

Green Mountain National Forest 2017 Monitoring Implementation Guide

Required Monitoring Element #	Monitoring Category	Monitoring Item Name: Evaluation Question	Detailed Monitoring Question	Monitoring Driver	Monitoring Frequency	Monitoring Reporting	Indicator	Measure	Rationale to Retain	Comments
1	Water	Forest-wide Water Quality Monitoring: To what extent are environmental stressors and Forest management affecting water quality and the physical features of aquatic, fisheries, riparian, vernal pool, and wetland habitats?	What is the existing status of watershed biological, chemical, and physical integrity on the Forest, and how are our management activities affecting them?	Forest Plan Goal 4 and associated Objectives.	Annually	Annually	Water quality, biological and physical attributes.	1) Water quality: dissolved oxygen, pH, nitrite, nitrate, total nitrogen, phosphate, temperature, E. coli, turbidity, conductivity, and total dissolved solids. 2) Biological: macroinvertebrate community biometrics, macroinvertebrate percent community composition by major orders, and macroinvertebrate community functional group composition. 3) Physical: stream bankfull channel dimensions (width and depth), substrate composition, substrate embeddedness, canopy cover, streambank condition, immediate upstream use, stream color condition, and wetland hydrology.	This monitoring provides meaningful information, is efficient to conduct, and within budget constraints. State conducts macroinvertebrate monitoring on some forest streams each year and has some of their "Sentinal Sites" on the Forest.	Addresses required Monitoring Element #1.
2	Vegetation	Forest Structure: To what extent have Objectives been attained?	To what extent are management actions and natural processes leading to increased structural diversity within forested stands and across forested landscapes, moving areas toward desired objectives identified under Goal 2 of the Forest Plan?	Forest Plan Goal 2 and associated Objectives.	5 years	5 years	1) Forest structure. 2) Management actions with forest structure objectives.	1) Number of acres and proportion of each forest type in each age class. 2) Number of acres and proportion of harvest acres treated with uneven-aged management. 3) Number of acres treated explicitly to enhance early successional characteristics. 4) Number of acres treated explicitly to enhance late successional characteristics. 5) Number of acres treated with various methods to explicitly enhance the health, longevity, and/or structural diversity of forested stands at the stand and landscape scales.	This question addresses a critical Forest Plan objective, along with composition.	Addresses required Monitoring Element #2. Substantial changes to monitoring guide elements from 7-year evaluation; incorporates early successional and late-successional forest habitat, and uneven-aged management questions into one overall structure question.
3	Aquatic Ecosystems	Focal Species (brook trout): Are the ecological sustainability and diversity of natural communities present and functioning on the GMNF?	Does the headwater streams ecosystem provide a full array of riparian and aquatic communities and stream channel types supported by the varied physiographic conditions across the Forest?	Forest Plan Goal 4 and associated Objectives.	Annually	Annually	Brook trout.	Number of wild brook trout per stream mile.	The headwater streams ecosystem has been identified as a priority for monitoring on the GMNF because high quality surface waters fill an essential niche in overall ecosystem health and provide important habitat for a richly biodiverse community of aquatic dependent species. Brook trout (<i>Salvelinus fontinalis</i>) is the best option for which there is both a strong tie to ecosystem conditions that can't be better monitored using more direct indicators. This monitoring provides meaningful information within staffing and budget constraints.	Addresses required Monitoring Element #3.
4	Rare Plants Population	Sensitive Plant Population Trends: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?	What are the population trends for sensitive plants on the GMNF? To what extent is management sustaining or enhancing habitat conditions for populations?	Forest Plan Goal 2 and associated Objectives, and Forest-wide Standards and Guidelines, Section 2.3.7 - Rare and Unique Biological Features.	Annually	Annually	Population trends for plants listed as Regional Forester Sensitive Species (RFSS).	1) Number of ramets or genets 2) Percent reproductive 3) Spatial extent of population 4) Number of populations of a species 5) Ranked condition of populations	Since RFSS are species of viability concern, monitoring these (or other rare plants tracked by the state) helps to understand whether viable populations are being maintained. This is an excellent direct indicator that is generally within budget constraints.	Addresses required Monitoring Element #4
5	Recreation	Equity: Is the Forest providing recreation equity to serve a diverse public?	Is there disproportionate utilization of recreation resources by demographic?	Forest Plan Goal 12 and associated Objectives.	Annually	Annually	Demographic data from NVUM	Does the percentage of users (race/ethnicity, age, socioeconomic status, disability, gender) align with average census data for the counties represented by survey respondents?	This is a national measure. This new monitoring item compares demographic data from the National Visitor Use Monitoring (race/ethnicity, age, socioeconomic status, disability, gender) with average census data for the counties represented by survey respondents.	Addresses required Monitoring Element #5. Replaced Recreation Opportunity Spectrum (ROS) Settings monitoring item starting in 2017 because it was too difficult to address and had never been reported since 2006. Without a complete inventory of the existing ROS settings, it is not feasible to determine the amount of change which has occurred.
5	Recreation	Recreation Visitor Satisfaction: To what extent have Objectives been attained?	Are we providing high quality recreation services that meet the expectations of the public?	Forest Plan Goal 12 and associated Objectives.	5 years	5 years	Visitor satisfaction from National Visitor Use Monitoring (NVUM).	Mean visitor satisfaction compared to mean importance to visitor.	This is the national standard.	Addresses required Monitoring Element #5. NVUM is done every 5 years.
