Chapter 5 - Monitoring and Evaluation Requirements

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Chapter 5 - Monitoring and Evaluation Requirements

Introduction

This chapter establishes guidance for determining compliance with, and determining the adequacy and appropriateness of, Forest Plan management direction. The first section of this chapter describes the process for determining Forest Plan consistency and the process for amending the plan when necessary. The second section of the chapter describes monitoring and evaluation, separate sequential activities that determine whether programs and projects are meeting Forest Plan direction.

Implementation

Forest Plan implementation is accomplished through (1) identification of management practices, analysis and evaluation of proposed actions; (2) deciding upon an appropriate course of action; (3) budget and development, project execution; and (4) administration. Implementation involves analysis of proposed management practices to meet both NFMA and NEPA requirements.

Proposed Actions

Information and direction needed to achieve the desired future condition of the Forest, as expressed by the goals and objectives of the Forest Plan, are provided by management area direction, including standards and guidelines, and management practices. Proposed management practices are identified through the management direction in the Forest Plan. In addition, actions may be proposed by someone outside the Forest Service.

Analysis and Evaluation

The purpose of analysis and evaluation is to make site-specific decisions based on the Forest Plan direction. Land allocations in the Forest Plan are approximate. They need to be validated or adjusted at the landscape watershed and site scale of analysis using site-specific data on capabilities, suitabilities and appropriateness for all resources. This should occur on an on-going basis as part of analysis and evaluation. The analysis process also includes an assimilation of management direction, current issues and site-specific data to make site-specific decisions on land management. The analysis assists in determining costs, schedules and direct, indirect and cumulative effects of related management practices. An interdisciplinary process must be used to address a practice within a given area. The following steps should be considered in identifying the scope and area involved in analysis:

1. Review data and information used in development of the Forest Plan;
2. Consider the land management decisions to be made in any given geographic area for the plan period;
3. Conduct scoping and determine the issues and other information about the project area and the possible decisions to be -made;
4. Determine the extent of the geographic project area requiring analysis based on identified issues and resource opportunities;
5. Determine the requirements for NEPA compliance, including the range of alternatives, the potential for cumulative effects and the possibility of connected and cumulative actions; and
6. Insure that proposed management practices and actions are analyzed through an integrated approach to resource management.

Findings - The analysis provides information to evaluate proposed management practices and actions, both internal and external proposals, to determine findings for NFMA, to ensure compliance with NEPA and to meet other appropriate laws and regulations. Review of the findings is essential in making a well-reasoned decision.

Consistency - All resource plans and permits, contracts and other instruments for the use and occupancy of National Forest System lands are to be consistent with the Forest Plan (16 U.S.C. 1604 (i)). The Forest Plan guides all natural resource management activities (36 CFR 219.1 (b)). All administrative activities affecting the Forest must be based on the Forest Plan (36 CFR 219.1 0 (e)). Thus, all management practices and activities must be consistent with the Forest Plan. If a proposed project or alternative action is not consistent with the Forest Plan, there are 3 options available for consideration:

a. Modify the proposal to make it consistent with the Forest Plan;
b. Reject the proposal; or
c. Amend the plan to permit the proposal.

Process to Amend the Forest Plan

Forest plans can and should be modified when conditions warrant. It is expected that the Forest Plan will be revised each decade, but 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 plan have changed, or when changes in Resource Planning Act policies, goals or objectives would have an effect on Forest programs.

The Forest Supervisor may also amend the Forest Plan. Based on an analysis of the goals and objectives, management direction including standards and guidelines, the Forest Supervisor must consider when a proposal is not consistent with the Forest Plan. The following actions must be taken:

1. Prepare a proposed amendment to the Forest Plan.
2. Make a determination of the significance of the change to the Forest Plan under 16 U.S.C. 1604 (f)(4), 36 CFR 219.10 (f), FSM 1922.5 and FSH 1909.12, 5.32.
3. Consider the (1) timing of the proposed change; (2) location and size of the area involved in the change; (3) whether the change alters the goals, objectives and outputs projected in the plan; (4) scope of the change and (5) impact on management prescriptions and desired future condition of the land.
4. If the amendment is determined not to be significant, the Forest Supervisor may implement the amendment following appropriate public notification and satisfactory compliance with Forest Service environmental policies and Oroced6res for the project or action.
5. If the change to the plan is determined to be significant, follow the 10-step process found at 36 CFR 219.12. Preparation of an Environmental Impact Statement is mandatory. The Forest Supervisor shall determine the issues to be addressed in the amendment and will normally concentrate on those issues that have generated the need for change.

Budget Development

The selected projects and actions are the basis for program budget development.

Policy contained in FSM 1930.3 requires that budget proposals be consistent with long-range direction provided by the Forest Plan.

Monitoring and Evaluation

The overall objective of monitoring and evaluating forest plans is to determine whether programs and projects are meeting forest plan direction. Monitoring is the collection of information, on a sample basis, from sources identified in the plan. Evaluation of monitoring results is used to determine the effectiveness of the Forest Plan and the need to either change the plan through amendment or revision or to continue with the plan.

Monitoring is an important component in implementing the ecosystem management approach prescribed in Chapter 4. Due to the broad scope of ecosystem management, the monitoring effort emphasizes coordination and cooperation between various Federal, State and local agencies; American Indian tribes; and other interests.

Regulations governing monitoring are found at 36 CFR 219. Unless noted otherwise, the citations below are from the 219 regulations that were in force when the plan was approved in 1995.

