need to learn math, reading, writing, and life skills. They also see the passion natural resource professionals have for their careers and the assessments, investigations, findings, and real life issues in which they are involved.

In fiscal year 2012, there were 13 teams participating with 125 total students involved. Nine teachers and 38 volunteers helped facilitate the program.

In fiscal year 2013, there was a record number of 17 teams participating with 130 total students involved. Fourteen teachers and 42 volunteers helped faciliate the program.

Salmon in the Classroom: This program was greatly reduced in fiscal year 2012 due to devastation of the National Fish Hatchery located in Bethel, VT and various portions of stream habitat from tropical storm Irene in late 2011. Damage to the hatchery resulted in no brood stock (Atlantic salmon adults) from which to obtain the salmon eggs/fry needed for the program. Following these events, the Atlantic salmon restoration efforts in Vermont were discontinued.

Trout in the Classroom: This program assists teachers through a science-based curriculum that exposes elementary and middle school students to the wonders of the brook trout life cycle and their environment. Through the Trout Unlimited organization a Vermont state-wide program coordinator has been appointed. The program is designed to inform and empower students striving to become the future generation of natural resource stewards.

In fiscal years 2012 and 2013, Forest Service staff along with state and federal partners provided environmental education to over 250 students in eight Vermont schools through the *Trout in the Classroom* program. Forest Service fisheries technicians assisted students and teachers in several schools with providing/setting up incubation tanks for brook trout eggs. The students take care of the tanks as they observe the eggs developing week by week until they hatch into tiny brook trout. The annual

culmination of the program is the release of trout fry into a nearby stream with hopes that one day they will grow/survive to adults and spawn naturally.

Recommendations: Continue to provide professional teacher development opportunities through the continuation of these programs and facilitate ideas that get families and children into the natural world.

Human Dimensions

Evaluation Question:

To what extent is the GMNF contributing to the economic health of local economies?

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

Monitoring Driver: Forest Plan Goal 17 and associated Objectives.

Background: Socio-economic concerns were a major issue for the revision of the Forest Plan in 2006. Concerns related to the potential revenues and employment from Forest Service management activities were analyzed in the 2006 Forest Plan Final Environmental Impact Statement (FEIS) (pages 3-352 to 3-386). Employment sectors are traditionally defined for economic analysis by the North American Industry Classification System (NAICS). This information was compiled at the county level and available through the U. S. Department of Commerce Bureau of Economic Analysis. The industries most directly impacted by Forest Service management are:

- Manufacturing (in the form of wood processing)
- Forestry, Fishing, and Farming Services
- Tourism (consisting of 4 categories: arts, entertainment, and recreation; accommodation and food services; motion picture and sound recording industries; and scenic and sightseeing transportation).

The information for personal income by employment sector for 2000 was displayed in the Forest Plan FEIS (page 3-377). The information displayed used the Standard Industrial Classification (SIC) rather than the NAICS. The two systems use slightly different employment categories and therefore cannot provide an exact comparison.

Monitoring Activities: The Bureau of Economic Analysis collects NAICS personal income by employment sector annually. Information from 2006 can be adjusted to 2013 dollars to provide a comparison of income by employment sector between 2006 and 2013 (Figure 3, and Tables 2-16 and 2-17). This comparison provides a picture of the economic health of the counties with NFS lands in relation to the sectors that are most directly impacted by Forest Service management activities.

Evaluation and Conclusions: Management activities on the GMNF continue to contribute to the economies of the counties with NFS lands through forestry, recreation and wood processing employment related activities. The contribution in dollars has remained relatively stable, although 2013 tourism dollars are generally down from 2006. The percent of the overall county income that each sector impacted by Forest Service management contributions has slightly decreased from 2006 to 2013. More robust economic analysis is needed to determine the reason for this decrease. More complex economic modeling such as was done for the Forest Plan FEIS would provide more detailed information on the contribution of Forest Service management to the local economies.