6	Forest Health	Increase of Destructive Insects and Diseases: Are insect and disease levels compatible with objectives for maintaining healthy forest conditions?	To what extent have destructive insects and disease organisms increased?	Forest Plan Goal 2 and associated Objectives, and Forest-wide Standards and Guidelines, Section 2.3.9 - Pests, Diseases, and Non-Native Invasive Species.	Annually	Annually	Insect or disease infestations.	1) Number of outbreaks by species. 2) Acres affected by species.	Insect and disease represent a potentially major stressor in the ecosystem. It is important to monitor both individual outbreaks of insect and disease as well as trends that may indicate ecosystems stress resulting from climate change, deposition or other factors. It is necessary to adapt management practices to achieve long term forest management goals. The monitoring questions meets intent for this monitoring element and is very cost effective.	Addresses required Monitoring Element #6. This monitoring item is currently conducted and reported by S&PF, Forest Health Protection Office in Durham, NH using Best Available Scientific Information (BASI). May consider including VT-ANR-FPR annual Forest Insect and Disease Condition report in the analysis method to increase the amount of data considered without increasing cost.
6	Forest Health	Tree Health: To what extent are the vegetation components of ecosystems changing over time in the context of climate change, acidic deposition, and non-native invasive species?	How is tree health and vegetation composition and structure changing over time under the influence of various environmental stressors? Are long-lived tree species able to maintain productivity over long rotations? Are forested ecosystems developing increased structural complexity over time as would be expected in aging forests?	Forest Plan Goal 8 and associated Objectives.	5 years	5 years	1) Tree health 2) Ecosystem complexity	1) Biomass productivity; Incremental growth; Tree survival; tree decline (foliage density, dieback, crown density). 2) Changes in vegetation composition, cover, and structure over time.	It is important to understand ecosystem health trends over time to adapt management practices to achieve long term forest management goals; the current Long-Term Ecological Monitoring Program (LEMP) which originated with this question address several key ecosystem characteristics associated with key ecosystems on the GMNF. LEMP monitoring is intended to measure changes at the scale of the plan area and detect changes related to climate change and forest health.	Addresses required Monitoring Element #6. Substantial changes made to monitoring guide components as part of 7-year evaluation; incorporates "Trends in Vegetative Community Composition (site-level scale)" question.
7	Program Management	Outputs Accomplished - Other Resources: How close are actual outputs and services to projected outputs and services?	How do actual outputs compare to those projected in Appendix D, Proposed and Probable Practices, specifically related to heritage, recreation, roads, vegetation, rare, ecological, wildlife, and fisheries resources?	Forest Plan Goal 1 and associated Objectives.	Annually	Annually	Amounts per Table D-5.	No differentiation from indicator.	This schedule of management practices provides information and direction to achieve the desired future conditions set out in the Forest Plan goals and objectives. This question shows how well management activities are meeting Plan direction.	Addresses required Monitoring Element #7.
8	Soils	Soil Quality Standard Compliance: Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land?	How are soil quality and productivity changing in response to forest management? More specifically: A) Are soil quality standards met (a Forest Service Manual requirement)? B) Are forest management activities affecting soil/site productivity?	Forest Plan Goal 3 and associated Objectives.	Annually	Annually	1) Soil sustainability 2) Hydrologic function 3) Site productivity	1) Amount of forest floor impacted. 2) Amount of topsoil displacement. 3) Severity of rutted, burned or compacted soil. 4) Severity of platy/massive soil structures, or puddled soil.	The USFS Soil Disturbance Monitoring Protocol outlines a framework for monitoring soil disturbances from forest management pre- and postactivity. FSM 2509.18-91-1 requires Forest Service staff to establish and monitor compliance with soil quality standards. This monitoring provides meaningful information, is efficient to conduct, and within budget constraints.	Addresses required Monitoring Element #8. Question, indicator/ measurement, and monitoring protocols are based on BASI- Scientific Background for Soil Monitoring on National Forests and Rangelands. Protocol: USFS Soil Disturbance Monitoring Protocol.

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n/a	Air	Air Particulate: To what extent are air quality and atmospheric deposition affecting sensitive components of the forest ecosystem?	What is the composition of particles in the air, and how are the levels of particulates changing over time?	Forest Plan Goal 5 and associated Objectives.	Weekly	Annually	Elements and compounds (type and amount) present in the particulate matter.	No differentiation from indicator.	This measures which atmospheric stressors are affecting the plan area.	Question, indicator/ measurement, and monitoring protocols are based on BASI. The protocol does not address to what extent air quality and atmospheric deposition are affecting sensitive components of the forest ecosystem—it only measures air quality and atmospheric deposition. However, it is an EPA station that is part of a nation-wide network, and EPA pays for the analysis. Effects on sensitive components of forest ecosystems are addressed in several other monitoring questions.
n/a	Aquatic Ecosystems	Fish and Aquatic Organism Passage: To what extent have Standards and Guidelines been applied?	Are culvert rehabilitation projects resulting in improved fish passage at stream crossings? Are road construction and maintenance activities resulting in improved or replaced culverts designed to transport water, sediment and debris, and allow free movement of resident aquatic life?	Forest Plan Goal 2 and associated Objectives, and Forest-wide Fisheries Standards and Guidelines.	Annually	5 years	Fish passage barrier based on survey findings, coarse filter analysis and passage criteria.	Course filter survey to determine if rehabilitation projects result in passable structure.	Retain to evaluate if that we are reducing degree of fragmentation by building passable structures.	Measure changed from previous version of this question because monitoring intent is not about the degree of fragmentation but is about whether installing structures are not barriers to aquatic organism passage. Detailed question has been edited to include sediment transport because BASI calls for transport of sedimentation, flow, debris and aquatic organisms.