Monitoring and Evaluation Requirements

Monitoring and evaluation determine whether: (219.7(f))

- activities on nearby lands managed by other Federal, State or local agencies are affecting management of the Forest.
- the Forest Plan is precluding other land management agencies from realizing their stated objectives.

Monitoring requirements shall provide for: (219.12(k))

- a quantitative estimate of performance comparing outputs and services with those projected by the Forest Plan;
- documentation of the measured prescriptions and effects, including significant changes in productivity of the land;
- documentation of costs associated with carrying out the planned management prescriptions as compared with costs estimated in the Forest Plan.
- a determination of compliance with the following standards:
    a. Lands are adequately restocked as specified in the Forest Plan.
    b. Lands identified as not suited for timber production are examined at least every 10 years to determine if they have become suited. If determined suited, such lands are returned to timber production.
    c. Maximum size limits for harvest areas are evaluated to determine whether such size limits should be continued.

d. Destructive insects and disease organisms do not increase to potentially damaging levels following management activities.

The Responsible Official may comply with any obligations relating to management indicator species by considering data and analysis relating to habitat, unless the plan specifically requires population monitoring or population surveys for the species. Site-specific monitoring or surveying of a proposed project or activity area is not required, but may be conducted at the discretion of the Responsible Official per 36 CFR 219.14 (f) (Federal Register, Vol. 70, No. 3, 1060, published January 5, 2005).

Monitoring determines (1) whether existing and emerging public issues and management concerns are adequately addressed, and (2) whether opportunities are realized.

Conceptual Framework

This conceptual framework for monitoring is taken from the ROD for the FSEIS. It is in addition to the Monitoring Plan presented in Table 5-1 for the Forest. In addition, specific monitoring protocols, criteria, goals and reporting formats will be developed for the standards and guidelines in the ROD for the FSEIS, subject to review and guidance of the Regional Ecosystem Office; they will be incorporated into the Forest Monitoring Plan as they are developed.

Scope

One of the challenges in designing a monitoring network is accommodating a variety of geographic scales (e.g., region, province, watershed and site) and land ownerships in a manner that allows localized information to be compiled and placed in a broader, regional context.

Monitoring at any scale should:

- Detect changes in ecological systems from both individual and cumulative management actions and natural events
- Provide a basis for natural resource policy decisions Provide standardized data
- Compile information systematically
- Link overall information management strategies for consistent implementation
- Ensure prompt analysis and application of data in the adaptive management process Distribute results in a timely manner

Relationship to Adaptive Management Process, Research and Watershed Analysis

Adaptive Management

Adaptive management is based on monitoring that is sufficiently sensitive to detect relevant ecological changes. In addition, the success of adaptive management depends on the accuracy and credibility of information obtained through inventories and monitoring.

Research

Close coordination and interaction between monitoring and research also are essential for the adaptive management process to succeed. Data obtained through systematic and statistically valid monitoring can be used by scientists to develop research hypotheses related to priority issues. Conversely, the results obtained through research can be used to further refine the protocols and strategies used to monitor and evaluate the effectiveness of these standards and guidelines.

Watershed Analysis

Watershed analysis is a technically rigorous procedure with the purpose of developing and documenting a scientifically-based understanding of the ecological structure, functions, processes and interactions occurring within a watershed (see Aquatic Conservation Strategy under Forest-wide Standards and Guidelines in Chapter 4). Watershed analysis is one of the principal analyses that will be used to meet the ecosystem management objectives of these standards and guidelines. Information from watershed analysis will be used in developing monitoring strategies and objectives.

Specific to monitoring and evaluation, the results and findings from watershed analysis are used to reveal the most useful indicators for monitoring environmental change, detect magnitude and duration of changes in conditions, formulate and test hypotheses about the causes of the changes, understand these causes and predict impacts, and manage the ecosystem for desired outcomes. Watershed analysis may result in additional monitoring questions. Watershed analysis will provide information about patterns and processes within a watershed and provide information for monitoring at that scale.

Components of the Monitoring and Evaluation Plan

The following framework focuses on the purposes for monitoring and proposes units of measure for the monitoring process.

Types of Monitoring

Three basic types of monitoring (implementation, effectiveness and validation) will be applied to meet the goals of the Forest Plan and evaluate the efficacy of management practices. These three types of monitoring encompass a spectrum of monitoring, although some agencies use different terminology (for example, trend, program evaluation).

Evaluation Questions

Each basic monitoring question can be expressed in more definite terms that will lead to more specific and directed measurements, as explained in the following text.

1. Implementation Monitoring

Implementation monitoring determines if the standards and guidelines were followed.

Implementation monitoring asks: Does the project and/or activity follow the direction in its management plan? Generally, implementation monitoring answers this question by determining if the standards and guidelines were correctly applied and followed.

Implementation monitoring considers 3 strategies: aquatic, terrestrial and social and economic. The components of these strategies include:

- Land allocations with specific boundaries
- Standards and guidelines for managing the land allocations, including Key Watersheds
- Watershed analysis
- Social and economic effects
- An adaptive management process, or learning framework

Evaluation Question: Are the aquatic, terrestrial and social and economic resources being managed according to the Forest Plan direction? To address this question, implementation monitoring is organized around land allocations, including types of activities- allowed and projected conditions within each allocation. For the most part, this approach focuses on areas broader than specific project sites and restricts evaluation questions to the fundamental elements and components of these standards and guidelines. This broader scope is consistent with the ecosystem approach.

