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Green Mountain National Forest

Monitoring Program Trends Report

Fiscal Years 2006 to 2013



*Measuring tree diameter for lichen study in Lye Brook Wilderness Area
Manchester Ranger District*

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**Monitoring Program Trends Report
Fiscal Years 2006 to 2013
Green Mountain National Forest**

USDA Forest Service, Eastern Region
August 2015

Monitoring and evaluation of forest plans is required by the National Forest Management Act and associated National Forest System Land Management Planning Rule (planning regulations) at 36 CFR 219 dated September 30, 1982. Monitoring plans provide what resources should be monitored to help determine how well management activities are meeting forest plan components including goals, objectives, desired future conditions, and forest-wide and management area standards and guidelines. The Green Mountain National Forest (GMNF) monitoring plan is described in Chapter 4 (Monitoring and Evaluation) of the GMNF Land and Resource Management Plan (Forest Plan) revised in 2006. Monitoring and evaluation of select resources included in the monitoring plan has been conducted since the completion of the revised Forest Plan. Monitoring results and the evaluation of information collected have been documented in monitoring and evaluation reports annually through 2013. This report documents recommendations to change Forest Plan components based on evaluation and conclusions from identified resource trends associated with each monitoring question.

1. Introduction

The revision of the GMNF Forest Plan was completed in 2006 under the authority of the National Forest Management Act and associated National Forest System Land Management Planning Rule, or planning regulations (36 CFR 219 dated September 30, 1982). The intent of the associated monitoring program cited in the rule (36 CFR 219.12(4)(k)), specifically the annual monitoring and evaluation reporting process, was designed to determine Forest Plan implementation effectiveness. In other words, it serves as the basis to determine how well management activities are meeting Forest Plan direction and identifying important discernable resource trends.

Monitoring questions and associated measurement indicators are driven by one or more Forest Plan components (goals, objectives, desired future conditions, and standards and guidelines). Evaluation of information collected to answer monitoring questions provide Forest Service resource specialists with the basis to determine whether changes are needed to Forest Plan components. These changes can be made through the amendment process to ensure the Forest Plan remains current by adapting to new information and changed conditions. Evaluation of monitoring information may also provide the basis for design changes to management activities to better meet Forest Plan direction.

Annual monitoring and evaluation reports were completed each year to document results of monitoring from fiscal year 2006 to fiscal year 2013. These reports describe monitoring questions by resource category, provide data pertaining to the effects and effectiveness of Forest Plan management direction, and discuss various resource management efforts implemented during this period. The *Green Mountain National Forest Monitoring Program Trends Report - Fiscal Years 2006 to 2013* documents discernable change to resource conditions identified from annual monitoring and evaluation reports since Forest Plan implementation began in 2006. It includes the evaluation and key conclusions for each monitoring question, and recommendations for potential change to Forest Plan components, the monitoring program, or project design for more effective implementation of management activities to meet Forest Plan direction.

2. Trends Identified from Monitoring Reports – Fiscal Years 2006 to 2013

Forest Service staff reviewed annual monitoring and evaluation reports from fiscal years 2006 to 2013 to identify discernable resource trends specific to the effectiveness of implementing Forest Plan direction. Each monitoring question was evaluated including recommendations to potentially improve plan components by changes to Forest Plan direction, development of more meaningful monitoring questions, or design changes to management activities. The primary questions they attempted to answer included:

- What has been the overall trend for the monitoring question (resource)?
- Has the monitoring resulted in meaningful information and understanding of Forest Plan components?
 - (Implementation) Have management activities been implemented according to Forest Plan direction?
 - (Effectiveness) Is the Forest Plan achieving desired outcomes?
 - (Validity) Does the Forest Plan need to be changed?
- Does the monitoring item (question, indicator/measure, monitoring protocol/methodology) need to be continued, dropped from further consideration, or changed?

The following section provides the evaluation, conclusion, and recommendation for each monitoring question identified from the review of annual monitoring and evaluation reports from fiscal years 2006 to 2013. The order of monitoring questions and associated information follows the same alphabetical order of resource categories found in the *2007 Green Mountain National Forest Monitoring and Evaluation Guide*.

Air

Monitoring Item Name: Air Particulate

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

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

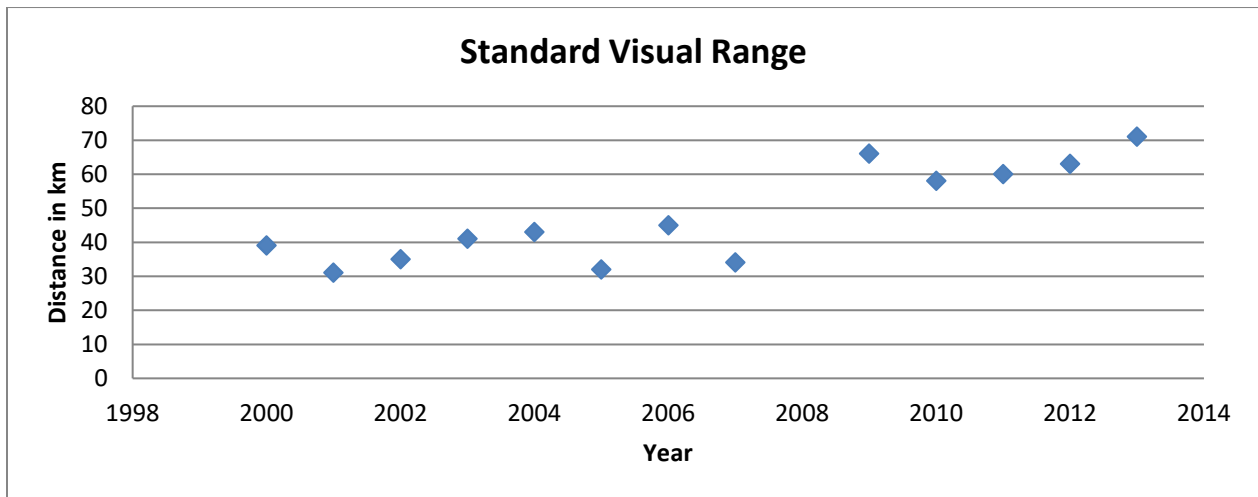
Monitoring Driver: Forest Plan Goal 5 and associated Objectives.

Monitoring Frequency: Weekly.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: 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 which consists of an aerosol visibility monitor. 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 1¹



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

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.

This data was also used as part of a lichen monitoring study 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 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.

Recommendations: No change to the monitoring question. Pursue review of lichen data in greater detail to confirm preliminary conclusions. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Aquatic Ecosystems

Monitoring Item Name: Fish and Aquatic Organism Passage

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives, and Forest-wide Fisheries Standards and Guidelines.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006 and 2008 annual monitoring and evaluation reports.

Evaluation and Conclusions: Since 1995, the Forest Service has conducted road crossing/stream culvert surveys to identify migration barriers to fish and other aquatic organisms. The objective of road crossing/stream culvert inventory and monitoring is to improve maintenance of crossing structures and improve the design and installation of new or replacement structures to provide aquatic organism passage, aquatic habitat connectivity, and fluvial geomorphic processes and functions in GMNF waters. This includes placement of structures that pass water, trees/wood material, and allow free movement in streams as in natural channels. The Forest Service also collaborates with the VT Departments of Fish and Wildlife and Environmental Conservation, U.S. Fish and Wildlife Service, and other organizations such as the White River Partnership and Batten Kill Watershed Alliance to improve passage for fish and other aquatic organisms within Vermont watersheds.

Fish and aquatic organism passage is critical to the survival and perpetuation of native fish and invertebrate populations. Impacts from barriers to aquatic passage can range from complete exclusion of species from rivers and their tributaries to highly fragmented habitats often associated with highly developed transportation systems adjacent to stream networks. Evaluation criteria and coarse filter screening process were developed using biological and hydrologic information from scientific literature. In recent years, the GMNF staff have incorporated fluvial geomorphology and engineering criteria to enhance the evaluation process. When the 2008 annual monitoring and evaluation report was published, approximately 175 culverts had been surveyed, evaluated and/or monitored on the Forest. Although evaluation of all culverts inventoried has not been completed, about 100 culverts were found to be impassable. Thirty-one barriers to aquatic organism passage have been removed from 2006 to 2013 on 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 improve flood resiliency.

Evaluation of culvert replacement indicates many benefits were achieved including:

- Unobstructed passage for fish to quality spawning and rearing habitat
- Improved habitat for other aquatic species such as native salamanders and insects.
- Restored habitat upstream of the culvert replacement
- Stabilized stream banks and reduced soil erosion
- Reduced sediment in aquatic habitat downstream of culvert replacement

Recommendations: No change to the monitoring question. Continue to inventory and assess culvert conditions throughout GMNF through collaboration with other agencies and partner organizations. Prioritize culvert replacement or enhancement needs and plan for implementation as budget and staffing allow. The next anticipated monitoring and evaluation report for this monitoring question is 2014.

Monitoring Item Name: Fish Habitat and Stream Channel Stability

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

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

Monitoring Driver: Forest Plan Goal 6 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006, 2007, 2008, and 2009 annual monitoring and evaluation reports.

Evaluation and Conclusions: In 1999, approximately 40 permanently marked (monument) sites on approximately 35 streams representing the range of stream sizes were established throughout the GMNF, with representation provided in each management area. Each site is monitored every five years to provide data to detect fish habitat and stream channel changes in managed and unmanaged areas of the Forest. This monitoring allows for detection of effects from management activities and from those associated with natural variability, as well as for assessment of Forest-wide trends over the long term.

A review and comparison of the 2004 and 2009 data indicate that fish habitat conditions are relatively unchanged, and stream channels are stable and within the range of natural variability for upland streams. The amount of pool habitat and fine sediment are good indicators for habitat quality and stability. Table 2-1 shows changes in pool area and fines (sand) over the past 5 years in five GMNF streams. These conditions provide quality aquatic habitat for aquatic insects and fish.

Table 2-1. Changes in percent pool habitat and fine sediment from 2004 to 2009.

Stream	Pool Area (%)		Percent Fines (% Sand)	
	2004	2009	2004	2009
Griffith	34	49	3	6
Greendale	39	42	5	4
Robbins	31	35	7	6
Michigan	23	14	6	9
West Branch	26	21	20	15

Recommendations: No change to the monitoring question. The next anticipated monitoring and evaluation report for this monitoring question is 2014.

Aquatic Habitat

Monitoring Item Name: Sedimentation/Substrate Embeddedness

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

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

Monitoring Driver: Forest Plan Goal 4 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006, 2008, and 2009 annual monitoring and evaluation reports.

Evaluation and Conclusions: Substrate embeddedness or sedimentation monitoring provides a quantitative measure from which fish spawning and rearing habitat can be measured and assessed and tracked over time for trends. Low embeddedness and sedimentation provide high quality habitat for native fish species and aquatic macroinvertebrates in stream ecosystems. The percent of fine sediments indicate the extent to which gravels and cobbles are surrounded (embedded) by sand and silt that reduces insect habitat and spawning success. Stream embeddedness and sedimentation data were collected using standard stream geomorphology protocols (Level III geomorphic survey) then summarized and compared to threshold levels from the scientific literature referenced in the Forest Plan.

Substrate composition baseline monitoring was done in 2004 and repeated in 2009. In 2004 the percentage of fines in the five streams sampled ranged from 3 to 20 percent. In 2009 fines ranged from 6 to 15 percent. All five streams monitored were well below the maximum Forest Plan desired condition (less than 20 percent fine sediment, sand, and silt in spawning areas). Minor changes in the amount of fines indicate GMNF streams continue to provide healthy habitat for fish and macro-invertebrates.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Water Temperature in Streams

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

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

Monitoring Driver: Forest Plan Goal 4 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal year 2007 annual monitoring and evaluation report.

Evaluation and Conclusions: Water temperatures are critical to the survival of native fish and aquatic invertebrate populations. The objective of this monitoring question is to determine if cold-water habitat for native fish and aquatic insects is being maintained in GMNF streams. Monitoring data is used to

prioritize which high-quality cold-water streams need protection, and to develop habitat enhancement projects such as planting stream bank buffers where water temperatures are too high to support quality aquatic habitat due to poor stream shading. Since 2006, GMNF fisheries staff have monitored 34 sites both on and off National Forest System land and in various watersheds. By using both baseline and long-term water temperature monitoring protocols, staff were able to maximize the area of coverage on the Forest and were able to focus on locations associated with specific projects. Both types of monitoring were useful for determining which watersheds, streams and sites required further focus.

Water temperatures in GMNF upland streams are monitored annually. Some of the sites are monitored from May to October within the same year and some are monitored year around. During the fiscal year 2007 to 2013 evaluation period, the number of sites monitored ranged from 7 sites in 2007 to 18 sites in 2013. Beginning in 2008, the GMNF fisheries program partnered with the VT Department of Environmental Conservation to monitor 7 sites year around; these permanent sites are called sentinel sites (White River, West River, and Deerfield River watersheds) and will continue to be monitored in the future. Year around monitoring has numerous benefits: the data collected are from a wide range of climate conditions and flow conditions, which results in a thorough thermal description of each site; the data can be compared among years and sites; and the data can be evaluated for patterns in thermal regimes.

None of the sentinel sites had a complete set of data during the 2006 to 2013 evaluation period due to the difficulty of keeping the temperature monitoring units intact all year around. High water events had the most impact; five of the seven sentinel units were lost or washed out of water during the high flows of tropical storm Irene in 2011. Even though each of the 7 sites had lost data for one or more years, site patterns and trends were still evident. For example, the outlet to Grout Pond consistently recorded the highest average daily temperatures and the most number of days with those highest temperatures. Conversely, Bingo Brook and Smith Brook consistently recorded average daily temperatures <70° F. There was also some variability within particular sites. Flood Brook downstream of Hapgood Pond varied from 0 days to 70 days with average daily temperatures >70° F. An analysis of the three sentinel sites in Flood Brook showed that the site below Hapgood Pond was the warmest, indicating that the pond's release was warming the channel below it. However, Flood Brook did cool down as it continued downstream; this was due to the influence of cold water coming from the Farnum Brook tributary, even though the site below the tributary has some variability. For all sites, the longer the monitoring continues, the more accurate the thermal description of each site will become.

Recommendations: Some of the results from the long-term monitoring data have led to potential changes in future monitoring protocol and evaluation. Although GMNF staff will continue to use both baseline and year-round monitoring, the monitoring conducted annually from spring through fall will be repeated at each respective site for at least 3 consecutive years. This will ensure enough data will be available to show typical stream temperature patterns. Another change may involve adjusting the evaluation indicators so that maximum temperatures are used instead of average daily temperatures. This can lead to evaluating how much time a critical temperature (greater than 70 degrees) is reached and then sustained in each 24-hour period and thus indicate the severity of the temperature impact on cold-water aquatic species. The seasonal timing of optimal temperatures for specific cold-water species, such as brook trout, can also be determined and tracked to determine if changes occur in temperature-dependent activities such as growth or spawning.

Although the monitoring guide indicated a 5-year monitoring evaluation frequency, the last monitoring and evaluation report including this monitoring question was 2007. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Aquatic Population - Streams

Monitoring Item Name: Atlantic Salmon Restoration - Salmon Productivity and Habitat Quality

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: 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 since the 1980s. Monitoring juvenile salmon populations tracks populations in individual streams as well as Forest-wide trends over the long-term. It is important to monitor Atlantic salmon populations and associated habitat for resource protection and restoration purposes. Forest Plan objectives are to increase Atlantic salmon (*Salmo salar*) populations in streams through stocking and spawning activities, in cooperation with the Connecticut River Atlantic Salmon Commission, as identified in the Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River Basin.

A major impact to the restoration program occurred when the White River National Fish Hatchery, in Bethel, VT, was nearly destroyed by tropical storm Irene in August 2011. This hatchery produced most of the salmon fry for stocking GMNF streams. The reduction in salmon stocking and monitoring activities on GMNF began in 2012. By 2013, the number of fry available to stock was severely reduced, and consequently, salmon parr and smolt monitoring is expected to further decline over the next few years. Fiscal year 2013 was the last year of salmon fry stocking on the GMNF.

Approximately 15 streams in the White River and West River watersheds have been monitored annually. Table 2-2 provides Atlantic salmon estimated densities and survival in GMNF streams derived from monitoring data. Generally, densities were higher in the West River watershed than in the White River watershed. The best year for estimated smolt production since Forest Plan revision was in 2007 as most of the streams sampled in 2006 recorded their highest parr densities. For 2007, smolts from GMNF streams and rivers contributed to about 10 percent of the estimated smolts projected for the Connecticut River watershed. The number of sites with salmon (age-classes young-of-the-year to juvenile) monitored from 2007 to 2011 remained fairly consistent, ranging from 14 in 2011 to 20 in 2007.

In 2012, even though fry stocking was reduced following tropical storm Irene, fisheries staff continued to monitor a high number of stream sites to assess the survival of juveniles that were stocked as fry in previous years. Salmon are expected to be present in five GMNF streams through 2015 and possibly 2016.

Table 2-2. Estimated annual Atlantic salmon smolt densities (per 100 square meter) from GMNF streams from 2007 to 2012¹.

Stream	Range	Average
1. Burnt Meadow	1.1 – 9.8	4.1
2. Farnum	0.5 – 5.5	2.9
3. Flood	0.4 – 7.2	1.2

Stream	Range	Average
4. Greendale	0.5 – 4.5	1.4
5. Griffith	0.3 – 3.7	1.9
6. Jenny Coolidge	0.5 – 6.3	2.6
7. Jones	0.6 – 3.6	2.3
8. Mount Tabor	1.0 – 5.9	2.5
9. Utley	0.7 – 4.7	1.4
10. Bingo	0.3 – 2.4	0.6
11. Brandon	0.3 – 2.8	1.0
12. Hancock Branch	0.1 – 1.8	0.5
13. Robbins Branch	0.2 – 4.4	1.5
14. Michigan Branch	0.1 – 3.6	0.5
15. West Branch White River	0.3 – 4.9	1.0

¹ Estimates of smolts migrating to the ocean are based on 65 percent over-winter parr survival rate.

Recommendations: Future Forest Service involvement with salmon restoration will depend on how the Connecticut River Atlantic Salmon Restoration program proceeds. This question should be modified or removed from the monitoring program depending on decisions made by Forest Service fisheries staff in collaboration with the Connecticut River Atlantic Salmon Commission. If monitoring continues, the next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Fire

Monitoring Item Name: Fire Agreements

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

Detailed Monitoring Question: How many agreements for fire management have been developed and maintained with outside partners?

Monitoring Driver: Forest Plan Goal 21 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Partnership agreements provide valuable services that help the Forest Service achieve desired management objectives associated with fire management. The Forest Service has developed cooperative fire protection agreements with the Volunteer Fire Departments and organizations in each of its surrounding towns within the GMNF since 2006. These agreements, which are scheduled to be updated every 5 years, set the framework for responding to wildfires on NFS land and sharing resources when needed.

Additional agreements in place include:

- A Master Cooperative Wildland Fire and Stafford Act Response Agreement signed by the Forest Service (GMNF and Northeast Area State & Private Forestry), the VT Department of Forests, Parks and Recreation, USDOJ Fish and Wildlife Service and the USDOJ 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 has been updated and reviewed by all parties each year.

- Fire protection 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.

In 2010, the Forest Service contacted 33 towns within or bordering GMNF to update their respective fire protection agreements. By the end of fiscal year 2012, a total of 24 agreements were signed. Although the status of the remaining agreements is unknown, it is anticipated they will be completed by 2014.

Recommendations: No change to the monitoring question. Follow up with the towns having expired cooperative fire protection agreements to ensure they are updated for use. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Fire Prevention

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

Detailed Monitoring 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 Driver: Forest Plan Goal 21 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

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. Wildland fires were suppressed in a manner that protected firefighter safety and avoided damage to private property. There were 26 reported wildland fires occurring on NFS lands from 2006 to 2013 totaling 38.65 acres (Table 2-3). All fires were of short duration, low in complexity, and required minimal fire staff for suppression efforts. None resulted in substantial acres burned or infrastructure destroyed. More importantly, no major injuries associated with fire suppression activities were reported.

Table 2-3. Reported wildfires on GMNF from fiscal years 2006 to 2013.

2006	2007	2008	2009	2010	2011	2012	2013	Total
<i>Number of Wildland Fires</i>								
6	5	4	1	2	0	4	4	26
<i>Acres Burned</i>								
6.5	10.3	13.7	0.5	0.4	0	6.75	0.5	38.65

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Hazardous Fuels

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

Detailed Monitoring Question: To what extent have hazardous fuels been reduced?

Monitoring Driver: Forest Plan Goal 21 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Hazardous build-up of fuels can increase the risk of wildland fire spread that starts in their vicinity. Increased fuel loading can also result in larger wildland fires occurring within the wildland urban interface (WUI) areas. Increased fuel loads can also lead to more intensive burns which can damage natural resources. Prescribed burning and some mechanical treatments (such as using a brush saw, mower, or masticator) can help to reduce these fuels. Additionally, 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. Table 2-4 shows the trend of prescribed fire and mechanical treatments from fiscal years 2006 to 2013. 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 2-4: Prescribed fire and mechanical treatment trends from fiscal years 2006 to 2013.

Treatment (Acres)	2006	2007	2008	2009	2010	2011	2012	2013	Total
Prescribed Fire	0	112	113	203	196	103	207	475	1,409
Mechanical Treatment	96	228	20	40	0	90	0	0	474
Total Acres	96	340	133	243	196	193	207	475	1,883

All hazardous fuel treatments were effective in reducing wildland fire risks. Hazardous fuels treatments also provided secondary benefit objectives, which include ecosystem restoration, and wildlife habit maintenance and improvement by way of returning wildlife openings to early successional habitat.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Prescribed Fire

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

Detailed Monitoring 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 Driver: Forest Plan Goal 6 and associated Objectives, and Forest-wide Fire Management Standards and Guidelines.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Monitoring the effectiveness of prescribed burns helps support decisions to use fire to meet certain objectives during the planning process. The two most common resource management objectives for prescribed burns are to maintain forest openings and apple orchards for wildlife habitat and to reduce hazardous fuel loadings. Specifically, the objectives as expressed in 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.

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. Monitoring associated with fuel reduction from prescribed fire 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?