n/a	Aquatic Ecosystems	Fish Habitat and Stream Channel Stability: 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?	How are fish habitat and stream channels changing over time?	Forest Plan Goal 6 and associated Objectives.	Annually	5 years	Fish habitat diversity, complexity and channel stability.	Pool/riffle ratio and habitat composition, large wood debris (LWD) quantities, bankfull and channel.	This monitoring documents physical characteristic and geomorphic attributes of streams for a range stream monitoring categories to include habitat restoration, and forest management and recreation activities as well as trends in reference and unmanaged areas. This monitoring will also compare measurements both before and after stream restoration projects to determine if they are resulting in increased habitat quality as identified in Forest Plan Goals 4 and 6.	Watershed Condition Framework used channel stability. Our current monitoring uses Level III surveys but there is a question about whether they really indicate watershed condition or just a local/reach condition. Level III works well for the effectiveness monitoring in restoration sites, but less effective evaluating effects from Forest or recreation management because of scale. This method is appropriate because the question is relative to response from forest management.
n/a	Aquatic Habitat	Sedimentation/ Substrate Embeddedness: To what extent have Objectives been attained?	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?	Forest Plan Goal 4 and associated Objectives.	Annually	5 years	Substrate embeddedness in fish spawning and rearing habitat.	Less than 50 percent in riffle/run habitats; less than 20 percent in spawning gravel areas.	Retain because Watershed Condition Framework does not address and sedimentation is a frequent public concern.	Methods should be changed to remove basin-wide surveys which are used for baseline assessments. Replace with pebble counts method as an option.
n/a	Aquatic Habitat	Water Temperature in Streams: 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?	Are summer water temperatures in upland streams suitable to maintain native fish species and have they changed over the planning period? Monitoring will help determine if we are maintaining or improving water temperature regimes for native, cold-water fish species. Stream temperature affects not only a species population but also community composition. These monitoring data help determine an aspect of water and habitat quality and where temperature may be too high and riparian and stream habitat restoration could be conducted?	Forest Plan Goal 4 and associated Objectives.	Annually	5 years	Average daily maximum temperature from last week of May through the last week of October.	Number of days during the monitoring period exceeding an average daily maximum temperature of 70 degrees Fahrenheit.	Watershed Condition Framework uses 303d list which may not be as effective as needed as a monitoring tool. The Forest Service and the State collect temperature data and can continue to use this monitoring question to assess one aspect of watershed condition.	
n/a	Fire	Fire Agreements: Do fire agreements with cooperators exist?	How many agreements have been developed and maintained with outside partners?	Forest Plan Goal 21 and associated Objectives.	Annually	Annually	1) Number of agreements established annually in I-Web. 2) Longevity of agreements with each entity.	No differentiation from indicator.	Partnership monitoring is mutually beneficial for the agency and cooperators to maintain agreements for training purposes, mutual aid wildfire response and financial reimbursement for the cooperator.	
n/a	Fire	Hazardous Fuels: To what extent have Forest Plan Objectives been attained?	To what extent have hazardous fuels been reduced?	Forest Plan Goal 21 and associated Objectives.	Annually	Annually	Number of KP6 and KP3 acres treated for hazardous fuels reduction through FACTS database.	No differentiation from indicator.	Desired conditions are to accomplish hazardous fuels reduction acres in WUI	
n/a	Fire	Prescribed Fire and Wildland Fire for Resource Benefit: What are the effects of management practices using fire as a resource tool?	Did wildland fires managed for resource benefit and prescribed fires successfully meet objectives set forth in the Forest Plan and the Fire Management Plan? Did the fire function as a natural ecosystem process to restore and/ or maintain natural plant communities? Are the forests actively reintroducing fire into historically fire adapted landscapes?	Forest Plan Goal 6 and associated Objectives, and Forest-wide Standards and Guidelines, Section 2.3.10 - Fire Management.	Annually	Annually	Wildlife & pollinator habitat, vegetation, soils, and fuels characteristics.	Fire Effects Monitoring and National Best Management Practices for Water Quality Management on NFS Lands Monitoring for "Wildfire Management Actions," are applied to prescribed fire effects monitoring and would be used for managing wildfire for resource benefit to ensure management practices are protecting natural resources. Fire Regime Condition Class. Percent bare soil, soil erosion severity, and percent loss of forest floor.	Although there have been no natural ignitions (e.g., lightning) on GNMN in the recent past to 'manage for resource benefit', the annual FEMO reports are helpful to monitor fire's function as a natural ecosystem process. This monitoring provides meaningful information, is efficient to conduct, and within budget constraints.	Modified prescribed fire monitoring item starting in 2017 to include wildland fire. Indicator and measure are incomplete in the monitoring guide, so may need updating. For soils, indicators could include bare soil, soil erosion, and forest floor depth. Protocols: FIREMON "Plot description", "Tree data", and "Fuel Load", after a wildfire. The protocols in FIREMON are still based on the BASI.
n/a	Fire	Wildfire Occurrence: To what frequency do wildfires occur?	How many wildfires occurred on NFS land? How many total acres? How many human-caused wildfires? How many wildfires in the Wildland Urban Interface (WUI)? Is there a Fire Danger Operating Plan in place?	Forest Plan Goal 21 and associated Objectives.	Annually	Annually	INFORM fire reporting for NFS lands	No differentiation from indicator.		Modified fire prevention monitoring item to wildfire occurrence starting in 2017.