Key items that require specific monitoring include standards and guidelines of:

- Late-Successional Reserves
- Riparian Reserves
- Matrix
- Adaptive Management Areas
- Key Watersheds
- Watershed analysis

Late-Successional Reserves - Key items to monitor include:

- Timber harvests consistent with standards and guidelines and with Regional Ecosystem Office review requirements.
- Other management activities in the LSR consistent with the standards and guidelines (for example, prescribed fire and resulting emissions).
- LSR assessment completed.
- Management activities consistent with the LSR assessment?

Riparian Reserves - Key items to monitor include:

- Width and integrity of RR (e.g., did the conditions that existed before management activities were conducted, change in ways that are not in accordance with the standards and guidelines?).
- Completion of watershed analysis prior to management activities where required.
- Management activities in RRs consistent with standards and guidelines.

Matrix - Key items to be monitored include:

- Number and distribution of green trees left in harvested areas.
- Snags, CWD.

- Completion of watershed analysis Prior to harvesting late-successional stands in watersheds with less than 15% late-successional forest remaining.
- Prescribed burning and resulting emissions.

Adaptive Management Areas - In AMAS, implementation evaluations of the standards and guidelines are required, including the requirement that an AMA Plan be developed that establishes future desired conditions.

Key items to monitor in AMAs include:

- Completion of an AMA plan.
- Measurement of conditions that have been agreed to in the AMA Plan.

Key Watersheds - Key items to monitor include:

- Watershed analysis prior to management activities.
- Presence and timing of activities, including restoration projects.
- No new roads in roadless areas.
- No net increase in roads.

In evaluating these questions, it is necessary to consider the roles Key Watersheds play in the Aquatic Conservation Strategy: refugia for at-risk stocks of anadromous salmonids and resident fish species, and sources of high quality water.

Watershed Analysis - Key items to monitor:

- Presence and timing of watershed analysis.

Participation - Key items to monitor include:

- Involvement of multiple agencies, the public and others in planning, implementing and monitoring watershed analysis.
- Opportunities to share information (applicable to all parties such as agencies, publics, communities).
- Identification of clear expectations and responsibilities.
- Active partnerships.

2. Effectiveness Monitoring

Effectiveness monitoring takes a step further by evaluating if application of the Forest Plan achieved the desired goals, and if the objectives of the Forest Plan were met. Success may be measured against the standard of desired future condition (sometimes referred to as reference c6ndition). For example: Does the management of this resource maintain or restore the habitat for late-successional associated species?

Effectiveness monitoring will be undertaken at a variety of reference sites in geographically and ecologically similar areas. These sites will be located on a number of different scales, and will require the assistance of research statisticians to design an appropriate sampling regime.

Aquatic Ecosystems - Evaluation Question: Is the ecological health of the aquatic ecosystems recovering or sufficiently maintained to support stable and well-distributed populations of fish species and stocks?

While many factors influence aquatic ecosystem integrity, the variables to be monitored will include important Habitat requirements identified bi research and watershed analysis, and represent a range of values indicative -of a healthy system. Variables may be surrogates representing other physical, biological and/or ecological processes. Variables must b-e quantifiable and measurable in a repeatable ay range of values for the variables measured will often result from the spatial and temporal variability found in a particular geographic area. Variables must describe conditions for functional, healthy aquatic ecosystems.

A core set of inventory elements will be collected for streams. Core inventory elements are the minimum set of variables to be collected at all scales. In all cases, standardized measurement and reporting protocols will be determined and are essential for consistency.

The health of aquatic and riparian ecosystems is dependent on water quality. Effectiveness monitoring that assesses the Physical, chemical and biological integrity of aquatic ecosystems is necessary to ensure conditions that will maintain water quality and support aquatic organisms. The Clean Water Act directs that states adopt water quality standards and criteria as necessary to protect designated beneficial uses. The standards and criteria of the Clean Water Act, which apply to both Federal and nonfederal lands, will be used in effectiveness monitoring to determine if water quality and the health of aquatic systems are being maintained.

An emphasis of the monitoring of aquatic ecosystems will be to determine if actions are meeting the Aquatic Conservation Strategy objectives. The Aquatic Conservation Strategy emphasizes watershed health and maintenance of the natural physical and biological integrity of aquatic and riparian habitats and watersheds. As such, monitoring will include aquatic, riparian and watershed conditions and the processes in a watershed to determine ff they achieve Aquatic Conservation Strategy objectives.

The wide range of natural variation and complex interaction of individual stream habitat components (for exam le, numbers of pools, pieces of large wood, percent fine sediment and water temperature) makes it difficult to establish relevant quantitative management directives for stream habitat components. Because of individual stream and watershed diversity and differences, it is also difficult to quantify direct linkages among processes and functions outside the stream channel to in-channel conditions and biological components. Watershed-specific objectives, based on watershed analysis are necessary to accommodate the natural variation among individual streams and watersheds.

Key monitoring items include:

- Pool frequency and quality (width, depth and cover).
- Percent fine sediment.
- CWD (size and quantity).
- Water temperature.
- Width-to-depth ratio.
- Bank stability and lower bank angle.

Biological Diversity, Late-Successional and Old-Growth Forest Ecosystems - The purpose and need of these standards and guidelines includes, ". . . to take an ecosystem approach to forest management; maintain and restore biological diversity as it applies to late-successional and old-growth forest ecosystems." This purpose includes forest processes as well as forest species.