Figure 3

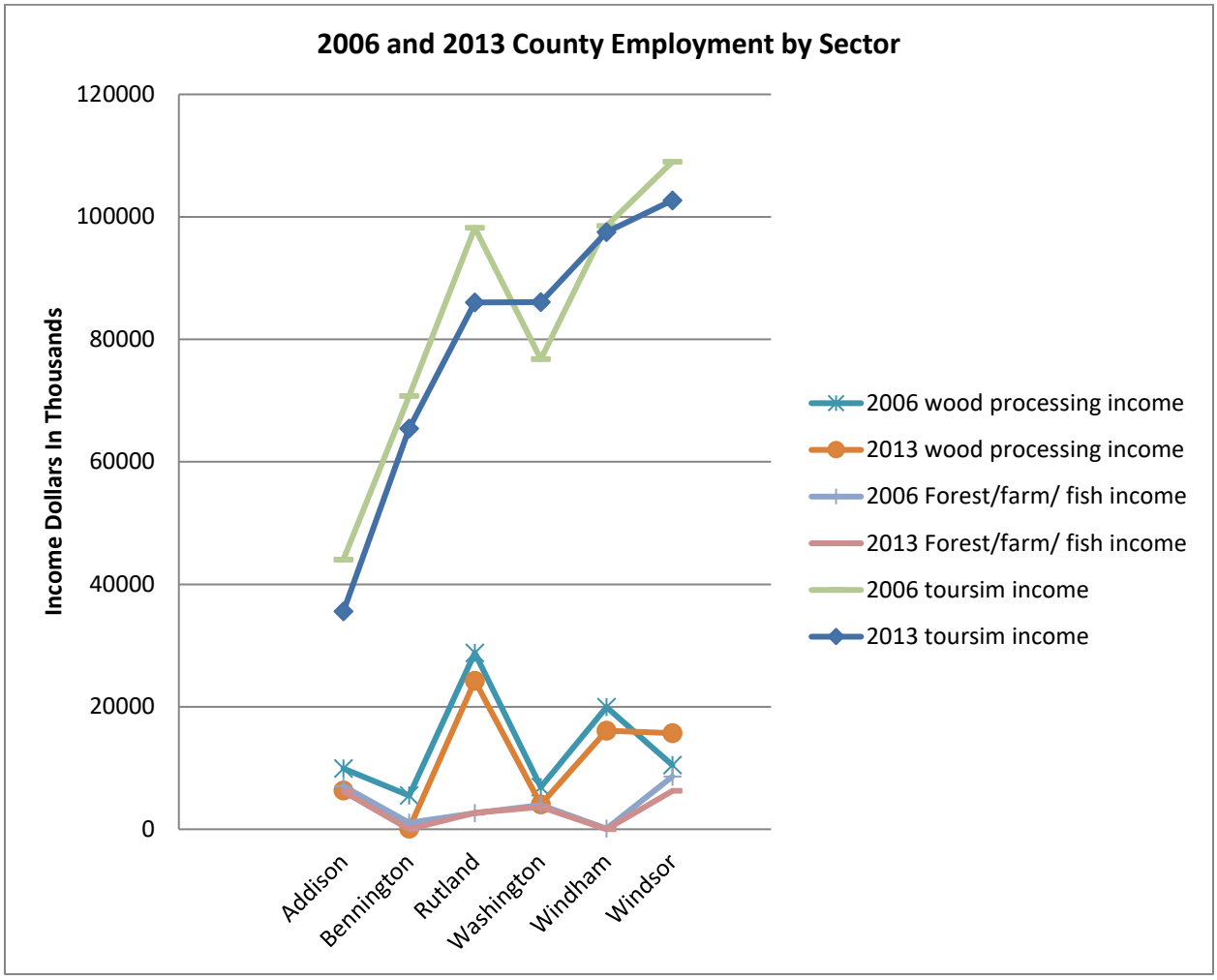


Table 2-16: Personal income by employment sector in 2006 expressed in 2013 dollars* (in thousands of dollars).

	All Sectors	Wood Processing		Forest/Farm/Fish		Tourism	
	Total Income	Income	% of Total	Income	% of Total	Income	% of Total
Vermont	26,458,695	116,628	0.44	83,007	0.31	947,460	3.58
Addison County	1,445,863	9,930	0.69	7,058	0.49	44,009	3.04
Bennington County	1,628,254	5,502	0.34	1,090	0.07	70,768	4.35
Rutland County	2,594,254	28,796	1.11	2,635	0.10	98,236	3.79
Washington County	2,621,790	6,864	0.26	3,958	0.15	76,756	2.93
Windham County	1,862,978	19,931	1.07	(D)		98,543	5.29
Windsor County	2,611,138	10,482	0.40	8,605	0.33	108,981	4.17

Source: Bureau of Economic Analysis, Regional Economic Accounts; Local Area Personal Income, Series CA05. https://www.bea.gov/
(D) Not shown to avoid disclosure of confidential information. This information is included in the statewide totals.
*Adjusted using the Consumer Price Index calculator.

Table 2-17: Personal income by employment sector in 2013 (in thousands of dollars)

	All Sectors	Wood Processing		Forest/Farm/Fish		Tourism	
	Total Income	Income	% of Total	Income	% of Total	Income	% of Total
Vermont	28,501,222	97,175	0.34	80,123	0.28	996,730	3.50
Addison County	1,541,175	6,325	0.41	6,185	0.40	35,556	2.31
Bennington County	1,656,937	(D)		(D)		65,441	3.95
Rutland County	2,754,230	24,247	0.88	2,696	0.10	86,022	3.12
Washington County	2,911,617	4,057	0.14	3,672	0.13	86,080	2.96
Windham County	1,947,545	16,097	0.83	(D)		97,521	5.01
Windsor County	2,704,269	15,705	0.58	6,261	0.23	102,698	3.80

Source: Bureau of Economic Analysis, Regional Economic Accounts; Local Area Personal Income, Series CA05. https://www.bea.gov/
(D) Not shown to avoid disclosure of confidential information. This information is included in the statewide totals.

Recommendations: Forest Service staff should continue to monitor economic contributions to communities through available data such as the Bureau of Economic Analysis, visitor use monitoring, timber sales and special use permits at regular intervals to garner insight into Forest Service management activities contribution to local economies.

Evaluation Question:

How many projects have been completed or undertaken that demonstrate innovative management practice, coordinated vegetation management as a tool to accomplish other resource objectives, and how the Forest is reducing the amount of energy used through conservation and use of renewable energy sources?

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

Monitoring Driver: Forest Plan Goals 9 and 11, and associated Objectives.

Background: The 2006 Forest Plan contains goals and objectives covering many resource and subject areas. During the revision of the Forest Plan a desire was expressed for Forest Service staff to use innovative management practices and to coordinate implementation activities amongst resources to give mutual benefits to resources particularly through vegetation management. Another desire was to increase energy efficiency and opportunities for the development and use of renewable energy on the GMNF. These desires were expressed as Forest Plan goals. This monitoring question is intended to track activities and projects that have clearly moved toward meeting these plan goals in order to monitor progress in Forest Plan implementation.

