

# CHAPTER FOUR

## Monitoring and Evaluation

### INTRODUCTION

Monitoring and evaluation are conducted at several scales and for many purposes, each of which has different objectives and requirements. Monitoring requirements and tasks are developed to be responsive to the objectives and scale of the plan, program, or project to be monitored. Monitoring is not completed on every activity nor is it designed to be similar to research in either purpose or degree of statistical rigor. Monitoring completed for the purpose of determining how well the forest plan is working is called National Forest Management Act (NFMA) monitoring.

Monitoring and evaluation are separate, sequential activities required by NFMA regulations to determine how well objectives have been met and how closely management standards and guidelines have been applied. Monitoring generally includes the collection of data and information, either by observation or measurement. Evaluation is the analysis of the data and information collected during the monitoring phase. The evaluation results are used to determine the need for changes to the Revised Plan or how it is implemented.

This chapter provides programmatic direction for monitoring and evaluating forest plan implementation. Monitoring will provide the Forest Supervisor with the information necessary to determine whether the Revised Plan is sufficient to guide management of the Arapaho and Roosevelt National Forests and Pawnee National Grassland for the subsequent year or whether modification of the plan is needed.

The monitoring program described in this chapter differs from the process used to monitor the 1984 plan. The monitoring program in this Revised Plan is more programmatic and is designed to better evaluate the conditions on the Forest. The following pages describe the monitoring process and requirements.

### MONITORING STRATEGY

NFMA monitoring for forest plan implementation involves both minimum legally required monitoring activities as well as additional monitoring that will be conducted based on the availability of funding and personnel. The level and intensity of monitoring and analysis will vary with the budget and other forest priorities.

The monitoring strategy components are:

- Minimum legally required monitoring.

- Monitoring questions which address monitoring beyond the minimum legally required activities. These questions are developed by an interdisciplinary team to address Forest Plan management emphases, goals, and objectives. Monitoring in response to these questions is identified, approved, and scheduled through the annual budget process.
- The Monitoring Evaluation Report which provides an analysis of monitoring results. This report also includes the annual operating plan to provide information on how the monitoring questions will be addressed.

## Monitoring

Monitoring will be accomplished through periodic sampling of current and emerging issues, and through examination of how well the implementation of the *Forest Plan's* goals and objectives is bringing the condition of the Forest and Grasslands to the desired condition specified by the *Plan*.

The *Forest Plan* has identified the key monitoring questions that address each of the priority management emphases, goals and objectives (chapter one) as well as activities mandated by Congress and/or required in the course of recurring work. The questions listed in Tables 4.1 and 4.2 provide focus for the direction and depth of the M&E process. They include priority items identified by both the Forest and the Grassland, and by the public.

In addition to the Forest Interdisciplinary Team's (IDT) responsibility for monitoring the progress of *Forest Plan* implementation, both the public and stakeholders will be involved to determine their perception of how successfully the Forest and Grassland have achieved *Plan* goals and objectives. Information from this involvement will also be used to identify emerging issues during the "life" of the *Plan* and constitutes a key element of both real-time planning and adaptive management.

## Evaluation

The evaluation provides an analysis of how close the Forest and Grassland are to reaching the desired conditions identified in the *Forest Plan* (including goals, objectives and sensitivity to emerging issues). Evaluation serves as a tool the Forest Supervisor can use to continue to involve the public and stakeholders, which began when the *Forest Plan* was first developed. Evaluation will serve as the springboard from which the Forest Interdisciplinary Team can identify changes needed in the *Forest Plan* or its implementation, or research needed to clarify and better address management issues.

## MONITORING QUESTIONS

The strategy appears as a series of monitoring questions. The monitoring questions presented have been developed to respond to legally required monitoring (Table 4.1), Forest Plan management emphasis goals and objectives (Table 4.2), and to provide focus for data collection and analysis. This chapter does not describe specific monitoring and evaluation activities or procedures.

