

Chapter IV

Monitoring and Evaluation

Table of Contents

	Page No.
Monitoring and Evaluation Overview.....	IV-1
Legal and Regulatory Requirements.....	IV-2
Monitoring Framework and Components	IV-2
Monitoring Framework	IV-2
Monitoring Prioritization	IV-3
Information Management.....	IV-4
Public Involvement	IV-5
The Monitoring Matrix	IV-5

Changes to Chapter IV Since 2006

Changes were made to the Monitoring Matrix based on Forest specialist review and recommendations captured in Forest Plan Administrative Corrections #7 and #8 made in 2009. The overall monitoring questions were reduced from 48 to 46, as some were added, some were dropped, and some were combined.

MONITORING AND EVALUATION OVERVIEW

Monitoring and evaluation are separate, sequential activities. Monitoring involves collecting data by observation or measurement. Evaluation involves analyzing and interpreting monitoring data. The information gained from monitoring and evaluation is used to determine how well the desired conditions, goals, objectives, and outcomes of the forest plan have been met. Monitoring and evaluation keep the forest plan up-to-date and responsive to changing conditions and issues, and provide the feedback mechanism for adaptive management (Figure IV-1). The results are used to identify if and when changes are needed to the forest plan or the way it is implemented.

Figure IV-1.
An Adaptive Management Learning Loop

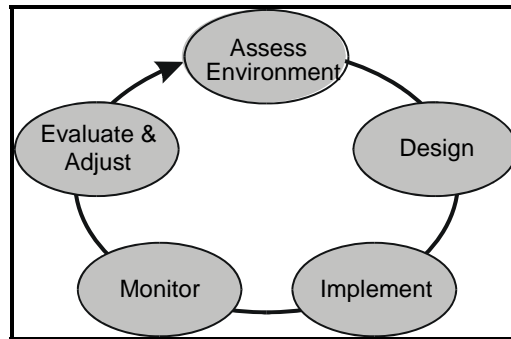
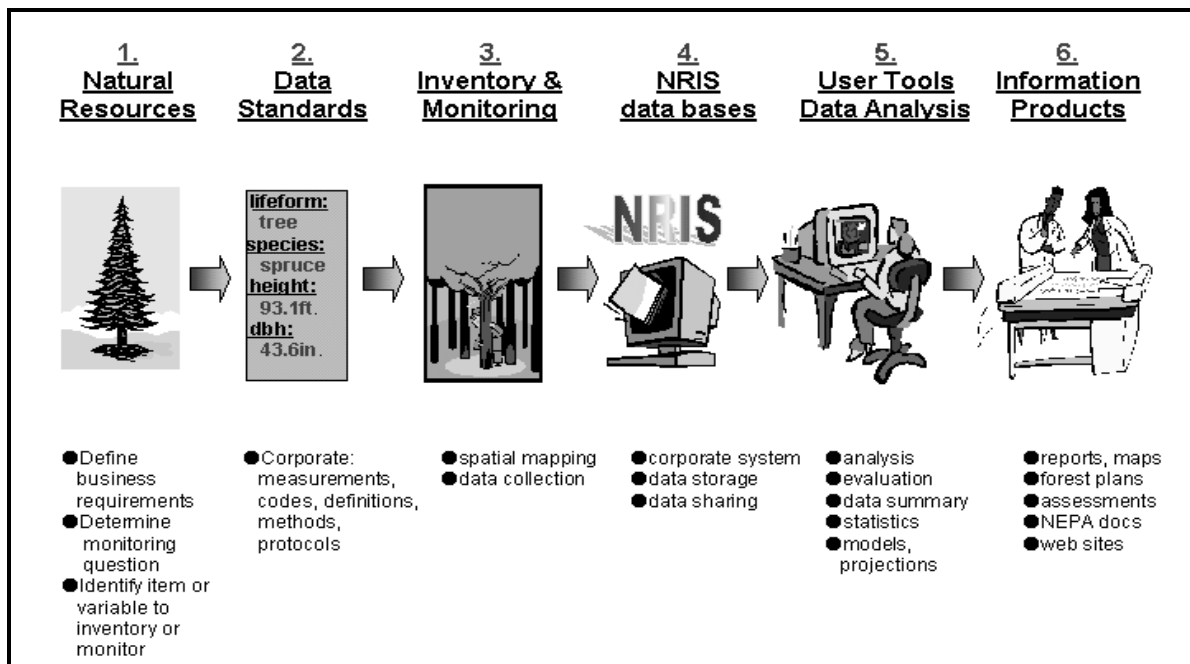


Figure IV-2. Steps in the Monitoring and Evaluation Process



Monitoring and evaluation involve more than just collecting and interpreting data. Data must be converted to useful information and stored in a form that is accessible to others. A plan for managing monitoring information over time is critical to a successful program (Figure IV-2).

Data will be designed and collected according to appropriate data standards and entered into corporate databases such as Automated Lands Program (ALP), Natural Resource Inventory System (NRIS), or Geographic Information System (GIS). The information can then be accessed and analyzed to produce information products such as monitoring reports that would be available for internal and external review.

LEGAL AND REGULATORY REQUIREMENTS

The forest plan addresses several types of monitoring. These requirements fall into four broad categories:

- Category 1: Required monitoring items related to the National Forest Management Act,
- Category 2: Attainment of goals and objectives,
- Category 3: Implementation of standards and guidelines, and
- Category 4: Effects of prescriptions and management practices.