Monitoring Activities:

Integrated Resource Projects

Forest Service staff uses an integrated resource project approach as one of the main strategies for achieving the Forest Plan goals, objectives, and desired future conditions. Projects developed using this approach maximize efficiency by identifying and developing resource projects in areas where there are multiple resource needs or opportunities such as timber, watershed restoration, heritage, recreation, trails, and wildlife. This collaborative approach to multi-resource projects is interrelated in their geographical location and ecological value. They involve specific analysis of NFS, state, town, and private lands

within a defined project area boundary at the watershed or sub-watershed level. Since the 2006 Forest Plan was approved there have been four integrated resource projects completed: 1) Nordic in the towns of Landgrove, Londonderry, Peru, and Winhall; 2) Natural Turnpike in the towns Ripton and Lincoln; 3) Upper White River in the towns of Hancock and Granville; and 4) Dorset Peru in the towns of Dorset, Peru, Manchester and Winhall. Planning was initiated in 2012 for the South of Route 9 Integrated Resource Project in the towns Bennington, Pownal, Readsboro, Stamford, Whitingham, and Woodford.

Long-Term Ecosystem Monitoring Project

The Long-Term Ecosystem Monitoring Project (LEMP) is a 50-year monitoring effort that will examine the long-term effects of broad-scale environmental changes, particularly changes in climate, air quality, and non-native invasive species. These changes may be indicated through variations in soil chemistry, plant composition and abundance, and lichen tissue chemistry. Throughout the next 50 years, soil, trees, plants, lichens, and down woody material will be sampled at regular intervals, typically every 10 years. Soil sampling protocols are based on those used by the Vermont Monitoring Cooperative, while the Forest Inventory and Analysis (FIA) Protocols are used for all other sampling areas. These plots are all established in areas that have not been recently disturbed by humans and are reasonably protected from future disturbance.

Forest Service-GMNF partners for the monitoring include the Forest Service Northern Research Station (project design and soil analysis), the Vermont Youth Conservation Corps (pit digging), a Natural Resources Conservation Service soil scientist (horizon description), and a Green Mountain College intern (project implementation and lichen surveying). The State of Vermont Agency of Natural Resources, the University of Vermont, and the Vermont Monitoring Cooperative are completing long-term monitoring projects similar to the LEMP that is hoped to complement monitoring on the GMNF.

Moosalamoo National Recreation Area (NRA) Campground Timber Management Project

This project authorized with the completion of the environmental analysis and decision in August 2012 consists of vegetation management to accomplish recreation program objectives. Specifically, the project authorized the management of vegetation within the Silver Lake and Moosalamoo developed campgrounds with the dual purpose of increasing the overall health and structure of the forested stands while reducing the number of high-risk trees within the campground.

Trails Collaborative

The Vermont Trail Collaborative was established in 2009 to improve management and sustainability of trails and trail-related recreation on the GMNF and throughout Vermont. The collaborative completed its work in October 2011. Eighteen different interest groups, ranging from non-profit trail and conservation organizations, colleges and universities, and local and state governments participated.

Much of the work of the collaborative was accomplished by three work groups: landscape management, science panel, and stewardship and communication. The landscape management work group evaluated ways to improve upon the overall existing GMNF trail system, surrounding areas, and throughout Vermont. The science panel consisted of representatives from the research community and the Vermont Trail Collaborative who reviewed existing science and literature to identify research most relevant to trail management issues in this landscape. The panel produced an annotated bibliography prefaced by a summary of key findings and research needs. The stewardship and communication work group took the lead on a coordinated effort throughout the state to improve the educational and interpretive information available for trail users.

Stewardship Contracting

The fiscal year 2003 Omnibus Appropriations Act authorized the Forest Service to develop and administer stewardship contracting projects. The goal of stewardship contracting is to assist in enhancing and restoring landscapes and improving forest health through a variety of management activities on NFS lands. Stewardship contracting does not replace timber sale contracts or service contracts; it is a way to combine and/or use these contracts in new ways, with new authorities that are meant to make it easier to meet ecological objectives in an efficient manner while addressing community needs. Through stewardship contracting, receipts from timber sales are retained by the National Forest where the harvesting occurs to enable service work in local communities to create jobs, develop new business opportunities, and provide healthier landscapes on the public lands.

Stewardship contracts associated with the Natural Turnpike, Upper White River, and Dorset Peru integrated resource projects continue to be implemented creating work for local vendors in communities where these projects are located.

Aquatic Organism Passage

With increasing miles of fragmented stream habitat due to undersized or failed road-stream crossings, restoring connectivity by eliminating physical barriers to aquatic species has become a priority for Eastern Region National Forests including the GMNF. Recent watershed-wide stream crossing assessments show as few as 24 percent of crossings allow passage for all species and size classes. Stream simulation design is a geomorphic and ecologically based approach to designing road-stream crossings that mimics natural channel structure, sediment characteristics, water velocity, depths, and resting areas for aquatic organisms. Effectiveness monitoring has demonstrated brook trout movement through stream simulation design structures soon after construction.

Although aquatic organism passage has been the primary priority of stream simulation design, work on the GMNF has demonstrated additional benefits of flood resiliency and economic savings. During tropical storm Irene in 2011, two completed stream simulation design projects on NFS lands received high flows during the sustained heavy rains. Unlike many traditional hydraulically designed crossings on state and town highways, these structures received no damage and traffic was able to be maintained immediately following the storm. Although stream simulation culvert installation costs are 10 to 30 percent higher than traditional hydraulic designs, cost savings from reduced maintenance, lack of failure from flooding and increased structure lifespan are substantial. Partnerships were formed with towns, federal agencies and non-profit organizations to overcome shortfalls in Federal Emergency Management Agency funding following the storm to replace damaged stream crossings with stream simulation designed crossings. Thirty-one barriers to aquatic organism passage have been removed from 2006 to 2013 on the GMNF. Of those removed, seven were complete removals with no replacement and the stream beds were restored to a natural state and 24 were replaced with various structures that were designed to meet stream simulation design criteria that allow for passage of aquatic organisms and improves flood resiliency.

