CHAPTER 5 – IMPLEMENTATION AND MONITORING

INTRODUCTION

Chapter 5 provides information to guide putting the Forest Plan into practice, or implemented. Two of the most important aspects of implementing the Forest Plan are monitoring and evaluation. Monitoring and evaluation provide information to determine whether programs and projects are meeting Forest Plan direction, and whether the Plan should be amended or revised. This Chapter establishes Monitoring Questions that are to be answered over the course of Forest Plan implementation.

The last section of this Chapter discusses how this Forest Plan may be amended or revised as a result of this monitoring and evaluation.

IMPLEMENTATION

The approval of this Forest Plan establishes direction so that all future decisions in the planning area will include an "interdisciplinary approach to achieve integrated consideration of physical, biological, economic and other sciences" (16 USC 1604(b)). The Forest Plan will be implemented through a series of project-level decisions based on appropriate site-specific environmental analysis and disclosure to assure compliance with the National Environmental Policy Act (NEPA). The NEPA analysis process begins once these individual projects have been identified. Project-level environmental analyses will tier to the Final Environmental Impact Statement (FEIS). The FEIS for the Forest Plan is an aid to project-level NEPA compliance.

Common project-level decisions include whether or not, and if so, in what way, timber will be harvested in a given area, a campground will be constructed, or a fisheries structure will be installed. The form of documentation for such analysis will be consistent with the Council of Environmental Quality NEPA Regulations [40 CFR 1500-1508], and Forest Service Manual and Handbook procedures.

The Forest Plan does not contain a commitment to the selection of any specific project. Instead, it determines what types of projects are permissible and under what conditions on different portions of the Forest. For instance, the Forest Plan may determine that portions of specific management areas are suitable for timber production. It does not make decisions on the specifics of any particular timber sale that could occur on lands suitable for timber production. Such decisions must be based on appropriate site-specific analysis and appropriate disclosure during project-level analysis.

Accomplishment of the annual program of work on the Forest is the incremental implementation of management direction in the Forest Plan. The projects chosen to implement this Forest Plan should be those which lead to achieving objectives, moving towards desired conditions. Depending on final budgets or other factors such as weather, outputs and activities in individual years may be significantly different from planned objectives.

As described in the Monitoring and Evaluation section of this Chapter, the Interdisciplinary Team will evaluate how the selection of projects is achieving the goals, objectives, and desired conditions of the Forest Plan.

MONITORING AND EVALUATION

Monitoring and evaluation provide information to determine whether programs and projects are meeting Forest Plan direction, and whether the cost anticipated to implement the Forest Plan coincides with actual costs. Monitoring and evaluation is required by National Forest Management Act (NFMA) implementing regulations (36 CFR 219.12(k)) to determine whether requirements of the regulations and Forest Plan are being met. Monitoring and evaluation are components of adaptive management. As resource conditions change, on-going monitoring and evaluation help identify the need to adjust desired conditions, objectives, and standards. This process helps determine how the Plan is being implemented, whether or not plan implementation is achieving

desired outcomes, and whether or not assumptions made in the planning process are valid. Monitoring and evaluation allows the incorporation of new understanding and technology; changes in law, policy, and resource conditions; and growing concerns, trends, and changing social values into land management planning.

The concept of adaptive management is foundational for planning and Forest Plan implementation in a dynamic environment. Regulations require that Forest Plans be revised periodically (36 CFR 219.10(g)). However, Forest Plans may need to be more dynamic to account for changed resource conditions (such as large storms or insect outbreaks), new information or findings of science, or new regulations or policies. An effective monitoring and evaluation program is essential for determining when these needs may exist and for leading to quick resolution of a need for change.

The Monitoring and Evaluation Framework was developed to address three types of monitoring:

- Implementation monitoring: addresses whether the Plan direction is being carried out.
- Effectiveness monitoring: determines whether or not implementing the direction and desired conditions in the Plan is achieving the goals and objectives.
- Validation monitoring: determines whether or not assumptions and models used in the Plan are appropriate.

Monitoring and evaluation are distinct activities. The monitoring phase generally includes the collection of data and information, either by observation, direct measurement or compiling data from appropriate sources. Evaluation is the analysis of this data and information, and is used to assess if the Forest Plan is being implemented correctly and whether it needs to be changed. Forest Plan Monitoring and Evaluations will be reported regularly in the Forest Monitoring and Evaluation Report.

Monitoring and evaluation may lead to adjustments of programs, projects or activities, changes or amendment to the Forest Plan itself or used to recommend changes in laws, regulations, and policies that affect both the Forest Plan and project implementation (FSM 1922.7).

Forest Plan amendments and revisions should be responsive to changes that affect the Forest Plan, and may be needed at any time if a Forest Plan becomes out of date in some way. Within an adaptive management framework, the need to amend or revise the Forest Plan may result from:

- Recommendations of an interdisciplinary team, based on evaluation and monitoring results;
- Changes in agency policy and regulations;
- Planning errors found during Forest Plan implementation;
- Changes in physical, biological, social, or economic conditions.