Evaluation questions:

- Is the forest ecosystem functioning as a productive and sustainable ecological unit.
- Is the use of prescribed fire or fire suppression maintaining the natural processes of the forest ecosystem?
- Are desired habitat conditions for the northern spotted owl and the marbled murrelet maintained where adequate, and restored where inadequate?
- Are habitat conditions for late-successional forest associated species maintained where adequate, and restored where inadequate?
- Are desired habitat conditions for at-risk fish stocks maintained where adequate, and restored where inadequate?
- Is a functional interacting, late-successional ecosystem maintained where adequate, and restored where inadequate?
- Did silvicultural treatments benefit the creation and maintenance of late-successional conditions?
- Will the overall conditions of the watersheds and provinces continue to be productive over the long term?

To address these questions, chemical, physical and biological indicators may need to be evaluated. A variety of variables can be monitored within each of these categories, and those selected will address plans. The Clean Air Act directs Federal agencies to monitor air burning on Federal lands in order to manage prescribed fire operations, verify air quality models, and assess air quality impacts.

Indicators for assessing the condition and trends include:

- Land use data.
- Seral development and shifts of forest plant communities.
- Locations and concentrations of plant diseases and insect infestations.
- Amount of fuels by category.
- Air quality.
- Riparian and stream habitat condition by stream class.
- Water quality.

Key monitoring items include:

- Size, location, spatial distribution, species composition and development of late-successional and old-growth forests.
- Retention of snags and CWD.
- Abundance and diversity of species associated with late-successional forest communities.

- Species presence (to calculate species richness i.e., numbers and diversity).
- Percent of land area affected by exotic species.
- Structure and composition.
- Ecological processes.
- Ecosystem functions.
- Air quality.

Use Levels of Natural Resources - Evaluation Question: Are predictable levels of timber and non-timber resources available and being produced?

Key items to monitor include:

- Timber harvest levels.
- Special forest products (for example, mushrooms, boughs and ferns).
- Livestock grazing.
- Mineral extraction.
- Recreation.
- Scenic quality (including air quality).
- Commercial fishing.

Rural Economies and Communities - Evaluation Question: Are local communities and economies experiencing positive or negative changes that may be associated with Federal forest management?

Key items to monitor include:

- Demographics.
- Employment (timber, recreation, forest products, fishing, mining and grazing).
- Government revenues (Forest Service and BLM receipts).
- Facilities and infrastructure.
- Social service burden (welfare, poverty, aid to dependent children and food stamps).
- Federal assistance programs (loans and grants to State, counties and communities).
- Business trends (cycles, interest rates and business openings and closings).
- Taxes (property, sales and business).

Information for these items are collected by local, county, State and Federal agencies. This information will be used through the adaptive management process in future planning efforts. Because of the complexity of the relationships and the number of factors involved in these items, it is not possible to set specific or definite thresholds or values that would cause a reevaluation of the goals and overall d guidelines.

American Indians and Their Culture - Evaluation Questions:

- For those trust resources identified in treaties with American Indians, what are their conditions and trends?
- Are sites of religious and cultural heritage adequately protected?
- Do American Indians have access to and use of forest species, resources, and places important for cultural, subsistence, or economic reasons, particulate those identified in tr6aties?

Key monitoring items include:

- Condition and trends of the American Indian trust resources.
- Effectiveness of the coordination or liaison to assure protection of religious or cultural heritage sites.
- Adequacy of access to resources and to the vicinity of religious or cultural sites.

3. Validation Monitoring

Validation monitoring determines if a cause and effect relationship exists between management activities and the indicators or resource being managed. Validation monitoring asks: Are the underlying management assumptions correct? Do the-maintained or restored habitat -conditions support st@tbl6 and well-distributed Populations of late-successional associated species?

Among the key set of assumptions that need to be validated is the relationships between habitat and populations. This requires a strong mix of inventory monitoring and research. Where knowledge gaps exist, research and/or inventory may be needed. Hypotheses can be proposed and tested through a combination of research and monitoring.

There is one primary evaluation question with regard to the northern spotted owl, the marbled murrelet and at-risk fish stocks: Is the population stable or increasing?

Key Items to monitor include:

- Northern spotted owls by physiographic province.
- Marbled murrelets within their known nesting range.
- Populations of fish species and stocks that are listed under the Endangered Species Act or are considered sensitive or at risk by land management agencies.
- Rare species.
- The relationship between levels of management intervention and the health and maintenance of late-successional and old-growth ecosystems.

Special Monitoring Issues and Situations

Natural and Induced Environmental Stressors - A preliminary step in designing any monitoring scheme is development of a pre-monitoring assessment or baseline data to define the natural and management-induced environmental stressors which could act as outside influences on the outcome of monitoring. Examples of natural stressors are large-scale disease cycles, climatic cycles and hot, expansive fires.

Management-induced stressors include habitat simplification; reduced habitat connectivity; high fire frequency resulting from fire suppression activities; forest diseases resulting from increased abundance of susceptible host species, loss of natural controls and introduced pests; acid precipitation; introduced competitor species; and changes in predator-prey dynamics.

Rare and Declining Species - Monitoring will address rare and declining species - Rare species are plants or animals classified as:

- Federally Threatened or Endangered species.
- Federally proposed Threatened or Endangered species.
- Federal Candidate Species.
- State-listed species.
- Forest Service Sensitive species.
- BLM special status species.
- Other infrequently encountered species not considered by any agency or group as endangered or threatened and classified in the FEMAT Report as rare.

