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# CHAPTER 4: 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 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 to revise management plans or how they are implemented, and form a basis for adaptively managing the national grasslands and forests. Monitoring and evaluation keep the Revised Management Plan up-to-date and responsive to changing issues by verifying the effectiveness of management plan standards and guidelines and anticipated program and project effects on resources, and providing information for amendments to the management plan.

This chapter provides programmatic direction for monitoring and evaluating management plan implementation. Monitoring provides the Forest Supervisor with the information necessary to determine whether the Revised Management Plan is sufficient to guide management of the national grasslands and forests for the subsequent year or whether modification of the plan is needed.

## MONITORING STRATEGY

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

The monitoring strategy components are:

- Legally required monitoring.

- Monitoring questions that address monitoring beyond the legally required activities. These questions address management plan emphases, goals, and objectives. Monitoring in response to these questions is identified, approved, and scheduled through the annual budget process.
- Monitoring and Evaluation Report that summarizes the completed monitoring and evaluation.

## **Monitoring**

The Revised Management Plan identifies the key monitoring questions that address each of the priority management goals and objectives (Chapter 1), 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 monitoring and evaluation process. They include priority items identified by both Forest Service employees and the public.

Forest Service research will be involved with developing protocols for monitoring, as well as, to the extent possible, other federal agencies and state agencies.

## **Evaluation**

The evaluation provides an analysis of how close the national grasslands and forests are to reaching the desired conditions identified in the Revised Management Plan. Evaluation also helps identify changes needed in the Revised Management Plan or its implementation, or research needed to clarify and better address management issues. The Monitoring and Evaluation Report serves as a tool to keep the public informed on the implementation of the Revised Management Plan.

## **Sources of Monitoring Information**

The 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 and Evaluation Report preparation, the Forest Service coordinates with other federal, state and local entities to monitor items that are broader in scope that cannot be resolved on a single national grassland or forest, such as migratory bird surveys and insect and disease trends. In addition, coordination with the public, academic, other government agencies, and research scientists is an important part of the monitoring program. Because of the complexities and uncertainties of resource management, the Forest Service relies on many sources for information, data, input, and feedback.

# MONITORING QUESTIONS

The monitoring questions presented have been developed to respond to legally required monitoring (Table 4.1), Revised Management Plan 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.

**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 (may not apply to many of the the National Grasslands):

- (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 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, with a goal of a 70 to 80% confidence level.

**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. Legally Required Monitoring**

| <b>Action, Effect or Resource to be Measured</b>   | <b>Frequency of Measurements</b>              | <b>Precision and Reliability</b> | <b>M &amp; E Report<sup>a</sup></b> |
|--|---|----------------------------------|-------------------------------------|
| Population trends of management indicator species in relationship to habitat changes. 36 CFR 219.19(a)(6)  | Annual<br>Analysis every 5 years              | A                                | Annual                              |
| Effects of off-road vehicles.<br>36 CFR 219.21 (g)   | Annual Review,<br>Analysis every 5 years      | B                                | Annual                              |
| Effects to lands and communities adjacent to or near the national grassland or forest and effects to the grassland or forest from lands managed by government entities.<br>36 CFR 219.7(f) | Every 5 years                                 | B                                | Every 5 years                       |
| Comparison of projected & actual outputs and services.<br>36 CFR 219.12(k)1  | Annual  | A                                | Annual                              |
| Prescriptions and effects. (See Table 4.2)<br>36 CFR 219.12(k)2  | Every 5 years                                 | B                                | Every 5 years                       |
| Comparison of estimated and actual costs.<br>36 CFR 219.12(k)3   | Annual  | A                                | Every 5 years                       |
| Effects of management practices. (See Table 4.2)<br>36 CFR 219.11(d)   | Every 5 years                                 | B                                | Every 5 years                       |
| Lands are adequately restocked (as applicable).<br>36 CFR 219.12(k)5(i)  | Mix of 1st, 3rd & 5th<br>years per FSM 2472.4 | A                                | Annual                              |
| Lands not suited for timber production (as applicable).<br>36 CFR 219.12(k)5(ii)   | Year 10                                       | A                                | Year 10                             |
| Harvest unit size (as applicable).<br>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                              |

<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.