n/a	Heritage	Heritage Resource Program Objectives: To what extent have Objectives been attained?	Have Heritage Resource Program Management Objectives related to backlogged site evaluations, meeting curation guidelines, developing a GIS model for prehistoric site locations, increasing partnerships for Section 110 activities, consulting with SHPO and Tribes, and incorporating Heritage components into historic building management plans been addressed?	Forest Plan Goal 16 and associated Objectives.	Annually	5 years	1) Previously inventoried sites evaluated against NRHP criteria. 2) Curation facilities for artifacts & archives meeting CFR 79 standards. 3) Successful integration of VT SHPO GIS model for location of prehistoric archaeological sites into the GNMN Heritage toolbox. 3) Yes or No. 4) Number and ratio of partnerships with formal documentation, compared to FY 2006. 4) Increase partnerships to assist with NHPA Section 110 activities. 5) Consultation with SHPO and Tribes. 6) Heritage Resource values as component of Facilities Management Plans cumulatively.	1) Percentage of previously inventoried sites evaluated this FY, & cumulatively. 2) Percentage of collections in condition and facilities meeting CFR 79 archaeological sites into the GNMN Heritage toolbox. 3) Yes or No. 4) Number and ratio of partnerships with formal documentation, compared to FY 2006. 5) Number of contacts/ consults with SHPO and individual Tribes in FY. 6) Percentage of Facility Management Plans with a Heritage Resource component completed in FY and cumulatively.	1) Part of our responsibility under the NHPA is to evaluate properties for eligibility. 2) 40 percent of curated collections currently meet federally regulated standards. 3) Yes 4) 2, 2:1 compared to FY06, Section 101 of NHPA provides guidance for this 5) The agency is required to ensure consultation takes place on proposed undertakings. This is clearly defined in 36 CFR 800 and within EO 13175. 6) this is OK as an indicator but should only be measured cumulatively.	The multifaceted question still meets the intent as all components are derived from implemented regulations at 36 CFR 800 and Secretary of Interior Standards.

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n/a	Heritage	Heritage Resource Site Protection: To what extent have Objectives been attained?	Have Heritage Resources across the Forest been inventoried and protected?	Forest Plan Goal 16 and associated Objectives.	Annually	5 years	Changed Condition of Heritage Resource site, such that its information value and/or eligibility to the National Register has been compromised.	Percent of monitored sites with significant Changed Condition.	Site monitoring is an important part of adhering to federal rules and regulations regarding the condition of sites being managed.	This is among the most important with regards to Heritage Resources but is met with the challenges of inadequate staff for all of the monitoring requirements. Changed condition of sites will assist in factoring exactly how sites will be managed.
n/a	Heritage	Heritage Resource Standards and Guidelines: To what extent have Objectives been attained?	Have Heritage Resource sites within the Areas of Potential Effect of Forest-sponsored projects (undertakings) been protected and managed according to our Standards and Guidelines?	Forest Plan Goal 16 and associated Objectives.	Annually	5 years	1) Implementation of S&Gs within projects' Areas of Potential Effect. 2) Effectiveness of S&G Implementation based on Changed Conditions.	1) Mitigation Measures/ Design Elements implemented (Yes or No, or percentage). 2) Percentage of sites within APE with significant Changed Condition due to lack of S&G implementation.	1) Mitigation measures implemented is best described with Yes or No. 2) Ensuring that the appropriate standards and guidelines are employed is imperative under the regulations for treatment of historic properties. Furthermore, is a particular site cannot be avoided it is important to be able to satisfactorily mitigate the adverse affect to the point of non significance.	Mitigation is one of the key components of Section 106 of the NHPA and can usually be done well within financial constraints. 3rd party projects should provide cost recovery funds. When heritage resources cannot be avoided, it is imperative to have a good mitigation strategy. 1) Mitigation measures to avoid adversely affecting significant cultural/heritage resources is required under 36 CFR Regs, they not only mandate this they also require public/SHPOTribal input into the process. 2) Follow up monitoring to ensure proper implementation of S&G's is imperative to calculate percentages such as this.
n/a	Human Dimensions	Contract Sizes to Local Economies: To what extent have Objectives been attained?	What is the range of dollar amounts and board feet in contracts? Who has been awarded the contract?	Forest Plan Goal 17 and associated Objectives.	5 years	5 years	Number of contracts awarded for ranges of board feet and monetary values, and location of contractor.	Number of board feet from GMNF processed at local mills.	Question effectively monitors contributions of the management of the plan area toward meeting social, cultural, and economic attributes of desired conditions in the Forest Plan.	
n/a	Human Dimensions	County Income by Employment Sector: To what extent have Objectives been attained?	To what extent is the GMNF contributing to the economic health of local economies?	Forest Plan Goal 17 and associated Objectives.	5 years	5 years	Bureau of Economic Analysis Regional Economic Accounts Local Area Personal Income related to Forest Activities - see Table 3.21.19 FEIS page 3-377.	No differentiation from indicator.		
n/a	Human Dimensions	Partnerships Maintenance and Enhancement: To what extent have Objectives been attained?	Are partnerships active and effective on the Forest and are Forest Service personnel participating in partnership activities?	Forest Plan Goal 18 and associated Objectives.	Annually	Annually	1) Number of formal partnership agreements (inter-agency, Challenge Cost Share, Memorandums of Understanding). 2) Number of Forest Service staff participating in outside organizations in official capacity (representing Forest Service interest). 3) Evaluation (narrative) of how the partnership has been effective in helping the Forest Service meet Goals and Objectives. 4) Number of people hours contributed by partnerships.	No differentiation from indicator.	Monitoring partnership contributions to management activities helps track progress toward meeting the desired conditions and objectives related to social and economic sustainability.	The question, measurement and methodology is still based on BASI and changes are not needed for the monitoring protocol to make the question more meaningful / effective.
n/a	Human Dimensions	Payments to Towns: To what extent have Objectives been attained?	What was the amount paid to each GMNF/FLNF town through PILT, 25% fund or Secure Schools. What type of communications have occurred on this topic with each town?	Forest Plan Goal 17 and associated Objectives.	Annually	Annually	1) Amount of payment to each town in each category. 2) Contacts made with towns about these programs.	No differentiation from indicator.	Tracking payments to towns is a good measurement of contributions to economic sustainability of communities. It remains important to inform municipalities of federal programs that impact their financial bottom line / tax base.	The question, measurement and methodology is still based on BASI and changes are not needed for the monitoring protocol to make the question more meaningful / effective.