Monitoring for the type, number, size and condition of special habitats over time will provide a good indication of the potential health of special habitat-dependent species. Although all special habitat areas do not support rare species, there is overwhelming evidence that special habitat types are closely related to the continued existence of certain rare species.

Since many rare species are associated with riparian habitats, the RR system offers potential protection. However, some rare species often are closely associated with or restricted to specific habitats that are outside RRs.

It is also important to recognize that many species' habitat requirements vary considerably with age or size of the individual, and with the season. In some cases, more than one special habitat must be available for the species to successfully complete its life cycle.

While a stable special habitat type through time is not proof that a special habitat-dependent species population is stable, a decrease in a special habitat type does indicate increased risk to that species population.

Widely-dispersed species not associated with special habitats usually are associated with as yet undefined habitats within the general upland environment. Species with this type of distribution are difficult to assess and monitor. Efforts will be made to identify key habitat components of existing species locations.

A monitoring program for rare and declining species will help to:

- Identify perceived present and future threats.
- Increase future possibilities of discovering new locations.
- Track their status and trends over time.
- Ensure that, in times of limited agency resources, priority attention will be given to species most at risk

Inventoried locations and special habitats of rare species will be registered in the multi-agency GIS data base. This information will be shared with the State Natural Heritage Programs.

Monitoring Plan

Monitoring requirements for the Forest Plan are outlined in Table 5-1. These requirements will be coordinated with project-level monitoring, identified through site-specific environmental analyses. Items such as reforestation survival that are routinely monitored for program management or that are standard operating procedures have not been included in Table 5-1. The following definitions will assist in understanding the contents of the table.

Activity, Effect or Resource to be Measured- This is a concise description of the specific item to be measured.

Monitoring Objective - A statement indicating the purpose of monitoring this specific item. The monitoring level is indicated in parentheses, I = implementation monitoring, E = effectiveness monitoring, and V validation monitoring. For some items more than one level of monitoring is indicated.

Monitoring Technique - Description of the specific sampling or inventory techniques, or sources of information to be employed. Techniques described are those recommended at the time the plan was written. If better techniques are developed, they may be used.

Monitoring Frequency - The time frame or schedule during which the activity, practice or effect is sampled.

Reporting Frequency - The frequency that results will be summarized and reported. Evaluation of results may be at a different time period.

Standard - The tolerance limits or standards by which the activity, practice or effect will be evaluated.

Variation from Standard Requiring Further Action - A statement which describes the tolerance limits within which actual performance can vary from predicted performance. When these limits are exceeded, further evaluation and monitoring are initiated. (Refer to evaluation description).

Evaluation

A summary of the purposes for evaluating the Forest Plan from 36 CFR 219 follows:

- To determine if conditions or demands in the area covered by the Forest Plan have changed significantly to require revision (219.10(g)).
- To determine if budgets have significantly changed the long-term relationships between levels of multiple-use goods and-services to require amendment (219.10(e)).
- To determine how well objectives have been met (219.12(k)).
- To determine how closely management standards and guidelines have been followed (219.12(k)).
- To review research needs for management of the Forest (219.28(a)).

Evaluation is the analysis and appraisal of observations made during the monitoring process. Determining whether conditions or long term relationships have changed significantly requires more than one year of monitoring. Consequently, some items in Table 5-1 are only reported and evaluated after 5 years of monitoring. An annual summary of findings will be prepared for other items. When monitoring results are compiled, the data's significance is evaluated and recommendations of further action may be made. Recommendations include:

- No action needed. Monitoring indicates goals, objectives and standards are achieved.
- Modify the management prescription as a Forest Plan amendment.
- Modify the application of a prescription as a Forest Plan amendment.
- Revise the projected schedule of outputs.
- Intensify monitoring where evaluation is not conclusive.
- Initiate revision of the Forest Plan.

Evaluation In Relation to the Three Monitoring Levels

Figure 5-1 displays the process for evaluating monitoring results from each monitoring level. There is a direct, sequential relationship between the levels. This relationship is designed to focus initial attention at the implementation monitoring phase. The approved forest plan represents the most appropriate, current management direction; therefore, first ensure that it is implemented as designed. Needless expense and confusion may result by going directly to effectiveness or validation monitoring.