### Legally Required Monitoring

The regulations in 36 CFR 219 describe the NFMA monitoring requirements. Some of these requirements provide guidance to develop the monitoring program while others include specific compliance requirements. The following information describes how the ARNF - PNG will respond to those sections that identify specific monitoring requirements.

**36 CFR 219.7 (f)** - A program of monitoring and evaluation shall be conducted that includes consideration of the effects of National Forest management on land, resources and communities adjacent to or near the National Forest being planned and the effects upon National Forest management of activities on nearby lands managed by other Federal or other government agencies or under the jurisdiction of local governments.

**36 CFR 219.11 (d)** - Monitoring and evaluation requirements that will provide a basis for a periodic determination and evaluation of the effects of management practices.

**36 CFR 219.12 (k)** - Monitoring requirements identified in the plan shall provide for:

- (1) A quantitative estimate of performance comparing outputs and services with those projected by the forest plan;
- (2) Documentation of the measured prescriptions and effects, including significant changes in productivity of the land;
- (3) Documentation of costs associated with carrying out the planned management prescriptions as compared with costs estimated in the forest plan;
- (4) A description of the following monitoring activities:
  - (i) the actions, effects, or resources to be measured, and the frequency of measurements;
  - (ii) expected precision and reliability of the monitoring process; and
  - (iii) the time when evaluations will be reported.

(5) A determination of compliance with the following standards:

- (i) Lands are adequately restocked as specified in the plan;
- (ii) Lands identified as not suited for timber production are examined at least every 10 years to determine if they have become suited; and that, if determined suited, such lands are returned to timber production;
- (iii) Maximum size limits for harvest areas are evaluated to determine whether such size limits should be continued; and
- (iv) Destructive insects and disease organisms do not increase to potentially damaging levels following management activities.

**36 CFR 219.19 (a)(6)** - Population trends of the management indicator species will be monitored and relationships to habitat changes determined. This monitoring will be done in cooperation with State fish and wildlife agencies, to the extent possible.

**36 CFR 219.21 (g)** - Forest planning shall evaluate the potential effects of vehicle use off roads and on the basis of the requirements of 36 CFR part 295 ..., classify areas and trails of National Forest System lands as to whether or not off-road vehicle use may be permitted.

Table 4.1 describes how the Arapaho and Roosevelt National Forests and Pawnee National Grassland will respond to the minimum legally required monitoring items. The specific techniques and protocols to be used are identified in the Annual Operational Plan, which is developed in conjunction with the annual budget and the work planning process. This allows monitoring to be defined based on emerging issues, forest priorities, and the budget. The monitoring methods used are divided into two categories, A and B based on their relative precision and reliability:

**A** - Methods are generally well accepted for modeling or measuring the resource. Methods used produce repeatable results and are often statistically valid. Reliability, precision, and accuracy are very good. The cost of conducting these measurements is higher than other methods. Methods are often quantitative.

**B** - Methods or measurement tools are based on a variety of techniques. Tools include: project records, communications, on site ocular estimates and less formal measurements such as pace transects, informal visitor surveys, aerial photo interpretation, and other similar types of assessments. Reliability, accuracy, and precision are good, but usually less than that of A. Methods may be more qualitative in nature but they still provide valuable information on resource conditions.

Table 4.1. Minimum Legally Required Monitoring Activities.