n/a	Human Dimensions	Teacher Professional Development in Forest Stewardship: To what extent have Objectives been attained?	Did teacher professional development in Forest stewardship occur?	Forest Plan Goal 19 and associated Objectives.	Annually	5 years	1) Number of teachers trained. 2) Number of programs offered.	No differentiation from indicator.	Programs designed to provide teacher emphasis on conservation can help toward goals and objectives related to social and economic sustainability. Monitoring will provide information showing commitment to teacher development and the next generation of forest users / stewards.	The question, measurement and methodology is still based on BASI and changes are not needed for the monitoring protocol to make the question more meaningful / effective.
n/a	Invasive Species Population	Non-native invasive species: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?	To what extent are non-native invasive species impacting other Forest resources?	Forest Plan Goal 2 and associated Objectives, and Forest-wide Standards and Guidelines, Section 2.3.9 - Pests, Diseases, and Non-Native Invasive Species.	Annually	Annually	Extent of infestations in habitats of concern.	Acres and/or priority sites surveyed; acres and/or priority sites infested; acres and/or priority sites treated; acres and/or priority sites with infestations reduced in size.	FSH lists NNIS as one of the stressors; extent of infestations helps us understand the size of the problem.	Currently non-native invasive plants are tracked to answer this question. Other types of non-native invasive organisms are assessed differently through other resource areas (e.g., fisheries, timber). Also, the current monitoring plan does not reference any literature. References are now provided in the columns to the right, and some changes to the current indicator and current measure are suggested. This is an excellent direct indicator that is generally within our budget.
n/a	Lands	Land Ownership Adjustment: To what extent have Objectives been attained?	To what extent has the Forest's land base been adjusted through purchase, exchange, transfer, interchange, boundary adjustment and donation?	Forest Plan Goal 22 and associated Objectives.	Annually	Annually	Amount of acres adjusted.	No differentiation from indicator.	Amount of acres adjusted is a tangible way to report out on an accomplishment. This is a direct indicator and the information is readily available on a yearly basis	
n/a	Lands	Special Uses - Lands: To what extent have Objectives been attained?	Is the Forest improving its administration of existing authorizations?	Forest Plan Goal 1 and associated Objectives, and Forest-wide Standards and Guidelines, Section 2.3.19 - Special Uses.	5 years	5 years	Percentage of authorizations administered to standard annually.	No differentiation from indicator.	Tracking number and types of special use authorizations help track contributions to economic sustainability of communities, and in providing renewable energy.	Consider changes to questions, indicators and measurements to focus on the programs contributions to regional infrastructure and provisioning services.
n/a	Program Management	Costs of Plan Implementation: How close are actual costs to projected costs?	To what extent is the Forest providing a mix of products, services and amenities? This monitoring compares the level of expected socioeconomic outputs with actual levels. It also compares actual and estimated costs by program area. These comparisons are required by the Forest Plan.	Forest Plan Goal 1 and associated Objectives.	Annually	Annually	1) GMNF/FLNF Annual Budget and Expenditures by Program. 2) GMNF Expenditures to produce items in Appendix D, Proposed and Probable practices.	No differentiation from indicator.	The cost to implement the Forest Plan is a good indicator showing management activities can be completed within budget constraints.	
n/a	Program Management	Desired Future Condition: What are the effects of management practices prescribed by the 2006 Forest Plan?	What activities have occurred in management areas? How have these management areas helped to achieve the desired future condition of the management area? Have activities occurred that detract from the desired future condition of the management areas?	Forest Plan Goal 1 and associated Objectives, and Forest Plan Management Area direction (management area major emphasis and desired future conditions).	Annually	Annually	Number of acres, number of miles, with location of projects and description of activity.	No differentiation from indicator.		

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n/a	Program Management	Innovative, Coordinated Management and Energy Conservation: To what extent have Objectives been attained?	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?	Forest Plan Goals 9 and 11, and associated Objectives.	5 years	5 years	1) Number of projects completed. 2) Number of projects underway. 3) Narrative on how each project demonstrates innovation, coordination, and/or energy conservation.	No differentiation from indicator.		
n/a	Program Management	Standards and Guidelines - Implementation and Effectiveness Monitoring: To what extent have Standards and Guidelines been applied?	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?	Forest Plan Goal 9 and associated Objectives.	5 years	5 years	Compliance with Forest Plan Standards and Guidelines, and project specific design features or mitigation measures.	No differentiation from indicator.	Not knowing the extent to which S&Gs are being implemented and effective could result in credibility problems with the public. This monitoring is critical to recommend meaningful project activity modification or changes to S&Gs for more effective Forest Plan implementation.	
n/a	Recreation	Effects of Vehicle Use Off Roads: 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?	What is the effect of snowmobile use on the quality of recreation experienced by other forest users?	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.	Annually	Annually	Trend in illegal use of motor vehicles off roads.	Percent change in law enforcement incidents and violations.		Modified the detailed monitoring question starting in 2017 to focus on possible snowmobile use conflicts with other forest users.
n/a	Recreation	Recreation Facility Maintenance: To what extent have Objectives been attained?	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?	Forest Plan Goal 12 and associated Objectives.	Annually	5 years	Facilities/sites managed to standard.	Percent managed to standard and trends.	INFRA measure for deferred maintenance corporate data base indicates trails meeting standard.	Doing better on keeping up with this (Recreation Facility) data collection. Based on BASI. Expensive to collect and maintain data- but not as bad as the Trails data. Twenty percent of Recreation facility condition surveys are done each year. Work done to reduce deferred maintenance may not be captured for several years, but this item is reported on a 5-year basis, not annually.