Deerfield Wind

The Deerfield Wind Project consisting of a special use permit for the construction and operation of 15 wind turbines located on two ridges was approved in early 2012 with the signing of the *Deerfield Wind Project Environmental Impacts Statement – Record of Decision*. The wind turbines are located just east and west of Route 8 in the towns of Searsburg and Readsboro. This project, the first wind project on a National Forest, has a capacity of up to 30 MW of power, or approximately 92,506 megawatt hours (MWh) of renewable wind energy.

Sustainability Team

A Forest Service- GMNF sustainability team was formed in 2008 to work with GMNF staff to fully integrate sustainable practices across the organization and into our day-to-day operation. The team's responsibility was to assess improvement needs by measuring our current environmental footprint and then identifying priorities that will make the biggest difference toward our reduction goal. The team's effort led to reductions in electrical consumption at offices, reductions in gasoline consumption through video conferencing, carpooling and purchasing more efficient vehicles, increases in recycling programs such as composting and battery recycling. The team also set up a green purchasing energy use audit and system upgrade to reduce energy use and the purchase of electricity through the Cow Power Program which takes cow manure turns it into methane and uses the methane to generate electricity.

Evaluation and Conclusions: The innovative projects and programs ongoing or initiated during fiscal years 2012 and 2013 helped address resource issues and have resulted in a more interdisciplinary approach to achieve management goals. Integrated resource projects have increased efficiency in inventory, planning and implementation. These projects also enable funding to be used to benefit more than one resource area. Aquatic organism passage projects benefit fisheries, water resources and roads. Other initiatives such as the Trails Collaborative have improved communication and relationships between interest groups. The sustainability team, made up of staff from many resource areas, was a leader in a holistic approach to achieving energy conservation in GMNF facilities and operations. Forest Service staff has made good strides in reaching these goals.

Recommendations: Continue to approach projects and resource concerns in a collaborative, interdisciplinary manner looking for ways to benefit multiple resources and increase efficiency. Maintain participation in the sustainability team and support the team's efforts to improve energy conservation. Continue to explore ways to increase the use of alternative energy to supply the energy needs of GMNF facilities.

Payments to Towns

Evaluation Question:

What was the amount paid to each GMNF town through Payments in Lieu of Taxes (PILT), 25 percent fund or Secure Schools? What type of communications has occurred on this topic with each town?

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

Monitoring Driver: Forest Plan Goal 17 and associated Objectives.

Background: 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.

Monitoring Activities: See Appendix A

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.

Lands

Evaluation Question:

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

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

Monitoring Driver: Forest Plan Goal 22 and associated Objectives.

Background: The Forest Service captures opportunities to meet Forest Plan and National Strategic Plan goals through purchase, donation, exchange, transfer and conveyance of lands to improve public access, provide outdoor recreation, conserve watersheds, minimize non-native invasive species, sequester carbon and prevent forest fragmentation. The Forest Service also aims to improve legal public use of NFS lands by acquiring rights-of-way for roads and trails. The Forest Service has increased and consolidated NFS lands within the GMNF to reduce fragmentation and encroachment, and achieve maximum public benefits for recreation, biodiversity, critical habitat conservation, and effective management.

Purchases and Donations:

Fiscal Year 2012

Lands were purchased in the towns of Ripton, Readsboro, Manchester and Winhall totaling approximately 425 acres.

Partnering with The Trust for Public land enabled the acquisition of a 300-acre Readsboro parcel which contains approximately 8 acres of wetlands. It is contiguous to a large block of NFS lands to the west and east. The property serves as an east west traveling corridor for black bears (a species of high public interest).

Partnering with the Manchester Land Trust enabled the acquisition of an 120-acre parcel in Manchester and Winhall that contains a significant portion of Stony Brook, which is a tributary to the Batten Kill River, high quality northern hardwoods, and opportunities for backcountry recreation.

A 4-acre parcel was acquired from a private landowner that consolidates the last block of private land within a section of NFS lands in the Town of Ripton.

Fiscal Year 2013

Lands were purchased in the towns of Woodford, Arlington and Dorset totaling approximately 337 acres.

The Forest Service acquired a 222-acre parcel in the Taconic Mountain expansion area to enhance public access and provide increased opportunities for snowshoeing, hunting, and hiking from Emerald Lake State Forest. The VT Department of Fish and Wildlife ranked this location as high in importance for its value as a linkage area for a wide range of animal species to move from one habitat to another, and as an important segment towards meeting the goal to link public lands between the Taconic and Green Mountain Ranges.

An additional 36 acres located within the Taconic Mountain expansion area and entirely surrounded by NFS lands was also acquired in the Town of Arlington. This inholding will reduce threats of trespass and encroachments, prevent habitat fragmentation, and reduce management costs for boundary location and maintenance.

A 79-acre parcel acquired in the Town of Woodford is contiguous to NFS lands and within the Sucker Brook watershed.

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. Monitoring activities in the form of the information sharing described above will continue to enhance the land adjustment program.

Evaluation and Conclusions: The major partners assisting in land acquisition were The Manchester Land Trust, who facilitated the purchase of the Manchester and Winhall parcels, and the Trust for Public Land who assisted in the Readsboro acquisition. 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.