## Grassland Management Emphasis

Table 4.2 represents management plan monitoring questions that address priority management emphasis, goals and objectives in Chapter 1. These questions will be addressed once legally required monitoring has been accomplished. This portion of monitoring and evaluation 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 monitoring questions may also vary from year to year.

**Table 4.2. Management Plan Monitoring Questions**

| <b>GOAL 1: ENSURE SUSTAINABLE ECOSYSTEMS</b>   |                                      |
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| <b>Goal 1.1: Endangered, Threatened, and Sensitive (TES) Species</b>   | <b>Desired Measurement Frequency</b> |
| Have appropriate strategies been developed jointly with US Fish and Wildlife Service and implemented within 3 years?   | Every 5 years                        |
| Has at least one conservation strategy been developed annually for a regionally sensitive species?   | Annual                               |
| Have positive trends in populations, habitat availability, habitat quality, or other factors affecting threatened, endangered, and sensitive species. been demonstrated for recovery of TES species?   | Every 5 years                        |
| <b>Goal 1.2: Species of Concern</b>  |                                      |
| Have positive trends been demonstrated in habitat availability and quality or other factors for species of concern?  | Every 5 years                        |
| Have unique plant and wildlife communities been inventoried and management strategies been developed?  | Annual                               |
| <b>Goal 1.3: Protected Areas</b>   |                                      |
| Have features and communities of special concern been conserved in protected areas (Wilderness, Research Natural Areas, and Special Interest Areas)?   | Fifth year                           |
| Have management plans been developed and implemented for Research Natural Areas?   | Fifth year                           |
| <b>Goal 1.4: Watershed, Riparian, and Aquatic Systems</b>  |                                      |
| Have 20 percent of 6th level watersheds moved from Class II to Class I, or from Class III to Class II? This applies to National Forest System Lands only.  | Every 10 years                       |
| Has a 20 percent reduction been achieved in acres of detrimentally impacted soils?   | Every 5 years                        |
| Has a 20 percent reduction been achieved in the amount of degraded water bodies?   | Every 5 years                        |
| Have at least 80 percent of unsatisfactory riparian areas noticeably and measurably moved towards proper functioning condition?  | Every 10 years                       |
| Have practices been implemented that will move at least 80 percent of the riparian areas and woody draw areas toward desired conditions?   | Every 5 years                        |
| <b>Goal 1.5: Rangeland Ecosystems</b>  |                                      |
| Have practices been implemented to achieve desired vegetation structure ? Desired level of reliability is an 80% confidence level.   | Annual                               |
| Are upland landscapes moving towards desired conditions for structure? (This includes identification of sufficient reference areas to provide data on potential grassland structure and to assess whether areas grazed by livestock are at, moving toward, or moving away from desired grassland structure.) | Annual                               |
| Have practices been implemented to achieve desired vegetation composition?   | Annual                               |