n/a	Recreation	Scenic Integrity Objectives (SIO's): To what extent have Objectives been attained?	Has the Forest transitioned from the current Visual Management System to the Scenery Management System?	Forest Plan Goal 15 and associated Objectives.	5 years	5 years	Percent of Forest with Scenic Integrity Objectives.	No differentiation from indicator.	Need to convert to Scenic Management System per planning rule.	We can say yes when we do it, easy to say yes hard to convert. Percent measure may not be very useful since this will be an all or nothing occurrence.
n/a	Recreation	Trail Maintenance: Is the quality of the Forest Service trail system being improved through operation and maintenance?	Is the amount of deferred maintenance on the GMMF/FLNF trail system being reduced?	Forest Plan Goal 12 and associated Objectives.	Annually	5 years	Total deferred maintenance for Forest trail system.	Total deferred maintenance divided by total system trail miles for the Forest.	INFRA measure for deferred maintenance corporate data base indicates trails meeting standard.	Have not been doing 10 percent of trail system per year for data gathering - only do the required Regional Office amount. Based on BASI. Expensive to collect and maintain data.
n/a	Recreation	Trends in Trail Partnerships: To what extent have Objectives been attained?	How well is the Forest using partnerships to assist in the operations and maintenance of the Forest trail system?	Forest Plan Goal 12 and associated Objectives.	Annually	Annually	Partner contributions in trail operations and maintenance.	Percent of contributions (cash and in-kind) when compared to total calculated operations and maintenance needs.	Provides the type of measurement that answers the question.	Tracking of partner and volunteer contributions is not at a level that reflects the actual contribution. Relatively easy and inexpensive to track.
n/a	Recreation	Visual Quality Objectives (VQO's): To what extent have Objectives been attained?	Is the Forest being managed in accordance with the visual standards and guidelines found in the Forest Plan and are the visual standards and guidelines and any additional site specific design criteria effective in helping to meet the VQO's (Visual Quality Objectives)?	Forest Plan Goal 15 and associated Objectives.	Annually	Annually	Number of projects or sites sampled that do not meet VQO's.	Design criteria, mitigation and standards and guidelines applied on the ground will be looked at in conjunction with the overall project implementation to determine if the VQO's were met or not met. If not met, what could have been done to achieve VQO and/or what could be done toward meeting VQO?	Need to monitor some scenic integrity until Forest Service staff convert to the Scenic Management System.	The current monitoring protocol is not the latest Forest Service standard. Monitoring every project or even a majority is time consuming.
n/a	Soils	Long Term Soil Quality and Soil Productivity Monitoring: Are the effects of atmospheric deposition and climate change 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? 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?	Forest Plan Goal 3 and associated Objectives.	5 years	10 years	1) Soil quality 2) Soil productivity 3) Soil climate	1) Soil nutrient levels and toxins by major horizon. 2) Forest Health - Note that all information (monitoring justification, protocols, methods, and costs) regarding the soil productivity measures resides in the monitoring item with the Resource Keyword: Forest Health, and the Monitoring Item Name: How is tree health changing over time? 3) Soil temperature and moisture, depth of freezing, correlated with selected meteorological parameters.	The Long-term Soil Monitoring Project (LTSMP) and LEMP are only in wilderness areas, so do not reflect changes due to forest management. This can help with differentiating between timber management and stressors and their respective effects on soil productivity. Atmospheric deposition of SOx, NOx, and Hg, and climate change, may decrease soil productivity and health. This is important monitoring because it provides information needed to differentiate between soil stressors from timber management contrasted to those from other sources (e.g. atmospheric deposition and climate change). It is fairly efficient to conduct, and is within our financial capacity to implement, with the help of ongoing partnerships.	Question, indicator/ measurement, and monitoring protocols are based on BASI. Protocol: Vermont Monitoring Cooperative Long-term Soil Monitoring Project (still under development).
n/a	Soils	Soil/Water Standards and Guidelines, Mitigation Measures, and Best Management Practices: To what extent have Standards and Guidelines and Mitigation Measures been applied? How often are BMPs implemented and effective?	Were Soil and Water S&Gs, mitigation measures, and BMPs implemented on selected projects, and were they effective in protecting the soil, water and wetland resources?	Forest Plan Goals 3 and 4, and associated Objectives, and Forest-wide Soil, Water, and Riparian Area Protection and Restoration and Management Area Standards and Guidelines.	Annually	Annually	1) S&Gs 2) Mitigation measures 3) Best Management Practices for Water Quality Management on NFS Lands	1) Percent of time implemented. 2) Percent of time implemented. 3) Implementation and Effectiveness Ratings	Measures potential influences on water resources and watershed conditions, including the effects of management activities. This monitoring provides meaningful information, is efficient to conduct, and within budget constraints.	Question, indicator/measurement, and monitoring protocols are based on BASI. Protocol: USFS Best Management Practices for Water Quality Management on NFS Lands monitoring protocols.
n/a	Terrestrial Ecological Units	Ecological Type Mapping and Representation: To what extent have Objectives been attained?	To what extent are ecological types on the Forest represented within the ecological reference area network? To what extent do ecological types represented on the Forest accurately represent the diversity of ecosystems and potential natural vegetation on the Forest?	Forest Plan Goal 6 and associated Objectives.	5 years	5 years	1) Number of acres and proportion of the GMMF with up-to-date ecological maps consistent with the NHFEU, including interpretations for management and potential natural vegetation. 2) Number of acres and proportion of ecological types within the reference area network.	No differentiation from indicator.	Representation of ecosystems within areas that are protected from any extractive uses helps to protect the full range of variation associated with ecosystems on the Forest. This question monitors what is missed by both the LEMP plots and the rare and outstanding sites.	Some minor changes from the 7-year eval; this monitoring focuses on representation and not condition, and directly addresses a Forest Plan objective threshold. Combines two monitoring questions into one.