3. Research and Studies

The following research and study activities occurred on GMNF during fiscal years 2012 and 2013.

Fiscal Year 2012

Investigating the Relationship between Calcium Depletion and Red Spruce Growth and Response to Environmental Stress

The data collected at the research sites will be used to examine red spruce, a tree species known for its sensitivity to calcium depletion, and evaluate how its growth and response to environmental stresses are related to modeled estimates of critical loads (the capacity of a site to tolerate pollution) and exceedance (the amount to which incoming pollution exceeds the critical load) estimates for acid deposition. This work will in turn evaluate the critical load model's ability to identify and quantify vulnerable red spruce stands across the landscape.

Developing a Multiproxy Tree-ring Based Reconstruction of Past Climate for Vermont

Tree-ring based climate reconstructions are few for northern New England, and existing chronologies for northern New England are missing the last three to four decades when climate has experienced some of the greatest changes for this region and globally. This project will bridge that gap in the climate chronologies record and will be used to test and verify output from general circulation models of future climate scenarios.

Establishment of air quality monitoring plots using lichens and bryophytes in three USDA Forest Service Class 1 Areas of the Northeast.

The purpose of this project is to enhance the existing air quality biomonitoring infrastructure in three northeastern Class I Wilderness Areas by comparing previous lichen reports to new lichen data to be collected. This work is necessary because decline of some lichen species is ongoing in New England.

Impact of Acidic Deposition and Soil Calcium Depletion on Terrestrial Biodiversity and Food Webs in Northern Hardwood Forest Ecosystems

This research expands on a previous pilot study, which found that by sampling upland hardwood forests along large gradients in soil calcium and acidic deposition, a strong influence of the interactions between soil calcium and acid rain on the structure, abundance and diversity of these forest communities was found. This expansion will cover the entire Northern Forest region by adding additional sites, approximately five of which will be on GMNF.

Fiscal Year 2013

Effects of Global Change on Mountain Forests of the Northeastern States

The data collected for this project will be used to evaluate how climate and soil affect tree recruitment, growth, mortality, and abundance in the spruce-fir zone of conserved areas in New York, Vermont, New Hampshire, and Maine. The data from these sites will become part of an integrated regional dataset that will include 12 mountain field sites, including three on the GMNF.

A Study of the Distributional Shifts of Tree Species along an Elevational Gradient

This study is part of the larger *Effects of Global Change on Mountain Forests of the Northeastern States* study and represents the addition of a fourth site on the GMNF to the project.

Development of a Geospatial Model of Soil Parent Material Chemistry and Mineralogy on the Green Mountain National Forest

This study will develop a database representing the mineralogy of each bedrock map unit in the new Vermont bedrock map, and will then use that database with a model of glacial movement to create a model that predicts and maps glacial till chemistry across the GMNF. As glacial till is the dominant parent material for soils on the GMNF, this model will significantly improve our understanding of soil and site productivity.

Impacts of Acidic Deposition and Soil Calcium Depletion on Terrestrial Biodiversity and Food Webs in Northern Hardwood Forest Ecosystems

This research initiated in 2011 was expanded in 2013 to include documentation of the level of earthworm invasion at the original sites.

A Study of the Lineages of the Diptera Genus Scaptomyza

The research aims to place the lineages of *Scaptomyza* into an evolutionary framework to test where, when, and how this species diversified. To do this the researchers need to collect *Scaptomyza* species and individuals from populations throughout the world, specifically North America, including in Vermont and on the GMNF.

A Study of the Phylogenetic Relationships of Polemonium

Previous studies of *P. vanbrunitae* suggest low variability within populations and little gene flow between populations. This study looks at the actual genome of the species and provides information across the entire range of the species. Broader sampling of *P. vanbruntiae* will clarify the relationships in the genus and clarify the biogeographic history of the genus. Particularly for *P. vanbruntiae*, this research will potentially provide an estimation of the phylogeographic history of the species (in what area it originated and has since dispersed to) as well as provide evidence for continuation of this taxon at the species-rank (as opposed to merely a subspecies of *P. caeruleum*).

Tradeoffs between Carbon Storage and Stream Quality in a Riparian Buffer

The data collected for this project will be used to evaluate the characteristics of natural riparian communities to inform riparian restoration strategies that will be most effective for protecting stream bank stability and mitigating climate change through carbon sequestration.

Using Silvicultural Management and Genetic Selection to Assist in the Restoration of American Chestnut to the Northern Forest

This project builds on a 2009 chestnut progeny planting established during the Dutton Brook timber sale. It involves planting an additional 500 chestnut seedlings at the existing planting sites and evaluating the growth and cold hardiness of these trees.

4. Adjustments or Corrections to the Forest Plan

Direction for Forest Plan amendments or administrative corrections are provided by planning directives at 36 CFR 219. There were no Forest Plan amendments or administrative corrections associated with the Green Mountain National Forest Land and Resource Management Plan (Forest Plan) in fiscal years 2012 and 2013.

5. List of Preparers

Table 5-1 provides the Forest Service interdisciplinary team that collected, evaluated, or compiled data for the fiscal years 2012 and 2013 Annual Monitoring and Evaluation Report:

Table 5-1: Preparers of the fiscal years 2012 and 2013 Annual Monitoring and Evaluation Report.