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| Are upland landscapes moving towards desired conditions for composition (this includes identification of sufficient reference areas to provide data on potential plant communities and to assess whether the existing plant communities are at, moving toward, or moving away from the desired plant composition) | Every 10 years (or sooner)                   |
| Has range infrastructure direction been met?  | Annual, analysis every 5 years               |
| <b>Goal 1.6: Forested Ecosystems</b>  |  |
| Are 20 percent of the forested landscapes moving towards desired conditions?  | Every 5 years                                |
| <b>Goal 1.7: Ecological Processes</b>   |  |
| Have desired percentages of rest been met?  | Annual                                       |
| Have prescribed fire practices been implemented to meet desired conditions?   | Annual                                       |
| Has expansion of areas affected by noxious weeds been reduced or limited?   | Every 5 years                                |
| Has a certified noxious weed program been developed and implemented?  | Third year                                   |
| Has an integrated pest management program for noxious weeds been implemented?   | Third year                                   |
| <b>Goal 1.8: Wildlife and Fish Habitat</b>  |  |
| Has sufficient habitat been provided for stable or increasing populations of management indicator species?  | Every 5 years                                |
| <b>Goal 1.9: Hazardous Substance Sites</b>  |  |
| Have response actions been taken on hazardous substance sites within high-priority watersheds?  | Annual or as specified in site recovery plan |
| <b>Goal 1.10: Water Quantity</b>  |  |
| Has appropriate percentage of instream flow rights been acquired?   | Every 5 years                                |
| <b>Goal 1.11: Air Quality</b>   |  |
| Have Prevention of Significant Deterioration permit applications been reviewed in a timely manner, and have appropriate recommendations been made?  | Every 5 years                                |
| <b>GOAL 2: PROVIDE MULTIPLE BENEFITS FOR PEOPLE WITHIN THE CAPABILITY OF ECOSYSTEMS</b>   |  |
| <b>Goal 2.1: Recreation Opportunities</b>   |  |
| Has at least 80 percent trail mileage rated poor or critical received appropriate maintenance within 15 years?  | Annual                                       |
| Has readily available off and on-site information on recreation opportunities for developed and historic sites been provided?   | Annual                                       |

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| Has appropriate directional signing to key recreation sites been provided?  | Annual         |
| Have site plans been developed and implemented for all developed recreation sites?  | Every 5 years  |
| Have new trails and recreation sites been developed, according to plan objectives?  | Every 5 years  |
| Have conditions at high use sites been inventoried and appropriate rehabilitation occurred?   | Every 5 years  |
| Has interpretive information been provided in response to customer surveys?   | Every 5 years  |
| <b>Goal 2.2: Wilderness and Special Area Opportunities</b>  |                |
| Have wilderness, research natural area, and national recreation area plans been revised to emphasize recreational, aesthetic, and educational experiences consistent with the values of those areas and other plan direction? | Third year     |
| <b>Goal 2.3: Heritage Education and Resource Use</b>  |                |
| Have targeted acreages for inventory and evaluation been met?   | Annual         |
| Have preservation plans been developed for at least 20% of all listed National Register heritage sites and heritage districts?  | Every 5 years  |
| Has interpretation been provided for National Register heritage sites where appropriate and consistent with preservation plans?   | Every 5 years  |
| Have management plans for protection of traditional cultural properties been developed as needed in consultation with American Indian tribes?   | Every 5 years  |
| Have prehistoric, ethnographic and historic overviews been updated?   | Every 10 years |
| Has a strategy and implementation schedule for heritage resources been developed?   | Third year     |
| <b>Goal 2.4: Miscellaneous Products</b>   |                |
| Have miscellaneous products been made available in a manner consistent with desired conditions?   | Every 5 years  |
| <b>Goal 2.5: Livestock Grazing</b>  |                |
| Has a sustainable supply of livestock forage been provided?   | Annual         |
| Have appropriate numbers of allotment management plans been revised?  | Annual         |
| <b>Goal 2.6: Mineral and Energy Resources</b>   |                |
| Have oil and gas leasing, exploration, and development requests been responded to in a timely manner?   | Every 5 years  |
| Has reclamation been completed to standard?   | Annual         |

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| <b>Goal 2.7: Geologic and Paleontologic Resources</b>   |               |
| Has 20 percent of high potential paleontologic formations been inventoried and evaluated?   | Annual        |
| Have conservation plans been developed for significant sites?   | Every 5 years |
| Has interpretation been provided for at least 20 percent of important geologic and paleontologic sites (consistent with conservation plans)?                          | Every 5 years |
| <b>Goal 2.8: Scenery</b>  |               |
| Have practices been implemented that will move the landscape toward scenery integrity objectives?   | Every 5 years |
| <b>Goal 2.9: Special Uses</b>   |               |
| Have special uses proposals that are consistent with desired conditions, standards and guidelines been processed in a timely manner?                                  | Annual        |
| Are outfitter-guide, resort, and concessionaire operations meetings customer service needs, and in compliance with the terms of their permits?                        | Third year    |
| <b>Goal 2.10: Wildlife and Fish Resource Use</b>  |               |
| Have wildlife/fish/plant viewing sites been identified and important ones protected, developed, and interpreted?  | Every 5 years |
| Has habitat been provided to help support harvestable fish and wildlife populations by moving upland landscapes towards desired vegetative composition and structure? | Annual        |