This Chapter establishes a Monitoring and Evaluation (M&E) Framework containing the questions to be answered over the course of Forest Plan implementation. This framework was developed from the Forest Service national model identified in the publication entitled *LMP Monitoring and Evaluation: a Monitoring Framework to Support Land Management Planning* (USFS 2007). The national framework model enables a consistent NFS approach in monitoring progress of land management toward achieving desired social, economic, and ecological conditions. It was also designed to be a framework for application agency-wide as the foundation of a multi-scale National Forest System (NFS) monitoring and evaluation program to meet regional and national reporting needs.

The six themes of the M&E framework summarize key forest management legislation that guides and regulates management on the NFS and reflect interrelated and interdependent social, economic, and ecological elements of sustainability.

- Theme 1 - Conservation of Biological Diversity: This theme addresses the Forest's contributions to securing the nation's heritage of plant and animal species in the plan area. Disturbance processes are included under maintenance of land health and vitality theme (T-2). In addition, abiotic plan components for ecosystem diversity are included under the conservation and maintenance of soil, water, and air resources theme (T-3).

- Theme 2 - Maintenance of Land Health and Vitality: This theme addresses ecological disturbance processes affecting social, economic, and ecological conditions within plan areas.

- Theme 3 - Conservation and Maintenance of Soil, Water, and Air Resources: This theme addresses the ecological condition (for soil, air, and water) of watersheds to protect the physical, chemical and biological integrity; the productive capacity of NFS land; water quality and quantity; and opportunities for beneficial uses. It also addresses the related capacity of watersheds to respond resiliently to flooding and to reach or sustain their aquatic ecosystem potential.

- Theme 4 - Maintenance and Enhancement of Social Systems: This theme addresses the opportunities, settings, suitable uses for multiple-use provided by the NFS, including opportunities for market and non-market activities. Related goods and services derived from the opportunities and settings provided are reflected in the economic theme.

- Theme 5 - Maintenance and Enhancement of Economic Systems: Given the opportunities and settings, suitable uses, and activities designed to make progress towards desired conditions, there are goods and services that come off the land. This theme is about goods and services derived from the opportunities and settings referenced in the social theme (T-4). Key contributions of goods and services include revenue and jobs associated with recreation, tourism, resident amenities, environmental services, and commodities such as AUMs and the potential for timber production.

- Theme 6 - Infrastructure Capacity: This theme addresses NFS infrastructure's ability to contribute to the aspirations characterized in the LMP.

In addition to the six themes, the framework establishes a set of nine social, economic, and ecological sub-element priorities to be considered in respective Forest/Grassland LMP monitoring programs. Common sub-element priorities include: vegetation diversity, species diversity, invasive species, resilience to fire disturbance, insects and disease, watershed health, diversity of opportunities and settings, provision of goods and services, and roads and trails.

The Forest monitoring framework is intended to be scalable so that it can be coordinated and integrated with relevant broader scale monitoring strategies. An example is the breeding bird surveys that provide direct Forest information and are part of broad landscape analyses of bird populations.

The Monitoring and Evaluation Framework is part of the Forest Plan and is stated in terms that will direct *what* will be monitored, but are not so specific as to address *how* monitoring will be accomplished. The Monitoring and Evaluation Framework will be further refined during Forest Plan implementation into Monitoring Elements and Task Sheets, which are more detailed, specific and measurable than the monitoring questions themselves. Monitoring Elements and Task Sheets may be modified and prioritized to guide monitoring activities over the course of Forest Plan implementation. The Monitoring Summary Table (Appendix H) indicates the nature of Monitoring Elements and monitoring details that are to be further developed during Forest Plan implementation. The Monitoring Summary Table is presented here only for information and may be modified as needed to address changes in needs, priorities, availability of personnel and funding.