Action, Effect or Resource to be Measured	Frequency of Measurements	Precision and Reliability	M & E Report <sup>a</sup>
Lands are adequately restocked. 36 CFR 219.12(k)5(i)	Mix of 1st, 3rd & 5th years per FSM 2472.4	A	Annual
Lands not suited for timber production. 36 CFR 219.12(k)5(ii)	Year 10	A	Year 10
Harvest unit size. 36 CFR 219.12(k)5(iii)	Years 5 & 10	B	Years 5 & 10
Control of destructive insects and diseases. 36 CFR 219.12(k)5(iv)	Annual	B	Annual
Population trends of management indicator species in relationship to habitat changes. <sup>b</sup> 36 CFR 219.19(a)(6)	Years 5 & 10	B	Years 5 & 10
Effects of off-road vehicles. 36 CFR 219.21	Annual Review, Analysis years 5 & 10	B	Years 5 & 10
Effects to lands and communities adjacent to or near the National Forest and effects to the Forest from lands managed by government entities. 36 CFR 219.7(f)	Years 5 & 10	B	Years 5 & 10
Comparison of projected & actual outputs and services. 36 CFR 219.12(k)1	Annual	A	Annual
Prescriptions and effects. 36 CFR 219.12(k)2	Years 5 & 10	B	Years 5 & 10
Comparison of estimated and actual costs. 36 CFR 219.12(k)3	Annual	A	Years 5 & 10
Effects of management practices. 36 CFR 219.11(d)	Years 5 & 10	B	Years 5 & 10

<sup>a</sup> The frequency of measurement and reporting are triggered by regulation as well as anticipated intervals at which gathered data will provide meaningful information.

<sup>b</sup> For further discussion of management indicator species (MIS), see Appendix G of the FEIS. Appendix G describes MIS habitat and effects on habitat. This serves as the basis to monitor population changes of management indicator species.

**Forest and Grassland Management Emphasis**

Table 4.2 represents Forest Plan monitoring questions that address priority management emphasis, goals and objectives in Chapter 1 of the Forest Plan. These questions will be addressed once legally required monitoring has been accomplished. This portion of M & E activities will vary each year in response to changing issues, budgets, science and methodologies. It is anticipated that the depth of analysis for any of the priority management emphasis questions may also vary from year to year.

**Table 4.2. Forest Plan Monitoring Questions for Priority Management Emphasis and Stakeholder/Public Involvement, ARNF-PNG, 1996-2007.<sup>a</sup>**

PROGRAM GOAL TOPICS	MEAS. FREQ.	QUESTIONS TO GIVE FOCUS TO MONITORING AND EVALUATION ACTIVITIES
<b>Priority Management Emphasis</b>		
<u>Biological Diversity</u> General - Successional - Structural Stages	Years 5 & 10	Have the Forests and Grassland made progress toward assuring adequate representation of the full range of successional or structural stages of community types across the forest and grassland landscapes? How has the representation of successional stages been accomplished? (Biodiversity; General - Obj. #12)
General - Ecological Processes & Human Influences	Years 5 & 10	Has progress been made toward improving Forest and Grassland wildlife habitat and watershed condition through modification of system roads, trails and ways? How has this been accomplished? (Biodiversity; General - Obj. #3)
General, Old Growth	Years 5 & 10	Have old-growth quantity and quality been maintained and have management activities assured adequate/sufficient old growth for the future? How has this been accomplished? (Biodiversity; General - Obj. #2) (36 CFR219.)
General, Threatened Endangered and Sensitive Species	Years 5 & 10	Have habitat-improvement projects resulted in protection, restoration and enhancement of habitat for threatened, endangered and sensitive species? What management practices have been most effective? (Biodiversity; General - Obj. #3)
Air, Soil & Water -Air Quality Related Values	Year 5	Is progress being made to move air quality related values from at-risk to a maintenance or higher level of protection? How were related values protected and improved? (Biodiversity; Air, Soil & Water - Obj. #4) (CFR 219.23 e)
Air, Soil & Water - Forest Emission Budget	Year 5	Has progress been made on developing a Forest and Grassland emission budget? How was the Forest emission budget developed? (Biodiversity; Air, Soil & Water - Obj. #5)