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: Refine the monitoring question to better ascertain the level of monitoring needed to ensure resource objectives are met. Develop a protocol that better defines sampling methodology for future monitoring of sites. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wildland Fire Use

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

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

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Wildland Fire Use (WFO) consists of the management of naturally ignited fire to achieve predetermined vegetative management objectives. The main objectives of using WFO includes restoring fire to its natural role in the ecosystem, such as allowing natural ignitions to burn

without suppression in wilderness areas and maintaining 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.

No wildland fires were managed for resource objectives during fiscal years 2006 to 2013.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Forest Health

Monitoring Item Name: Tree Health

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

Monitoring Question: How is tree health changing over time from the influence of acid deposition, climate change, invasive species and other environmental problems, in combination and separate from land management practices? Is this affecting the longevity of long-lived tree species and their ability to produce high quality wood products on long rotations?

Monitoring Driver: Forest Plan Goal 8 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any annual monitoring and evaluation report.

Evaluation and Conclusions: Long-term changes are occurring in GMNF ecosystems. Environmental changes such as changes in climate, atmospheric deposition, and the spread of non-native invasive species, are known to have effects on forest vegetation and soils. Forest managers must better understand these changes and their effects to make sound land management decisions in the future.

In partnership with the Vermont Monitoring Cooperative, the USFS Northern Research Station, VT Department of Forests, Parks and Recreation, the Vermont Youth Conservation Corps, and the Natural Resource Conservation Service, the Forest Service developed a monitoring project to address this question. The Long-term Ecosystem Monitoring Project (LEMP) is a 50-year monitoring effort established to characterize and quantify changes to representative ecosystems on GMNF over time. Site selection criteria were used to locate permanent plots within dominant natural communities and soils across the geographic range of GMNF. Sampling methodology is based on a modification of FIA plot design, and plots are intended to be sampled every 10 years for 50 years. The sampling methodology was chosen to be most compatible with other long-term soil and vegetation monitoring efforts so that data can be compared across several monitoring projects and trends identified at different scales.

Plots are located in areas with minimal evidence of past anthropogenic disturbance. Data is gathered on site characteristics, all layers of vegetation, soil, lichens, and down woody material occur during each sampling session. Soil samples are collected for analysis of pH, base cations, nutrient status, and mineralogy of the subsoil; soil samples will be archived. The plots are also intended to include monitoring of other factors of interest to the research community. Plot data will be used to quantify baseline conditions of soil and vegetation and associated trends, and will contribute to sensitivity models, regional long-term monitoring datasets, and science in general.

Twenty plots were established between 2008 and 2011. Soil and vegetation diversity sampling was completed on all 20 plots, while tree, sapling, down woody material, and lichen sampling were completed on less than half of the plots. All plots are permanently monumented so they can be relocated during

subsequent monitoring. Soil samples were dried and shipped to Hubbard Brook for chemical and physical analyses and storage. Data on vegetation and soils is currently stored in spreadsheets and on paper.

Plot establishment and the collection of the initial soil and vegetation data for vegetation and soils provide baseline data for future trend analysis. Consequently, there are no trends to analyze to date, thus no answers to this set of monitoring questions are available for this trends report. The Forest Service intends to gather some of the missing data over the next few years prior to the next monitoring cycle which begins in 2018. Adjustments will be made to protocols to ensure all the data can be collected at a plot in the same year. It is unlikely that trends will be clear before the end of the third cycle of monitoring, which will be in 2031.

Anecdotal evidence based on field inventories in other locations, as well as on the plots, suggests that decline from beech bark disease is becoming more noticeable, and regeneration of red spruce and balsam fir is abundant in many areas dominated currently by northern hardwoods. The increased growth of red spruce regeneration has also been noted by researchers in the region, and there have been a variety of hypotheses posed to explain this in the context of a warming climate (red spruce being a tree of cold damp climates). Additional research is needed to explore these hypotheses further.

Recommendations: Continue LEMP in collaboration with other research and monitoring efforts to ensure that this monitoring occurs and is of sufficient quality. The focus between now and the next cycle of sampling should be to gather the missing data and develop a storage platform for the data collected. This monitoring item should be broadened to include all vegetation measures (tree, sapling, cover, structure, down wood) associated with the LEMP. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Increase of Destructive Insects and Diseases

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

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

Monitoring Driver: Forest Plan Forest-wide Pests, Diseases, and Non-Native Invasive Species Standards and Guidelines.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: This monitoring item helps track trends in insect and disease (I&D) activity across GMNF. 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 GMNF resources provide 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 (*Agilus planipennis*) and Asian long-horned beetle (*Anoplophora glabripennis*), both exotic insect pests, has become a national monitoring effort. Early detection efforts are the combined focus of forest research and management organizations at the state, federal and university levels to monitor the severity of I&D outbreaks and identify potential control efforts for implementation.

I&D aerial monitoring was conducted for GMNF annually since 2006 by the Northeastern Area, State and Private Forestry and the VT Department of Forests Parks and Recreation (VFPR). Staff from VFPR also

conducted surveys in GMNF campgrounds and other areas at risk from emerald ash borer, other insects and invasive plants. Cooperation with Durham Field Office - Forest Health Staff has been ongoing since 2006 to conduct inventories, surveys, testing pheromones, trapping and response activities.

The most significant damage on GMNF from insects was from forest tent caterpillars (*Malacosoma americanum*) in 2006 with aerial detecting roughly 28,000 acres of hardwood defoliation. Tent caterpillar defoliation substantially declined to less than 1,000 acres by 2008. No suppression activities were implemented and forest conditions recovered. Other than tent caterpillars, there were no significant outbreaks detected from any major insect pests with occurrence varying from year to year. Hemlock woolly adelgid (*Adelges tsugae*) remains a species of concern on the Forest. The emerald ash borer was also discovered in Concord, New Hampshire in 2013 and is considered a pest of concern for the ash resource. Overall, most disease or non-insect induced damage across GMNF were dieback from beech bark disease (*Cryptococcus fagisuga/Neonectria spp. Complex*) and defoliation due to pear thrips, anthracnose, and frost. Insect and disease levels at present do not impact the ability to maintain healthy forest conditions and meet objectives to provide forest products.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Measurement of Oak Growth within the Escarpment

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

Detailed Monitoring Question: What effect has gypsy moth defoliation caused overtime to the growth and productivity of the oak timber resource in the Escarpment Management Area?

Monitoring Driver: Forest Plan Forest-wide Pests, Diseases, and Non-Native Invasive Species Standards and Guidelines.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in the fiscal year 2007 annual monitoring and evaluation report.

Evaluation and Conclusions: There has been a reduction in the growth and productivity of oak forests in the Green Mountain Escarpment Management Area over the last several decades and defoliation resulting from gypsy moth (*Lymantria dispar*) infestation has been a contributing factor. At least six significant gypsy moth defoliations were documented in the 20th century. Following studies by Forest Service staff and researchers after the 1980-81 defoliations, GMNF maturity guides used for managing the oak types were adjusted in the late 1980's. This was done to reflect that tree diameters were not achieved as expected for corresponding age and site index classes. It was found by coring oak and other trees in the Escarpment area, that tree growth had been suppressed following defoliation and drought episodes. The forest sprayed 3,000 acres for gypsy moths in 1990 with more done on state and private lands.

Although no severe gypsy moth outbreaks or defoliation has occurred on GMNF since 1990, oak growth and productivity have continued to decline. Inventory conducted on the Middlebury Ranger District indicate reduced oak regeneration and increased mortality primarily in the intermediate and suppressed classes of oak trees. Many of the oak and oak/hardwood stands in the Escarpment have a similar establishment history and age. There is little recent history of active management, or disturbance including fire or summer logging to help establish advanced regeneration of oak seedlings. It is generally understood these factors are important in maintaining the health of oak stands and in regenerating oak.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Heritage

Monitoring Item Name: Heritage Resource Program Objectives

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

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

Monitoring Driver: Forest Plan Goal 16 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: The known heritage resources on GMNF are primarily archaeological sites dating to the 19th century. More than 1,100 heritage sites were recorded on the GMNF by 2006. A small (30) number of pre-European archaeological sites has been recorded; the small number of sites is largely due to the lack of intensive survey, not because these sites do not exist in larger numbers. Very few Forest Service heritage sites have been studied to evaluate whether or not they are eligible for the National Register of Historic Places.

Forest heritage resource staff have implemented Heritage Historic Preservation Act, Section 110 protection activities through partnerships with organizations and Tribes. Heritage program 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 several National Register of Historic Places historic building designations.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Heritage Resource Standards and Guidelines

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

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

Monitoring Driver: Forest Plan Goal 16 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006, and 2008 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Most site-specific project activities on GMNF have the potential to affect one or more heritage resource sites. Considerable effort between resource staff have ensured heritage resource protective measures are included in project design including contracts and permits. Monitoring

has indicated the application of Forest Plan Forest-wide and Management Area Standards and Guidelines, and project-specific design criteria or mitigation measures have successfully protected heritage resources from disturbance or damage.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Heritage Resource Site Protection

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

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

Monitoring Driver: Forest Plan Goal 16 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: There are hundreds of historic period archaeological sites on GMNF. An accurate and comprehensive inventory of these sites has not been completed, but progress has been made annually in small increments since 2006. Although 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, it is estimated heritage resource related inventory for 200 sites covered approximately 46,890 acres. Comparing baseline site condition information (documented on Forest Service site forms) with the observed condition in the field demonstrates 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: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Human Dimensions

Monitoring Item Name: Contract Sizes to Local Economies

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

Detailed Monitoring Question: What is the range of dollar amounts and board feet in contracts? Who has been awarded the contract?

Monitoring Driver: Forest Plan Goal 17 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: Forest management on GMNF provides important economic contributions to local rural economies and provides employment opportunities not just through logging and trucking, but through processing of wood into a wide range of products. Many towns are greatly concerned about the potential economic benefits of timber harvesting on National Forest System (NFS) lands or loss of economic opportunities should harvesting not occur, or occur only at reduced levels. Processing wood into products provides the most job creation resulting from timber harvest, especially processing of high-

value forest products. When wood is hauled to processing facilities outside of the region, there are reduced economic benefits to communities more local to GMNF.

A bid monitoring report is compiled annually which is sent to the Forest Service Region 9 - Regional Forester at the end of each fiscal year. This report analyzes changes and trends in bidding, bid values and the bidders for timber sales offered each year. Data required for bid monitoring comes from Timber Sale Accounting (TSA) system reports. Volumes are reported in hundred cubic feet (CCF) as well as thousand board feet (MBF). Volumes and targets are officially reported in CCF.

From fiscal years 2006 to 2012, GMNF sold 25 separate timber sales to 15 different bidders. Sales ranged in volume from 83 CCF to 4,368 CCF (56 MBF to 2,957 MBF). Individual contract values ranged from \$2,000 to \$366,000. The average contract size was 1,862 CCF (1,260 MBF) and the average value was \$138,000. Successful bidders consisted of logging companies (44 percent), sawmills (40 percent) and non-profits, partners or local governments (16 percent). Of the successful bidders, all but one is headquartered in Vermont and approximately 75 percent are based in communities within or adjacent to NFS lands. With only a few exceptions, logging from the timber sale contracts was completed by companies based in communities and towns within or adjacent to the Forest.

Forest Service staff make an effort to regularly offer timber sales geographically distributed across GMNF and in a range of sizes to provide economic benefits to different towns and businesses of various sizes. Sales since 2006 have been largely concentrated on the north half of the Manchester Ranger District, but about 25 percent of sales were located on the Middlebury/Rochester Ranger Districts north of US Route 4. Recently completed integrated resource projects (IRP), including the Upper White River IRP (2010) on the Rochester District and the Dorset Peru IRP (2013) on the southern edge of GMNF, will help provide geographically distributed sales in the future. Sale sizes have varied with over one third offered smaller than 1,000 CCF or 660 MBF. Although smaller contracts did attract bids from some smaller businesses, these businesses typically were not successful in winning bids even on smaller sales.

All businesses that have purchased timber sales since 2006 are considered small businesses according to standards set by the Small Business Administration. These businesses are competitive in bidding on the varying sizes of sales being offered on the Forest. Although smaller sales cost more to prepare and administer, Forest Service staff still consider the costs and benefits of offering small sales to determine how best to balance providing economic opportunities for the smallest businesses with other management objectives.

The Forest Service does not track the marketing of wood after it has been sold and removed. There is no data collected to provide estimates of wood volume used for various products or processing locations. Data collected by the State of Vermont and published in the report, Economic Importance of Vermont's Forest Based Economy 2013, shows that roughly 60 percent of wood harvested in Vermont is processed in the state. Anecdotal evidence supports a similar percentage of wood harvested on NFS lands is processed in the state. Most of the wood being exported is softwood processed in Canada and pulpwood processed in New York. The local economic benefits of timber harvest from GMNF are strongly tied to local and regional markets for wood. These markets are constantly changing largely in response to broader national and international economic trends.

The most significant challenge to providing economic benefits to local and regional economies is the overall level of GMNF timber harvesting. The amount of timber sold and harvested each year remains well below the levels estimated in the Forest Plan and averages less than 25 percent of the Allowable Sale Quantity (ASQ). These relatively low levels of harvest result in fewer direct and indirect jobs related to timber harvesting and processing. Less overall harvest also results in fewer timber sale contracts and longer durations between contracts in or near individual communities. Forest Service staff plan to increase volume sold by approximately 20 percent in fiscal years 2014 to 2016, from about five million board feet to 6 million board feet annually.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Other Agencies, Organizations, and Groups Coordination

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

Detailed Monitoring Question: Has the Forest Service improved communication and collaboration with federal and State agencies, regional commissions, town governments, and other local organizations?

Monitoring Driver: Forest Plan Goal 20 and associated Objectives.

Monitoring Frequency: Every 3 years.

Reporting Frequency: Every 3 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: Although there has been no formal documentation of coordination and collaborative efforts between Forest Service staff and other entities specific to this monitoring question, partnerships are a hallmark of GMNF management activities. GMNF staff have worked with partners since 2006 to achieve social, economic, and ecological goals. Each year staff continues relationships with existing State, county, local and other federal agencies, and non-profit organizations and enters into 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.

Recommendations: Remove this question from the monitoring program because it is redundant with the Partnerships Maintenance and Enhancement monitoring item.

Monitoring Item Name: County Income by Employment Sector

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

Detailed Monitoring Question: To what extent is the GMNF contributing to the economic health of local economies?

Monitoring Driver: Forest Plan Goal 17 and associated Objectives.

Monitoring Frequency: Every 5 years.

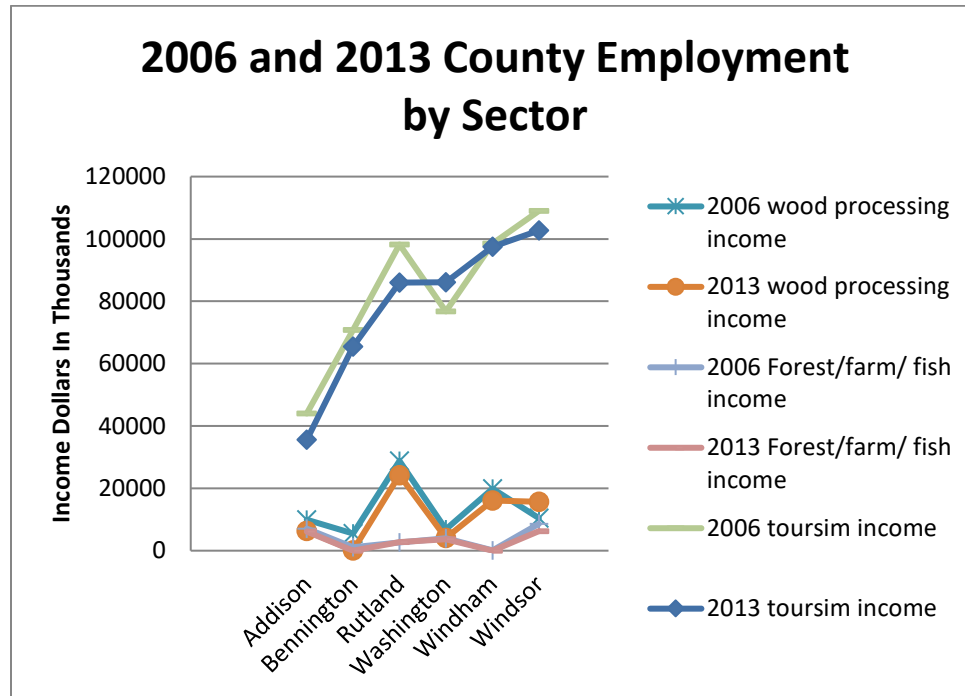
Reporting Frequency: Every 5 years. Included in fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: Socio-economic concerns were a major issue for the revision of the Forest Plan in 2006. The industries most directly impacted by Forest Service management are:

- Manufacturing (in the form of wood processing)
- Forestry, Fishing, and Farming Services
- Tourism

This monitoring question is intended to provide data trends to ascertain how Forest Service management activities are contributing to the economic health of towns and counties within and adjacent to GMNF. Since 2006, GMNF management activities have contributed to the economies of the counties with NFS lands primarily through forestry, recreation and wood processing employment related activities. Although the contribution in dollars has remained relatively stable, overall county employment by sector slightly decreased compared to 2006 (Figure 2).

Figure 2



Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Forestry Education Sites

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

Detailed Monitoring Question: Were sites established on the Forest for forestry education?

Monitoring Driver: Forest Plan Goal 19 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: A Forest Plan Goal 19 objective specifically calls for the establishment of two sites (one on the North Half of the Forest and one on the South Half of the Forest) for demonstration forests, discovery trails, or plots and other living laboratories for teacher/non-formal educator use. These sites were not planned or established during fiscal years 2006 to 2013.

Recommendations: Remove this question from the monitoring program because its intent is redundant with the Teacher Professional Development in Forest Stewardship monitoring item.

Monitoring Item Name: Partnerships Maintenance and Enhancement

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

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

Monitoring Driver: Forest Plan Goal 18 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Partnerships and collaboration are essential throughout all levels of the Forest Service. GMNF staff have worked with partners to achieve social, economic, and ecological goals. Each year, staff have maintained relationships with existing cooperators and developed 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. The Forest Service has very active partners and are dependent on partner relationships since 2006. Formal and informal agreements with state, county, local and other federal agencies, and non-profit organizations increase the amount of management and educational activities that occur on GMNF. Partnerships also increase the ownership that these entities have in GMNF management activities.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Payments to Towns

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

Detailed Monitoring 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 Driver: Forest Plan Goal 17 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Communicating contributions helps inform municipalities of federal programs that impact their financial planning. Tracking payments to towns is a good measurement of contributions to economic sustainability of communities. There are two types of federal payments disbursed to towns that have National Forest System lands: 1) Payments in Lieu of Taxes (PILT); and 2) Public Law 106-393, Secure Rural Schools and Community Self-Determination Act of 2001 (SRS), 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. The Forest Service receives payment information for PILT and SRS funds from the Vermont State Treasurer's office. These fund disbursements are regularly communicated to towns within the GMNF proclamation boundary.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Teacher Professional Development in Forest Stewardship

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

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

Monitoring Driver: Forest Plan Goal 19 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in fiscal years 2006, 2007, 2010, 2011 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: The role of 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. The Forest Service has supported teacher and student development in Forest stewardship through the Forest for Every Classroom and Envirothon Programs since 2006.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Invasive Species Population

Monitoring Item Name: Non-native Invasive Species

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives, and Forest-wide Pests, Diseases, and Non-Native Invasive Species Standards and Guidelines.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: 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 into 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 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. All data gathered 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.

Apart from 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 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 (*Reynoutria japonica*). Roadsides, especially in the Upper White River valley, are heavily infested with wild chervil (*Anthriscus sylvestris*). 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 (*Lythrum salicaria*) 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.

While monitoring has indicated the extent of NNIP infestations, Forest Service staff do not currently have a reliable or accurate 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.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Lands

Monitoring Item Name: Land Ownership Adjustment

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

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

Monitoring Driver: Forest Plan Goal 22 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: The Forest Service has increased and consolidated NFS lands within the GMNF proclamation boundary to reduce fragmentation and encroachment, and achieve maximum public benefits for recreation, biodiversity, critical habitat conservation, and effective management. Land adjustment accomplishments have varied annually depending on the complexity of the cases. Total land acquired from fiscal years 2006 to 2013 totals 7,397 acres (Table 2-5). Acquisitions are expected to decrease starting fiscal year 2014, due to the management decision deemphasizing the lands program as part of a GMNF reorganization process that occurred in fiscal year 2013.

Table 2-5. Lands acquired (acres) from fiscal years 2006 to 2013.

FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total
3,392	965	511	16	506	1,245	425	337	7,397

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Special Uses - Lands

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

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

Monitoring Driver: Forest Plan Goal 1 and associated Objectives, and Forest-wide Special Uses Standards and Guidelines.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: Agency direction is to annually inspect Special Use Authorizations (SUA) that may affect key resources and others per an established schedule, so each permit gets inspected at least every 5 years. Direction also includes keeping all SUAs current and all fees are paid. There are two components to administering existing SUAs. The first is on-the-ground inspection of the authorized area to ensure compliance with the terms, conditions and mitigation measures contained in that authorization. The second is ensuring the authorization is current, fees are paid, and proper records are kept. Monitoring of SUA's includes site inspection(s), documenting the conditions found, taking any corrective action needed, calculating fees and preparing bills, tracking and documenting payments, and reporting all outcomes in the SUDS database.

Forest Service staff continue to meet annual targets for SUA administration, and to improve efficiency while doing so. For example, the SU Administrator from the Eastern Region Winter Sports Team assigned to administer the Sugarbush and Mount Snow Ski Area Permits has also been assigned to administer the Communication Site SUAs located at each of those ski areas. Staff from the Forest health branch of the Northern Area of State & Private Forestry in Durham, NH, and from GMNF timber staff inspect National Forest System lands under SUA for maple tapping several times per year to ensure permit compliance limitations such as number of taps per tree and proper vehicular access as required by the SUA. Forest Service staff continue to focus on increased efforts to reduce the number of current uses that do not have current authorizations.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Program Management

Monitoring Item Name: Costs of Plan Implementation

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

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

Monitoring Driver: Forest Plan Goal 1 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: This monitoring question is intended to compare the expected level of

socioeconomic management output with actual levels achieved from project implementation. It also allows the comparison of estimated and actual costs by program area. Although the question also calls for comparing management activity implementation costs with projected cost, estimates associated with project implementation costs are not included in the Forest Plan or associated supporting documentation.