n/a	Terrestrial Wildlife Habitat	Wildlife Reserve Trees: To what extent do Forest Service management activities contribute toward restoration and maintenance of habitat for native and desirable non-native species?	Are we retaining the best individual trees & snags? How do they persist/ improve/ degrade over time? How well did retained future trees & snags develop over time?	Forest Plan Goal 2 and Wildlife Reserve Tree Objectives, and Forest-wide Wildlife Reserve Trees - General Standards and Guidelines.	5 years	5 years	Site inspection and long-term observation of reserve trees.	No differentiation from indicator.	The Forest Plan (Chapter 2 Goal 2) describes the reserve trees to help monitor Forest structure which is important for wildlife (food/cover/nesting) diversity and health.	Consider focusing on appropriate implementation of S&Gs in marking plans with spot field checks. The current question meets the monitoring element adequately. Snag trees are important on the landscape for many species including some TES species as well as cavity nesting and insectivorous birds.

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Required Monitoring Element #	Monitoring Category	Monitoring Item Name: Evaluation Question	Detailed Monitoring Question	Monitoring Driver	Monitoring Frequency	Monitoring Reporting	Indicator	Measure	Rationale to Retain	Comments
n/a	Terrestrial Wildlife Population	Bicknell's Thrush: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?	What is the population trend of Bicknell's thrush on the GMNF and adjacent lands?	Forest Plan Goal 2 and associated Objectives.	Annually	Annually	Presence and number of individuals.	No differentiation from indicator.	The current question meets the monitoring element adequately. Snag trees are important on the landscape for many species including some TES species as well as cavity nesting and insectivorous birds.	Consider focusing on appropriate implementation of S&Gs in marking plans with spot field checks.
n/a	Terrestrial Wildlife Population	Common Loon: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?	Do we have common loons on/near the GMNF? Are they nesting? Are they nesting successfully? Do they need protection or habitat management?	Forest Plan Goal 2 and associated Objectives.	Annually	Annually	Number & location of individuals, documented nests.	No differentiation from indicator.	The current question meets the monitoring element adequately.	
n/a	Terrestrial Wildlife Population	Herpetic Sensitive Species: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?	What are the population trends of wood turtle, Jefferson salamander, blue-spotted salamander, and four-toed salamander on National Forest System and adjacent lands? Do they need protection or habitat management?	Forest Plan Goal 2 and associated Objectives.	Annually	Annually	Presence, location, and number of individuals or reported sightings.	No differential from indicator.	Reptiles and amphibian RFSS have local and regional interest and concern. It is important to track management actions with potential to result in adverse or beneficial effects, especially relative to wetlands and seasonal pools.	
n/a	Terrestrial Wildlife Population	Peregrine Falcon: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?	What is the population trend of peregrine falcons on the GMNF and adjacent lands?	Forest Plan Goal 2 and associated Objectives.	Annually	Annually	Presence, location, and number of individuals or reported sightings, documented nests.	No differentiation from indicator.	Monitoring can be a good measure of proper management activities to protect nesting falcons.	
n/a	Terrestrial Wildlife Population	Threatened, Endangered, and Sensitive Species - Bats: To what extent are Forest Service management activities contributing toward population viability for native and desired non-native species?	Are management actions adequately protecting ecological conditions required by threatened, endangered, and sensitive bat species known to occur on National Forest System lands?	Forest Plan Goal 2 and associated Objectives.	Annually	Annually	Presence, location, and number of individuals. Amount of available habitat.	No differentiation from indicator.	There are currently 2 T&E bats (Indiana & northern long-eared) as well as 3 RFSS bats (tri-colored, eastern small footed & little brown). Something we need to keep a close eye on, even if it is mostly open dialogue with VT FWD and reporting their results. The monitoring questions lends themselves to helping determine if the activities of the USFS are sustaining bat populations on the forest.	Collaborate with VFWD, NYDEC, USFWS. Continued survey routes (NABAT) will indicate presence/no detection of species through the forest for the TES species. Currently changes are occurring with NLEB. Communication with the USFWS is paramount during this transition time. Also collaboration with any nearby research could help indicate bat usage on/near the forest. The monitoring question adequately meets the monitoring element. Consider changing indicator to "Presence/no detection, location, and/or number of individuals as appropriate based on current science and direction from USFWS on handling protocols". Drop "amount of available habitat".
n/a	Vegetation	Forest-wide Habitat Composition: To what extent have Objectives been attained?	To what extent are management actions and natural processes moving Forest composition toward desired objectives in table 2.2-1 of the revised Plan?	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.	5 years	5 years	1) Number of acres and proportion in each type. 2) Number of acres of treatments associated with habitat objectives, including: - To enhance softwood component or convert to mixedwood or softwood habitat. - To maintain, enhance, or restore oak habitat. - To maintain, enhance, or create aspen habitat. - To maintain, enhance, or create permanent upland opening habitat.	No differentiation from indicator.	This monitoring item will track the extent to making progress toward habitat composition objectives.	Substantial changes made to monitoring guide components as part of 2016 transition; incorporates all of the habitat-specific monitoring items into this one question. Include conversion of hardwoods to mixedwood and softwoods; aspen-birch & early successional habitat; oak and oak-pine maintenance and restoration, oak regeneration, and permanent upland openings.