Figure 5-1. Evaluation of Monitoring Results for Forest Plan Implementation

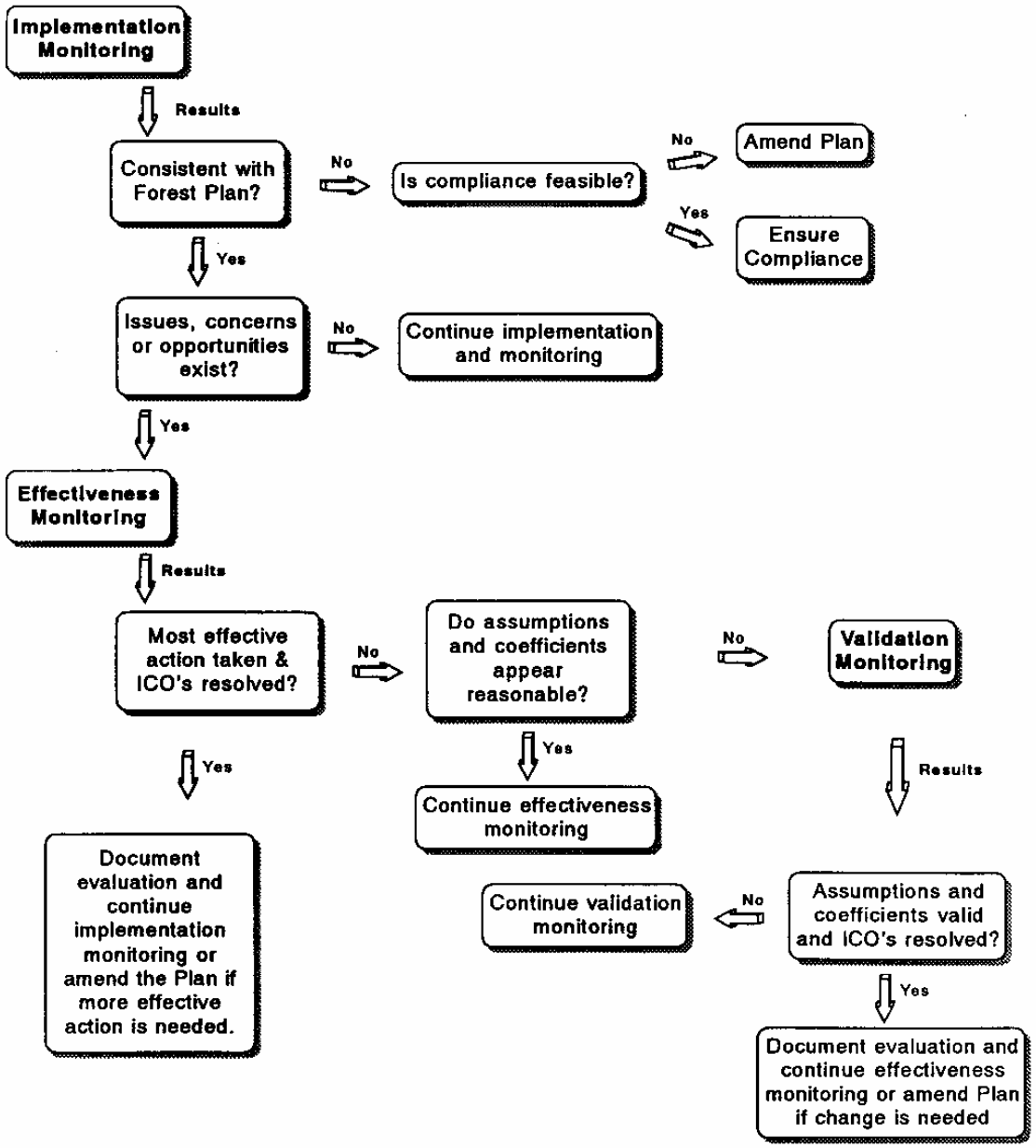

Table 5-1. Monitoring Plan by Resource.						
Activity, Effect or Resource to be Measured	**Monitoring Objective**	**Monitoring Technique**	**Monitoring Frequency**	**Reporting Frequency**	**Standard**	**Variation from Standard Requiring Further Action**
Geology						
Landslides	Test assumptions for landslide production rates in Forest Plan. Determine effectiveness of S&Gs in reducing landslide rates (E,V). Determine cost-effectiveness for landslide stabilization and erosion control projects (E).	Inventory, analysis	Annually	Annually	Forest Plan goals, Forest Plan Standards and Guidelines (S&Gs).	50% deviation from rates predicted in Forest Plan or if S&Gs don't meet objectives.
Geologic Hazards	Determine levels of hazardous materials (asbestos, radon, etc.) and if the Forest is meeting required standards (I). Evaluate effectiveness of S&Gs for reducing environmental threats from geologic hazards (abandoned mines, landfills, seismic, volcanic, snow avalanche, etc.) (E).	Inventory, testing.	Annually	Annually	Federal and State Laws, Forest Plan S&Gs.	Non-compliance with applicable laws, policies and regulations.
Geologic SIAs, Caves	Assess the condition of unique geologic areas and effectiveness of Forest Plan S&Gs and resource management programs in preserving and protecting these resources (I, E).	Inventory, analysis.	Annually	Annually	Federal and State Laws and Regulations.	Non-compliance with laws; degradation of areas/resources.
Geologic Mapping	Assess the accuracy of mapping units in the Forest Plan geologic database (rock type, geomorphic terrains, unstable and potentially unstable lands, etc.) (I, E). Evaluate RRs for accuracy (I, E).	Inventory, testing, analysis.	Annually	Annually	Forest Plan database and definitions of unstable, potentially unstable, and unsuited lands.	Variation of more that 20% in an analysis area will require resolution and further action. Verifiable evidence that land type require reclassification.
Soil						
Soil Productivity	To assess the implementation and effectiveness of soil standards, guidelines and thresholds to maintain soil productivity (I, E).	Field investigation of soil cover, soil compaction and organic matter on 5% of activity areas.	Annually	Every 5 years	Regional soil quality standards, Forest Plan S&Gs	Soil quality standards are to be met on at least 85% of lands dedicated to producing vegetation. For soil compaction, a 10% or more reduction in total soil porosity of the surface soil over natural conditions on 15% or more of the area.
Water						
Water quality	Assess compliance with BMPs and evaluate effectiveness of BMPs (I, E)	Project and field reviews in-channel monitoring, Regional BMP effectiveness evaluation program	Annually	Annually	State and Federal laws, Forest Plan goals, Forest Plan S&Gs.	Not meeting law or Forest Plan S&Gs.
Threshold of concern (TOC) used in Cumulative Watershed Effects Analysis	Test the validity of the techniques used for determining TOC in the Forest Plan (V).	Select 2 watershed annually, monitor adverse predicted effects compared to observed conditions.	Annually	Annually and after first landslide producing storm	Forest Plan.	If observed values are consistently different than predicted values.
Air						
Effects of Forest activities on air quality related values of the Class I area in Marble Mountain Wilderness	Establish base-line data. Identify trends. Identify areas of potential impairment (I,E,V).	Level of particulates by visual observation. Amount of acid rain from lake samples. Effect on lichen.	Annually	Annually	Screening levels established in General Technical Report RM-165.	10% change in screening levels.