The annual reporting for cost of implementing the Forest Plan is based on each fiscal year 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. The cost of providing other outputs was estimated through annual program work plans. Many items included cost of implementing project activities on the Finger Lakes National Forest due to the inability to discern costs between each Forest. Accuracy of some implementation costs may also not reflect actual values.

Recommendations: Consider removing this question from the monitoring program because monitoring project costs is not strongly tied to any Forest Plan component and it does not provide enough meaningful or accurate information to warrant its retention. Additionally, tracking management activity outputs is redundant with the Outputs Accomplished - Other Resources monitoring item. If retained, the next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Desired Future Conditions

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

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

Monitoring Driver: Forest Plan Goal 1 and associated Objectives, and Forest Plan Management Area direction (management area major emphasis and desired future conditions).

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2007 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: The Forest Plan includes Forest-wide goals and objectives. It also includes the major emphasis and desired future conditions for seventeen different management areas (Forest Plan, Chapter 3). It is important to track site specific projects implemented annually to understand how well they are meeting Forest Plan direction and moving management areas toward their respective desired future conditions. Past monitoring and evaluation reports have not included what management areas were targeted for each project implemented. Future monitoring should include the management area where each project is designed to better evaluate how well activities are meeting Forest-wide objectives and goals, and management area emphasis and desired future conditions.

Table 2-6 provides all projects approved for implementation by National Environmental Policy Act (NEPA) analysis level and associated decision. A total of 278 individual projects were approved from fiscal years 2006 to 2013 representing the first eight years of Decade 1 for Forest Plan implementation. With the implementation of these projects, considerable progress has been made to move existing resource conditions toward desired future conditions within management areas.

Table 2-6. Projects approved by level of NEPA decisions for fiscal years (FY) 2006 to 2013.

NEPA Level ¹	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	Total
EIS - Record of Decision	1	0	0	0	0	0	1	0	22
EA - Decision Notice	1	0	1	0	1	3	0	1	9
CE - Decision Memo	19	7	19	23	15	14	15	15	150

NEPA Level ¹	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	Total
CE - Letter to File	0	2	5	27	6	8	16	4	87
SIR	0	0	0	3	15	4	0	2	30
Total	21	9	25	53	37	29	32	22	278

¹ EIS = Environmental Impact Statement; EA = Environmental Assessment; CE – Decision Memo = categorical exclusions citing categories requiring a Decision Memo; CE – Letter to File = categorical exclusion for categories not requiring a Decision Memo but have been documented in a Letter to the File; and SIR = Supplemental Information Report.

EIS and EA level projects:

- FY06: GMNF Land and Resource Management Plan (EIS); and Supervisor Office Construction (EA)
- FY08: Natural Turnpike (EA)
- FY10: Upper White River Integrated Resource Project (EA)
- FY11: GMNF Forest-wide Non-native Invasive Plant Control, Mount Snow Snowmaking, and Forest Plan Amendment #1 (all EAs)
- FY12: Deerfield Wind (EIS)
- FY13: Dorset Peru Integrated Resource Project (EA)

Recommendations: No change to the monitoring question apart from including which management areas are affected by project activities. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Innovative, Coordinated Management and Energy Conservation

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

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

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in the fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: The 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 when developing project activity with an interdisciplinary approach to provide multi-resource benefits particularly through vegetation management (Forest Plan Goal 9). Another desire was to increase energy efficiency and opportunities for the development and use of renewable energy on GMNF (Forest Plan Goal 11). The following project activities highlight management efforts to meet these Forest Plan goals:

Integrated Resource Projects

Forest Service staff uses an integrated resource project approach as one of the main strategies for achieving 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. Since the 2006, there have been four integrated resource projects IRPs

completed: 1) Nordic IRP (Manchester Ranger District; 2) Natural Turnpike IRP (Middlebury Ranger District); 3) Upper White River IRP (Rochester Ranger District); and 4) Dorset Peru IRP (Manchester Ranger District). Additionally, planning was initiated in 2012 for the South of Route 9 Integrated on the Manchester Ranger District.

Aquatic Organism Passage

Although aquatic organism passage has been the primary priority of restoring fish habitat (see Fish and Aquatic Organism Passage monitoring item), work on 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.

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 day-to-day operations. The team's responsibility has been to assess improvement needs by measuring GMNF's environmental footprint and then identifying priorities to reduce operation impacts. 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, and increases in recycling programs such as composting and battery recycling. The team also initiated a green purchasing energy use audit and system upgrade to reduce energy use and the purchase of electricity through the Cow Power Program which converts cow manure into methane for electricity generation.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Outputs Accomplished - Other Resources

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

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

Monitoring Driver: Forest Plan Goal 1 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: This monitoring question provides a quantitative estimate of performance comparing outputs and services with those projected by the Forest Plan (Appendix D, Proposed and Probably Practices). All resource outputs and services are moving toward estimated total amounts for the first eight years (2006 to 2013) of Decade 1 of Forest Plan implementation. 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 Decade 2 of Forest Plan implementation (2016 to 2025).

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Standards and Guidelines Compliance

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

Detailed Monitoring Question: Did any project require guideline modification or a Forest Plan amendment to modify a standard? If so, what was the project? Which standard or guideline was changed? What was the rationale for the change?

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

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2011 annual monitoring and evaluation reports.

Evaluation and Conclusions: Standards and Guidelines are designed to achieve the Forest Plan goals, objectives, and desired conditions. They are usually worded as protective measures that minimize or negate the effects of a management action or land use below levels of unacceptable thresholds.

Standards are mandatory permissions, limitations, desirable conditions, or in some instances required courses of action needed to achieve Forest Plan direction. Standards can be Forest-wide or management-area specific. Deviation from standards requires a Forest Plan amendment.

Guidelines are discretionary guidance, permissions, limitations, desirable conditions, or courses of action that should be implemented in most situations. Guidelines can be modified at the project level without a Forest Plan amendment but require the rationale for deviation be disclosed in the project decision analysis documentation.

Only one Forest Plan amendment was completed in 2012 to modify Forest-wide Standard specific to the Deerfield Wind Tower Project Record of Decision. The Deerfield Wind Project approved activities included heavy machinery to work within a protected strip defined by Standard S-2 for Soil, Water, and Riparian Area Protection and Restoration. The widths of the protective strips vary according to the slope percentage between the disturbed area and the water source. Although there are certain conditions when heavy equipment is allowed within these strips, the use of heavy equipment associated with the Deerfield Wind Project does not meet any of these conditions. Thus, the approval of the use of heavy equipment within the protective strips required a deviation from Standard S-2 as a site specific non-significant Forest Plan amendment only applicable to this project. The amendment results in no change in Forest Plan goals, objectives, or outputs (goods and services, and multiple-use goals and objectives for long-term land and resource management will not be affected. There will be no adjustment of management area boundaries or

management prescriptions. The location and size of the protective strips that will be affected by the change is very small in relation to the overall GMNF.

There were no deviations from Forest Plan Guidelines for any project approved or implemented from 2006 to 2013.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Standards and Guidelines - Implementation and Effectiveness Monitoring

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

Detailed Monitoring Question: Are standards, guidelines, and mitigation measures being implemented on projects consistent with Forest Plan and project NEPA direction? Are these measures effective at achieving the desired results? Are there other measures that could be more effective?

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

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: The Forest Plan states that Forest-wide Standards and Guidelines (S&Gs) apply to all National Forest System lands 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 goals and objectives and minimize or negate the effects of a management action or land use. Additional design features and mitigation measures have also been developed for site specific projects during the environmental analysis process to further protect resources or lessen impacts.

Monitoring project implementation during or after completion determines if projects have been implemented as designed and whether they have achieved the desired results. Monitoring projects also determines whether Forest Plan S&Gs, and project specific design features and mitigation measures have been implemented and whether they have protected resources as intended. Although this level of monitoring is completed by resource specialists as they visit project sites throughout the year, they also visit sites as a monitoring team on scheduled dates to discuss the interdisciplinary approach to assess implementation effectiveness (Table 2-7).

Table 2-7. Site specific project GMNF monitoring field reviews from fiscal years 2006 to 2013.

Fiscal Year	Location	Date(s)
2008	Manchester Ranger District	June 26, 2008
2009	Rochester/Middlebury Ranger Districts	October 16, 2008
2009	Manchester Ranger District	September 29, 2009
2013	Rochester/Middlebury Ranger Districts	May 22 and 23, 2013

Each project visited was evaluated using a set of questions designed to answer the following Forest Plan implementation monitoring questions:

1. Did the project move the area or resource toward the Forest Plan desired future condition and/or meet the intent of the purpose/need from the decision document? Did the project accomplish what it was planned to achieve?

2. If no, what is it about the project that did not move toward the desired future condition or achieve what it was planned to do? How could the project be improved to do so?
3. Was the project implemented as designed?
4. If no, what was changed and what was the reason for the change? Were the changes effective, and within the project scope of the analysis and decision including mitigation measures? Were the changes reviewed, reported or documented?
5. Were Forest Plan standards and guidelines followed during project preparation and implementation?
6. If no, what is it about the project that did not meet Forest Plan standards and guidelines and how could it be improved to do so?
7. Should the Forest Plan standards and guidelines be changed or improved as a result of the implementation of this project?
8. If yes, how and why should it change?
9. Were the mitigation measures and/or design criteria included in the project decision followed during project preparation and implementation?
10. If no, what is it about the project that did not include required mitigation measures and/or design criteria and how could it be improved to do so?
11. Were the mitigation measures and/or design criteria effective and achieve their desired intent?
12. If no, what changes or improvements should be made so that they are more effective?
13. Were the applicable Forest Plan standards and guidelines, mitigation measures and/or design criteria included in the project contract or force account instructions, or reviewed with partners or Forest Service staff implementing the project?
14. If no, how could this process be improved?
15. Are there any other specific concerns for your resource area that you have identified from monitoring this project?

Except for limited circumstances highlighted below, all projects monitored during the interdisciplinary field visits were found to have Forest Plan S&Gs, and project design features and mitigation measures implemented effectively to achieve their desired level of protection to resources.

Monitoring timber sale activity associated with the Greendale project on the Manchester Ranger District in spring and summer 2008 revealed some deviation from soil and water S&Gs, Acceptable Management Practices (AMPs), and project specific mitigation measures resulting in higher than desired resource impacts. This included greater than desired soil disturbance, rutting of skid roads, erosion, and wetland sedimentation. Remedial post-harvest activities addressed most of these impacts, but some effects were expected to persist for multiple years. The Greendale Timber Sale Soil and Aquatic Resource Monitoring Report dated July 2008 recommended actions to prevent similar future scenarios such as greater presence of sale administration, closer attention to implementation, more timely monitoring, increased staff understanding of S&Gs and AMPs, and better detail of protected resources on timber sale maps.

Monitoring construction of Liberty Hill Snowmobile Access Trail on the Rochester Ranger District in October 2008 revealed some deviation from wetland guidelines and trail construction standards. Improper drainage structures, breach of wetland on the private land section of the project, and poorly located trail tread on steep slopes were identified as issues in need of attention to avoid long-term impacts. Remedial activities were adequate to address these concerns and resource impacts were anticipated to be minimized below thresholds of concern. Providing training to ensure an understanding of trail construction standards by partner groups charged with implementation was identified as an important need for future trail projects.

Monitoring timber sale activity on some harvest units associated with the Dutton Brook II project on the Middlebury Ranger District in October 2008 revealed higher occurrence of soil rutting than desired.

Observed impacts approached non-compliance with Soil, Water and Riparian Area Protection and Restoration Standard S-3. Although harvest activities occurred during winter months per project specific mitigation measures, some deep rutting was observed due to non-frozen ground conditions. More attention is needed during timber sale administration to ensure soil protective measures are implemented to avoid future unacceptable impacts.

Monitoring timber sale activity on a harvest unit associated with the Root Beer Ridge sale (Nordic Project) revealed some higher than desired impact to a designated trail. Although mitigation measures were specified in the NEPA document to protect the trail, inadequate visual buffers and damage to the trail occurred during harvest activities. These impacts were partly remedied by post-harvest restoration of the trail. It was noted better understanding of project mitigation measures should be conveyed to sale layout and sale administration staff.

Monitoring road repair work along Corporation Brook Road in May 2013 revealed that some areas where soil was disturbed were still bare which did not appear to comply with Soil, Water and Riparian Area Protection and Restoration Guideline G-6 and G-7. It was noted that seeding and mulching did occur but was applied in the previous late fall. This was addressed with additional seeding in the early growing season but highlighted the need for timely monitoring to identify possible remedial action.

There was no identified need to modify S&Gs or recommended changes to Forest Plan components from routine monitoring efforts conducted by resource specialists or during the interdisciplinary site reviews.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Rare Plants Population

Monitoring Item Name: Ginseng Population Trends

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

Detailed Monitoring Question: What are the trends in ginseng plant size and distribution/occurrence on National Forest System lands?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Every 3 years.

Reporting Frequency: Every 3 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: American ginseng (*Panax quinquefolius*), referred to simply as “ginseng”, is a globally vulnerable species (rounded global status G3) that is ranked S3 (uncommon) in Vermont, and is on the GMNF Regional Forester Sensitive Species (RFSS) list. Population trends and viability concerns, distribution, life history, habitat, limiting factors, and management activities that may affect viability were assessed for ginseng by means of a literature review and expert panel review as part of the 2006 Forest Plan revision. Although ginseng has a wide geographic range, it has a narrow ecological niche with sparsely distributed populations that is declining across its range, mainly because of extensive digging of the plant’s rhizomes for medicinal uses and commercial sale. Deer browsing in some areas has also been documented to exacerbate the decline. As a result, very few ginseng populations were thought to have enough individuals to be considered viable over the long-term. A suspected decline in plant numbers has occurred on GMNF, although new small populations or individual plants are found

intermittently. The 2005 literature review documented ten extant ginseng populations on GMNF. In 2006, a contractor was hired to monitor the ten known population locations, and this data was considered the baseline to which 2006 to 2013 monitoring results were compared.

GMNF botany staff developed a five-year monitoring cycle in 2009 for all terrestrial plants, including ginseng. Since the start of this cycle, eight of the ten known populations have been monitored (Table 2-8), seven populations not known during Forest Plan revision (although known by other entities) have been located and monitored (Table 2-9), and some new subpopulations were discovered.

Table 2-8. Ginseng monitoring results for ten populations known to occur during 2006 Forest Plan revision.

Site	Population size at the time of literature review during FPR	2006 monitoring results	Data from most recent monitoring	Trends
Big Branch	1996: observed, but no population data	0 plants; wrong location searched	2011: 17 plants 9 3-pronged, 7 2-pronged, 1 1-pronged, 11 with flowers or fruits.	Trend unknown because of lack of population data in 1996 and wrong location searched in 2006.
Bristol Cliffs ¹	1996: no population data	19+ plants; population appears viable & healthy; plants of differing sizes, leaf #, & probably ages; most w/ viable fruits; minor insect or slug herbivory on some fruits.	2011: 43 plants in 8 clumps, a variety of ages, sizes, & many fruits	Population size may have increased, or a larger area may have been more thoroughly searched.
Bryant Mountain Hollow	1993: 9 plants, of which 5 were fruiting; thinning occurred in 1995, after which monitoring showed all plants doing well	0 (not found), but 3 plants found in 2008: 17 genets, 6 with immature fruits, 11 w/ none	2013: Needs monitoring	Population size may have increased.
Dow Brook (now considered Abby Pond)	1996: 2-3 plants	0	2013: 21 stems; 3 3-prongs, 1 w/ fruit, 3 2-prongs, & the rest 1-prongs.	Population size may have increased, or a larger area may have been more thoroughly searched.
Elephant Mountain	1996: no population data	0	2010: 6 plants; Largest w/ mature, red fruit cluster, healthy, 1.5 feet tall; 3 plants 6 to 8 inches tall, no fruit; 1 plant, 1' tall w/ 2 immature fruit; not vigorous.	Trend unknown because of lack of population data in 1996, and population not found in 2006.
Falls of Lana ¹	1982: no population data	0	2010: 6 patches of 19 genets; 9 bore up to 15 green fruits, & 10 were vegetative. Of the vegetative plants, 6 grew directly under 1 parent plant & were about 2 years old;	Trend unknown because of lack of population data in 1996, and population not found in 2006.

Site	Population size at the time of literature review during FPR	2006 monitoring results	Data from most recent monitoring	Trends
			medium stature & vigor.	
Handy Road Woods (AT corridor, first observed 1990)	1990: 10 plants	3 plants; all in fruit but fruits aborted. 1 plant w/ 3 leaves, 2 w/ 2 leaves each.	2011: 3 plants: 1 genet w/ 8 fruits & 3 leaves; 1 seedling; another plant w/ 2 leaves, 3 fruits	Downward trend 1990 to 2006, but stable through 2011.
Leicester Hollow/Silver Lake ¹	1998: 2 plants, 1 transplanted from middle of trail to off trail. 2003: 5 plants of low vigor	2 plants; larger plant grazed by deer, & only 1 leaflet & the fruit remained from a 4-leaf plant; smaller plant had 2 leaves, wasn't browsed, & had fewer fruits.	2009: west wall subpopulation discovered: 24 stems; 2 vegetative, 4 w/ aborted fruits; 18 w/ 1-14 fruits (not aborted); plants healthy, most < 1 foot tall, not robust. 2011: middle, east wall subpopulation discovered; 6 genets: 2 w/ 3 leaves & fruit; 1 w/ 2 leaves, flowers, no fruit; 2 vegetative w/ 2 leaves each, 1 seedling 2011: southeast wall subpopulation discovered: 1 small vegetative plant w/ only 2 branches.	Population may have increased, or larger area may have been more thoroughly searched.
Lincoln Brook	1993: no population data; not relocated in 2000; stand selectively harvested.	0	Not monitored again	Population presumably extirpated.
The Cape RNA	1986: 2 plants	Not monitored	2009: 15 stems; 11 in immature fruit; plants big, robust, w/ full umbels of plump fruits.	Population may have increased, or larger area may have been more thoroughly searched.

¹ Woody non-native invasive plants nearby.

Table 2-9. Ginseng monitoring results for sites not assessed during 2006 Forest Plan revision.

Sites	Previous documentation	Monitoring done since start of 5-year cycle	Trends
Mount Tabor work center (found prior to, but not accounted for, during Forest Plan revision)	1995: 10 plants; clump 1 has 1 huge plant (1.5 to 2 feet tall, w/ 4 leaves, in fruit); 2 small plants; clump 2 has 1 in fruit & 1 small not reproducing; clump 3 has 1 plant w/ 8 stalks, 4 more plants, 2 of these in fruit & 1 w/ remnant fruiting stalk.	2010: 7 plants varying in size 10 to 18 inches, all appear healthy although showed signs of browsing; 1 plant w/ no leaves, w/ 4 immature seeds below plant on ground.	Population declined from 10 to 7 plants.
Appalachian Trail (AT)	2005: 1 plant in trail.	2009: 24 ramets (≥14 genets) in wildlife opening; plants not robust,	Trend unknown because of lack of previous

Sites	Previous documentation	Monitoring done since start of 5-year cycle	Trends
Bridgewater (includes trail & nearby wildlife opening in AT corridor)		but healthy; includes 3 seedlings, 3 vegetative ramets, 12 ramets that had flowered, but bore no fruits, & 6 ramets w/ 1 to 4 mature fruits. 2011: 1 plant from the trail not found.	population data in wildlife opening; plant along trail may be extirpated.
Perkins Road West (AT corridor)	Not previously documented	2011: 14 ramets, 13 genets; 1 9 to 10 inches tall w/ 11 to 12 green fruits, 2 flowering, 1 vegetative w/ 2 stems, & 9 seedlings.	Trend unknown because population only recently documented.
Thistle Hill (AT corridor, mostly)	2006: 2 plants nearly ready to flower, 6 to 7 inches tall.	2011: 13 plants in 6 locations; 7 are mature plants, 3 w/ 2 leaves, 1 second year plant w/ 1 leaf, & seedlings; 5 plants fruiting; 2 along trail 12 inches tall.	Population has increased, & 2 known plants known are taller.
Totman Hill (AT corridor, mostly)	2001: about 2 dozen plants.	2008: 1 tiny plant; S: 1 not found, 4 other stems found (probably 2 genets). 2011: 7-8 stems of 5-8 genets; mature plants small $\leq 12''$ tall; post-flowering plants w/ 0 to many fruits; only 1 plant w/ all leaflets ungrazed	Population decline.
Dana Hill (AT corridor)	2007: 4 young vegetative plants.	2012: relocated & 1 new subpopulation found; total of 8 stems of up to 8 genets: 1 seedling, 5 w/ 2 leaves & 0 to 3 berries; 2/ w/ 3 leaves & 5 fruits	Population increase.
Townshend Brook (land purchased after 1998)	1998: 15 plants, 10 w/ immature fruit.	2012: 13 ramets: 4 vegetative w/ 2-3 leaves; 9 that had flowered & had 0-35 ripening green fruits. (plant w/ 35 fruits had 5 leaves)	Slight population decline.

There are now 17 known sites, compared to ten known sites in 2006; however, one of the original ten populations may be extirpated, and another is now known to consist of several sub-populations. One other population needs monitoring as of the end of 2013, to keep it on the five-year cycle that was begun in 2009. One has a documented decline, and five have documented increases, although it is uncertain whether the population actually increased, or whether a larger area was more thoroughly searched. For the remaining two of the original ten populations, the trend is unknown because of lack of population data in 1996, and population not found in 2006.

Of the seven sites that were not known to occur by Forest Service staff during Forest Plan revision, five occur in the Appalachian Trail (AT) corridor, one is on land federally purchased after the ginseng was documented, and the other was apparently overlooked. Of these seven, three have at least a slight population decline, two have not had enough monitoring cycles for trends to be assessed, and two show population increases.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2016.