Name	Position
Jay Strand	Monitoring Team Leader/Forest Planner
Melissa Reichert	Recreation Program Manager
Diane Burbank	Ecologist
Angie Quintana	Soil Scientist
Carol Burd	Recreation Planner
Jeff Tilley	Silviculturist
MaryBeth Deller	Botanist
Pam Gaiotti	Budget and Accounting Officer
John Kamb	Engineer
Dave Lacy	Archaeologist and Heritage Resource Specialist
Jen Wright	Wilderness Coordinator
Dan McKinley	Wildlife and Fisheries Program Manager
Lindsay Silvia	Fire Planner
Pat D'Andrea	Realty Specialist
Doreen Urquhart	Lands Acquisition Specialist
John Sease	Wildlife Biologist
Ralph Perron	Air Quality Specialist

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; 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. 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 PILT payments and acreage for fiscal years 2012 and 2013

	Fiscal Year 2012		Fiscal Year 2013	
Town[1]	Payment	Total Entitlement Acres[2]	Payment	Total Entitlement Acres[2]
ARLINGTON TOWN	$10,137	4,108	$9,893	4,108
BARNARD TOWN	$7,848	650	$7,491	650
BENNINGTON COUNTY	$41,927	26,630	$42,737	26,630
BENNINGTON TOWN	$3,188	1,292	$3,112	1,292
BRANDON TOWN	$220	89	$214	89
BRIDGEWATER TOWN	$2,098	850	$2,951	1,225
BRISTOL TOWN	$13,588	5,507	$13,262	5,507
CHITTENDEN TOWN	$72,568	29,409	$70,824	29,409
CLARENDON TOWN	$0	30	$0	30
DANBY TOWN	$0	6	$0	6
DORSET TOWN	$13,295	5,388	$12,976	5,388
DOVER TOWN	$13,917	5,640	$13,583	5,640

	Fiscal Year 2012		Fiscal Year 2013	
Town[1]	Payment	Total Entitlement Acres[2]	Payment	Total Entitlement Acres[2]
GOSHEN TOWN	$18,793	7,616	$18,341	7,616
GRANBY TOWN	$4,096	1,660	$3,997	1,660
GRANVILLE TOWN	$36,495	14,790	$35,618	14,790
HANCOCK TOWN	$47,592	19,287	$46,447	19,287
HARTFORD TOWN	$2,803	1,136	$2,735	1,136
HARTLAND TOWN	$1,529	620	$1,493	620
JAMAICA TOWN	$4,668	1,892	$4,557	1,892
KILLINGTON TOWN	$9,414	3,815	$9,187	3,815
LANDGROVE TOWN	$1,991	807	$1,944	807
LEICESTER TOWN	$6,776	2,746	$6,613	2,746
LINCOLN TOWN	$26,844	10,879	$26,199	10,879
LONDONDERRY TOWN	$1,732	702	$1,690	702
MANCHESTER TOWN	$13,340	5,406	$13,161	5,465
MENDON TOWN	$6,845	2,774	$6,680	2,774
MIDDLEBURY TOWN	$8,034	3,256	$7,841	3,256
MOUNT HOLLY TOWN	$8,291	3,360	$8,091	3,360
MOUNT TABOR TOWN	$32,710	25,117	$41,045	25,117
NORWICH TOWN	$1,658	672	$1,618	672
PERU TOWN	$42,407	17,186	$41,387	17,186
PITTSFIELD TOWN	$18,995	7,698	$18,539	7,698
POMFRET TOWN	$3,178	1,288	$3,102	1,288
POWNAL TOWN	$10,023	4,062	$9,782	4,062
READSBORO TOWN	$21,428	8,684	$21,635	8,984
RIPTON TOWN	$54,781	22,201	$53,475	22,205
ROCHESTER TOWN	$31,076	12,594	$30,329	12,594
RUPERT TOWN	$661	268	$646	268
SALISBURY TOWN	$9,451	3,830	$9,223	3,830
SEARSBURG TOWN	$14,944	7,632	$17,521	7,632
SHAFTSBURY TOWN	$5,078	2,058	$4,956	2,058
SHREWSBURY TOWN	$5,506	2,231	$5,373	2,231
SPRINGFIELD TOWN	$499	202	$486	202
STAMFORD TOWN	$29,174	11,823	$28,472	11,823
STOCKBRIDGE TOWN	$2,006	813	$1,958	813

	Fiscal Year 2012		Fiscal Year 2013	
Town[1]	Payment	Total Entitlement Acres[2]	Payment	Total Entitlement Acres[2]
STRATTON TOWN	$27,729	18,238	$34,880	18,238
SUNDERLAND TOWN	$53,999	21,884	$52,701	21,884
THETFORD TOWN	$2,411	977	$2,353	977
TOWNSHEND TOWN	$2,446	991	$2,386	991
WALLINGFORD TOWN	$22,381	9,070	$21,843	9,070
WARDSBORO TOWN	$7,659	3,104	$7,475	3,104
WARREN TOWN	$17,468	7,079	$17,048	7,079
WEATHERSFIELD TOWN	$2,741	1,111	$2,676	1,111
WESTON TOWN	$22,465	9,104	$21,924	9,104
WILMINGTON TOWN	$4,527	1,835	$4,419	1,835
WINDHAM COUNTY	$14,589	9,323	$14,881	9,323
WINDSOR COUNTY	$0	0	$717	0
WINHALL TOWN	$39,017	15,812	$38,225	15,873
WOODFORD TOWN	$61,814	25,051	$60,329	25,051
WOODSTOCK TOWN	$1,370	555	$1,337	555

[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

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 provides the payments to Vermont towns by county in fiscal years 2012 and 2013. 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.

Table A-2: Secure Rural Schools payments by Vermont town/county for fiscal years 2012 and 2013.