n/a	Vegetation	Outputs Accomplished - Volume and Acres of Timber Offered and Sold: How close are actual outputs and services to projected outputs and services?	How do actual outputs compare to those projected in Appendix D, Proposed and Probable Practices, specifically related to timber offered and sold?	Forest Plan Goal 8 and associated Objectives.	Annually	Annually	1) Acres of even-aged regeneration harvest annually and total for the decade. 2) Acres of even-aged intermediate harvest annually and total for the decade. 3) Acres of uneven aged harvest annually and total for the decade. 4) MMBF Volume of Sawtimber and Pulp offered and sold in FY and decade.	No differentiation from indicator.	Question effectively monitors contributions of the management of the plan area toward meeting social, cultural, and economic attributes of desired conditions in the Forest Plan.	
n/a	Vegetation	Rare or Outstanding Natural Areas: To what extent have Objectives been attained?	To what extent are rare and outstanding biological, ecological, or geological features on the GMNF being protected, maintained, or enhanced?	Forest Plan Goal 7 and associated Objectives.	Annually	Annually	1) Number of conservation actions taken to protect, maintain, or enhance these areas. 2) Ranked condition of identified areas (A-D). 3) Number of rare or outstanding natural area sites monitored.	No differentiation from indicator.	Like rare species, rare or outstanding natural communities are vulnerable to loss because the combination of biophysical factors and disturbance history that created or sustain these communities are unusual or rare. Monitoring these areas on a schedule helps to sustain them by identifying potential threats before the system is irreparably harmed.	Changes made to monitoring guide components as part of 7-year evaluation; would benefit from additional thought on key indicators/measures.
n/a	Vegetation	Stocking Level: Are harvested lands adequately restocked according to Plan goals?	Are lands adequately restocked within five years of a regeneration harvest or site preparation activities?	The National Forest Management Act requires suitable timberlands are adequately restocked following harvest (16 USC 1604(g)(3)(E)(ii)).	Annually	Annually	Acres with percent stocked to minimal standards.	No differentiation from indicator.	The NFMA requires that suitable timberlands are adequately restocked following harvest. This monitoring item helps to determine if we are meeting this requirement.	
n/a	Vegetation	Suitable Timber Lands: To what extent is timber management occurring on lands suitable for such production?	Are harvests occurring onlands suitable for timber management?	The National Forest Management Act requires identification of lands suitable for timber production every 10 years where commercial harvesting is allowed (16 USC 16014(k)). 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.	10 years	10 years	Acres meeting requirements for suitable timber lands.	No differentiation from indicator.	This is a NFMA required item. This monitoring helps identify where timber harvest can take place.	

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Required Monitoring Element #	Monitoring Category	Monitoring Item Name: Evaluation Question	Detailed Monitoring Question	Monitoring Driver	Monitoring Frequency	Monitoring Reporting	Indicator	Measure	Rationale to Retain	Comments
n/a	Vegetation	Sustainability of Special Forest Product Gathering: To what extent have Objectives been attained?	What types and quantities of special forest products are being gathered annually that require a permit? What products are not allowed to be gathered, and what products are being evaluated for gathering at levels requiring a permit (commercial or personal use)? What products are being gathered at levels that may be unsustainable.	Forest Plan Goal 8 and associated Objectives.	Annually	Annually	1) Number & type of SFPs being gathered under permits. 2) Number of permits issued/denied by SFP. 3) Number & type of SFPs under evaluation. 4) Estimated number and type of SFPs reported to be gathered either outside of permit requirements or without permits.	No differentiation from indicator.	Gathering of SFPs has increased over the past 7 years and continues to be a highly valued activity by a segment of Forest users. Use is concentrated in a few products, but seems to respond to economic conditions and publicity. This use is required to be sustainable, so monitoring the use is an important way to document changes and patterns of use.	Changes made to monitoring guide components as part of 7-year evaluation. Indicators are shy on in field monitoring - mostly focused on permits issued; in field monitoring is very challenging except for maple sap permits.
n/a	Water	Forest-wide Water Quantity and Flow Monitoring: To what extent are environmental stressors and Forest management affecting water quantity and flow timing?	What is the existing status of water quantity and flow timing on National Forest System lands, and how are our management activities affecting them?	Forest Plan Goal 4 and associated Objectives.	Annually	Annually	Stream discharge.	Stream area, velocity, and flow.		This is a new question starting in 2017.
n/a	Wild & Scenic Rivers	Wild and Scenic Rivers: To what extent are eligible Wild and Scenic Rivers managed to preserve their outstandingly remarkable values?	Are management activities within the eligible National Wild & Scenic River management area consistent with the Outstandingly Remarkable Values for which each river segment was determined eligible??	Forest Plan Eligible Wild, Scenic, and Recreational Rivers Management Area direction.	Annually	5 years	Outstanding Remarkable Value quality.	1) Number of projects within Wild and Scenic Corridors and number of projects that impact their eligible Outstandingly Remarkable Values. 2) Changes in road crossings in eligible river corridors, changes in trail bridge crossings in eligible river corridors, changes in harvest activity in eligible river corridors.	Forest Plan management direction requires protection of outstandingly remarkable values for rivers that are eligible for Wild and Scenic River consideration.	
n/a	Wilderness	Wilderness Areas Managed to Standard: To what extent have Objectives been attained?	How are wilderness areas trending to meet the national Wilderness Stewardship Performance?	Forest Plan Goal 13 and associated Objectives, and Wilderness Area Management Area direction.	Annually	Annually	Increase in the total element score per Wilderness for Wilderness Stewardship Performance (WSP) measures.	Wilderness stewardship performance.	This is a national measure.	This question replaces all previous wilderness related monitoring questions. The 10-Year Wilderness Stewardship Challenge is now complete and obsolete. This new question is based on a new national wilderness program initiated in 2015 and includes the most recent BASI related to wilderness management.