Monitoring Item Name: Regional Forester Sensitive Species - Plant Population Trends

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives, and Forest-wide Rare and Unique Biological Features Standards and Guidelines.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: The Regional Forester Sensitive Species (RFSS) list which includes plants on GMNF for which population viability is a concern was updated in December 2011. There are 88 vascular plants and 18 non-vascular plants on the updated RFSS list for a total of 106 species (there were 71 plants listed prior to 2011). Forest Plan Forest-wide Rare and Unique Biological Features Standard S-1 requires all project sites to be investigated for the presence of RFSS, and/or habitat for these species prior to beginning any authorized ground-disturbing activity at the site. Sensitive plant surveys must be completed for all new ground-disturbing projects, when biologists determine sensitive plant species occurrences are likely. Additionally, Forest Service policy requires a plant biological evaluation for project activities to be completed before they are implemented. Biological evaluations must document the proposed management activities do not result in a loss of population viability or trend toward federal listing. Mitigation measures are often included in project environmental analysis decisions to ensure protection of known sensitive plant populations during project implementation.

Although for some project activity it was found there may be impacts to individual plants, no loss of plant population viability or trend toward federal listing has been determined for any project analyzed or implemented from 2006 to 2013.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Recreation

Monitoring Item Name: Catamount Trail Designation

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

Detailed Monitoring Question: Is the Forest making progress on the designation of the Catamount Trail?

Monitoring Driver: Forest Plan Goal 12 and associated Objective: *Complete construction and designation of remaining sections of the Catamount Ski Trail within the GMNF in cooperation with the Catamount Trail Association.*

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. The completion of the Catamount Trail on National Forest System (NFS) land was noted in the fiscal year 2007 annual monitoring and evaluation report.

Evaluation and Conclusions: The Catamount Trail is a cross-country ski trail that spans the State of Vermont from Massachusetts to the Canadian border. The trail is promoted and maintained by the Catamount Trail Association. A large segment of the trail traverses GMNF running north and south and is designated as part of the National Forest Trail System. The final segments of the Catamount Trail on GMNF were completed in 2007.

Recommendations: Remove this question from the monitoring program since the designation of the Catamount Trail across NFS lands has been completed.

Monitoring Item Name: Comprehensive Trail Planning

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

Detailed Monitoring Question: To what extent has the Forest completed comprehensive trail planning for the GMNF?

Monitoring Driver: Forest Plan Goal 12 and associated Objective: *Complete comprehensive trail planning for 100 percent of the Forest.*

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Although this question was not included in any fiscal year annual monitoring and evaluation report, Forest Service staff initiated a comprehensive trail strategy in 2012.

Evaluation and Conclusions: The GMNF Comprehensive Trail Strategy was initiated in 2012 to provide guidance and recommendations for the sustainable management of non-motorized and motorized trails on NFS lands. The overall purpose of the strategy is to enable the Forest Service to efficiently and effectively respond to stakeholder requests, address capacity concerns, and comply with the Forest Plan Goal 12 and associated Objective.

Recommendations: No change to the monitoring question pending completion of the GMNF Comprehensive Trail Strategy, which is anticipated by 2015, but remove it from the monitoring program at that time. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Effects of Vehicle Use Off Roads

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

Detailed 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) state that use of vehicles off roads shall be planned, implemented and monitored to protect resources and visitors from considerable adverse effects, promote public safety, and minimize conflicts with other uses of National Forest System lands.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: 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 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 reports show a trend of decreasing documentation of off-highway vehicle use in recent years and appears to indicate that illegal use of vehicles off roads is not causing considerable adverse effects on resources or other forest visitors. The Forest Service has made a focused effort to include site specific project design criteria and mitigation measures associated with management activities to deter unauthorized vehicles through public collaboration and education, installation of signing, and engineering controls such as gates, stiles and boulders. These efforts have shown to be effective in managing illegal use of vehicles off roads below unacceptable levels.

Recommendations: Remove this question from the monitoring program. Although the effects of illegal use associated with natural resources remain a concern, recent trends show a decrease in this activity in conjunction with a concerted effort to close or block vehicle access to interior forested areas. Additionally, identifying the amount of illegal use is not accurate when measured by law enforcement incidents given the low level of patrol capacity across the forest. Future project proposals should continue to incorporate design features or mitigation measures to minimize illegal off-road vehicle access.

Monitoring Item Name: Recreation Facility Maintenance

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

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

Monitoring Driver: Forest Plan Goal 12 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006 to 2010 annual monitoring and evaluation reports.

Evaluation and Conclusions: The GMNF has a great diversity of recreation facilities, however the Forest Service has a limited budget to operate and maintain all the sites. Although GMNF relies on multiple partners to help address some maintenance backlog, this may not be sufficient to meet long-term needs. With a desire to provide high quality recreation, the Forest Service needs to determine if the management of recreation facilities is being maintained or improved through monitoring efforts. Recreation site monitoring was initiated for GMNF in fiscal year 1999 because of Congressional direction regarding deferred maintenance reporting. Deferred maintenance condition surveys were completed for 23 separate GMNF recreation sites using national protocols starting in 2006. These surveys were completed at a level sufficient to maintain GMNF data to national standards. Deferred maintenance in terms of funds needed to address deficiencies for fiscal years 2007 to 2009 is provided in Table 2-10. Fiscal year 2010 data is not available due to changes in Forest Service staff preventing adequate monitoring. Deferred maintenance has increased in 2009 compared to the baseline year 2007.

Table 2-10. Recreation site deferred maintenance from fiscal years 2007 to 2009.

Recreation Site Description	FY 2007	FY 2008	FY 2009
Buildings	\$293,909	\$441,304	\$504,693
Water Systems	\$25,085	\$21,680	\$16,275
Waste Water Systems	\$75,788	\$75,788	\$388
Minor Constructed Features	\$154,662	\$141,168	\$94,192
Total Deferred Maintenance	\$549,444	\$679,940	\$615,548

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2015.

Monitoring Item Name: Recreation Visitor Satisfaction

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

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

Monitoring Driver: Forest Plan Goal 12 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any annual monitoring and evaluation report.

Evaluation and Conclusions: The National Visitor Use Monitoring (NVUM) program survey protocol on GMNF was conducted in fiscal year 2005 and reoccurred in fiscal year 2010. The NVUM program provides science-based estimates of the volume and characteristics of recreation visitation on National Forest System (NFS) lands, as well as the benefits recreation brings to the American public. The NVUM program has two concurrent goals. First, to produce estimates of the volume of recreation visitation to NFS lands. Second, to produce descriptive information about that visitation, including activity participation, demographics, visit duration, measures of satisfaction, and trip spending connected to the visit. The measure for visitor satisfaction is the Mean Visitor satisfaction from the NVUM compared to the Mean importance to the visitor. “Percent Meet Expectations (PME)” is the proportion of satisfaction ratings in which the numerical satisfaction rating for a particular element is equal to or greater than the importance rating for that element. This indicator tracks the congruence between the agency’s performance and customer evaluations of importance. The idea behind this measure is that those elements with higher importance levels must have higher performance levels. Lower scores indicate a gap between desires and performance.

National sampling procedures were developed for each individual sample year. Samples for GMNF occurred throughout the year, using a random sample of locations and days stratified by site type and expected use level at various points where visitors exited GMNF during fiscal years 2005 and 2010 (Table 2-11). About one-third of the recreation visitors surveyed were asked a series of additional questions about satisfaction.

Table 2-11. Green Mountain National Forest National Visitor Use Monitoring (NVUM) scores for fiscal years 2005 and 2010.

Fiscal Year 2005			
<i>Satisfaction Element</i>	<i>Percent Meets Expectation Scores (%)</i>		
	Developed Sites	Undeveloped Areas	Designated Wilderness
Developed Facilities	75.5	64.8	50.0
Access	75.7	91.9	86.9
Services	86.4	79.7	67.8
Feeling of Safety	76.1	94.7	83.9
Fiscal Year 2010			
<i>Satisfaction Element</i>	<i>Percent Meets Expectation Scores (%)</i>		
	Developed Sites	Undeveloped Areas	Designated Wilderness
Developed Facilities	77.8	80.9	76.8
Access	80.6	81.8	88.8
Services	82.9	75.8	91.8
Feeling of Safety	88.7	79.5	100.0

Expectations were met for a large percentage of GMNF recreation visitors. The trend in satisfaction between 2005 and 2010 is generally increasing for developed sites and wilderness and generally decreasing for undeveloped areas. In 2006, the New England Wilderness Act created two new wilderness areas and increased the acreage of four other existing wilderness areas, adding a total of 41,655 acres to the wilderness system (an increase of 70 percent). This may explain why visitor expectations were met at a higher level in 2010 for the elements in designated Wilderness. The 2009 American Recovery and Reinvestment Act resulted in a significant amount of investment on GMNF in 2009 and 2010, which could have played a part in the increasing numbers for developed sites but also could have resulted in disruption of recreation opportunities and services during construction. With only two data sets, the information is not adequate to make meaningful trend conclusions.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2015.

Monitoring Item Name: Recreation Opportunity Spectrum (ROS) Settings

Monitoring Question: To what extent are ROS settings being provided?

Detailed Monitoring Question: Is the Forest moving toward the desired future condition for ROS settings?

Monitoring Driver: Forest Plan Goal 12 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any annual monitoring and evaluation report.

Evaluation and Conclusions: This monitoring question is intended to compare inventoried Recreation Opportunity Spectrum (ROS) settings at the time of Forest Plan revision with the inventory after 5 and 10 years of plan implementation. The ROS framework is used for identifying, classifying, planning, and managing a range of recreation settings. Six distinct settings: urban, rural, roaded natural, semi-primitive motorized, semi-primitive non-motorized, and primitive are defined using specific physical, managerial, and social criteria. Each Forest Plan management area has a desired ROS class associated with it. An inventory of the ROS settings has not been done since completion of Forest Plan revision. The desired

ROS settings are determined and documented during the environmental analysis for each project planned for implementation.

Only projects which have a positive effect toward the desired ROS, or no effect at all, are approved for implementation. Some projects, such as removing road culverts from Wilderness and decommissioning the roads, are known to have occurred and would move some areas of GMNF toward the desired future condition for ROS settings. However, without a complete inventory of the existing ROS settings, it is not feasible to determine the amount of change which has occurred.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Scenic Integrity Objectives

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

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

Monitoring Driver: Forest Plan Goal 15 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. This question was first evaluated in the fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: In the late 1990's the Forest Service developed the Scenery Management System (SMS) which evolved from and was designed to replace the Visual Management System (VMS) developed in the 1970s. The SMS is intended to ensure application of the principles of landscape aesthetics, scenery management, and environmental design in project-level planning.

The 2012 planning regulations (36 CFR 219) require the *“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 an objective for Forest Plan Goal 15 is to *“complete a transition from the current Visual Management System to the Scenery Management System”* during the planning period, lack of or changing landscape architect or visual resource staff and competing priorities have prevented this from occurring.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Special Uses - Recreation

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

Detailed Monitoring Question: Is the Forest helping to provide a diverse range of high-quality, sustainable recreation opportunities by improving its administration of existing authorizations?

Monitoring Driver: Forest Plan Goal 12 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any annual monitoring and evaluation report.

Evaluation and Conclusions: There are two components to administering existing special use authorizations (SUAs). The first is on-the-ground inspection of the authorized area to ensure compliance with the terms, conditions and mitigation measures contained in that authorization. The second is ensuring the authorization is current, fees are paid, and proper records are kept.

Revised directives on outfitting and guiding on NFS lands went into effect in October 2008 (fiscal year 2009). At that time, Forest Service staff reorganized and split recreation and non-recreation special use responsibilities into separate areas. In April 2011, Forest Service Handbook 2709.14, Chapter 50, was amended to provide direction for outfitting and guiding, and other concession services. In November 2013, the GMNF Forest Supervisor signed a decision memo which established a priority use pool and a temporary use pool of service days. Priority use is authorization of use for up to 10 years. Temporary use authorizations are for short term, non-recurring, seasonal distribution.

Monitoring SUA's includes site inspection(s), documenting the conditions found, taking any corrective action needed, calculating fees and preparing bills, tracking and documenting payments, and reporting all outcomes in the SUDS database. The Forest reports annually how many recreation special uses have been administered to standard.

In fiscal year 2007, GMNF had a target of 32 recreation SUAs administered to standard. In fiscal years 2008 and 2009, the initial target was to administer 19 recreation SUAs to standard. This increased to 28 in fiscal years 2010 to 2012. The Forest has generally been meeting or exceeding their target accomplishments, ranging from 100 to 129 percent. These changes were likely because of adequate budgets for proper administration.

Monitoring results suggest GMNF is providing a diverse range of high-quality, sustainable recreation opportunities through SUAs. However, it is difficult to discern whether there has been improvement in the administration of existing authorizations since 2006. Although GMNF is meeting targets for 'administered to standard' and have changed from mostly temporary permits to mostly long-term permits for outfitters and guides, there are no clear trends identified.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Trail Maintenance

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

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

Monitoring Driver: Forest Plan Goal 12 and associated Objectives.

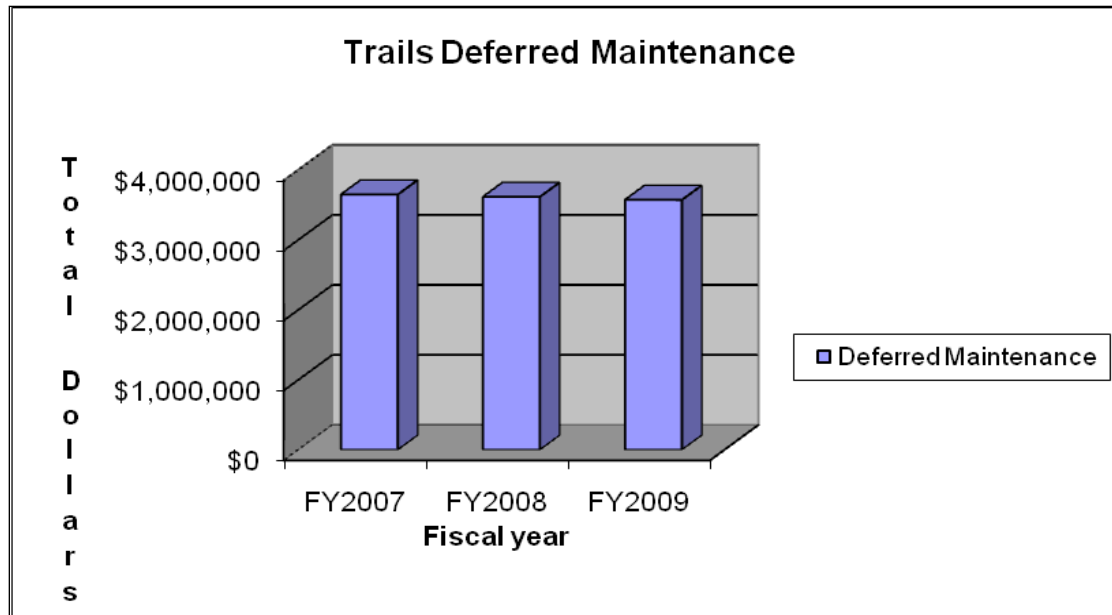
Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in the fiscal years 2006 to 2010 annual monitoring and evaluation reports.

Evaluation and Conclusions: There is a large and diverse trail system on GMNF, however the Forest Service has a limited budget to operate and maintain all the trails. As a result, there is a backlog of trail maintenance (or deferred maintenance) across GMNF. Deferred maintenance refers to the amount of trail maintenance (repair, annual maintenance, rehabilitation) not completed when needed or when it was scheduled. Maintenance of trails is important to provide a high-quality recreation experience and to reduce safety risk and adverse resource effects. Like developed recreation facilities and sites (recreation facility management monitoring item) GMNF relies on multiple partners to help address some

maintenance backlog, but this may not be sufficient to meet long-term needs. Trail system monitoring was initiated for GMNF in fiscal year 1999 because of Congressional direction regarding deferred maintenance reporting. Deferred maintenance in terms of funds needed to address deficiencies for fiscal years 2007 to 2009 is provided in Figure 3.

Figure 3.



In fiscal year 2007 total deferred maintenance of the trails system was \$3,645,340 which serves as a baseline for future years. Total deferred maintenance was \$3,612,198, and \$3,569,455 in fiscal years 2008, and 2009, respectively. The total deferred maintenance in fiscal year 2009 was reduced \$75,885 from fiscal year 2007 levels or about 2 percent reduction. This reduction in deferred maintenance is likely a result of a modest amount of trail maintenance activities, but more likely the result of the increased effort to monitor and more accurately report maintenance needs in the corporate databases. Total deferred maintenance is expected to continue to decline over the next several years as Forest Service staff continue the effort to update and correct outdated trail data and focus on targeted trail maintenance activities to reduce the backlog of maintenance.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2015.

Monitoring Item Name: Trends in Trail Partnerships

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

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

Monitoring Driver: Forest Plan Goal 12 and associated Objective: *Increase the effective use of partnerships in the improvement, maintenance, and operation of the Forest trails system.*

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: This question is intended to track whether there is an increase in the effective use of partnerships for the improvement, maintenance and operation of the GMNF trails system (Forest Plan Goal 12 objective). As discussed in the trail maintenance monitoring item, there is a substantial trail system deferred maintenance backlog. The annual trails budget covers only about 10 percent of calculated operations and maintenance for the existing system but the public continues to desire more new trails. There is an expectation that partner groups will assist with maintenance of the existing trail network. Although GMNF has a strong and active partners program, their contribution does not cover total trail system maintenance needs.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Visual Quality Objectives

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

Detailed Monitoring 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 Driver: Forest Plan Goal 15 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in the fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Monitoring activities since 2006 have included the review of the overall appearance of the GMNF landscape. More specifically, monitoring has also included review of visual resource concerns related to project planning, examination of vistas during project planning to determine if the vista was being lost due to tree growth, analysis and mapping visual foreground as seen from the Appalachian Trail, inspection of storm related damage to determine impacts to the visual resource, and site specific post-project monitoring done by the landscape architect individually or as part of the monitoring interdisciplinary team. The overall appearance of GMNF continues to meet Visual Quality Objectives (VQOs) as provided by the Forest Plan. Monitoring of vegetation management treatments showed that some project specific design features and visual guidelines should be reviewed and possibly revised to incorporate new approaches for 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: No change to the monitoring question. Consider new approaches when developing future project proposals to maintain or enhance visual resources associated with regeneration harvest treatments or creation of wildlife openings. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Soils

Monitoring Item Name: Long Term Soil Quality and Soil Productivity

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

Detailed Monitoring Question: Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land? How are soil/site quality and productivity changing over the long term, in response to factors such as acid deposition, climate change, invasive species, other environmental problems, and forest management? More specifically: A) Are soil nutrient levels changing,

and are the changes affecting soil/site productivity? B) What toxins exist in the soil (e.g. from the atmosphere), and how are they changing in quantity and type over time? Is this affecting productivity? C) Are forest management activities affecting soil/site productivity?

Monitoring Driver: Forest Plan Goal 3 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 10 years. Included in the fiscal year 2007 annual monitoring and evaluation report.

Evaluation and Conclusions: Although not included in any fiscal year annual monitoring and evaluation report since 2007, status for this monitoring question is summarized below.

Long-Term Soil Monitoring (LTSM)

GMNF staff participated in the Long-Term Soil Monitoring project in collaboration with Natural Resource Conservation Service, Vermont Agency of Natural Resources, Forest Service-Northern Research Station, University of Vermont, and the U.S. Geological Survey. Soil samples at five Long-Term Soil Monitoring sites in Vermont (two in the Lye Brook Wilderness Area on the GMNF) have been collected since 2002, as part of a study led by the Vermont Monitoring Cooperative (VMC), which will likely span 100 years (originally planned for 200 years). This monitoring is intended to evaluate the long-term effects of environmental factors on soils such as acid deposition, toxins, and climate change. It also provides insight into whether soil quality and productivity are changing.

Sampling data were collected in 2002, 2007, and 2012, with the next sampling currently scheduled for 2017. Samples were analyzed for pH, texture, cations, base saturation, Cation Exchange Capacity, and total Carbon (C), nitrogen (N), and sulfur (S) content in each horizon or depth increment. Soil toxins measured include mercury (Hg), oxalate extractable aluminum (Al), iron (Fe), manganese (Mn), silicon (Si), and phosphorus (P), and pyrophosphate Al, Fe, and Mn. Sampling data results are still too limited to draw definitive conclusions.

Long-Term Ecosystem Monitoring Project (LEMP)

In 2008, the Forest Service initiated a long-term study on GMNF lands similar to the LTSM project planned to span 50 years with the same VMC partners. The first round of sampling concluded when soil, forest health, and vegetation community data were collected on 20 plots in 2008, 2009, 2010, and 2011 (five per year). Soil parameters monitored include pH, and percent Carbon (C) and nitrogen (N), and extractable Calcium (Ca), magnesium (Mg), Sodium (Na), potassium (K), aluminum (Al), manganese (Mn), phosphorus (P), and strontium (Sr) (mg/kg in pH 4.8 ammonium acetate). The first round of sampling provides a baseline against which to evaluate trends over time. Since only one year's worth of data has been collected and analyzed (year 0 of the experiment for each plot), trends in soil nutrient levels, soil toxins, and carbon sequestration cannot be detected.

Other Monitoring Activities

As part of the LTSM project, a Soil Climate Analysis Network (SCAN) site was established near the plots in the Lye Brook Wilderness Area in 2000. Soil temperature and moisture data, including spring and fall temperature inversion turnover dates can be used as climate change indicators. These occur when the temperature throughout the soil profile switches from being warmer in the upper layers to warmer in the lower layers in fall, and then reverts each spring as temperatures increase.

The SCAN site at Lye Brook established baseline soil climate data for the area. Over winter, soil temperature gradually drops to near 0 °C, and then changes very little between December and April, with deeper layers being warmer than surface layers. Stability of winter soil temperatures results from snow insulating soil from daily surface temperature swings tied to air temperature and solar radiation. On an average monthly basis, March has the coldest soil temperatures. This is two months later than the coldest

average monthly air temperature. Ten-year average turnover dates occur on April 19 and September 30 under the forest canopy. Soils have the highest moisture content in spring, typically in April, due more to snowmelt than increased precipitation. Soil becomes dry in the summer, regardless of precipitation levels. The 8-inch soil depth has the highest moisture levels in almost all months.