PROGRAM GOAL TOPICS	MEAS. FREQ.	QUESTIONS TO GIVE FOCUS TO MONITORING AND EVALUATION ACTIVITIES
Air, Soil & Water - Functional Watersheds	Annual or as Needed	Has the Forest made progress toward moving sixth-level watersheds from at-risk or non-functional to functional? Which watersheds were improved and how was this accomplished? (Biodiversity; Air, Soil & Water - Obj. #7)
Air, Soil & Water - Ecological Land Units	4 ELU' per Year	Has the Forest made progress toward moving Ecological Landtype Units from at-risk to a maintenance or higher functioning level? How was this accomplished? (Biodiversity; Air, Soil, & Water - Obj. #6) (CFR 219.23 e)
Air, Soil & Water - Stream Flows	As Needed	Has the Forest made progress toward obtaining (through negotiation, trade or purchase) stream flows to sustain aquatic life and maintain stream processes on up to 5 reaches of stream channels? What were the most effective and cost efficient methods? (Biodiversity; Air, Soil & Water - Obj. #8)
Air, Soil & Water - Point Source Pollution	Annual or as Needed	Has the Forest made progress toward reducing non-point source pollution in Class II and III watersheds and in streams which are not fully supporting State-designated uses? How has this been accomplished? (Biodiversity; Air, Soil & Water - Obj. #10)
Vegetation - High Fire Hazard	Annual	Has the Forest made progress toward reducing the number of high fire hazard, high value, and high and moderate risk acres? How was this accomplished? What was the most effective method? (Biodiversity; Vegetation - Obj. #11)
Human Uses Wilderness	Annual	Is the Forest making progress toward providing designated wilderness campsites where resource impacts from users are evident? (Human Uses - Obj. 2)
Developed Recreation	Annual	Has the Forest made progress toward providing a mix of facility reconstruction, expansion, and, when possible, new development consistent with future use projections? Has this been done to assure quality developed recreational opportunities? (Human Uses, Developed Recreation - Obj. #4)
Dispersed Recreation	Annual	Has the Forest made progress toward reconstructing or rehabilitating impacted dispersed areas and sites, providing new designated dispersed campsites consistent with future use projections? How has this been accomplished? (Human Uses, Dispersed Recreation - Obj #1, #3)
Visitor Satisfaction	Annual	Have the Forest and Grassland made progress toward providing satisfactory recreational experiences to visitors? (Human Uses, Visitor Satisfaction - Obj. # 5)
Travel Management	Annual or as Needed	Have priorities been established and implemented for managing travel to best meet future travel and access needs of Forest users? How has this been accomplished? (Human Uses, Travel Management - Obj #6, #7, #8, #9, #10, #11)

PROGRAM GOAL TOPICS	MEAS. FREQ.	QUESTIONS TO GIVE FOCUS TO MONITORING AND EVALUATION ACTIVITIES
<b>Land Uses &amp; Ownership Boundary Mgt., Access, &amp; Land Ownership Adjustments</b>	<b>Semi Annual</b>	Has the Forest made progress toward improving boundary management, access, and land ownership adjustments to protect and enhance Forest and Grassland resources and to increase management efficiencies? Which approaches have been effective? (Land Uses & Ownership, Boundary Mgt., etc. - Obj. #1, #2)
<b>Case Backlog for SUPs, ROW Grants, &amp; Land Ownership Adjustments</b>	<b>Annual or as Needed</b>	Have the Forest and Grassland made progress toward improving customer services to reduce the number of backlogged cases for special-use permits, rights-of-way grants, and landownership adjustments? How has this been accomplished? (Land Uses & Ownership, SUPs, ROW Grants & Landownership Adjustments - Obj. #2)
<b>Permit Review</b>	<b>Annual</b>	Have the Forest and Grassland made progress toward working with potential permittees to insure that benefitting parties assume the costs of permit review and administration? How has this been accomplished? (Land Uses & Ownership, Permit Review - Goal #2)
<b>Stakeholder &amp; Public Involvement</b>		
<b>Emerging Issues</b>	<b>Annual</b>	Have changes in agency management activities resulted in unforeseen issues that the ARNF and PNG need to address? How were needed changes determined and what recommendations or solutions did the public offer?
<b>Public Involvement</b>	<b>Annual</b>	How and to what extent have the public and stakeholders been involved in assisting implementation, monitoring and evaluation of the Forest Plan.