MONITORING AND EVALUATION FRAMEWORK THEMES AND ELEMENTS

<table>
<tr><td>Theme 1</td><td>T1.3 Ecological Diversity</td></tr>
<tr><td>Theme 1</td><td>Conservation of Biological Diversity: This theme addresses National Forest System (NFS) contributions to securing the nation's heritage of plant and animal species in the plan area. Disturbance processes are included under the maintenance of Land Health and Vitality Theme (T-2). In addition, abiotic plan components for ecosystem diversity are included under the conservation and maintenance of soil, water, & air resources theme (T-3).</td></tr>
<tr><td>Sub-element NFS Generic Desired Condition</td><td>T1.3 Ecological Diversity: Contributing to securing the nation's heritage of plant species and related habitats for T&E, sensitive and locally rare species in the plan area.
Appropriate ecological conditions are provided throughout the plan area to support populations of native species, contribute to the recovery of T&E species, to avoid federal listing of species, and to achieve resource goals for other species of concern.</td></tr>
<tr><td>Contextual Statement</td><td>There are 24 ecological systems identified for the GWNF. These systems have similar potential and opportunities for management. The ecological systems for the GWNF represent both major and rare community types. We identified that many of the ecological systems had similar key attributes, indicators, species associates and resulting forest plan components. For purposes of analysis we combined the systems into the following ESE Tool Systems:
<table>
<tr><th>Ecological System Groups</th><th>Ecological System</th></tr>
<tr><td>Spruce Forest</td><td>Central and Southern Appalachian Spruce-Fir Forest</td></tr>
<tr><td rowspan="2">Northern Hardwood Forest</td><td>Appalachian (Hemlock)-Northern Hardwood Forest</td></tr>
<tr><td>Southern Appalachian Northern Hardwood Forest</td></tr>
<tr><td>Cove Forest</td><td>Southern and Central Appalachian Cove Forest</td></tr>
<tr><td rowspan="5">Oak Forests and Woodlands</td><td>Northeastern Interior Dry-Mesic Oak Forest</td></tr>
<tr><td>Central and Southern Appalachian Montane Oak Forest</td></tr>
<tr><td>Central Appalachian Dry Oak-Pine Forest</td></tr>
<tr><td>Southern Appalachian Oak Forest</td></tr>
<tr><td>Southern Ridge and Valley/Cumberland Dry Calcareous Forest</td></tr>
<tr><td rowspan="3">Pine Forests and Woodlands</td><td>Southern Appalachian Montane Pine Forest and Woodland</td></tr>
<tr><td>Central Appalachian Pine-Oak Rocky Woodland</td></tr>
<tr><td>Southern Appalachian Low-Elevation Pine Forest</td></tr>
<tr><td rowspan="2">Mafic Glade and Barrens and Alkaline Glades and Woodlands</td><td>Southern and Central Appalachian Mafic Glade and Barrens</td></tr>
<tr><td>Central Appalachian Alkaline Glade and Woodland</td></tr>
<tr><td rowspan="3">Cliff, Talus and Shale Barrens</td><td>North-Central Appalachian Circumneutral Cliff and Talus</td></tr>
<tr><td>North-Central Appalachian Acidic Cliff and Talus</td></tr>
<tr><td>Appalachian Shale Barrens</td></tr>
<tr><td rowspan="6">Floodplains, Wetlands, and Riparian Areas</td><td>Central Appalachian Floodplain</td></tr>
<tr><td>Central Appalachian Riparian</td></tr>
<tr><td>Central Interior Highlands and Appalachian Sinkhole and Depression Pond</td></tr>
<tr><td>Southern and Central Appalachian Bog and Fen</td></tr>
<tr><td>North-Central Appalachian Acidic Swamp</td></tr>
<tr><td>North-Central Appalachian Seepage Fen</td></tr>
<tr><td>Caves and Karstlands</td><td>Caves and Karstlands</td></tr>
</table>
</td></tr>
</table>

Theme 1	*T1.3 Ecological Diversity*
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Ecological Systems Diversity
Objectives	See Forest Plan Chapter 3 Objectives for Ecological Systems Diversity
Desired Trend Statement	Trends in conditions of all of our ecological systems are moving toward the LMP desired conditions and objectives.
Monitoring Questions	How are ecological conditions maintaining or making progress toward the LMP desired conditions and objectives? What are the current condition and trend of key characteristics for vegetation identified in the desired conditions (DC) for the plan area? How are management actions maintaining or making progress toward DC for the key characteristics of vegetation in the plan area?
LMP Performance Measures	Current level and trend of ecological conditions, as might be shown by: **1.** Abundance, distribution, and trend of aquatic and terrestrial ecosystem conditions (e.g., vegetation types, successional stages, and structure) that provide species habitat **2.** Abundance, distribution and trend of conditions of special biological areas
Data Sources	FACTS, LANDFIRE, State Agencies (WV DNR, VA DGIF, VA DCR-Natural Heritage Program), FIA, NRIS (Fauna, FSVeg, Terra), The Nature Conservancy, NatureServe, Other Partners.
Importance	Managing for the diversity of plant and animal communities is required by NFMA. The specific direction is the following: "Provide for diversity plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" (16 USC 1604(g)(3)(B)). Ecosystem diversity is a primary means by which a plan contributes to sustaining ecological systems and conserving biodiversity. (NOTE: Disturbance processes are included under maintenance of land health and vitality theme. In addition, abiotic plan components for ecosystem diversity are included under the conservation and maintenance of soil, water, and air resources theme.)
What it Tells Us	This sub-element addresses the composition, structure, abundance, distribution and successional processes of vegetation types in the plan area. Information on these characteristics provides direct evidence of changes in biodiversity and also indexes of the quality, distribution and abundance of habitat to support other elements of biodiversity in the plan area. This information can be used as indicators of change to ecosystems and their associated biota that are difficult to measure directly. (NOTE: This sub-element was narrowed to focus on key characteristics of vegetation of terrestrial ecosystems. Aquatic ecosystems are included under the conservation and maintenance of soil, water, and air resources theme.)