Recommendations: No change to the monitoring question recommended at this time but consider adding plots within managed areas for future monitoring. Neither the LTSM nor LEMP studies directly measure whether forest management activities affect soil/site productivity, since all the plots are in areas protected from management activities. Data from managed areas can provide information to detect changes in a comparative format with unmanaged areas. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2016.

Monitoring Item Name: Soil/Water Standards and Guidelines, Mitigation Measure, and Soil Quality Standard Compliance

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

Detailed Monitoring 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 Driver: Forest Plan Goals 3 and associated Objectives, and Forest-wide Soil, Water, and Riparian Area Protection and Restoration and Management Area Standards and Guidelines.

Monitoring Frequency: Variable.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: Soil monitoring activities measured the implementation and effectiveness of Forest Plan Forest-wide and management area Standards and Guidelines associated with soil and water designed to control erosion, prevent sedimentation, protect wetlands, and maintain soil and water quality. Tree harvest activities have a high potential to impact soil, water, and wetland resources so harvesting continues to be the major monitoring emphasis. Forest Plan soil and water related standards and guidelines, and project specific mitigation measure implementation has improved to nearly 100 percent compliance and were found to be effective in protecting the soil, water, and wetland resources.

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 established new soil quality standards for the GMNF. Soil Disturbance Monitoring quantifies the degree, extent, distribution, and duration of soil disturbance from project activity. *National Best Management Practices for Water Quality Management on National Forest System Lands* monitoring protocols are also used to assess soil and water standard and guidelines and mitigation measure compliance.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Terrestrial Ecological Units

Monitoring Item Name: Ecological Type Mapping and Representation

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

Detailed Monitoring Question: 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 Driver: Forest Plan Goal 6 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: 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 (Forest Plan EIS). The primary emphasis to address this question during plan implementation is to (1) evaluate significant ecological features in terms of quality and disturbances, and (2) maintain significant ecological features at their current level of quality or higher. Monitoring occurred before and after select management activities to determine if actions contributed to or detracted from composition, structure, and function of the sites in relation to their values.

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 has incorporated these notes into site reports and/or rare plant reporting forms that are prepared during the winter months.

The Forest Plan supports the concept that ecological processes and systems are to be maintained on GMNF within the desired ranges of variability. This goal includes the objective to manage at least five percent of each ecological type present on GMNF for old growth characteristics. Managing a small proportion of each type in a way that allows natural disturbance processes to regulate forest types and forest structure ensures that the full range of variation in ecological systems on GMNF can be supported.

To address the representation of ecological types in the network of reference areas, ecological types are defined in the Forest Plan EIS in three ways:

1. Landtype Associations (LTAs) represent landscape-sized units defined by broad patterns of vegetation in combination with the physical environment. LTAs include Ecological Land Unit Groups and are nested within Vermont biophysical regions (e.g. valley bottoms LTA or mountain slopes LTA with the Northern Green Mountains; Table 3.11-3, Forest Plan EIS, p. 3-236).
2. Ecological Land Unit Groups (ELUGs) represent groups of ecological types defined by unique combinations of soil conditions and late-successional vegetation expected to be at a particular site due to geology, soils, topography, existing vegetation, and land use history (e.g. subalpine forest, mid-elevation slope forest, low rocky slope and crest forest; Table 3.11-4, Forest Plan EIS, p. 3-237).
3. Major Forest Communities are similar to habitat types defined in the Forest Plan. They consist of groupings of forest types that are classified by foresters for inventory purposes. For example,

northern hardwoods include typical beech-birch-maple forests as well as forests dominated by beech and red maple, and those dominated by sugar maple, basswood, and ash (Table 3.11-5, Forest Plan EIS, p. 3-237).

The Forest Plan EIS ensures that old growth characteristics are maintained on GMNF by representing these ecological types in the “Reference Area Network”, a grouping of management areas and other conditions that “...provide ecological reference or benchmark conditions for baseline monitoring and research, provide refuge for rare species, and provide some ecological conditions or functions that are not otherwise available across the landscape.” (Forest Plan EIS, p. 3-227). Areas that are or will provide these conditions for GMNF comprise the Reference Area Network (RAN) and include the following management areas (MA):

- Wilderness MA
- Remote Backcountry Forest MA
- Robert T Stafford White Rocks National Recreation Area MA
- Existing and Candidate Research Natural Area MA
- Ecological Special Area MA
- Alpine/Subalpine Special Area MA
- Eligible Wild Rivers MA
- Unsuitable lands

In addition to monitoring adequate representation, another objective associated with this monitoring item was to revise the Forest’s ecological classification system to ensure it represents the latest science and understanding of ecological classification and natural communities in the Green Mountains of Vermont. If there are ecosystems not captured or well-characterized in the classification system, then they may not be adequately represented in the RAN.

Updates to Ecological Classification

In 2009, the Forest Service developed an action plan for revising the current ecological classification system on GMNF. Two precursors were identified that would need to exist prior to this revision: 1) the development of a till model for till chemistry, and 2) the acquisition of LiDAR coverage of GMNF. As of 2013, the Forest Service is still seeking an opportunity to work with a partner to develop the till model. In contrast, LiDAR coverage for the western portion of Addison County was almost completed, while LiDAR was being flown over Rutland County. GMNF staff have also received LiDAR coverage for Bennington County. GMNF staff are also working closely with White Mountain National Forest staff as they revise and update their ecological classification system using LiDAR and computer modeling. This effort shows promise to reduce the amount and intensity of field sampling required for a revision to their system.

The State of Vermont Natural Heritage Inventory Program continues to inventory, map, and classify natural communities across Vermont, and has updated and revised many natural community types and groups since 2006. Until GMNF staff completes a revision of its ecological classification system, it will evaluate and use of the variety of existing ecological types and natural communities as it monitors representation in the RAN.

Representation Analysis

This report documents an updated analysis of representation of ecological units in the RAN. Three factors affect this analysis and can lead to different proportions than those documented in the Forest Plan EIS (Section 3.11, pp. 3-226 to 3-254): 1) adjustment of management area allocation can change the size and delineation of the RAN; 2) new acquisitions can change the abundance and distribution of ecological types; and 3) new classifications of ecological types can change the analysis of what is being represented in the RAN.

In April 2011, the Forest Service issued a decision on Forest Plan Amendment #1, Reallocation of Wilderness Study Areas, Remote Backcountry Forest, and Candidate Research Natural Areas Management Area Remnants resulting from the New England Wilderness Act. This decision caused adjustments to the RAN, which were incorporated into the updated representation analysis.

Approximately 7,530 acres have been added to the GMNF land base since the representation analysis was conducted for the Forest Plan revision. In addition, the Forest Service has made corrections since 2006 to several geographic data layers that represent GMNF ownership, management area delineation, stand delineation, and classification of unsuitable lands. These corrections are ongoing and will continue for the foreseeable future, and Forest Service staff only have the capacity to make these corrections in areas where projects are currently ongoing. These changes affect both the relative proportion of ecological types on GMNF, and the acres and delineation of the RAN (which includes unsuitable stands).

Since the previous analyses, additional ecosystem modeling efforts have been undertaken in Vermont and the Northeastern U.S. by The Nature Conservancy (TNC). The State of VT contracted with TNC to create an LTA layer for the entire state. This layer has adjusted the number, size, and delineation of landscape units to use for the representation analysis. Additionally, TNC developed a model and map of “modelled community ecosystems” for use in its ecoregional planning and conservation efforts (the TNC community ecosystem map is available online for download at:

www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/mapsdata/Pages/default.aspx

While these modeled ecosystems have not been field validated on GMNF, they make use of the same base ecological units used in the Forest Plan EIS representation analyses (that formed the basis of Ecological Land Unit Groups or ELUGs), and cover the entire state of Vermont (which the ELUGs did not).

For this analysis, the Forest Service used the new statewide LTA classification to represent landscape-scale ecological units. The TNC modeled ecological system units were used rather than the ELUGs to represent approximations of natural communities, ensuring that the entire GMNF can be analyzed and allowing consistency with regional conservation planning. The Forest Service also used a major forest community/habitat type classification similar to what was used in the Forest Plan EIS to represent habitats that are actually inventoried on the ground.

LTAs continue to be represented in the RAN above the Forest Plan threshold of five percent for most LTAs (Table 2-12), except for approximately 2,636 acres within the Southern Vermont Piedmont LTAs, which had not been delineated prior to previous analyses of representation. Many LTAs are represented at levels above 20 percent. National Forest System lands within the Southern Vermont Piedmont are all included in the Appalachian Trail MA, which provides a certain level of conservation in the context of management for trails. This MA was not considered part of the RAN because of the level of ground disturbance that can be created by trail construction and intensive use. Additionally, low levels of vegetation management can occur to maintain pastoral character in some parts of the trail corridor in this biophysical region. The GMNF in this region is also characterized by a narrow, linear shape, which further reduces its conservation value. In combination with adjacent conserved lands, however, this MA can offer overall conservation of many ecosystem values, such as vegetation composition and structural integrity outside of the footpath and managed openings.

Representation of modeled ecological systems within the RAN is above 20 percent for all but five rare ecosystems, which are not represented at all (Table 2-13). These rare ecosystems cover two to 27 acres on GMNF, which is less than one one-hundredth of one percent of the Forest. Individual ecosystem patches range from less than an acre to 10 acres in size. Two of these ecosystems fall within the Appalachian Trail MA, and the previous discussion related to LTA representation and conservation within this MA applies here as well. The other three are within very isolated patches on the edges of the GMNF boundary in association with major river corridors. These ecosystems need to be field validated to determine if they

are accurately represented by the model and to determine their significance. Often very small patches of rare habitat are protected via Forest Plan Standards and Guidelines rather than by management area designation.

Table 2-12. Representation of landtype associations (LTAs) within Vermont biophysical regions (and ecomap subsections) in the Green Mountain National Forest reference area network (RAN).

LTA	LTA Acres on GMNF ¹	LTA Proportion of GMNF	LTA Acres in RAN	LTA Proportion of RAN
	(acres)	(%)	(acres)	(%)
Northern Green Mountain Biophysical Region (M212Ca)				
Valley Bottoms	311	<1	46	15
Hills and Footslopes	7,681	2	1,610	21
Mountain Slopes	63,613	16	22,599	36
Upper Mountain Slopes/Mountain Tops	31,637	8	25,909	82
Southern Green Mountain Biophysical Region (M212Cd)				
Valley Bottoms	8,416	2	4,936	59
Vermont Escarpment	34,798	8	18,459	53
Hills and Footslopes	95,322	23	34,452	36
Precambrian Plateau	53,887	13	20,359	38
Mountain Slopes	67,525	16	26,202	39
Upper Mountain Slopes and Mountain Tops	31,154	8	18,761	60
Taconic Mountain & Vermont Valley Biophysical Regions (M212Cb)				
Valley Bottoms	213	<1	109	51
Low Rolling Upland	538	<1	122	23
Hills and Footslopes	1,044	<1	121	12
Mountain Slopes	5,511	1	670	12
Enriched Mid-elevation Slopes	1,111	<1	861	78
Upper Mountain Slopes and Mountain Tops	1,755	<1	1,410	80
Southern Vermont Piedmont Biophysical Region (M212Bb)				
Water-deposited Glacial Sediments Along Rivers	47	<1	0	0
Dissected Low to Mid-elevation Calcareous Hills	1,806	<1	0	0
Temperate Oaky Hills of Southeastern VT	787	<1	0	0
Champlain Valley Biophysical Region (212Ec)				
Valley Bottoms	5	<1	5	93
Valley Floor Glacial Lake/Marine Plains	4	<1	3	68
Marine-Lacustrine-Glaciofluvial Coarse Sediments	55	<1	16	30
Low Rolling Upland	264	<1	65	24
TOTAL	407,484	100	176,715	43

Source: Ferree and Thompson (2008), Forest GIS data

¹Acres are less than the >408,000 acres of federal ownership due to exclusion of acreage in large bodies of water like Chittenden Reservoir.

Table 2-13. Representation of The Nature Conservancy ecological systems (ES) in the Green Mountain National Forest reference area network (RAN).

Ecological System	ES Acres on GMNF ¹ (acres)	ES Proportion of GMNF (%)	ES Acres in RAN (acres)	ES Proportion of RAN (%)
Acadian-Appalachian Alpine Tundra	2	<1	2	100
Acadian Sub-boreal Spruce Flat	1,682	<1	897	53
Acadian Low Elevation Spruce-Fir-Hardwood Forest	10,606	3	5,194	49
Acadian-App. Montane Spruce-Fir-Hardwood Forest	23,612	6	18,359	78
Laurentian-Acadian Conifer-Northern Hardwood Forest	23,495	6	11,309	48
Laurentian-Acadian Cool Northern Hardwoods Forest	16,129	4	7,974	49
Laurentian-Acadian Northern Hardwood Forest	245,692	61	97,456	40
Appalachian Cool (Hemlock)-Northern Hardwood Forest	910	<1	316	35
Appalachian (Hemlock)-Northern Hardwood Forest	3,940	1	1,068	27
Appalachian Dry (Hemlock)-Northern Hardwood Forest	2	<1	0	0
Laurentian-Acadian Cool Pine-Hemlock-Hardwood Forest	375	<1	171	46
Laurentian-Acadian Pine-Hemlock-Hardwood Forest:	14,089	3	3,415	24
Laurentian-Acadian Red Oak-Northern Hardwood Forest	28,335	7	8,524	30
Central Appalachian Dry Oak-Pine Forest	288	<1	138	48
Central Appalachian Pine-Oak Rocky Woodland	27	<1	17	63
Central Appalachian Alkaline Glade and Woodland	19	<1	0	0
Laurentian-Acadian Floodplain Forest	26	<1	0	0
North-Central Interior Wet Flatwoods	8	<1	0	0
Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	389	<1	222	57
Northern App.-Acadian Conifer-Hardwood Acidic Swamp	10,731	3	4,783	54
North-Central Interior and Appalachian Rich Swamp	128	<1	40	32
North-Central Appalachian Acidic Swamp	9	<1	0	0
Laurentian-Acadian Wet Meadow-Shrub Swamp	1,213	<1	761	63
Boreal-Laurentian-Acadian Acidic Basin Fen	992	<1	840	85
Laurentian-Acadian Freshwater Marsh	3,189	1	2,373	74
Laurentian-Acadian Calcareous Rocky Outcrop	1,306	<1	787	60
N. Appalachian-Acadian Rocky Heath Outcrop	9,366	2	5,318	57
Laurentian-Acadian Acidic Cliff and Talus	4,379	1	2,867	65
Laurentian-Acadian Calcareous Cliff and Talus	1,413	<1	1,185	84
North-Central Appalachian Acidic Cliff and Talus	619	<1	551	89
North-Central Appalachian Circumneutral Cliff and Talus	97	<1	51	53
TOTAL	403,068	100	175,621	44

Source: The Nature Conservancy (2006), Forest GIS data.

¹Acres are less than the > 408,000 acres of federal ownership due to exclusion of acreage in waterbody, agricultural, and developed ecological system classes.

Major forest communities are represented within the RAN at well above 20 percent for all communities (Table 2-14). As these are broadly conceived habitats, this is not surprising. Most of the aspen/birch is represented by paper birch forests in old clearcuts that are now in many of the designated wilderness

areas. Significant increases in aspen/birch representation in the RAN are due to changes in the RAN associated with Forest Plan Amendment #1. Increases in hemlock/pine and oak/pine/hardwood communities overall were related to new acquisitions on the edges of GMNF where these communities are more common. Their representation in the RAN has declined since 2006 as these new acquisitions are not within the RAN. Other shifts in proportion of GMNF forest communities within the RAN can be attributed to corrections and adjustments to stands due to more recent inventories and corrections.

Table 2-14. Representation of major forest communities (MFCs) in the Green Mountain National Forest reference area network (RAN).

Major Forest Community	MFC Acres on GMNF ¹ (acres)	MFC Proportion of GMNF (%)	MFC Acres in RAN (acres)	MFC Proportion of RAN (%)
Aspen/Birch	14,696	4	10,707	73
Northern Hardwood	298,686	77	128,445	43
Mixedwood	44,235	11	14,674	33
Oak/Pine/Hardwoods	5,206	1	1,888	36
Hemlock-Pine	5,681	2	1,818	32
Spruce-Fir	17,686	5	9,732	55
Softwood Swamp	636	<1	581	91
TOTAL	386,826	100	167,846	43

Source: Forest stand and GIS data

¹Acres are less than the >408,000 acres of federal ownership due to incomplete inventory data, some new acquisitions that have not been inventoried, and the exclusion of openings.

Based on current information, a range of ecosystems and processes on GMNF continues to be represented within the RAN at greater than five percent. All ecological units analyzed represented in the RAN occur at greater than five percent, with most occurring at greater than 20 percent. This level of representation helps to ensure that most of GMNF ecosystems are protected from direct human modification and can develop structural complexity over time. In the context of climate change and non-native invasive species, these ecosystems provide baseline conditions for long-term monitoring of environmental change. Some of these ecosystems are represented within GMNF Long-term Ecosystem Monitoring Project (LEMP) plots, which are monitored every 10 years (see Long Term Soil Quality and Soil Productivity monitoring item). Smaller patch ecosystems that are considered rare or significant on GMNF are monitored more regularly for condition and threats.

A group of ecological units, three LTAs and five ecological systems, are rare on GMNF and are not currently represented within the RAN. These units are found on the edges of NFS lands outside of the Green Mountains, in landscapes very different from those typical of GMNF. These units will be field validated for type and evaluated for their condition and quality. Once this is done, Forest Service staff will determine the best way to conserve these types, given the condition and quality of the sites and the surrounding landscape. Small patches surrounded by agricultural or developed lands or lands that are young or infested with non-native invasive species or intensively managed may require restoration and may not be good candidates for the RAN.

The most pressing challenge in representing ecosystems within the RAN is in classification of ecosystems. Most of the classifications for ecosystems smaller than landscapes rely on existing vegetation. While it is relatively straightforward to model or inventory ecosystems based on vegetation, particularly with new remote sensing technology, existing vegetation is generally a product of past land use and disturbance history. The history of forest change is extensive and dramatic for Vermont and GMNF, and forest ecosystems and the RAN are a product of that history. Ecosystem components besides vegetation, such as terrain, aspect, elevation, soils, and geology, can be very useful in defining ecological

units that are relatively static compared to vegetation. Forest Service staff are trying to characterize these “enduring features” as part of its ecological classification efforts, as these features are least likely to be affected by climate change and land use history. As vegetation shifts with climate change, as long as the full range of these enduring features is represented within the RAN, it is likely that the RAN will represent the full range of natural communities as well. Until the revision of the ecological classification system is complete, the best solution for representing ecosystems in the RAN is to analyze a variety of classifications.

Summary

Representation of ecological types in the RAN continues to be important to monitor, particularly within the context of climate change. The abundance and distribution of species is expected to change with time as a result of changes in temperature and patterns of precipitation. It will be important to monitor how ecological types are changing over the next 100 years in terms of composition, structure, and function. Having representation of all types within a RAN ensures baseline conditions that can be monitored and compared to management activities outside the RAN and to regional trends in species movements and natural community changes.

New classifications that identify ecological units not represented within the RAN (such as the LTAs and TNC’s modeled community ecosystems), should be more extensively field validated. Forest Service staff should work with TNC and other partners to field validate and adjust the models as information is gathered.

Continued efforts at updating and improving existing ecological classifications will be important to better determine baseline conditions and detect changes in vegetation composition and structure. The Forest Service should work with Natural Resources Conservation Service and White Mountain National Forest staff, and other partners to use remote sensing technology like LiDAR and LANDSAT imagery along with geospatial modeling to delineate enduring features that can then be sampled in the field to gather associated vegetation data. Analysis of this data can be used to revise mapping of enduring features and to create maps of ecological units. Final ecological units should be hierarchically nested so that at least two scales are represented (landscape and land unit), which would then be combined with current stand inventory to evaluate representation of ecosystems within the RAN. Once the classification has been updated, the LEMP plots should be evaluated to determine if there are any ecological units not currently monitored so they can be prioritized for establishment of long-term monitoring.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Terrestrial Wildlife Habitat

Monitoring Item Name: Deer Wintering Areas

Monitoring Question: To what extent do Forest Service Management activities contribute toward restoration and maintenance of habitat for native and desirable non-native species?

Detailed Monitoring Question: Are Standards and Guidelines improving quality of softwood cover in Deer Wintering Areas (DWAs)? Are Standards and Guidelines improving availability and quality of browse in and near DWAs? Is the occupancy of DWAs changing over time?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives, and Forest-wide Deer Wintering Areas Standards and Guidelines.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in fiscal years 2006, 2007, and 2008 annual monitoring and evaluation reports.

Evaluation and Conclusions: Deer wintering areas, or “deer yards,” include two basic habitat components required by white-tailed deer during winter: 1) shelter from harsh weather conditions, and 2) food or browse. Softwood stands with high crown closure create shelter or “cover,” which provides protection from snow depth, wind, and cold temperatures. Hardwood and softwood regeneration provide accessible food or “browse.” The quality of deer wintering areas is determined by forest stand characteristics, such as species composition, maturity, height, and closure of the canopy, which vary by site specific features, such as elevation, slope, aspect, and soil type. The Vermont Department of Wildlife mapped potential deer wintering areas in Vermont during the 1980s. The Vermont deer herd in 2006 has approximately half the numbers as it had in the early 1980s when wintering areas were mapped. Thus, currently mapped deer winter areas may represent potentially suitable wintering habitat, not necessarily areas actually occupied by deer during winter.

The monitoring activities are intended to collect data regarding current animal use, cover condition, forage availability, and opportunities. This data is used to inform site specific project analysis, and shared with the State of Vermont to assist with their management of the Vermont deer herd. Forest Service staff have actively sought to increase the relative representation of softwood species on GMNF, which will provide cover for deer, as well as creation of temporary and permanent upland openings that will provide hardwood browse for deer. It should be recognized that demonstrating a population response to management activities by deer is difficult. Monitoring should focus on the abundance, quality, and availability of softwood habitats that provide suitable cover, and on early-successional habitats that provide browse for deer, not on attempting to monitor deer use of site-specific areas or deer population trends.