	Fiscal Year 2012		Fiscal Year 2013	
Town by County	Payment Amount	Acres	Payment Amount	Acres
Addison County				
Bristol	$4,338.80	5,528	$4,117.92	5,528
Goshen	$5,977.63	7,616	$5,673.31	7,616

	Fiscal Year 2012		Fiscal Year 2013	
Town by County	**Payment Amount**	**Acres**	**Payment Amount**	**Acres**
Granville	$11,675.05	14,875	$11,080.69	14,875
Hancock	$15,137.93	19,287	$14,367.27	19,287
Leicester	$2,155.27	2,746	$2,045.55	2,746
Lincoln	$8,927.98	11,375	$8,473.47	11,375
Middlebury	$2,641.90	3,366	$2,507.40	3,366
Ripton	$17,430.88	22,208	$16,543.49	22,208
Salisbury	$3,006.08	3,830	$2,853.04	3,830
Bennington County				
Arlington	$3,224.28	4,108	$3,086.95	4,144
Bennington	$1,014.06	1,292	$962.44	1,292
Dorset	$4,377.26	5,577	$4,319.79	5,799
Glastenbury	$20,901.29	26,630	$19,837.22	26,630
Landgrove	$636.54	811	$604.13	811
Manchester	$4,365.41	5,562	$4,143.17	5,562
Peru	$13,527.36	17,235	$12,838.70	17,235
Pownal	$3,188.17	4,062	$3,025.87	4,062
Readsboro	$7,051.18	8,984	$6,692.21	8,984
Searsburg	$5,990.19	7,632	$5,685.23	7,632
Shaftbury	$1,079.79	1,376	$1,024.82	1,376
Stamford	$9,279.61	11,823	$8,807.19	11,823
Sunderland	$17,213.93	21,932	$16,337.59	21,932
Winhall	$12,541.87	15,979	$11,903.38	15,979
Woodford	$20,997.04	26,752	$19,987.02	26,831
Rupert	$131.86	168	$125.15	168
Essex County				
Granby	$1,302.90	1,660	$1,236.57	1,660
Rutland County				
Brandon	$69.85	89	$66.30	89
Chittenden	$23,082.47	29,409	$21,907.36	29,409
Mendon	$2,513.96	3,203	$2,385.98	3,203
Mt Holly	$2,637.19	3,360	$2,502.93	3,360
Mt Tabor	$19,713.77	25,117	$18,710.16	25,117
Pittsfield	$6,041.99	7,698	$5,734.39	7,698
Sherburne	$1,405.72	1,791	$1,334.15	1,791
Wallingford	$6,718.55	8,560	$6,376.52	8,560
Danby		6		6
Washington County				
Warren	$5,669.96	7,224	$5,381.30	7,224
Windham County				
Dover	$4,426.71	5,640	$4,201.35	5,640
Jamaica	$920.35	1,173	$873.49	1,173

	Fiscal Year 2012		Fiscal Year 2013	
Town by County	**Payment Amount**	**Acres**	**Payment Amount**	**Acres**
Londonderry	$342.99	437	$325.53	437
Somerset	$7,395.90	9,423	$7,019.38	9,423
Stratton	$14,314.60	18,238	$13,585.85	18,238
Wardsboro	$2,436.26	3,104	$2,312.23	3,104
Wilmington	$1,440.12	1,835	$1,366.80	1,835
Windsor County				
Rochester	$9,889.46	12,600	$9,385.99	12,600
Stockbridge	$635.75	810	$603.39	810
Weston	$7,145.53	9,104	$6,781.75	9,104

Appendix B: Threatened, Endangered and Sensitive Species

Table B-1 lists federally listed threatened and endangered species specific to the Green Mountain National Forest per the Endangered Species Act.

Table B-1: Species listed as threatened or endangered under the Endangered Species Act with currently or historic occurrence in Vermont and on lands now administered by the Green Mountain National Forest.

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

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

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

MAMMALS	
Myotis leibii	Eastern Small-footed bat
Myotis lucifugus	Little Brown Myotis
Myotis septentrionalis	Northern Myotis
Perimyotis subflavus	Tri-colored Bat
BIRDS	
Catharus bicknelli	Bicknell's Thrush
Cistothorus platensis	Sedge Wren
Euphagus carolinus	Rusty Blackbird
Falco peregrinus anatum	American Peregrine Falcon
Gavia immer	Common Loon
Haliaeetus leucocephalus	Bald Eagle
AMPHIBIANS	
Ambystoma jeffersonianum	Jefferson Salamander
Ambystoma laterale	Blue-spotted Salamander
Hemidactylium scutatum	Four-toed Salamander
REPTILES	
Glyptemys insculpta	Wood Turtle
INVERTEBRATES-BIVALVES	
Alasmidonta varicosa	Brook Floater
Lasmigona compressa	Creek Heelsplitter
INVERTEBRATES - INSECTS	
Lanthus vernalis	Southern Pygmy Clubtail
Cicindela ancocisconensis	Appalachian Tiger Beetle
Pieris virginiensis	West Virginia White
Somatochlora forcipata	Forcipate Emerald
Tachopteryx thoreyi	Gray Petaltail
Williamsonia lintneri	Ringed Boghaunter
NON-VASCULAR PLANTS	
Isopterygiopsis pulchella	Isopterygiopsis Moss
Atrichum crispum	Atrichium Moss
Bucklandiella microcarpa (=Racomitrium heterostichum)	Rachomitrium Moss
Cephaloziella elachista	
Frullania bolanderi	
Hamatocaulis vernicosus	Hamatocaulis Moss
Harpanthus scutatus	
Hygrohypnum subeugyrium	Hygrohypnum Moss
Meesia triquetra	Meesia Moss
Metzgeria crassipilis	
Pohlia annotina	Pohlia Moss
Pohlia bulbifera	Pohlia Moss
Pohlia elongata var. elongata	Elongate Pohlia Moss
Pohlia sphagnicola	Pohlia Moss
Polytrichastrum (=Polytrichum) longisetum	Polytrichum Moss
Scapania paludicola var. paludicola	
Sematophyllum marylandicum	Maryland Sematophyllum Moss
Sphagnum pulchrum	Sphagnum
PLANTS	
Agrostis mertensii	Arctic Bentgrass
Arabis drummondii (syn = Boechera stricta)	Drummond's Rockcress
Arceuthobium pusillum	Eastern Dwarf-mistletoe
Asclepias exaltata	Poke Milkweed
Aureolaria pedicularia	Fernleaf Yellow False Foxglove
Blephilia hirsuta	Hairy Woodmint
Botrychium oneidense	Bluntlobe Grapefern
Calamagrostis stricta ssp. inexpansa	New England Northern Reed Grass