Theme 1	***T1.1 Vegetation Diversity & T1.2 Species Diversity***
Theme 1	***Conservation of Biological Diversity:*** This theme addresses NFS contributions to securing the nation's heritage of plant and animal species in the plan area. Disturbance processes are included under maintenance of land health and vitality theme (T-2). In addition, abiotic plan components for ecosystem diversity are included under the conservation and maintenance of soil, water, & air resources theme (T-3).
Sub-element NFS Generic Desired Condition	***T1.1 Vegetation Diversity:*** *Contributing to securing the nation's heritage of plant species and related habitats for T&E, sensitive, & locally rare in the plan area.* ***T1.2 Species Diversity:*** *Contributing to securing the nation's heritage of animal species and related habitats for T&E, sensitive, & locally rare in the plan area.*
Contextual Statement	Providing for ecosystem diversity meets the needs most of the species on the Forest. However, some species with narrow habitat needs, limited habitat abundance or limited habitat distribution need additional attention. 290 species were identified that needed additional analysis including 10 Federally listed Threatened or Endangered species. The Plan has identified 14 Management Indicator Species (MIS) to indicate the effects of management activities and achievement of desired conditions and objectives.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Species Diversity
Objectives	See Forest Plan Chapter 3 Objectives for Species Diversity
Desired Trend Statement	Trends in ecological conditions for T&E species, sensitive species and locally rare are moving toward the LMP desired conditions and objectives.
Monitoring Questions	How are ecological conditions for selected T&E species, sensitive, or locally rare maintaining or making progress toward the LMP desired conditions and objectives? How are management actions for the recovery of T&E species, conservation of sensitive, and management of locally rare achieving LMP objectives? How are changes in Management Indicator Species and the relationship to their habitats reflecting the effectiveness of management activities in achieving desired conditions and objectives?
LMP Performance Measures	Current level and trend of ecological conditions for T&E, species, sensitive, or locally rare species, as might be shown by: 1. Abundance, distribution, and trend of habitat needs for identified species groups or identified species. 2. Estimation habitat changes for MIS.
Data Sources	FACTS, LANDFIRE, State Agencies (WV DNR, VA DGIF, VA DCR-Natural Heritage Program), FIA, NRIS (Fauna, FSVeg, Terra), The Nature Conservancy, NatureServe, Other Partners.
Importance	Species diversity part of the framework for sustaining ecological systems. T&E species, sensitive and locally rare species must be identified, and specific plan components may be developed for them as required by NFMA. T&E species and their habitats are also required to be protected and managed for under the Endangered Species Act. Monitoring of MIS and the relationships to habitat changes is required by NFMA.

Theme 1	***T1.1 Vegetation Diversity & T1.2 Species Diversity***
What it Tells Us	Ecological conditions, not provided for in T1.1 (ecosystem diversity) to establish appropriate ecological conditions for specific T&E, sensitive and locally rare species, are co-implemented here by additional needed provisions consistent with agency authorities, the capability of the plan area, and overall multiple use objectives. Information is collected on ecological conditions in order to determine whether LMP desired conditions and objectives for species are being met. Estimations of MIS and changes in their habitat conditions could indicate that current management is adversely affecting the composition, structure, or function of those habitats, resulting in Plan direction and desired conditions not being met and the need for adaptive management.

Theme 2	***T2.1 Invasive Species***
Theme 2	**Maintenance of Land Health and Vitality:** This theme addresses ecological disturbance processes affecting social, economic, and ecological conditions within LMP plan areas.
Sub-element NFS Generic Desired Condition	***T2.1 Invasive Species*** The National Forest/Grassland has reduced the potential for introduction, establishment, and spread of invasive species and has reduced existing infestations in priority areas.
Contextual Statement	Invasive species of highest current concern include gypsy moth, Japanese stiltgrass, autumn olive, garlic mustard, tree-of-heaven, multiflora rose, oriental bittersweet, bush honeysuckle, Japanese knotweed, and spotted knapweed. Existing infestations are presumably expanding because control efforts are limited.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Nonnative Invasive Species
Objectives	See Forest Plan Chapter 3 Objectives for Nonnative Invasive Species
Desired Trend Statement	The GWNF has reduced the potential for introduction, establishment, and spread of invasive species and has reduced existing infestations in priority areas.
Monitoring Questions	What are the status and trends of areas infested by aquatic and terrestrial invasive species on the unit's plan area relative to the desired condition? How effective were our management activities including partnerships in preventing or controlling targeted invasive species (some of which may be Species of Interest)?
LMP Performance Measures	Change in extent and rate of spread of the targeted species infestation Change in ecosystem and species diversity in infested areas Percentage of priority (treated) acres successfully restored against targeted invasive species
Data Sources	Data are available from these Forest Service sources: FIA, FACTS, and NRIS.
Importance	Invasive species infestations negatively affect forest health, management objectives, genetic diversity, recreational use, resource production, water quality, and the economy. The threat to land health from invasive species is acute and is expanding. If invasive species are present, natural processes and the survival of native species are at great risk. NFMA requires that we provide for diversity of native species, and invasive species threaten our ability to meet this requirement. Both the national Invasive Species Council and the Forest Service have national strategies and management plans.
What it Tells Us	With the wide range of invasive species (plants, vertebrates, invertebrates, and pathogens) affecting ecosystems and the respective native species and natural processes, monitoring the status of infestations on the National Forest System will help us to evaluate the effectiveness of our management activities, and subsequently the condition of the land, or land health. It will also help us to prioritize areas for restoration.