<sup>a</sup>All monitoring assumes that the full range of management activities follows management area, geographic area, and forestwide direction; laws and management policy; and acceptable resource-protection standards and guidelines. Deviations from this assumption will be identified through the monitoring process.

Where there is a “less than ideal” budget situation, the Forest Leadership Team will prioritize M & E activities in Table 4.2 on an annual basis and make recommendations for budgeting and Forest Supervisor approval to proceed.. Examples of criteria to prioritize annual M&E activities include, but are not limited to the following:

- Does the activity represent key input to resolving priority issues stakeholders and/or Forest Service employees?
- Does the activity effectively minimize the potential for appeals and litigation may cause remand or major rework?
- Does the activity provide “best information” to improve management direction and/or *Plan* implementation?

- Does the activity generate increasing public and/or employee support for *Plan* implementation?

## **THE ANNUAL MONITORING AND EVALUATION REPORT**

The interdisciplinary team develops an annual Monitoring Evaluation Report which summarizes the results of completed monitoring, evaluates the data, and makes recommendations to the Forest Supervisor. Based on the report and other relevant information, the Forest Supervisor will either certify the Revised Plan as sufficient for management over the subsequent year or that the plan needs to be amended.

The Monitoring Evaluation Report may provide summaries of data collected, but is primarily written to display the evaluation of the data and the conclusions and recommendations reached. Comparison of subsequent monitoring evaluation reports provides a tracking mechanism for forest plan implementation, for the plan's effectiveness, for changes to the plan that have been made, and for those changes still needed.

The Monitoring Evaluation Report:

- Summarizes the results of monitoring.
- Assess management practices and the effectiveness of management in achieving goals, objectives, and desired conditions specified in the Revised Plan.
- Compares actual outputs, services, and costs with those estimated in the Revised Plan.
- Evaluates the data for indications of trends or effects.
- Identifies needed changes in forest plan implementation. Indicated whether there is a need to amend or revise the Revised Plan.
- Identifies research needed by the National Forest System.
- Outlines the annual operational plan used to develop the Monitoring Evaluation Report. The Forest Supervisor determines the appropriate level of funding for monitoring after the annual operational plan has been developed and discussed by the Forest Leadership Team.

Monitoring and the evaluation of monitoring data are considered key management elements. They keep the Revised Plan up-to-date and responsive to changing issues by verifying the

effectiveness of forest plan standards and guidelines, anticipated program and project effects on resources, and providing the basis for amendments to the Plan.

### **Sources of Monitoring Information**

The information needed to answer questions in Table 4.2 may be the result of a special data gathering effort, or it may come from existing sources. These information sources include regular inventory surveys, accomplishment reports, environmental reports, integrated management reviews, site-specific observations by specialists, and special data collection efforts initiated for other purposes but of value for monitoring. Detailed information collected through project-level monitoring will be used whenever appropriate. Monitoring and evaluation will be conducted in an efficient, practical, and affordable manner and should not duplicate existing data collection or analysis efforts.

As an integral part of the Monitoring Evaluation Report preparation, the interdisciplinary team will coordinate with other federal, state and local entities to monitor items that are broader in scope that can be resolved on a single National Forest (examples may include goshawk and Neotropical bird surveys, insect and disease trends, etc). In addition, coordination with the public, academia, other government agencies, and research scientists is an important part of the monitoring program. Due to the complexities and uncertainties of resource management, the Forest will rely on many sources for information, data, input, and feedback.

### **SUMMARY**

The monitoring strategy identified in this chapter establishes the process the Forest will follow to ensure it meets regulatory requirements for monitoring. The three major components of the process are:

- The minimum legally required monitoring.
- The monitoring questions to verify how well the Forest Plan is being implemented.
- The Monitoring Evaluation Report which provides both an analysis of monitoring results and the annual operational plan.

Through this process, implementation of Forest standards and guidelines will be evaluated, effects of prescriptions and management practices will be analyzed, and the outputs, services, and costs associated with plan implementation will be conducted.