Table 5-1. Monitoring Plan by Resource.

Activity, Effect or Resource to be Measured	Monitoring Objective	Monitoring Technique	Monitoring Frequency	Reporting Frequency	Standard	Variation from Standard Requiring Further Action
Biological Diversity						
Ecosystem diversity	Track changes in vegetative composition. Track changes in "old growth" meeting currently accepted definition.	Field reviews and vegetative inventories.	Every 5 years	Every 5 years	Forest Plan goals and objectives.	Greater than 1% reduction in each seral stage/vegetation type.
Size and shapes of openings	Ensure openings are consistent with ecosystem composition, structure and function (I).	Use remote sensing data.	Annually	Annually	Forest Plan S&Gs	Size and shape of openings change the bell curve distribution of polygon size and shapes +20%.
Sensitive Plants						
Monitoring Sensitive plant populations.	Assure maintenance of Sensitive plant populations and/or species viability (I, E).	Activity site visits. Counts of individuals, transects, photo points, observation of habitat condition changes.	Will vary by spp. depending on mgt activities likely to affect the species and on species life history factors.	Same as for monitoring frequency.	Forest Plan S&Gs, Species Management Guides.	20% change in number of individuals or in range of distribution. Significant changes in habitat conditions.
Wildlife						
Bald eagle (breeding)	Determine trend and productivity of breeding population. Evaluate trend of habitat delineated to meet Recovery Plan objectives. Assess effectiveness of S&Gs (I, E).	Ground nest surveys, habitat condition and use surveys, population surveys.	Annually or project induced	Annually	USFWS Recovery Plan, nest management plans, State survey procedures, Forest Plan S&Gs.	Any decline in habitat or population.
Bald eagle (wintering)	Determine use, condition and trend of identified active and potential roost sites. Assess effectiveness of S&Gs (I, E).	Ground roost surveys, habitat capability analyses, population surveys.	Annually or project induced	Annually	USFWS Recovery Plan, roost management plans, Forest Plan S&Gs.	Any significant decline in habitat capability or decline in roosting population.
Peregrine falcon	Verify nesting and reproductive success during breeding season. Assess effectiveness of S&Gs (I, E).	Ground surveys.	Annually	Annually	USFWS Recovery Plan Eyrie Management Plan, Forest Plan S&Gs.	Any change in nest occupancy and nest success rate.
Marbled murrelet	To be determined – will be consistent with USFWS Recovery Plan.					
Northern spotted owl	Determine number of pairs within LSRs.	Ground surveys (about 100,000 acres per year for first 4 years of Forest Plan implementation). Verify 20% of known pair sites annually following first 4 years.	Annually	Same as monitoring frequency	Regional Protocol, ISC Conservation Strategy, USFWS Recovery Plan (when completed.)	Thresholds to be set as part of Regional monitoring program.
Goshawk	Determine occupancy of suitable habitat.	Ground survey	Annually	Annually	Regional survey protocol.	To be determined in Regional Conservation Strategy.
Willow flycatcher and great grey owl	Determine occupancy of suitable habitat.	Ground-breeding surveys	Annually	Annually	Regional Protocols	Greater than 20% decline in detected presence or occupancy.
Fisheries Management						
Fisheries management for Forest Service Sensitive Species (summer steelhead and spring Chinook salmon)	Determine population trends and habitat conditions (I).	Direct observations, mask and snorkel counts. Cooperation with CDFG. Survey 90% of stream habitats.	Annually	Annually	Region 5 methodology, Forest Plan S&Gs.	Greater than 20% decline in population trends and habitat condition.

Table 5-1. Monitoring Plan by Resource.