Theme 2	***T2.2 Resilience to Fire Disturbance*.**
Theme 2	**Maintenance of Land Health and Vitality:** This theme addresses ecological disturbance processes affecting social, economic, and ecological conditions within LMP plan areas.
Sub-element NFS Generic Desired Condition	***T2.2 Resilience to Fire Disturbance*.** Fire-adapted ecosystems in the plan area contribute to sustainable environmental, social, and economic benefits, i.e., Fire Regime Condition Class (FRCC) 1.
Contextual Statement	On the GWNF, fire management, both prescribed fire for ecosystem restoration and wildfire, is a major focus to us and to our neighbors and partners. A return to fire-adaptive ecosystems throughout the GWNF is preferred, yet, in areas near residential developments and other high-value sites, rapid suppression and management treatments are likely necessary until successful return to fire-adapted systems occurs on adjacent wildlands.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Fire
Objectives	See Forest Plan Chapter 3 Objectives for Fire
Desired Trend Statement	Management activities allow for no net loss of FRCC 1 lands, while restoring FRCC 2 and FRCC 3 areas, where restoration activities have the highest probability of success, are consistent with multiple resource objectives, and are socially and economically feasible.
Monitoring Questions	What is the distribution and trend in Fire Regime Condition Class on the National Forest/Grassland? How effective are management actions in moving the National Forest/Grassland toward FRCC 1?
LMP Performance Measures	Number of acres in each FRCC at a benchmark (*i.e.,* the release of LANDFIRE National data) compared to acres in each FRCC at a five year interval following the benchmark year. Impact of management actions designed to improve FRCC distribution
Data Sources	LANDFIRE, FACTS, and local monitoring
Importance	Fire suppression has caused ecosystem health problems. Much of the GWNF has ecological systems where periodic fire has historically played an important role in preserving structure and composition of the systems.

Theme 2	***T2.2 Resilience to Fire Disturbance*.**
What it Tells Us	By focusing on assessing resilience to fire disturbance, we will be able to adjust our management actions to restore lands to a more healthy fire frequency and intensity. We will use Fire Regime Condition Class (FRCC), which is a measure of ecological integrity and/or departure from reference conditions. It tells us if the ecosystem in question is doing well, in concert with inherent disturbance regimes (class 1), in some jeopardy based on the time since the last disturbance (class2), or significantly altered and at risk of losing key ecological components that define that ecosystem as unique (class 3). It is most relevant to measure long-term trends rather than annual changes, and the scale of FRCC is also meaningful for hydrological sub unit analysis. In the LMP, FRCC monitoring can be useful in targeting areas for priority management activities or measuring progress or deterioration of a given area over time.

Theme 2	***T2.3 Native Insects & Pathogens***
Theme 2	**Maintenance of Land Health and Vitality:** This theme addresses ecological disturbance processes affecting social, economic, and ecological conditions within LMP plan areas.
Sub-element NFS Generic Desired Condition	***T2.3 Native Insects & Pathogens*.** National Forest/Grassland ecosystems have the capacity for renewal and recovery from outbreaks caused by native insects and pathogens while meeting desired values, uses, products, and services.
Contextual Statement	The main native insect of concern on the GWNF is the southern pine beetle. It is not often a major problem, but populations can occasionally build up to the point that it causes damage to the native pine stands on the GWNF.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Native Invasive Species
Objectives	See Forest Plan Chapter 3 Objectives for Native Invasive Species
Desired Trend Statement	Native insect and pathogen populations are maintained within or moving towards a range that allows the ecosystem to recover from outbreaks while meeting desired values, uses, products and services.
Monitoring Questions	What are the status and trends of outbreaks of native insects and pathogens on the National Forest/Grassland? What are the trends in areas at risk to future outbreaks of native insects and pathogens on the National Forest/Grassland?
LMP Performance Measures	Location and extent of outbreaks of native insects and pathogens. Location and extent of areas at risk to future outbreaks of native insects and pathogens.
Data Sources	Data are available from FHM, FHP, FIA, and NRIS.
Importance	Native insects and pathogens are natural components of ecosystems playing critical roles in development and succession of plant communities, decomposition, and soil formation. Population dynamics of native insects and pathogens are influenced by vegetation condition, climate, other disturbances, management activities, host defenses, and natural enemies. Changes in these factors can lead to outbreaks or epidemics of native insects and pathogens with significant ecological and economic consequences.
What it Tells Us	This sub theme will help us determine the status and trends in outbreaks of native insects and pathogens and relate those to the health and sustainability of the National Forest/Grassland ecosystems. Identifying areas at risk for future outbreaks will facilitate development of prevention strategies.