Cardamine parviflora var. arenicola	Sand Bittercress
Carex aestivalis	Summer Sedge
Carex aquatilis var. aquatilis	Water Sedge
Carex argyrantha	Hay Sedge
Carex backii	Rocky Mountain Sedge
Carex bigelowii	Bigelow's Sedge
Carex foenea	Dryspike Sedge
Carex haydenii	Cloud Sedge
Carex lenticularis	Shore Sedge
Carex michauxiana	Michaux's Sedge
Carex oligosperma	Fewseed Sedge
Carex schweinitzii	Schweinitz's Sedge
Carex scirpoidea	Bulrush Sedge
Ceratophyllum echinatum	Prickly Hornwort
Clematis occidentalis var. occidentalis	Purple Clematis
Collinsonia canadensis	Canada Horse-balm
Conopholis americana	Squaw-root
Cryptogramma stelleri	Fragile Rockbrake
Cynoglossum virginianum var. boreale	Northern Wild Comfrey
Cypripedium parviflorum var. pubescens	Greater Yellow Lady's-slipper
Cypripedium reginae	Showy Lady's-slipper
Desmodium paniculatum	Panicledleaf Ticktrefoil
Desmodium perplexum	Perplexed Ticktrefoil
Diplazium pycnocarpon	Glade Fern
Draba arabisans	Rock Whitlow-grass
Dryopteris filix-mas	Male Fern
Eleocharis intermedia	Matted Spikerush
Eleocharis olivacea v. olivacea (=E. flavescens v. olivacea)	Bright Green Spikerush
Eleocharis ovata	Ovate pikerush
Equisetum pratense	Meadow Horsetail
Eupatorium purpureum (=Eutrochium purpureum)	Sweet Joe-pyeweed
Galium kamtschaticum	Boreal Bedstraw
Glyceria septentrionalis	Floating Mannagrass
Hackelia deflexa var. americana	Northern Stickseed
Helianthus strumosus	Harsh Sunflower
Hieracium venosum	Rattlesnakeweed
Huperzia appalachiana	Appalachian Clubmoss
Isotria verticillata	Large Whorled Pogonia
Juglans cinerea	Butternut
Juncus trifidus	Highland Rush
Lespedeza hirta	Hairy Lespedeza
Lespedeza violacea	Violet Lespedeza
Littorella uniflora (=L. americana)	American Shoregrass
Lobelia siphilitica	Great Blue Lobelia
Mimulus moschatus	Muskflower
Muhlenbergia uniflora	Bog Muhly
Myriophyllum farwellii	Farwell's Water-milfoil
Nyssa sylvatica	Blackgum
Panax quinquefolius	American Ginseng
Peltandra virginica	Green Arrow-arum
Phegopteris hexagonoptera	Broad Beechfern
Physostegia virginiana	False Dragon-head
Pinus rigida	Pitch Pine
Platanthera orbiculata	Lesser Roundleaved Orchid
Polemonium vanbruntiae	Bog Jacob's-ladder
Potamogeton bicupulatus	Snail-seed Pondweed
Potamogeton confervoides	Algae-like Pondweed
Potamogeton hillii	Hill's Pondweed
Prenanthes trifoliolata	Gall of the Earth
Pyrola chlorantha	Greenflowered Wintergreen
Pyrola minor	Snowline Wintergreen
Quercus muehlenbergii	Chinquapin Oak
Ranunculus pensylvanicus	Pennsylvania Buttercup
Rhodiola rosea	Roseroot Stonecrop
Sanicula canadensis	Canadian Blacksnakeroot
Saxifraga paniculata	White Mountain Saxifrage
Scheuchzeria palustris ssp. americana	American Scheuchzeria
Selaginella apoda	Meadow Spike-moss
Selaginella rupestris	Ledge Spike-moss
Sisyrinchium angustifolium	Pointed Blue-eyed-grass
Sisyrinchium atlanticum	Eastern Blue-eyed-grass
Solidago patula	Roundleaf Goldenrod
Solidago simplex ssp. randii	Rand's Goldenrod
Solidago squarrosa	Squarrose Goldenrod
Stellaria alsine	Bog Chickweed
Symphyotrichum prenanthoides	Crooked-stem Aster
Trillium cernuum	Whip-poor-will Flower
Utricularia resupinata	Northeastern Bladderwort
Vaccinium uliginosum	Alpine Blueberry
Woodsia glabella	Smooth Woodsia

Appendix C: Rare or Uncommon Natural Communities

Table C-1 show the rare or uncommon natural communities recognized as significant as listed in the Green Mountain National Forest Land and Resource Management 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