Recommendations: Modify or remove this question from the monitoring program. If modified, the next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Early Successional Habitat

Monitoring Question: To what extent do Forest Service Management activities contribute toward restoration and maintenance of habitat for native and desirable non-native species?

Detailed Monitoring Question: Are temporary and permanent openings used by early successional habitat species? What are short- and long-term changes in structural components and use of openings of different sizes?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in fiscal years 2006, 2007, 2008, and 2009 annual monitoring and evaluation reports.

Evaluation and Conclusions: Management activities have continued to maintain existing permanent upland openings that provide early successional habitat (ESH), as well as create new permanent upland openings. Activities have also continued to create temporary upland openings through regeneration timber harvest treatments. Early successional communities typically are dependent on stand disturbing events, such as fire, wind throw, flood, timber harvest, or agriculture, that create forest openings, which allow sunlight to reach the ground. The species and characteristics of vegetation on these sites progress through reasonably predictable successional (or seral) stages, reverting eventually to mature forest. Forest Service staff did not monitor for or detect differences in structural changes to temporary and permanent openings and their relative value for ESH because of the difficulty associated with the development of meaningful

survey protocol. Future monitoring should be designed to test common assumptions and concepts with a more intensive survey of areas within managed openings compared to interior forest habitat.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Management Indicator Species Habitat Trends

Monitoring Question: To what extent do Forest Service Management activities contribute toward restoration and maintenance of habitat for native and desirable non-native species?

Detailed Monitoring Question: What are habitat trends for MIS? 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 Driver: Forest Plan Goal 2 and associated Objectives, and NFMA requirements for MIS (1982 planning regulations at 36 CFR 219.19(a)).

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports. The fiscal year 2011 annual monitoring and evaluation report was the only exception.

Evaluation and Conclusions: Management Indicator Species (MIS) are vertebrate or invertebrate species selected for monitoring habitat conditions on GMNF because their population changes are believed to indicate the effects of management activities (1982 planning regulations at 36 CFR 219.19(a)(1)). The selection of management indicator species was primarily based on their association with habitats subject to active structural manipulation, such as creation of temporary openings, regeneration of aspen or oak stands, or enhancement of riparian habitat. Table 2-15 provides the MIS and associated habitat type as provided in the Forest Plan, Appendix C.

Table 2-15. Management Indicator Species 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

Forest Plan direction to maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals includes striving toward specific forest habitat composition and age class objectives. Forest Service staff worked with local volunteers, conservation organizations, and state and federal agencies to gather data for MIS following nationally accepted protocols particularly American woodcock, ruffed grouse, and brook trout. 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 MIS data severely restricts the ability to draw robust or meaningful conclusions about specific trends of MIS populations and associated habitats resulting from management activities or natural processes.

The use of MIS as a management concept was discontinued in 2012 when the planning regulations were revised (2012 planning regulations, 36 CFR 219) because the effectiveness of MIS monitoring was

determined to be unreliable. As a result, MIS monitoring is no longer required as part of NFMA implementation.

Recommendations: Remove this question from the monitoring program.

Monitoring Item Name: Wildlife Reserve Trees

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

Detailed Monitoring Question: Are 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 Driver: Forest Plan Goal 2 and Wildlife Reserve Tree Objectives, and Forest-wide Wildlife Reserve Trees - General Standards and Guidelines.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in fiscal years 2006 annual monitoring and evaluation report, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: Forest Plan direction includes 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.

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 have verified these conditions are being met throughout the timber sale administration process. Surveys have not been specifically completed to determine 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 GMNF.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Terrestrial Wildlife Population

Monitoring Item Name: Bald Eagle

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports. The fiscal year 2011 annual monitoring and evaluation report was the only exception.

Evaluation and Conclusions: The bald eagle (*Haliaeetus leucocephalus*) remains listed as a Regional Forester Sensitive Species updated December 2011. All project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. Prior to 2006, there were no nesting bald eagles in Vermont. In 2006 a pair of bald eagles were confirmed nesters in the Connecticut River Valley. Since that time, bald eagles have successfully nested on several occasions in both the Lake Champlain and Connecticut River valleys. Although bald eagles occasionally occur within GMNF boundaries, the Forest Service has no evidence suggesting bald eagles have attempted nesting on National Forest System (NFS) lands. Although there were several reported sightings of bald eagles on or immediately adjacent to GMNF in 2012 and 2013, it appears they continue to be transient birds and not nesting adults.

Recommendations: Consider removing this question from the monitoring program until bald eagles are confirmed to be nesting on NFS lands. If retained, the next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Bicknell's Thrush

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports. The fiscal year 2011 annual monitoring and evaluation report was the only exception.

Evaluation and Conclusions: Bicknell's thrush (*Catharus bicknelli*) remains listed as a Regional Forester Sensitive Species updated December 2011. All project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. In the northeastern United States 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 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.

The Vermont Center for Ecostudies (VCE) oversees Mountain Birdwatch which is an international monitoring effort for Bicknell's thrush. Forest Service biologists and technicians have cooperated with VCE annually to conduct two Mountain Birdwatch surveys on Killington Peak. Additionally, volunteers conducted surveys on other peaks on or adjacent to NFS lands. Monitoring indicates the population of Bicknell's thrush continues to exist at very low levels on GMNF. It is uncertain whether numbers are increasing or decreasing at a meaningful or measurable rate.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Common Loon

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006, 2008, 2009, and 2010 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: The common loon (*Gavia immer*) remains listed as a Regional Forester Sensitive Species updated December 2011. All project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. The 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. This annual effort includes about 200 volunteers. Only a small portion of the lakes and ponds on GMNF are large enough to provide suitable nesting habitat for loons.

Loon populations have been on an upward trend in part due to increased awareness, and site-specific protections throughout Vermont and GMNF. The loon population in Vermont has increased from a low of only 7 known nesting pairs in 1983 to 70 nesting pairs in 2012 and 81 nesting pairs in 2013.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Management Indicator Species Population Trends

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

Detailed Monitoring Question: What are population trends of MIS? To what extent are MIS responding to Forest Service management of suitable habitat?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives, and NFMA requirements for MIS (36 CFR 219.19(a)).

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports. The fiscal year 2011 annual monitoring and evaluation report was the only exception.

Forest Plan direction to maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals includes striving toward specific forest habitat composition and age class objectives. Forest Service staff worked with local volunteers, conservation organizations, and state and federal agencies to gather data for MIS following nationally accepted protocols particularly American woodcock, ruffed grouse, and brook trout. 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 MIS data severely restricts the ability to draw robust or meaningful conclusions about specific trends of MIS populations and associated habitats resulting from management activities or natural processes.

The use of MIS as a management concept was discontinued in 2012 when the planning regulations were revised (2012 planning regulations, 36 CFR 219) because the effectiveness of MIS monitoring was determined to be unreliable. As a result, MIS monitoring is no longer required as part of NFMA implementation.

Recommendations: Remove this question from the monitoring program.

Monitoring Item Name: Peregrine Falcon

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports. The fiscal year 2011 annual monitoring and evaluation report was the only exception.

Evaluation and Conclusions: The peregrine falcon (*Falco peregrinus anatum*) remains listed as a Regional Forester Sensitive Species updated December 2011. All project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. 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. Vermont's breeding population has steadily increased, paralleling similar trends throughout much of the eastern United States. From 1982 through 1987, 93 young falcons were released at 3 hack sites in Vermont including Mount Horrid and White Rocks on GMNF. From 2008 through 2013, there were 30 to 40 breeding pairs of peregrine falcons in Vermont. This includes several nesting sites on and adjacent to GMNF.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Regional Forester Sensitive Species - Odonates and Lepidopterans

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

Detailed Monitoring Question: Do *odonate and lepidopteran*, listed as a Regional 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 Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in fiscal years 2006 and 2007 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: At the time of Forest Plan revision, available information suggested that the West Virginia white (*Pieris virginiensis*) is the only lepidopteran sensitive species that could occur on the GMNF. All project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. The Vermont Center for Ecostudies (VCE) sponsored a Vermont butterfly survey during 2002 to 2007, maintaining results online. 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.

The Forest Service did not conduct surveys specifically targeting *lepidopteran* and *odonate* sensitive species since 2007. There has been no organized monitoring or surveying by Forest Service partners other than the 2002 to 2007 Vermont Butterfly Survey coordinated by VCE. Although no population or distribution data are available for *odonates*, each of these species occurs in riparian or wetland habitats. Forest Plan standards and guidelines require careful consideration of any activities that occur in these areas. Water quality has been increasing on 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: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Threatened, Endangered, and Sensitive Species - Bats

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports. The fiscal year 2011 annual monitoring and evaluation report was the only exception.

Evaluation and Conclusions: Indiana bat (*Myotis sodalists*) is Federally listed as an endangered species. All projects must comply with Endangered Species Act consultation requirements prior to implementation to ensure Indiana bat protection. Eastern small-footed bat (*Myotis leibii*) remains listed as a Regional Forester Sensitive Species updated December 2011. All project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. The Vermont Fish and Wildlife Department is the lead agency for bat surveys and monitoring in Vermont. The Forest Service continued working cooperatively with state and federal agencies in monitoring and surveying bats on land adjacent to the GMNF to gain a better understanding of bat movements and activities on NFS lands. Since 2006, the population of cave- and mine-hibernating bats have suffered unprecedented population declines from White Nose Syndrome (WNS). The impact of WNS on Indiana bats and eastern small-footed bats is not known, as these bats were rare or uncommon in Vermont prior to this disease occurrence.

Other bat species, particularly little brown bats (*Myotis lucifugus*) and northern long-eared bats (*Myotis septentrionalis*) have suffered population declines ranging from 90 to 99 percent. Little brown bat,

northern long-eared bat, and tri-colored bat (*Perimyotis subflavus*) were added as Regional Forester Sensitive Species as part of the updated December 2011 list.

Recommendations: Consider changing this monitoring question to include additional bat species, specifically the northern long-eared bat, little brown bat, and tri-colored bat. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Threatened, Endangered, and Sensitive Species - Herptiles (wood turtle, Jefferson and blue-spotted salamanders)

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

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

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2009 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: Wood turtle (*Glyptemys insculpta*), Jefferson salamander (*Ambystoma jeffersonianum*), blue-spotted salamander (*Ambystoma laterale*), and four-toed salamander (*Hemidactylium scutatum*) remain listed as a Regional Forester Sensitive Species updated December 2011. All project analyses include a biological evaluation to ensure sensitive species viability and to preclude trends toward endangerment that would result in the need for Federal listing. 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. 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. There is little information to evaluate, and population trends are unknown based on historical survey results.

Recommendations: Consider modifying this monitoring question to focus on wetland habitats instead of the herptile species. Forest Service staff can monitor wetlands but lack the expertise to directly monitor herptiles. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Threatened, Endangered, and Sensitive Species - Mammals (wolf, cougar, lynx)

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

Detailed Monitoring Question: Do gray wolves, eastern cougars, or Canada lynx occur on or near the GMNF?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006, 2008, and 2009 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: Gray wolf (*Canis lupus*) and eastern cougar (*Felis concolor cougar*) are Federally listed as endangered species, and Canada lynx (*Lynx canadensis*) is Federally listed as threatened. These species are protected by the Endangered Species Act. The GMNF has only historical occurrence records for gray wolf, eastern cougar, and Canada lynx. These species are not known to occur on or near the GMNF, although occasional undocumented sightings persist. The presence of these species on the GMNF at any time in the foreseeable future is unlikely.

Recommendations: Consider removing this question from the monitoring program since the presence of these species on GMNF at any time in the foreseeable future is unlikely. If retained, the next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wildlife in Remote Areas

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

Detailed Monitoring Question: What 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 Driver: Forest Plan Goal 2 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in fiscal years 2006 and 2007 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

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.

Evaluation and Conclusions: This question was established to quantify the establishment of the Remote Wildlife Habitat and Wilderness Study Areas Management Areas on the GMNF. The Wilderness Study Areas Management Area (MA) was removed from the Forest Plan after wilderness designations were established by Congress in 2006. Residual acres within the Wilderness Study Areas MA were distributed to other Forest Plan management areas with a Forest Plan amendment in 2011 (see response to the Wilderness Study Areas monitoring item).

The first habitat-management activities proposed to take place in the Remote Wildlife Habitat MA 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 MA are scheduled for implementation in fiscal year 2015. There is currently no data available to assess differences in habitat use in more or less remote habitats on the GMNF.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Vegetation

Monitoring Item Name: Age Class Distribution

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

Detailed Monitoring Question: To what extent are management actions and natural processes moving age class structure of lands managed using even-aged silvicultural systems toward desired objectives in Table 2.2-2 in the revised Plan?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objectives that states management should apply age-class objectives found in Forest Plan Table 2.2-2 to suitable lands that will be managed using even-aged silvicultural systems to provide a variety of habitat conditions for wildlife and create a balanced distribution of age classes to meet timber objectives. Also, maintain a full range of age classes from young to old, including late successional and multi-age conditions, within management areas where age class can be actively manipulated toward goals, objectives, and desired future conditions.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: The Forest Plan identified a desire to maintain and enhance age class diversity within forested stands via even-age and uneven-age silvicultural systems as well as natural processes. Age class objectives associated with even-age systems are identified in Tables 2.2-2 and 2.2-3 (Forest Plan, pp. 11-12), while the objective for managed uneven-age forest structure is a minimum of 20 percent of lands suitable for timber management (Forest Plan, p. 12). Table 3.5-7 in the Forest Plan Final Environmental Impact Statement (FEIS) displays a forest-wide summary of age class distribution by forest community type as of approximately 2004 and can be used for general comparison.

Forest Plan Goal 2 age class objectives states, “Because balancing age classes to meet objectives takes time, it may be decades before these age class objectives are attained” (Forest Plan, p. 11). This caveat also applies to uneven-aged systems and natural processes, as the GMNF is still recovering from the land use history of the 19th and early 20th centuries, and most forested stands are less than 100 years old. Most of the GMNF had been cleared at least once by the end of the 19th century, and the flatter portions of it were also farmed. By the time the GMNF was first established in 1932, these forested landscapes had been experiencing waves of abandonment by the early settlers that started following the Civil War, as well as harvesting of second growth hardwoods for charcoal. Almost three-quarters of forested stands on the GMNF with age data fall between 70-130 years old.

Structural diversity, including age class diversity, is one of the key considerations during vegetation management planning. Forested stands that fall within the young and early mature age classes tend to have lower structural diversity, so the objective generally is to develop the regenerating and older mature and old age class, and balance age class distribution in lands managed using even-age management (i.e. work toward the age class objectives in Table 2.2-2 in the Forest Plan). Uneven-age management diversifies forest structure by creating additional age classes within a forest stand. Both maintenance of northern hardwood forests and conversion of hardwoods to mixedwood (mixed hardwoods and softwoods) or softwood forest can be facilitated using this system. Under natural disturbances, structural diversity develops with the aging of forest stands and the natural development of an uneven-age structure. This occurs with the appearance of small to moderate-sized patches of regenerating trees resulting from wind and ice storms as well as insects and diseases. If no management activities are implemented, these conditions would develop on their own, probably in another 50-100 years, but in the meantime stands would continue to have low levels of structural diversity.

To balance age classes toward desired objectives, and diversify age classes, management opportunities are considered for regenerating stands to create early successional habitat, as this habitat is ephemeral, lasting 10-15 years. The creation of patches of regenerating forest, whether by cutting or natural processes, is the only mechanism by which age class diversity and many elements of structural diversity can be achieved. As an ephemeral habitat, regenerating forests are highly valued habitat by a suite of wildlife species. Areas to thin are also an important consideration to improve forest health and allow growing room so that trees can continue to be productive into the old age class, particularly in areas managed using long rotations. Based on field inventories, areas are identified for potential management to diversify habitats that are best managed using uneven-age systems and looks to develop or enhance those conditions. Lands that are not part of the suitable land base are allowed to develop under the influence of natural disturbances.

Various areas and watersheds are periodically analyzed to determine potential management needs. As part of this analysis, existing vegetation data is compiled to identify opportunities to balance and diversify age class and structure toward Forest Plan objectives. These opportunities are then discussed with the public, analyzed further via an environmental assessment, and then decided upon. The documentation for these decisions includes a table that lists the stands to be managed and the type of treatment to be applied (such as clearcut or selection harvest methods). Management objectives for each stand are further clarified and specified in a management prescription after the decision is made. Once the management prescription is completed, the information about the stand and treatment is updated in various databases and reports.

Monitoring the progress made toward desired age class and structure objectives is conducted by gathering this information and running various reports. Several new databases have been developed and used since the plan revision was completed, however some of the management activities that have occurred have not yet been fully entered into these databases and geospatial stand layer. This layer provides a specific update to Forest Plan age class objectives provided by Table 2.2-2. Table 2-16 displays the acres treated to move age class structure toward desired objectives from 2006 to 2013. Table 2-17 displays a comparison of existing age classes with Table 3.5-7 in the Forest Plan FEIS, with caveats regarding some missing harvest information.

Table 2-16. Treatment acres from 2006 to 2013 to move age class distribution toward Forest Plan objectives (Forest Plan, Table 2.2-2).

Management Treatment Method	Acres ¹
Create regenerating age classes	543
Thin to improve health and longevity	941
Uneven-age management	2,027
Total	3,511

Source: Forest Service data.

¹ 237,985 acres represent federal lands suitable for timber harvesting that have suitability data; 2,380 represents one percent of these lands.

Depending on the source used, there have been between 3,500 and 3,800 acres of harvesting on the GMNF from 2006 to 2013. To maintain the minimum 20 percent of suitable lands managed using uneven-age systems as required by the Forest Plan, on average 20 percent of the harvested acres should be harvested using uneven-age systems. Since 2006, approximately 53 to 58 percent of suitable NFS lands have been managed via uneven-age systems, well above the objective. Using uneven-age systems at twice the minimum requirement certainly increases structural diversity. In fact, the application of uneven-age silviculture has occurred over this timeframe on almost four times as many acres as creation of even-age patches of regenerating forest. Although there are larger amounts of acres managed under uneven-aged conditions, they do not provide the small to moderate-sized patches of even-age regenerating habitat valued by some wildlife species.

In the projections developed during plan revision (Forest Plan, Appendix D, Table D-5), a substantially larger amount of even-age regeneration harvesting was anticipated than uneven-age harvesting. Although

most of the estimated outputs related to harvest are unlikely to be met in the first decade, this proportional difference between even-age and uneven-age harvesting is decidedly different than anticipated. There are several potential reasons for this, ranging from silvicultural recommendations due to stand condition to reluctance to implement a substantial amount of regeneration harvesting. The uneven-age system is evolving as well, and there is increased emphasis on small group and patch selection methods. Patch selection does create a limited amount of regenerating habitat and so may help to mitigate that concern, although these patches won't replace the benefit some species derive or require from larger acreages of regenerating trees.

Active vegetation management has been occurring on the GMNF since 2006. However, as indicated in Table 2-17, forested lands are aging quickly. Across all forest types, the old age class has almost doubled in area, increasing from 18 percent to 30 percent of the forested land base. For each habitat type the old age class increased as well, and for most the mature age class decreased, indicating that the shift from mature to old is not being compensated by a shift from young to mature. The trends are similar for the forested land base as a whole and for just the suitable lands.

Table 2-17: Comparison of the 2013 age class distribution across NFS lands suitable for timber management with the conditions documented in the Forest Plan FEIS (FEIS, Table 3.5-7) and Forest Plan age class objectives (Forest Plan, Table 2.2-2).

Habitat Type	Age Class (years)		2013 existing Condition (all NFS lands) ¹		Existing Condition (suitable) ²		Existing Condition 2006 Plan ³		Forest Plan Objectives
	yrs	class	ac	%	ac	%	ac	%	%
Northern Hardwood	0-9	Regen.	0	0	0	0	1,192	<1	5-10
	10-59	Young	26,880	9	21,237	11	34,786	12	30-50
	60-119	Mature	197,703	67	137,193	73	217,755	76	35-50
	120+	Old	69,641	24	29,439	16	34,144	12	5-30
Mixedwood	0-9	Regen.	12	<1	12	<1	336	1	5-15
	10-39	Young	1,802	4	1,628	6	2,303	6	15-40
	40-99	Mature	21,140	50	14,520	53	24,389	63	35-55
	100+	Old	19,670	46	11,331	41	11,463	30	5-40
Softwood	0-9	Regen.	49	<1	49	1	83	<1	5-15
	10-39	Young	1,113	5	1,039	11	1,862	8	15-40
	40-99	Mature	11,971	51	5,385	57	14,864	60	35-55
	100+	Old	10,473	44	2,843	31	7,933	32	5-40
Aspen	0-9	Regen.	18	2	18	3	89	1	10-20
	10-39	Young	392	51	354	67	NA	NA	45-55
	40-59	Mature	35	5	15	3	NA	NA	25-35
	60+	Old	318	42	141	27	NA	NA	3-5
Birch	0-9	Regen.	0	0	0	0	0	0	5-15
	10-49	Young	377	3	260	13	1,120	10	45-55
	50-79	Mature	2,368	17	669	34	1,949	17	30-40
	80+	Old	11,000	80	1,060	53	8,218	72	3-5
Oak	0-9	Regen.	0	0	0	0	37	1	5-15
	10-59	Young	173	4	173	5	265	7	45-55
	60-99	Mature	1,603	35	1,353	41	1,453	41	30-40
	100+	Old	2,820	61	1,780	54	1,794	51	5-10

Habitat Type	Age Class (years)		2013 existing Condition (all NFS lands) ¹		Existing Condition (suitable) ²		Existing Condition 2006 Plan ³		Forest Plan Objectives
	yrs	class	ac	%	ac	%	ac	%	%
All Types		Regen.	79	<1	79	<1	1,737	<1	n/a
		Young	30,736	8	24,691	11	40,336	11	n/a
		Mature	234,821	62	159,134	69	260,410	71	n/a
		Old	113,922	30	46,594	20	63,552	18	n/a

¹ These acres do not include the 464 acres of regenerating age class harvested between 2007 and 2013 that have not been entered into Forest Service databases to date.

² Applies only to federal lands suitable for timber management

³ Documented in Table 3.5-7, p. 3-67 of the Forest Plan FEIS; aspen and birch are combined in this table; new regeneration harvests in this period focused on aspen; it is impossible to attribute acres in other age classes to each type so all are assigned to birch.