Theme 3	***T3.1 Watershed Health***
Theme 3	**Conservation and Maintenance of Soil, Water, and Air Resources:** This theme addresses the ecological condition (for soil, air, and water) of watersheds to protect the physical, chemical and biological integrity; the productive capacity of NFS land; water quality and quantity; and opportunities for beneficial uses. It also addresses the related capacity of watersheds to respond resiliently to flooding and to reach or sustain their aquatic ecosystem potential.
Sub-element NFS Generic Desired Condition	***T3.1 Watershed Health*** Ecological function operates in its natural role within watersheds of the plan area while resource management activities sustain human needs and uses.
Contextual Statement	The GWNF has tremendous opportunities that depend upon healthy watersheds, including the abundance of high-quality water that provides drinking water to neighboring communities and habitat for T&E, sensitive and locally rare species. Concern for healthy watersheds is growing because so much depends upon it. A watershed is the area of land that drains water to an outlet at some point along a stream channel. Watershed function is the ability of watersheds to route water, sediment, nutrients, and organic material from hill slopes and groundwater aquifers to the channel network. It also includes the ability of stream channels to transport the sediment being delivered to them. The rates at which these processes occur are a function of climate, geology, landforms, soils, and vegetation. Watershed integrity and stability refer to the ability of watersheds, stream channels, riparian areas, groundwater aquifers, and wetlands to absorb and reduce the impacts from normal floods (i.e., those that occur approximately every 2 to 3 years, on average) and similar disturbances without rapid erosive changes to the system.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Watersheds, Soils, and Geologic Resources
Objectives	See Forest Plan Chapter 3 Objectives for Watershed Resources
Desired Trend Statement	Trends in aquatic ecosystems are moving toward the LMP desired conditions and objectives.
Monitoring Questions	What is the ecological condition and trend of watershed health, including the aquatic ecosystem potential, for watersheds identified in the desired condition and/ or objectives of the plan area? How effective are management actions in moving the National Forest/Grassland toward improving watershed health? Are management systems implemented in a manner to assure they do not substantially and permanently impair the productivity of the land?
LMP Performance Measures	Current status and trend for soil productivity, water quality and quantity, air quality, and other ecological parameters to address ecological condition within watersheds so that they are able to attain their aquatic ecosystem potential. Examples o Physical characteristics of stream channel (e.g., amount of large woody debris) o Chemical characteristics of stream channel (e.g., nutrient loading) o Biological characteristics of stream channel (e.g., macro-invertebrate populations) o Riparian area characteristics (e.g., vegetation diversity, invasive species, etc.) o Upland characteristics of watershed (e.g., soil monitoring, vegetative trend and condition)

Theme 3	***T3.1 Watershed Health***
Data Sources	Macroinvertebrate monitoring database, water quality monitoring database
Importance	Watershed health is integral to all aspects of resource management and use. Watershed health is a state in which resource management activities sustain human needs and uses of the watershed while ensuring ecological function is maintained. Maintaining watershed health through watershed management requires land managers to balance human needs and uses with ecological conditions within the watershed. Good watershed management maintains the productive capacity of NFS land; protects water quality and quantity; provides beneficial uses; and reduces the threat of flood. Productive soils and adequate moisture ensure the existence of potential community types and wildlife habitats.
What it Tells Us	The sub-element will measure the status and trend of ecological conditions to reflect results of cumulative effects of watershed management activities on watershed health and the cumulative benefits of good land management. This is not a direct measure of biodiversity. Rather, it addresses ecological conditions that will in turn support biodiversity (aquatic ecosystem potential). Biodiversity itself is addressed in the "conservation of biological resources" theme.

Theme 4	***T4.1 Diversity of Opportunities and Settings***
Theme 4	**Maintenance and Enhancement of Social Systems:** This theme addresses the opportunities, settings, suitable uses for multiple-use provided by the NFS, including opportunities for market and non-market activities. Related goods and services derived from the opportunities and settings provided are reflected in the economic theme (T-5).
Sub-element NFS Generic Desired Condition	***T4.1 Diversity of Opportunities and Settings*** *(including 'Access' & 'Opportunity for Commodity Production')* Settings available on the NFS unit deliver multiple social opportunities that contribute to the sustainability of social, ecological, and economic systems in the plan area.
Contextual Statement	As the largest National Forest east of the Mississippi River, the GWNF provides a wide diversity of opportunities to a very large population. These include recreation opportunities ranging from wilderness to remote backcountry to developed campgrounds in attractive, natural-appearing settings. Mountain biking, horseback riding, hiking and motorized trail use are all important activities. The GWNF provides habitat for a wide variety of species and habitat management activities often result in timber production. Hunting and fishing are also important uses of the Forest.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Recreation, Trails, Scenery, Heritage Resources, Geologic Resources, Lands and Special Uses, Roads and Facilities, Timber Management, Mineral Resources, and Drinking Water
Objectives	See Forest Plan Chapter 3 Objectives for Recreation, Scenery, Timber Management, and Wilderness, Roadless Areas, Eligible Wild and Scenic Rivers
Desired Trend Statement	Trends in monitoring measures indicate either progress toward or alignment between desired conditions, desired settings, and desired opportunities
Monitoring Questions	What is the status and trend of settings and opportunities provided by the NFS unit compared to Desired Conditions stated in the LMP? How are management actions maintaining or improving Desired Conditions for settings and opportunities provided by the NFS unit, including contributions to sustaining social systems within the unit's LMP analysis area? How do people involved in the adaptive planning process interpret settings and opportunities provided by the NFS unit compared with Desired Conditions? Do they think there is a need for change?
LMP Performance Measures	Settings and opportunities associated with social systems (e.g., via facilities, Wilderness, open space, scenery, recreation infrastructure, access, accessibility, commodity production, special use permits, visitor days, outfitter guide permits, etc.) Other as appropriate • Acres and location of ROS classes • Incidents of ATV and OHV violations (discernible routes and miles, violations per patrol-day, etc.) • Backcountry campsite conditions (dispersed recreation sites) • NVUM survey indicators • customer satisfaction comment cards (completed at campgrounds) • condition surveys • contributions toward meeting national accessibility targets • Developed recreation sites meet regional quality standards • National accessibility standards and targets met • Acres and location meeting Scenic Integrity Objectives • Progress toward restoring historic landscape character when natural fire influenced scenic integrity