Activity, Effect or Resource to be Measured	Monitoring Objective	Monitoring Technique	Monitoring Frequency	Reporting Frequency	Standard	Variation from Standard Requiring Further Action
Fisheries Management (cont'd)						
Fisheries management for MIS species	Determine population trends and relationship to habitat changes (I).	Habitat condition inventory, 10% of habitat per year. Ecosystem classification. Coordination with CDFG on fish surveys.	Annually	Annually	Region 5 methodology, Forest Plan S&Gs.	-30% deviation from S&Gs (riparian criteria)
Fisheries and watershed restoration	Determine effectiveness of restoration projects at achieving Aquatic Conservation Strategy objectives (E).	Habitat condition inventory, smolt production surveys. Standing crop estimates. Project analysis.	Annually	Annually	Forest Plan Aquatic Conservation Strategy objectives.	-10% of planned accomplishments
Fisheries Management	Determine effectiveness of S&Gs in meeting objectives. Determine applicability to Klamath Mountain Province (E,V)	Habitat condition inventory, ecosystem classification.	10% of habitat per year.	Annually	Forest Plan S&Gs.	Any variation from standard.
Visual Resource Management						
Visual condition of the Forest	Determine Forest-wide visual condition and scenic character trends (I, V).	Photo interpretation and field correlation.	Every 10 years.	Every 10 years.	Forest Plan VQOs and Desired Future Condition.	When trend is contrary to Desired Future Condition.
Visual quality objectives	Determine compliance with Forest Plan VQOs (I).	Photo documentation and field inspection from project viewing area. Determine if the Forest is meeting VQOs.	Every 3 to 5 years	Every 3 to 5 years	Forest Plan VQOs.	-10% of 1 and 2 Sensitivity Level acreages, -15% of other acreages.
Wilderness						
Limits of acceptable change (LAC) opportunity classes	Use LAC to refine future wilderness management direction (I).	"Limits of Acceptable Change System for Wilderness Planning," Stankey, et. al.	Annually	Project-Induced	Forest Plan S&Gs.	Unacceptable deviation from Forest Plan S&Gs.
Lands Program Management						
Effect of land adjustment on total Forest land-base for all resources	To determine if land adjustments have increased administrative efficiency and to assure that Forest outputs are not adversely affected (E).	Compare effectiveness of resultant landownership pattern with baseline. Determine net change in acres and inventory for each land adjustment.	Annually	Every 5 years.	Forest Plan.	None.
Timber Management						
Growth and yield projections	Determine if growth and yield projections for silvicultural prescriptions are occurring as projected (V).	Timber inventory of plantations and untreated stands.	Every 5 years	Every 5 years	Regional and Forest inventory standards.	Unacceptable results based on an ID team review.
Wildland fire effects on plantations	Determine average rate of loss.	Plantation surveys maps, stand record system.	Annually	Annually	Regional	Unacceptable results based on ID Team Review.
Dispersal of harvest openings	Ensure that spacing of harvest openings conforms to Regional policy and Forest Plan direction (I).	Review timber sale EAs, projects, plans and reports.	Every 5 years	Every 5 years	Openings nearly surrounded by stands greater than 5 acres (15% of periphery may be common with other openings).	Any variation.
Timber stand improvement	Determine success of release and stand improvement practices to meet desired future condition (E).	Systematic and/or random samples of project areas. 10% of projects.	Within 5 years of project completion	Annually	Stocking and growth rate that will produce the height basal area and volume predicted in yield tables.	More than 10% of timber units growing potential below standard –20% deviation from yield tables.

Table 5-1. Monitoring Plan by Resource.

Activity, Effect or Resource to be Measured	Monitoring Objective	Monitoring Technique	Monitoring Frequency	Reporting Frequency	Standard	Variation from Standard Requiring Further Action
Fire Management						
Fire suppression	Assure compliance with Initial Attack's 90^{tth} percentile Objective (I).	Review fire reports monitor number of escaped fires.	Daily during fire season	Annually	Forest Plan S&Gs	Within 20% over a 10-year period
Prescribed fire program	Determine effectiveness of prescribed burn program in reducing wildfire effects (E).	Classify wildfire severity in areas where prescribed fire has been used.	Annually	Annually	Goals & objectives of Forest Plan and S&Gs.	None; evaluate after 10 years.
	Is prescribed fire being used more?	Annual review of number of prescribed fire acres burned.	Annually	Annually	Forest Plan	20% deviation from projected costs.
Range Management						
Range health	Determine vegetative ecological condition and trend (E, V).	Photo points and ecodata plots, field observations.	Ongoing	Every 5 years	Forest Plan S&Gs.	Continued downward or static trend in problem areas.
Permitted AUMs	Compare permitted to Forest Plan projected AUMS (I).	Annual grazing report.	Annually	Annually	Forest Plan.	Permitted AUMs vary 20% from Forest Plan estimates for 3 consecutive years.
Wild Horse Management	Determine number of wild horses and territory expansion (I),	Aerial counts and observations.	Annually	Annually	Forest Plan S&Gs	Numbers exceed or fall below determined levels.
Riparian Health	Assure riparian objectives are in AOIs and S&Gs are met (I).	Review EAs and ecodata plots	Annually	Annually	Forest Plan S&Gs	Lack of riparian objectives in AOIs.
Forage availability	Determine compliance with Forest Plan S&Gs for forage utilization (I,E).	Production utilization studies, field observations, use mapping and utilization measurements.	Ongoing	Annually	Forest Plan S&Gs	Exceeding Forest Plan utilization S&Gs as specified in RPDs and AOIs. Forest Plan S&Gs not implemented.
Noxious weeds	Determine if noxious weeds have increased to damaging levels (I).	County weed inventory, mapping exercises.	Annually	Annually	Infestation levels acceptable for management objectives.	Levels significantly rising.
Implementing RPDs	Ensure, RPDs include S&Gs and are implemented. Determine effectiveness of S&Gs (I, E).	Field reviews	Annually	Annually	Forest Plan S&G's	Deviation from management direction.
Cultural Resources Management						
Archaeological sites – assess site condition	Assure that Class I & II sites are not being adversely impacted (I).	On-site inspection.	15% of Class I & II sites per year	Annually	FSM and State Historic Preservation Office direction.	If the site has been altered, it will be re-recorded.
Planning						
Forest Plan modeling	Validate assumptions used in Forest Plan to predict impacts to resource programs including visual, wildlife and earth sciences (V).	Spatial disaggregation program (10-20% of landscape projects).	Annually	Annually	Forest Plan S&Gs	Will vary by resource.
Program and budget	Determine actual costs associated with implementing planned management prescriptions as compared with costs estimated in Forest Plan (I, V).	Tracking Forest budget and annual budget projections.	Annually	Annually	Forest Plan	20% deviation from projected costs.