### **GOAL 3: ENSURE ORGANIZATIONAL EFFECTIVENESS**

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| <b>Goal 3.1: Capital Infrastructure</b>  |               |
| Have travel opportunities and restrictions been identified, including designating travelways, and has information to the public been provided? | Every 5 years |
| Has at least 20 percent of Forest Development roads received appropriate maintenance?  | Annual        |
| Has at least 10 percent of high-priority facility reconstruction projects been completed?  | Annual        |
| Are at least 20 percent of buildings, bridges, and other facilities up to standard?  | Annual        |
| <b>Goal 3.2: Land Ownership</b>  |               |
| Has an approved land ownership adjustment plan been developed?   | Every 5 years |
| As opportunities occur, have appropriate land adjustments been made?   | Annual        |

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**Goal 3.3: Boundary and Title Management**

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| Has at least 30 percent of National Forest System boundary lines been surveyed, marked and maintained? | Annual |
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**Goal 3.4: Public and Organizational Relations**

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| Have opportunities been provided for American Indians to participate in planning and management of National Forest System Lands? | Every 5 years |
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| Has cooperation occurred with federal, state , county agencies, grazing associations, and other non-government organizations for control of noxious weeds, insects, and predators? | Annual |
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| Have partnerships been created to further goals of management of the fossil resource? | Every 5 years |
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| Has cooperation occurred with appropriate state agencies in balancing desired population objectives with desired habitat conditions? | Annual |
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| Has partnering occurred in management of avian habitats and wetland ecosystems for waterfowl and wetland wildlife by cooperating in the North American Waterfowl Management Plan and Partners in Flight Program? | Every 5 years |
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**VALIDATION MONITORING**

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| How valid are assumptions on grassland structure and composition, including describing potential plant communities? Should be monitored at an 80% confidence level . | Annual, analysis every 5 years |
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| In cooperation with research and as funding allows, have assumptions on the effects of fire on such things as species composition, wildlife habitat quality, exotic species control, fire dependent species, rare plant communities, and woody species been validated? | Every 5 years |
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All monitoring assumes that the full range of management activities follows management area, geographic area, and grassland 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 Service leadership will prioritize monitoring and evaluation activities on an annual basis and make recommendations for budgeting and Forest Supervisor approval to proceed. Examples of criteria to prioritize annual monitoring and evaluation activities include, but are not limited to the following:

- Does the activity provide important information to analyze if desired conditions and trend are being met?
- Does the activity represent key input to address important management concerns and public issues?
- Does the activity provide "best information" to improve management direction and/or Revised Management Plan implementation?

# ANNUAL MONITORING AND EVALUATION REPORT

The Monitoring and Evaluation Report summarizes the results of completed monitoring and evaluation, and contains recommendations to the Forest Supervisor. Based on the report and other relevant information, the Forest Supervisor certifies the Revised Management Plan as sufficient for management over the subsequent year or that the plan needs to be amended.

The Monitoring and 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 management plan implementation, for the plan's effectiveness, for changes to the plan that have been made, and for those changes still needed.

The Monitoring and Evaluation Report:

- Summarizes the results of monitoring.
- Assesses management practices and the effectiveness of management in achieving goals, objectives, and desired conditions specified in the Revised Management Plan.
- Compares actual outputs, services, and costs with those estimated in the Revised Management Plan.
- Evaluates the data for indications of trends or effects.
- Identifies needed changes in management plan implementation. Indicated whether there is a need to amend or revise the Revised Management Plan.
- Identifies research needed by the National Forest System.