Theme 4	*T4.1 Diversity of Opportunities and Settings*
	• Ecological intactness relative to long-term scenery and scenic integrity: scenic effect of ecological processes and conditions • Number of acres under lease for oil and gas development • Progress toward meeting the 10-Year Wilderness Stewardship Challenge objectives • Heritage Program performance indicators (Heritage Program Managed to Standard, Heritage Program Plan, National Register eligibility, priority heritage assets, volunteer opportunities)
Data Sources	Data is available from existing programs, such as NVUM, budgets, and contracting information. Existing INFRA databases. Special Use Database (SUDS) is available to track special uses.
Importance	An overall goal of the NFS is to contribute to sustaining the social and economic systems within LMP plan areas. Our ability to characterize the diversity of settings and associated opportunities provided by NFS units is essential for us to tell an integrated story of delivering multiple social and economic benefits to diverse communities. All agency goals have social dimensions and the settings and opportunities provided are especially useful for showing how agency goals are interrelated.
What it Tells Us	It enables us to tell how we are doing in our efforts to (1) contribute to sustaining social systems affected by FS activities and (2) provide settings and opportunities that contribute to maintenance or achievement of sustainable social, ecological, and economic systems. It enables us to tell whether we are providing opportunities consistent with desired conditions. And it enables us to describe our need to change or continue forest and grassland strategies in response to the combination of changing public demands, ecological conditions, and fiscal constraints.

Theme 5	***T5.1 Provision of Goods and Services***
Theme 5	**Maintenance and Enhancement of Economic Systems:** Given the opportunities and settings, suitable uses, and activities designed to make progress towards desired conditions, there are goods and services that come off the land. This theme is about goods and services derived from the opportunities and settings referenced the social theme (T-4). Key contributions of goods and services include revenue and jobs associated with recreation, tourism, resident amenities, environmental services, and commodities such as AUMs and the potential for timber production.
Sub-element NFS Generic Desired Condition	***T5.1 Provision of Goods and Services*** Goods and services provided by or derived from the GWNF contribute to sustaining economic systems in the plan area.
Contextual Statement	Contributions to economic sustainability are reflected in traditional financial measures, amenity values derived from living, working, or owning property within the plan area of analysis, and from non-market valuation of benefits, such as recreation days or environmental services. We want to monitor product and/or financial measures affected by LMP implementation so we have an indication of how opportunities and setting provided are contributing to local economies within the plan area.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Recreation, Timber Management, and Mineral Resources
Objectives	See Forest Plan Chapter 3 Objectives for Timber Management
Desired Trend Statement	Trends in goods and services derived from or provided by the GWNF are consistent with near-term and long-term progress towards desired conditions.
Monitoring Questions	What are the status and trends of goods and services provided from the unit with regards to progress towards desired conditions? How do these goods and services contribute to key opportunities for sustaining economic systems relevant to the plan area?
LMP Performance Measures	Value and quantities of goods and services: (e.g., the following might apply) • Wellheads for production • Mineral materials removed • MMCF offered • MMCF sold • Permits, etc. • Employment and labor income attributable to goods and services provided by NFS management in the plan area.
Data Sources	Resource data availability is generally good at the broad scale within the Forest Service through IMPLAN (Impact Analysis for Planning—an input-output model), and Forest-level specialist reports. NVUM (National Visitor Use Monitoring) data, recreation and wildlife visits and spending, volume of timber harvested and minerals extracted.

Theme 5	*T5.1 Provision of Goods and Services*
Importance	An overall goal for NFS planning is to contribute to sustaining the social and economic systems within the plan area. While the Maintenance and Enhancement of Social Systems Theme characterizes settings and opportunities provided the public, the Maintenance and Enhancement of Economic Systems Theme characterizes the associated economic outcomes of the settings and opportunities provided. Management of National Forests and Grasslands generates commodity and non-commodity goods and services. Examples include timber and non-timber forest products, range forage, recreation opportunities, water, minerals, energy resources, and various other environmental goods and services. Such complex economic systems involve many participants. Responsible Officials decisions impact multi-scale economies whether the Forest is a major or minor contributor. Regardless of the magnitude of contribution, stability and trend of labor and employment contributions and the impact of goods and services on local economies tend to be common concerns across many NFS units. Additionally, "how" we impact economic systems is not limited to magnitude of quantified valuation, but also includes more subtle qualitative relationships, e.g. the economic activity spawned by wildlife viewing or scenic byways.
What it Tells Us	This sub-element allows us to measure contributions to economic systems that are relevant to the plan area and that are attributable to NFS management. It also allows us to measure our efforts in contributing to economic systems using an interdisciplinary and collaborative approach.