The regenerating age class across all types is well below Forest Plan objectives for suitable even-aged lands. While there are 464 acres of regenerating age class that aren't represented in Table 2-17, across all habitats these acres do not account for one percent of the land base, and so their additional contribution is unlikely to increase that age class to the minimum five percent objective for the more common habitat types.

These trends in age class distribution indicate the GMNF is moving apace toward older and more uneven-age structure on forested lands. This increase in structural diversity enhances forest diversity and conditions and will continue to increase into the foreseeable future. However, there are two areas of concern associated with the aging and succession of the forests predominantly through natural disturbance processes and through uneven-age management.

First, until large 5 to 20 acre or larger openings are created through natural processes as even-aged stands start to fall apart (which may not happen for another 50-100 years), regenerating forest habitat of that size will have very limited availability on the GMNF. Outside of the GMNF there are increasing concerns about forest fragmentation due to development, and indications that forest cover has been reduced in Vermont over the past few decades. With the forests that remain, among small landowners there has been less interest in regeneration harvesting than in uneven-age management or no management. Without the establishment of larger patches of early successional habitat over the next 50 or more years, a whole suite of early successional species strongly associated with this habitat may further decline.

Second, as the suitable land base ages along with the other forested NFS lands, eventually areas of windthrow damage will become a more common occurrence. For forests that haven't been thinned to sustain productivity and growth, many of these older even-aged stands will decline due to natural insect and disease processes, becoming increasingly vulnerable to being blown down by wind events that are anticipated to increase in frequency and intensity over the next 50 to 100 years. With 89 percent of the suitable land base in the mature and old age classes along with the existing rate of regeneration harvesting, it is possible that a substantial proportion of suitable forest land will be affected by a combination of insects, disease, and natural disturbances that will create large areas of dead trees. Allowing the suitable land base to reach this point reduces management options by essentially limiting management to wholesale regeneration and creation of a very large area of even-age forest similar to what exists now. Understanding these trends can help lead to the development of strategies to accelerate balancing of age classes and keeping forest management options open.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Based on age class diversity trends documented since 2006, the Forest Service should consider re-evaluating the current Forest Plan, Table 2.2-2, to determine if regenerating age class objectives should be

adjusted given the trends discussed. If forested areas are only entered every 20 years instead of 10 years, then the abundance of regenerating habitat created would need to be double what is identified in the table to keep proportions within the ranges identified for the other age classes. For instance, if only seven percent of the northern hardwood land base is regenerated every 20 years, then there is no way to meet the other age class objectives in the table for northern hardwoods – it is mathematically impossible.

Management considerations should also include treating every suitable and accessible acre in the mature age class during future integrated resource projects to enhance health and longevity. This could be accomplished through thinnings, improvement cuts, or other alternative approaches. By prolonging the health and longevity of these forested stands, the agency can prolong options available for management.

Finally, consider re-evaluating the objective of having a minimum of 20 percent of suitable lands managed using uneven-age systems. Currently this type of management represents around half of the management happening on the Forest. The forested landscape will have a different character depending on whether it is managed at 20 percent in uneven-age conditions or 50 percent in uneven-age conditions. If the objective is to remain at 20 percent, then additional efforts should be made to seek opportunities for even-age management applications, or other silvicultural systems that provide a wider range in the size of regenerating forest patches.

Monitoring Item Name: Aspen-Birch and Early Successional Habitat

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

Detailed Monitoring Question: How many acres are being treated with varying management actions to maintain and increase aspen-birch and regenerating forest?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objective that states management should increase acres of aspen-birch forest and regenerating forest in order to support species that prefer these habitats.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: Table 2-18 provides Forest Plan composition objectives (Forest Plan, Table 2.2-1, p. 11) representing long-term ecological tendencies of Forest landscapes. This provides a basis for development of management vegetation management activities in a way that supports the natural transition of forested ecosystems toward composition that is more suited to the natural tendencies of the sites within which they are found.

Table 2-18. Long-term composition objectives for all NFS lands (Forest Plan, Table 2.2-1).

Habitat Type	Current (% all NFS lands)	Objective (% all NFS lands)
Northern Hardwoods	76	30-40
Mixedwood	10	45-55
Softwoods	7	15-25
Aspen - Birch	3	1-5
Oak	1	1-5
Permanent Upland Openings	1-2	1-5
Wetlands	1-2	1-2

Source: 2006 Forest Plan, p. 11.

Most of the GMNF had been cleared at least once by the end of the 19th century, and the flatter portions of it were also farmed. In addition, most of the red spruce was preferentially harvested, and few mature trees were left to provide seed except in the steepest or more inaccessible sites. As a result, most of the forests on the GMNF regenerated to northern hardwoods or its variants, as noted in Table 2-18 where northern hardwoods account for 76 percent of the habitat present on the Forest. About half of this northern hardwood habitat falls on sites that are more suited for softwoods or conifers like red spruce and hemlock, for example sites that are cold, moist, with either poorer drainage or shallow soils.

Recently, scientists have seen a robust level of softwood regeneration for both red spruce and balsam fir in northern hardwood forests, forests of mixed northern hardwoods and spruce (“mixedwood”), and in high elevation paper birch forests, in Vermont and elsewhere. Several hypotheses have been proposed to explain this situation, as it is unexpected given the general climate warming that has been documented over the past twenty years and the impacts of acidic deposition. One thing is clear however: where these conifers are successfully regenerating are on ecological sites that are most suited for them. In other words, they occur on sites where they are at a competitive advantage over northern hardwoods.

While planning for vegetation management, sites are identified where the forest type dominating the site appears to be less ecologically suited to it than another type. The Forest Service uses mapped ecological landtypes (ELTs) to identify these inconsistencies; ELTs use site, soil, and vegetation information to predict the general natural communities expected to occupy a site over the long-term under natural processes. Where there are inconsistencies, the likelihood of success at converting one general habitat to another is determined and management strategies are identified to implement habitat shifts for those areas which may have a reasonable likelihood of success.

In addition to facilitating transitions from hardwoods to mixedwood and softwoods, considerations are made to maintain and enhance existing habitats that are short-lived or uncommon and have high value for a variety of wildlife and plant species. Such habitats include forests dominated by aspen, paper birch, and other early successional hardwoods, forests dominated by or mixed with oak, and upland openings. Without management intervention, it is likely that most of these habitats would become quite rare on the GMNF; the abundance of these habitats was documented in the Forest Plan FEIS to have declined over time (Forest Plan FEIS, pp. 3-62 to 3-64).

Various areas and watersheds are analyzed to determine if there are management needs. As part of this analysis, existing vegetation data is compiled and helps identify opportunities to shift the habitat composition of the area closer toward Forest Plan objectives, as applied to the ecological conditions of the analysis area represented by ELTs. These opportunities are then discussed with the public, analyzed further via an environmental assessment, and then decided upon. The documentation for these decisions includes a table that lists the current composition of the stands to be managed, and the management objectives for the stands. Those management objectives are further clarified and specified in a management prescription after the decision is made. These prescriptions describe in more detail the current stand composition, the desired stand composition, and the treatment or type of cutting that will take place to work toward that composition. Once the management prescription is implemented, the information about the stand and treatment is updated in various databases and reports.

Monitoring of the progress made toward desired composition objectives is conducted by gathering this information and running various reports. Unfortunately, the Forest Service has implemented several new databases since the Forest Plan revision was completed, and some of the management activities that have occurred since 2006 have not yet been entered into our geospatial stand layer. This layer provides the basis for updates to Forest Plan composition objectives (Table 2-18). The Forest Service can report on the acres treated to move composition toward desired objectives which is what is presented in this report. The GMNF is currently consists of approximately 408,000 acres, so a one percent shift in composition from one type to another would require about 4,080 acres of treatment. Table 2-19 provides a summary of management treatment acres by habitat objective from 2006 to 2013 that have contributed toward moving habitat composition toward Forest Plan composition objectives.

Table 2-19. Acres treated from 2006 to 2013 to move habitat composition toward Forest Plan objectives (Forest Plan, Table 2.2-1).

Habitat Objective	Acres
Maintain & enhance mixedwood and softwood habitats	1,781
Convert hardwoods to mixedwood	234
Convert hardwoods or mixedwood to softwood	89
Maintain and create aspen-paper birch habitat	308
Maintain and create early successional habitat ¹	5,528
Enhance and restore oak habitat	221
Maintain and enhance upland opening habitat ²	4,596
Create new upland opening habitat	126
Convert non-native softwood plantations to native habitats	173

Source: Forest Service data.

¹ Includes even-age regeneration treatments of all types and opening creation and maintenance.

² Includes repeated treatments on the same acres.

There are no clear trends from year to year. Changes in acres of habitat management between years are related more to what specific timber sales and opening maintenance projects are planned in a particular year or to weather. Maintenance and enhancement of upland openings represent the greatest amount of treatment and represent most of the treatments to maintain and create early successional habitat (all but 932 acres). However, these acres also represent repeated maintenance of a set of around 295 openings that collectively represent approximately 2,759 acres. Not all openings are treated annually; some are treated by mowing or burning every two to three years, while others may only be treated once every five to ten years.

Considering that existing and new openings do not represent one percent of the GMNF land base, currently none of these activities presented in Table 2-19 are making enough of a change in overall Forest composition to be detectable at the Forest scale. These treatments, while small, do contribute toward composition objectives and show steady, consistent progress. Timber sales and non-commercial activities continue to provide opportunities to facilitate shifts in habitat composition toward desired objectives and will ultimately only supplement natural shifts that will occur over time for habitats like northern hardwood, mixedwood, and softwood. For oak and aspen, the level of activity to promote these habitats is not keeping pace with the aging and decline of stands of these species. Most aspen stands are now either mature or over-mature, and once they start to decline, they quickly die and are replaced by species expected to live two-three times as long. Aspen is the most likely habitat to fall below the one percent lower threshold in the Forest Plan composition objectives over the next 50 years at the current level of treatment.

Oak stands are also aging, and the trees species growing below the large old oaks tend to be northern hardwood species, particularly red maple and beech. While oak trees are long-lived and these stands will still be considered oak and oak-hardwood stands in 50 years, as the understory ages it will become almost impossible to restore oak to these stands. Understories of red maple and beech make the habitat more moist and humid, which creates a competitive advantage for northern hardwood species. While it will take longer, at the rate of current management it is likely that eventually many of the Forest's existing oak stands will be replaced by northern hardwoods, and its proportion of the GMNF will fall below one percent. A warmer climate has the potential to be advantageous to oak, but only if on balance the climate is also drier or includes significant drought periods that kill or stress northern hardwoods in the understory. If the climate is moister on balance, then other hardwood habitat types like maples and beech will likely replace these forests.

Given current and expected future levels of staffing and funding, the Forest Service expects permanent upland openings will be maintained at or below the one percent level. It costs a great deal of money to restore openings that have been unmaintained for more than 10 years and it is costly in general to

maintain openings mechanically (such as mowing). While burning openings can be cost-effective, there are only around 14 days suitable for burning before the woods and fields “green up” and make it difficult for a fire to burn. It will continue to be a challenge to cost-effectively maintain permanent upland openings at a level that exceeds the low end of the desired composition range.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

The Forest Service should continue to work toward the existing habitat composition objectives identified in the Forest Plan in Table 2.2-1. Progress, however slow, will ensure that the presence of each of these habitats in the landscape is maintained. Additionally, a strategic plan should be developed for maintaining the presence of oak, aspen, and upland opening habitat at levels and in a manner that is effective given expected staffing and funding.

Table 2.2-1 was developed prior to the development of climate change viability analyses and adaptation strategies for New England and Vermont. In the context of climate change and habitat connectivity concerns, there is now some debate about the wisdom of composition objectives that seek to increase the abundance of red spruce and permanent openings. Over the next few years, staff should consider the best available science on these issues and identify if any changes are needed to Table 2.2-1.

Monitoring Item Name: Conversion of Hardwoods to Mixedwood and Softwoods

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

Detailed Monitoring Question: How many acres are being treated with varying management actions that will likely result in an increase in mixedwood and softwood forests on ecologically suitable sites?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objective that states management should support, and where desirable enhance, the natural conversion of northern hardwood forests to mixedwood and softwood forests on sites that ecologically support a higher proportion of softwoods.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Aspen-Birch and Early Successional Habitat monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018. Also, see response to the Aspen-Birch and Early Successional Habitat monitoring item.

Monitoring Item Name: Forest-wide Habitat Composition (landscape scale)

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

Detailed Monitoring Question: To what extent are management actions and natural processes moving Forest composition toward desired objectives in table 2.2-1 of the revised Plan?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objective that states management should address composition objectives found in the Forest Plan Table 2.2-1 which represent long-term ecological tendencies of Forest landscapes, with adjustments to manage aspen-birch, oak, and permanent upland opening habitats at, or slightly higher than, current levels.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Aspen-Birch and Early Successional Habitat monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018. Also, see response to the Aspen-Birch and Early Successional Habitat monitoring item.

Monitoring Item Name: Late-Successional Forest

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

Detailed Monitoring Question: How many acres are there within the old forest age class, and how many acres are developing late successional forest characteristics?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objective that states management should increase acres of late-successional and old forest habitats through natural successional processes within lands not suitable for timber management, and through use of extended rotations within lands suitable for timber management.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Age Class Distribution monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018. Also, see response to the Age Class Distribution monitoring item.

Monitoring Item Name: Oak and Oak-Pine Forest Maintenance and Restoration

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

Detailed Monitoring Question: How many acres are being treated with varying management actions that will likely result in the maintenance and restoration of oak and oak-pine forests, and oak within oak-northern hardwood forests?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objective that states management should increase acres of oak-dominated and oak-pine forest habitat on sites that ecologically support these habitats. Maintain, and where ecologically feasible increase, the oak component in oak-northern hardwood forests.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions See response to the Aspen-Birch and Early Successional Habitat monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018. Also, see response to the Aspen-Birch and Early Successional Habitat monitoring item.

Monitoring Item Name: Oak Regeneration

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

Detailed Monitoring Question: How many acres were treated to encourage oak regeneration?

Monitoring Driver: Forest Plan Goals 2 and 6 and associated Objectives. Specifically, the objective that states management should maintain oak-pine natural community presence and continuity using natural as well as human-caused disturbance processes including fire use when necessary.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Aspen-Birch and Early Successional Habitat monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018. Also, see response to the Aspen-Birch and Early Successional Habitat monitoring item.

Monitoring Item Name: Outputs Accomplished - Volume and Acres of Timber Offered and Sold

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

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

Monitoring Driver: Forest Plan Goal 8 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. This question has been included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

Evaluation and Conclusions: The Forest Plan, Appendix D, Table D-2 provides the average annual allowable sale quantity (ASQ) by decade (Table 2-20). The average ASQ is the maximum volume that may be offered and sold during a decade of Forest Plan implementation from land identified for timber management. During the first decade (2006 to 2015) 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.

Table 2-20: Forest Plan, Table D-2: Maximum annual average allowable sale quantity for sawtimber and pulpwood combined.

Decade	Annual Allowable Sale Quantity (million board feet)	Decadal Allowable Sale Quantity (million board feet)
1 (2006 to 2015)	19.7	197
2 (2016 to 2025)	19.7	197

Table 2-21 provides actual timber volume sold annually during the period from fiscal years 2006 to 2013. The amount of timber sold each year remains well below the levels stated in the Forest Plan due mainly to staff and funding limitations. Total volume sold from 2006 to 2013 is only 24 percent of the allowable sale quantity of 157.6 million board feet (MMBF) for this period (assuming 19.7 MMBF per year). 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.

Table 2-21: Actual annual timber volume sold from fiscal years 2006 to 2015.

Fiscal Year	Timber Volume Sold (million board feet)
2006	4.87
2007	4.54
2008	3.65
2009	4.75
2010	5.01
2011	5.00
2012	4.89
2013	5.09
Total	37.8

The Forest Plan, Appendix D, Table D-4 lists the estimated acreage of silvicultural practices that would be used to work toward the vegetative and other multiple-use desired conditions and objectives of the Forest Plan. Table 2-22 shows the actual acres harvested by treatment type from 2006 to 2013 compared to the estimated acreage for the first decade of Forest Plan implementation (2006 to 2015).

Table 2-22: Actual acres of harvest by treatment type from 2006 to 2013 compared to the estimated acreage for implementation for 2006 to 2015.

Estimates of Management Practices	Acres in Decade 1 Acres ¹	Acres Harvested Fiscal Years 2006 to 2013	Percent of Total Estimated Acres
Even-aged Regeneration Harvest	17,500	781 ²	4.5
Even-aged Intermediate Harvest	13,240	941	7.1
Uneven-aged Harvest	9,810	2,027	21.0
Total Harvest	40,550	3,749	9.2

¹ Forest Plan, Appendix D, Table D-4.

² Includes clearcut, shelterwood and shelterwood removal harvest methods.

Actual acres harvested for the first eight years of Forest Plan implementation are well below acres estimated for all treatment types during the first decade. Unless harvest acres are substantially increased in the next few years, the vegetative and other multiple-use desired conditions and objectives envisioned by the Forest Plan will be substantially underachieved. See also response to the Age Class Distribution monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Permanent Upland Openings

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

Detailed Monitoring Question: How many acres are being treated with varying management actions to maintain and increase upland opening habitats?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objective that states management should maintain, and where desirable increase, the acres of upland open habitats at slightly higher than ecological tendencies to support species that prefer these habitats.

Monitoring Frequency: Annually.

Evaluation Frequency: Annually. Included in the fiscal years 2006 annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Aspen-Birch and Early Successional Habitat monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014. Also, see response to the Aspen-Birch and Early Successional Habitat monitoring item.

Monitoring Item Name: Rare or Outstanding Natural Areas

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

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

Monitoring Driver: Forest Plan Goal 7 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports. This question was combined with the Ecological Type Mapping and Representation monitoring item in the reports.

Evaluation and Conclusions: See response to the Ecological Type Mapping and Representation monitoring item.

Recommendations: No change to the monitoring question but consider combining it with the Ecological Type Mapping and Representation monitoring question and changing the monitoring and reporting frequency to 5 years. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014. Also, see response to the Ecological Type Mapping and Representation monitoring item.

Monitoring Item Name: Regeneration Harvest Opening Size

Monitoring Question: Are maximum size limits for harvest areas appropriate, and should these limits be retained?

Detailed Monitoring Question: Is the maximum opening size for even-aged harvesting being met and are we accomplishing resource objectives? Are we meeting wildlife habitat regeneration objectives in both size and quantity of openings by habitat types?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives, Chapter 2 Forest-wide Management Direction, Section 2.3.5 Openings Standard S-1, various Management Area Openings Standards with more limitations, and National Forest Management Act temporary opening size limitation requirements.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Included in the fiscal years 2007 to 2011 annual monitoring and evaluation reports.

Evaluation and Conclusions: The 2006 Forest Plan Forest-wide management direction states that temporary openings created through even-aged regeneration harvests should not exceed 30 acres within the Diverse Forest Use, Green Mountain Escarpment, and Moosalamoo Recreation and Education Management Areas (MAs), 20 acres within the Diverse Backcountry and Remote Wildlife MAs, and five acres within the Robert T. Stafford White Rocks National Recreation Area. Exceptions may include salvage of timber resulting from natural catastrophes caused by fire, insects, disease, ice or windstorm. Permanent upland openings may exceed 30 acres if it addresses site specific needs such as beaver flowages.

Forest Service staff tracks and monitors the size of even-aged regeneration harvest units (clearcuts, shelterwoods or variants) produced by timber sale implementation. This is accomplished through timber contract review by interdisciplinary teams prior to advertisement of timber sales. These reviews are documented in the Change Analysis documents signed by the responsible official and filed in sale folders at the Ranger District level. Additionally, site specific project monitoring field reviews have been conducted on a sample of timber sales across the Forest to assess consistency with the Forest Plan (see response to the “Standards and Guidelines - Implementation and Effectiveness Monitoring” monitoring item).

The maximum size limits for temporary openings created by even-aged regeneration harvest have not been exceeded for sales offered or cut between fiscal years 2006 and 2013. Forest Service interdisciplinary teams have been working to design openings that approach size limits to address habitat needs for bird and other wildlife species that benefit from larger openings and to meet Forest Plan desired future conditions regarding habitat (forest type, age class and structure). Implementation of these openings can be challenging due to public concern over creating temporary forest openings through timber harvest. In many cases, stand acres proposed for this type of harvest must be reduced to follow Forest Plan Forest-wide and Management Area Standards and Guidelines designed to protect and maintain other resource conditions such as deer wintering habitat, visual quality, and water quality.

Projects implemented since 2006 have included increasingly large proportions of even-aged regeneration harvest. The Upper White River Integrated Resource Project (IRP) approved in 2010, includes larger proposed temporary opening sizes than have been implemented in other recent projects. The Dorset-Peru IRP approved in 2013 also includes many planned temporary and permanent openings at or near the maximum size allowed in the Forest Plan, relative to previous projects.

The most significant challenge to implementing the quantity and size of openings needed to meet desired future conditions is the overall level of timber harvest on the Forest. The amount of timber sold and harvested each year remains well below the Allowable Sale Quantity (ASQ) levels stated in the Forest

Plan (see response to the Outputs Accomplished - Volume and Acres of Timber Offered and Sold monitoring item). This smaller application amounts of silviculture results in reduced creation of openings and desired habitat conditions than would result from levels of harvest closer to the ASQ.

Forest Service staff will continue to incorporate temporary openings through even-aged management to the extent possible in vegetation management proposals and look for opportunities to create openings approaching maximum size limits where appropriate. Increased levels of timber harvest would create additional opportunities to meet habitat and forest structure objectives associated with openings.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2016.

Monitoring Item Name: Shelterwood with Reserves

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

Detailed Monitoring Question: Can the shelterwood w/reserves method be used to: 1) maintain the big tree character in visually sensitive areas or to convert low quality stands to uneven-aged structure, 2) the ability to leave good quality, wind-firm trees of sufficient number, size, and distribution to maintain a pleasing overstory, and 3) the ability to retain the overstory until the regenerated stand is commercially thinned in 40-60 years?