Theme 6	***T6.1 Roads and Trails***
Theme 6	**Infrastructure Capacity:** This theme addresses NFS infrastructure's ability to contribute to the aspirations characterized in the LMP.
Sub-element NFS Generic Desired Condition	***T6.1 Roads and Trails*** The road and trail system on the NFS unit is safe, reflects appropriate access, considers needs of adjacent landowners, and meets public demand.
Contextual Statement	The GWNF is projected to have the most area of increases in housing density of all national forest with projected changes on more than 1.4 million adjacent private rural acres by 2030. This will increase use of the Forest and place added demands on infrastructure.
LMP Desired Condition Statement	See Forest Plan Chapter 2 Desired Conditions for Trails, Lands and Special Uses, and Roads and Facilities
Objectives	See Forest Plan Chapter 3 Objectives for Recreation, Roads and Facilities Scenery, and Lands and Special Uses
Desired Trend Statement	Deferred maintenance needs and environmental impacts of the road and trail system within the plan area are stable or declining. Suitable recreation opportunities provided by the road and trail system are increasing.
Monitoring Questions	How many miles of the designated roads and trails meet standard? Where is unauthorized use occurring on or off the road and trail system and is unauthorized use increasing or decreasing? Are the impacts from the road and trail system on soils, water quality, wildlife, and other natural and cultural resources sustainable and within acceptable tolerance? Is the road and trail system serving its intended purposes and addressing recreational demands?
LMP Performance Measures	Miles and percent of road and trail network maintained to standard. Percent of road miles decommissioned compared to target decommissioning
Data Sources	Infra roads, Infra trails, Infra ATM
Importance	Management of trail and road systems can have important effects on land productivity and the accomplishment of desired conditions. Nationally, the Forest Service manages 125,000 miles of National Forest System trails, including portions of 6 national scenic trails and 11 national historic trails, and 386,000 miles of National Forest System roads. This system of roads and trails provides recreational and administrative access and transportation for goods and service providers. It is essential to the Forest Service's capacity to contribute to social, economic, and ecological sustainability, which is an overall goal for NFS management. A well-maintained system provides transportation and recreation opportunities while contributing towards desired ecological conditions.
What it Tells Us	Knowing the status and condition of our road and trail systems inform our efforts to (1) contribute to sustaining social systems affected by FS activities and (2) provide settings and opportunities that contribute to maintenance or achievement of sustainable social, ecological, and economic systems. It highlights the threats of unmanaged recreation, especially OHV recreation, and whether we are providing opportunities consistent with desired conditions. It tells us how well we provide for outdoor recreation and for support for resource protection activities such as wildfire mitigation.

One additional monitoring question is what is the impact of climate change on the planning area? The types of changes that are anticipated are changes in the ecologic characteristics, species needs, and soil and water characteristics that are monitored as part of the previous six themes. Monitoring for climate change will not necessarily entail additional monitoring actions, but will involve close coordination in the evaluation of monitoring results to put them into the context of larger scale monitoring for climate change.

RESEARCH NEEDS

Research and monitoring are related activities that help to meet information needs for adaptive management of national forests. Research involves rigorous study under controlled conditions, following the scientific method. Research activities include study planning, design, quality control, peer review and relatively rigid publication standards. Monitoring is generally conducted under less controlled conditions and results are often more general in contrast with research.

Research needs for management of the National Forests are to be identified during planning and periodically reviewed during monitoring and evaluation of implemented Forest Plans (36 CFR 219.28).

The Forest Service Research Branch is the largest forestry research organization in the world and a national and international leader in forest conservation. Agency research contributes to the advancement of science and the conservation of many of our Nation's most valuable natural resources, both on private lands and the National Forests. Research needs identified during planning, monitoring and evaluation are to be included in formulating overall research programs and plans for Forest Service Research to support or improve management of the National Forests.

Research needs identified during development of this Forest Plan are listed in Appendix G. Research needs identified while monitoring the implementation of the Forest Plan will be reported in Annual Monitoring and Evaluation Reports.

AMENDMENTS

The Forest Plan can be amended at any time during its existence. Such amendments are necessary to ensure that the Plan remains a viable, flexible document for managing the Forest.

Errata sheets may be issued if necessary to correct spelling or grammatical errors, which may lead to confusion in the Forest Plan. Such changes are not considered amendments.

The Forest Plan may also be amended as part of a project-level decision where a change or adjustment in the Forest Plan is appropriate for that project but is not applicable to the entire Forest. Examples of such changes might be adjustments to, or waivers of, standards.

If it is determined during project design that the best method of meeting the management area goals of the Forest Plan is in conflict with either Forest or management area standards, the Forest Supervisor may approve a project-specific amendment to the Forest Plan.

REVISION

This Forest Plan will be revised on a 10-year cycle or at least every 15 years. It may also be revised whenever the Forest Supervisor determines that conditions or demands in the area covered by the Forest Plan have changed significantly or when changes in policies, goals, or objectives would have a significant effect on the Forest-level programs. In the monitoring and evaluation process, the interdisciplinary team may recommend a revision of the Forest Plan at any time.

Future revisions are not effective until considered and approved in accordance with the requirements for the development and approval of a Forest Plan. The Forest Supervisor will review the conditions on the land

covered by the Forest Plan at least every 5 years to determine whether conditions or demands of the public have changed significantly