Monitoring Driver: Forest Plan Goal 9 and associated Objective. Specifically, the objective that states management should develop demonstration forestry project areas and areas where state-of-the-art silvicultural practices are applied.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. Not yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: The Forest Plan includes direction to demonstrate innovative, scientifically, and ecologically sound management practices that can be applied to other lands (Forest Plan, Goal 9). Shelterwood with reserves is a silvicultural technique that has been developed relatively recently and has not been widely applied in the northeast. The technique has the potential to provide flexibility in meeting silvicultural objectives by regenerating stands while maintaining some overstory to address other concerns. In implementing this prescription in a number stands and collecting long-term data, the Forest has the potential to develop demonstration forestry project areas and areas where state-of-the-art silvicultural practices are applied. The Campground Plot (Rochester Ranger District) and the French Hollow Plot (Manchester Ranger District) were established in 1990. The plots have been re-measured every 5 years and provide long-term data sets.

The purpose for these demonstration sites is to better understand survival and growth of overstory trees, epicormic branching response to overstory trees, regeneration response to the shelterwood with reserves harvest method overtime. Approximately 30 overstory trees have been tagged and have been measured for survival, diameter breast height growth, tree grade, epicormic branching and damage. Trees have been identified with a driven wire and aluminum numbered tag placed below stump height. Approximately 10 regeneration stocking plots have been marked with plastic stakes. 1/700-acre plots have been used to sample seedlings, and 1/100-acre plots have been used to sample saplings.

Plot data resulting from 2011 field checks show loss of larger yellow birch and beech seed trees after the cut. This could be attributed to drier post-harvest conditions; birch leaf fungus and birch leaf miner affecting older yellow birch more; advanced beech bark disease and old age of beech trees afflicting the beech more. These observations are consistent with current research which shows that larger, older overstory trees retained in shelterwood harvests are likely to deteriorate in vigor and value over time. All

marking guides implementing the shelterwood w/reserves prescription now specify leaving younger; mostly wind firm trees 12 to 16 inches in diameter at breast height with healthy appearing crowns for reserved seed trees.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Stocking Level

Monitoring Question: Are harvested lands adequately re-stocked according to Forest Plan goals?

Detailed Monitoring Question: Are lands adequately re-stocked according to stocking surveys?

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

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

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

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. 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. Review of evaluation surveys completed in fiscal years 2006 to 2013 indicates that reforestation efforts continue to be sufficient to meet stocking certification for all units within the required timeframes.

Forest timber staff will continue to conduct first, third, and if necessary fifth year plantation survival evaluations to determine reforestation survival and growth, especially of planted stock, and whether restocking to desired levels following regeneration harvest treatments has been achieved.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Suited Timber Lands

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

Detailed Monitoring Question: Are lands termed unsuitable for timber production adequately described and mapped?

Monitoring Driver: The National Forest Management Act requires identification of lands suitable for timber production where commercial harvesting is allowed. The Forest Plan provides direction for harvest of timber on these lands in Chapter 2 Forest-wide Management Direction, Section 2.3.4 Timber or Vegetation Management Standards and Guidelines.

Monitoring Frequency: Every 10 years.

Evaluation Frequency: Every 10 years. Included in the fiscal years 2007, 2008, 2009, and 2011 annual monitoring and evaluation reports.

Evaluation and Conclusions: The National Forest Management Act (NFMA) requires classification of National Forest System lands as not suited and suited for timber production during the development of Forest Plans. Suitable forest land constitutes the land base for determining the Allowable Sale Quantity (ASQ) where management for timber production occurs on a regulated basis. Land is considered tentatively suitable forest land when it has the capability of producing 20 cubic feet of commercial wood per acre per year. The process for determining forest land suitability for the GMNF Forest Plan is described in the 1982 version of the planning regulations (36 CFR 219.14) and is included in the Forest Plan FEIS (pp. 3-280). Approximately 189,616 acres were classified as suitable for timber production as part of the revision process culminating in the 2006 Forest Plan (Forest Plan FEIS, p. 3-287, Table 3.13.-6). The management areas that are appropriate for timber production include: Diverse Forest Use, Diverse Backcountry, Remote Wildlife Habitat, Moosalamoo Recreation and Education Area, and the Green Mountain Escarpment. These management areas also contain some lands that are not appropriate for Timber production such as inclusions of steep slopes, wet soils, and riparian areas.

The extent of timber harvesting on suitable lands from 2006 to 2013 is provided in response to the Outputs Accomplished - Volume and Acres of Timber Offered and Sold monitoring item since harvesting toward the ASQ is by definition based on harvest amounts from suitable lands. Forest timber staff refine and map unsuitable lands during timber sale planning from project specific inventory. Application of Forest Plan Standards and Guidelines for buffering and protecting resources such as wetlands, steep slopes, and shallow soil result in identification of unsuitable lands for each project. Changed condition reports regarding this have been prepared for each sale as needed where there are minor changes due to suitability or areas to exclude from harvest.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2023.

Monitoring Item Name: Sustainability of Special Forest Product Gathering

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

Detailed Monitoring 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 requirements?

Monitoring Driver: Forest Plan Goal 8 and associated Objectives. Specifically, the objective that states management should provide sustainable opportunities to harvest special forest products.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2013 annual monitoring and evaluation reports.

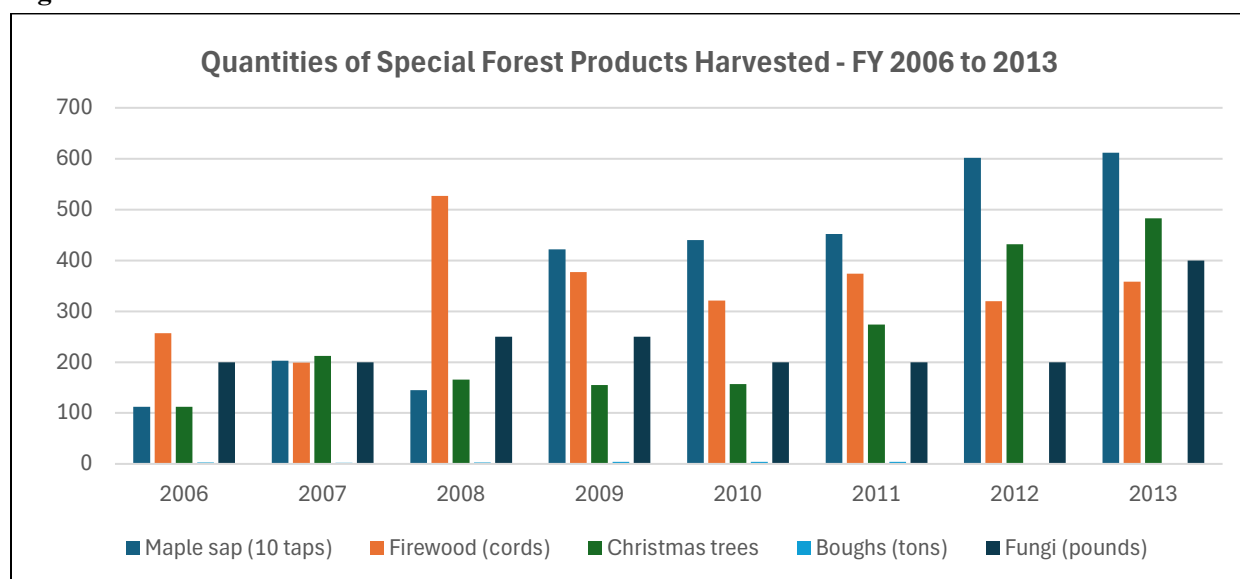
Evaluation and Conclusions: The public gathering of Special Forest Products (SPDs) is allowed by permit on NFS lands for the following items: maple sap, firewood, Christmas trees, boughs, seedlings, saplings, fungi (mushrooms), and miscellaneous items such as dead/down wood and sawtimber/pulp. Although permits are not tracked by permit quantity, the total amount of product permitted are reported

annually. Table 2-23 and Figure 4 display the annual quantity of each SFP gathered by permit on the GMNF from fiscal years 2006 to 2013.

Table 2-23: Quantity of Special Forest Projects permitted from fiscal years 2006 to 2013.

Product	2006	2007	2008	2009	2010	2011	2012	2013
Maple sap (taps)	1,120	2,031	1,450	4,220	4,410	4,527	6,027	6,120
Firewood (cords)	257	199	527	377	321	374	320	358
Christmas trees	112	212	166	155	157	274	432	483
Boughs (tons)	3	2	3	4	4	4	1	0
Seedlings	0	0	0	0	0	0	0	0
Saplings	0	0	0	0	0	0	0	0
Fungi (pounds)	200	200	250	250	200	200	200	400
Miscellaneous	0	0	0	0	0	0	0	0

Figure 4



Maple Sap

Maple sap is sold by the tap. The annual average of taps permitted from 2006 to 2013 is approximately 3,738 taps. 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 in 2012 which accounts for the increase in taps through 2013. Tap levels are expected to 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. 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.

Firewood:

The average annual amount of fire permitted from 2006 to 2013 is approximately 241 cords with a spike noted in 2008. While it was likely that firewood permitted in 2008 was related to the economic recession at that time, it appears firewood permitted has remained level through 2013. The consistent demand for permitted firewood is attributed to the increase in efficient woodstoves, the increased emphasis on local sources of energy, and a ready and inexpensive supply of available firewood from NFS lands.

Christmas Trees:

The average annual amount of Christmas trees permitted from 2006 to 2013 is approximately 249 trees. The requests for permits have risen substantially since 2010 with the highest amount reported in 2013 at 483 trees. This increase can be partly attributed to more robust advertising and the tradition of cutting a live tree in a natural setting versus at a farm or purchase at a commercial lot. It is anticipated that any additional levels of harvest will be sustainable because in terms of absolute numbers it is a fraction of total small softwood trees available and will not make a detectable difference in forest composition across the GMNF.

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 annual amount since 2006. Given the limits placed on quantities, it is anticipated commercial and non-commercial mushroom gathering at the maximum levels to be sustainable in the future. The Forest Service continues to allow other types of historical gathering which have occurred within the GMNF over the last 25 years and is open to gathering of other similar products. 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 is not permitted for 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 received are infrequent with perhaps one or two per year on average.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Trends in Vegetative Community Composition (site-level scale)

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

Detailed Monitoring Question: How the vegetation composition is changing over time from the influence of acid deposition, climate change, invasive species and other environmental problems, in combination and separate from land management practices?

Monitoring Driver: Forest Plan Goal 6 and associated Objectives.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. No yet included in any fiscal year annual monitoring and evaluation report.

Evaluation and Conclusions: Although formal monitoring of resources associated with this question has not been completed to allow a meaningful evaluation in this report, some conclusions are addressed in response to the Long-Term Soil Quality and Soil Productivity monitoring item. It is anticipated that natural ecological functions will not be able to maintain the present vegetation composition as resources are affected by changing climate conditions. Expected increases in invasive plants, insects and pathogens, dramatic swings in precipitation including droughts and floods, warmer winters, longer growing seasons, and other environmental factors will affect normal ecosystem functions across the landscape. Continued monitoring of forest health and associated resources will be necessary to characterize and quantify changes in the vegetation that may affect management activity efficacy to adequately meet current Forest Plan objectives.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018.

Monitoring Item Name: Uneven-aged Management

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

Detailed Monitoring Question: How many acres of land suitable for timber management were treated using uneven-aged silvicultural systems to create multi-age conditions, and what proportion of the annual harvest acres do these acres represent? What proportion of the lands suitable for timber management has an uneven-aged prescription?

Monitoring Driver: Forest Plan Goal 2 and associated Objectives. Specifically, the objective that states a minimum of 20 percent of lands suitable for timber management should be managed using uneven-age silvicultural systems to create multi-age conditions.

Monitoring Frequency: Every 5 years.

Reporting Frequency: Every 5 years. No yet included in any fiscal year annual monitoring and evaluation report.

See response to the Age Class Distribution monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2018. Also, see response to the Age Class Distribution monitoring item.

Water

Monitoring Item Name: Forest-wide Water Quality Monitoring

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

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

Monitoring Driver: Forest Plan Goal 4 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2010 annual monitoring and evaluation reports.

Evaluation and Conclusions: Water quality is a critical component of aquatic, riparian, fisheries, and wetland resources, and macroinvertebrate populations are an important indicator of water quality. See response to the Fish Habitat and Stream Channel Stability and Water Temperature in Streams monitoring items.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Wild and Scenic Rivers

Monitoring Item Name: Wild and Scenic Rivers

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

Detailed Monitoring Question: Are agency activities on eligible National Wild and Scenic Rivers consistent with the Outstandingly Remarkable Values for which the river segment was determined eligible?

Monitoring Driver: Forest Plan Eligible Wild, Scenic, and Recreational Rivers Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Every 5 years. Included in fiscal years 2006 to 2010 annual monitoring and evaluation reports.

Evaluation and Conclusions: The 1968 Wild and Scenic Rivers Act as amended established the National Wild and Scenic Rivers System, stating, *“It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in a free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.”* There are no federally designated wild, scenic, or recreation rivers on the GMNF. Rivers and streams on the GMNF were inventoried and evaluated to determine their eligibility as Wild, Scenic or Recreation Rivers during Forest Plan revision (Forest Plan FEIS, pp. 3-268 to 3-274, and Appendix D). The Forest Plan identifies seventeen eligible Recreation River segments, eight eligible Scenic segments, and three eligible Wild segments on the GMNF. The Forest Service may only recommend a river as eligible and suitable for national status. Designation of a river occurs only through an act of Congress.

Although there is not any standard annual monitoring protocol implemented for these river segments, all proposed projects and activities must be evaluated using management direction provided by Forest Service Handbook (FSH 1909.12, Chapter 82.5 - Interim Management of Eligible or Suitable Rivers). Projects may be authorized within eligible river corridors when: 1) the free-flowing character of the identified river is not modified by the construction or development of stream impoundments, diversions, or other resource projects and 2) outstandingly remarkable values of the identified river are protected. All environmental analyses for proposed projects within or adjacent to eligible river segments included these criteria as part of the NEPA documentation process from 2006 to 2013 to ensure their protection.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2015.

Wilderness

Monitoring Item Name: Wilderness Areas Managed to Standard

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

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

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. This question has been included in fiscal years 2007 to 2010 annual monitoring and evaluation reports, and 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: There are eight existing Wilderness areas on the GMNF: Bristol Cliffs, Breadloaf, Joseph Battell, Big Branch, Peru Peak, Lye Brook, Glastenbury, and George D. Aiken totaling 101,039 acres. Management emphasizes the maintenance of wilderness values consistent with the Wilderness Act of 1964 and subsequent legislation. In order to maintain these values, wilderness areas prohibit the use of motorized and mechanized vehicles and equipment, installation of new structures, and road development except where provided by law.

In 2004, the Chief of the Forest Service created the 10 Year Wilderness Stewardship Challenge that identified ten key elements that help define successful wilderness stewardship. The key elements include the following items: fire use, non-native invasive species treatment, air quality related values, education plan implementation, opportunities for solitude or primitive and unconfined recreation, completed recreation site inventory, existing outfitter/guide operating plans, adequate forest plan direction to prevent degradation of resource, database administration and upward reporting, and baseline workforce in place. The number of wilderness areas managed to standard has fluctuated since 2006. It steadily increased from 2007 to 2010 then dropped drastically in 2011. All GMNF wilderness areas reached the national standard by 2013.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Natural (human threats)

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

Detailed Monitoring Question: What are the trends of human threats to natural conditions?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2010 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Wilderness Areas Managed to Standard monitoring item. Forest Service wilderness staff have 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 (see response to the Air Particulate monitoring item).

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Natural (biophysical conditions)

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

Detailed Monitoring Question: What are the trends of selected biophysical conditions and processes sensitive to human threats?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. This question has been included in fiscal years 2007 to 2010 annual monitoring and evaluation reports, and 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: Forest Service wilderness staff worked with the Forest Service Region 9 air specialist to determine Air Quality Related Values (AQRV) for Lye Brook wilderness area. The air quality has improved since 2006 (see response to the Air Particulate monitoring item). The Forest Service and the Vermont Department Environmental Protection, Watershed Management Division also 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 times (spring, summer, and fall) in five wilderness areas (George D. Aiken, Big Branch, Joseph Battell, Bristol Cliffs, and Breadloaf).

Other wilderness area monitoring included fish surveys, sensitive plant species surveys, and non-native plant surveys and infestation control. There has been no extirpation of native ecosystems, plant communities, and plant and animal species in wilderness areas.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Primitive Recreation

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

Detailed Monitoring Question: What are the status and trends of outstanding opportunities for primitive recreation?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2010 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: 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*”. Forest Service wilderness staff maintained eleven trail register boxes at various trail portals to GMNF designated wilderness areas. This increased to fifteen trail register boxes starting in 2008. Information recorded on these sheets includes date, party number, destination, length of stay, and address of visitor.

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. Considering 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: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Solitude

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

Detailed Monitoring Question: What are the status and trends of outstanding opportunities for solitude?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. This question has been included in fiscal years 2007 to 2010 annual monitoring and evaluation reports, and 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Wilderness Character - Primitive Recreation monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Unconfined Recreation

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

Detailed Monitoring Question: What are the status and trends of outstanding opportunities for unconfined recreation?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2010 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: See response to the Wilderness Character - Primitive Recreation monitoring item.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Undeveloped (inholdings)

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

Detailed Monitoring Question: What are the status and trends of inholdings?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. This question has been included in fiscal years 2006 to 2010 annual monitoring and evaluation reports, and 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: As of 2013, there are eleven private land parcels affecting existing GMNF wilderness areas. These parcels are monitored 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 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 private parcels potentially affecting wilderness character is an important aspect of the core wilderness management program. Wilderness boundaries were confirmed in fiscal year 2010 for systematically monitoring each wilderness boundary once every 8 years. Monitoring activities included checking property boundaries for potential encroachment onto National Forest System lands and access needs. No adverse effects to wilderness characteristics were identified.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Undeveloped (motorized and mechanical transport)

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

Detailed Monitoring Question: What are the status and trends of the use of motorized equipment and mechanical transport?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. This question has been included in fiscal years 2006 to 2010 annual monitoring and evaluation reports, and 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: 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.

The Forest Service in coordination with the Vermont Department of Fish and Wildlife stock native brook trout annually using a rotor-winged aircraft (helicopter) in Bourn Pond (Lye Brook wilderness area) and Big Mud Pond (Peru Peak wilderness area) since 2006. 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. Monitoring showed no signs of motorized vehicles outside of the permitted road. Motorized equipment was used just inside the wilderness boundary in 2008 to re-channel a stream away from a private residence because of flood waters. It was determined that motorized equipment was necessary due to the urgency of the situation in relation to human health and safety, and property investments. There have been no adverse effects to wilderness characteristics reported associated from all instances of motorized use within wilderness boundaries.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Undeveloped (permanent improvements)

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

Detailed Monitoring Question: What are the trends of physical evidence of modern human occupation or modification?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Evaluation Frequency: Annually. Included in fiscal years 2006 to 2010 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: 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 (punchon, waterbars, drain dips, stone steps, corduroy, and bridges) and trail shelters/tent platforms and associated privies. The Green Mountain Club 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.

Some occurrences of illegal tree cutting probably associated with backcountry skiing has been reported 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 also continue to observe tree cutting at Bourn Pond in the Lye Brook wilderness area.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Character - Untrammelled

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

Detailed Monitoring Question: What are the trends of actions that control or manipulate the community of life in wilderness?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2010 annual monitoring and evaluation reports, and fiscal years 2012 and 2013 combined annual monitoring and evaluation report.

Evaluation and Conclusions: See responses to the Wilderness Areas Managed to Standard, and Wilderness Character - Primitive Recreation monitoring items.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Field Presence

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

Detailed Monitoring Question: To what extent has staff been in the field monitoring wilderness boundaries and providing public education and outreach?

Monitoring Driver: Forest Plan Goal 13 and associated Objectives.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2011 annual monitoring and evaluation reports.

Evaluation and Conclusions: On-the-ground monitoring of wilderness has consistently fallen short to meet desired minimum standards for wilderness staffing levels. Forest Service staffing presence within wilderness areas has fluctuated since 2006 proportionate with funding capabilities. As much time as possible is spent providing public education/outreach and boundary monitoring along with their other duties including trail maintenance, non-native invasive species surveys and treatment, and campsite monitoring. Leave No Trace (LNT) and other wilderness education programs are very effective in providing information to the public to achieve a basic understanding of wilderness stewardship.

Recommendations: No change to the monitoring question. The next fiscal year annual monitoring and evaluation report to include this question is anticipated in 2014.

Monitoring Item Name: Wilderness Study Areas

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

Detailed Monitoring Question: Are Wilderness Study Areas being managed to maintain roadless characteristics pending legislation as to their designation?

Monitoring Driver: Forest Plan Wilderness Study Area Management Area direction.

Monitoring Frequency: Annually.

Reporting Frequency: Annually. Included in fiscal years 2006 to 2011 annual monitoring and evaluation reports.

Evaluation and Conclusions: A total of 27,473 acres (7 percent) of National Forest System Lands were allocated to the Wilderness Study Area Management Area (MA) when the Forest Plan was completed in 2006. These acres were recommended to be designated wilderness as part of the Forest Plan revision process. The purpose of this management area was to manage these areas to protect wilderness characteristics pending legislation as to their designation and provide for existing uses where compatible with protecting wilderness character.

President Bush signed into law the New England Wilderness Act (NEWA) in December 2006 which included the designation of 41,652 acres of additional wilderness on the GMNF. Approximately 26,516 acres of the additional wilderness were part of the Wilderness Study MA. A Forest Plan amendment (Forest Plan Amendment #1 - Reallocation of Wilderness Study Areas, Remote Backcountry Forest, and Candidate Research Natural Areas Management Area Remnants resulting from the New England Wilderness Act) was completed in 2011. The amendment allocated the remaining 957 acres of the Wilderness Study MA to other management areas in the Forest Plan (Table 2-24).

Table 2-24. Wilderness Study Area Management Area acres allocated to other management areas.

Management Area	Acres
Diverse Forest Use	809.8
Diverse Backcountry	114.1
Remote Wildlife Habitat	32.8
Total	956.7

Recommendations: Discontinue this monitoring question since the Wilderness Study Area Management Area is no longer part of the Forest Plan.