Category 1 monitoring items are mandatory components of the Forest Plan, whereas Category 2 through 4 monitoring items are more flexible and are tailored to address issues raised through public comments and interdisciplinary team review, as translated into Forest-wide direction and management practices. These items are more likely to change through time as indicated through monitoring evaluation results and recommendations. A more complete description of Category 1 through 4 monitoring items is shown in the Monitoring Matrix section.

MONITORING FRAMEWORK AND COMPONENTS

Monitoring Framework

Many approaches to Forest Plan monitoring are currently being used throughout the agency. However, each monitoring plan should: 1) meet the legal requirements of the planning regulations, 2) be consistent with corporate data standards and protocols, and 3) be developed by an interdisciplinary team that addresses the ecological, social and economic dimensions of Forest management in an integrated manner.

To meet these objectives, the Forest's monitoring framework has four components:

1. Forest Plan (Chapter IV) Direction that provides broad, strategic guidance.
2. A Monitoring and Evaluation Implementation Guide that provides specific, technical guidance.
3. An Annual Monitoring Schedule that outlines specific tasks for the current year.
4. An Annual Monitoring Evaluation Review that provides a forum to review current year findings and identify specific modifications if necessary.

The relationship between each is shown in Table IV-1.

Table IV-1. Monitoring Framework

Forest Plan Monitoring (Chapter 4)	Monitoring and Evaluation Implementation Guide	Annual Monitoring Schedule	Annual Monitoring Evaluation Review
<i>Broad and Strategic.</i> Provides the monitoring requirements in the forest plan itself. It focuses on what is needed to monitor the forest plan. It provides the overall monitoring strategy including specific questions that need to be answered, what will be monitored, timetables for reporting, and other information.	<i>Focused and Technical.</i> Describes how, where, and when to accomplish the monitoring prescribed in the forest plan. It provides the specific methods, protocols and analytical procedures. The Guide is intended to be flexible and could be modified in response to new information, updated procedures, emerging issues, and budgetary considerations without amending the forest plan.	<i>Specific, Technical, and Prescriptive.</i> Identifies precisely what will be monitored, where, when, and by whom for the current or upcoming year. The Annual Monitoring Schedule will be tied to the Forest Plan Monitoring (Chapter 4) and the Monitoring Implementation Guide.	<i>Specific, Technical, and Prescriptive.</i> A Forest interdisciplinary team will review the current year's monitoring and evaluation results at the end of each calendar year. Based on these findings they will recommend to the Forest Leadership Team necessary changes (if any) to the Forest Plan, Monitoring Guide, or Forest Service Manual or Handbook.

Monitoring Prioritization

Within any agency or institution, necessary or desirable work demands often exceed available funding. Forest Plan monitoring is no exception. If budget levels limit the Forest's ability to perform all monitoring tasks, then those items specifically required by law or court order will be given the highest priority for implementation. Additionally, a prioritization process for Chapter IV and the Monitoring Implementation Guide items will be developed to ensure efficient use of limited time, money and personnel. Following is a list of potential criteria that may be used in the screening process:

- Is monitoring of a particular question or resource mandated by law or court order?
- Is there a high degree of uncertainty associated with management assumptions?.
- Is there a high degree of disparity between existing and desired conditions?
- Are proposed management activities likely to affect resources of concern?.
- How do monitoring items fit into national and regional priorities?
- How well do monitoring items fit with public comments and interests?
- What are the consequences of not knowing resource conditions?
- Will monitoring respond to a key issue?

Monitoring priorities will be established each year using the above criteria, information gained during the past year, and budgets. The prioritization process will be described within the Monitoring Implementation Guide.

Information Management

There will likely be a tremendous amount of monitoring information collected over time. If this information is not documented so it can easily be retrieved, shared with the public and other stakeholders, or used by agency managers to foster better decisions, it is of limited value.

Therefore, information management should consist of:

1. Management of the collection and storage of data,
2. Evaluation and interpretation of data, and
3. Sharing of information internally and externally.

Manage the Collection and Storage of Data

A Forest interdisciplinary team will work with Forest Service employees and cooperators to see that data are collected using standard methods found in the Monitoring Implementation Guide and are entered into the appropriate databases.

Evaluation and Interpretation of Data

Evaluation is the process of transforming data into information. It is a process of synthesis that brings together value, judgment, and reason with monitoring information to answer selected monitoring questions. Successful adaptive management depends on this information in order to move the Forest toward desired conditions.

A Forest interdisciplinary team will review the current year's monitoring and evaluation results at the end of each calendar year. Based on these findings, they will recommend to the Forest Leadership Team necessary changes (if any) to the Forest Plan, Monitoring Implementation Guide, or Forest Service Manual or Handbook.

The findings gathered through monitoring will be summarized in various reports (most notably the annual Monitoring and Evaluation Report) and publications, and they will be shared internally and externally with cooperating agencies and organizations, interest groups, policy makers, and the general public.

Annual Monitoring and Evaluation Report

The annual Monitoring and Evaluation Report provides an opportunity to track progress toward the implementation of revised forest plan decisions and the effectiveness of specific management practices. The focus of the evaluation is providing short- and long-term guidance to ongoing management. The Monitoring and Evaluation Report should include components such as:

1. Forest accomplishments toward desired conditions and outputs of goods and services.
2. Forest Plan Amendment Status.
3. Status of other agency/institution cooperative monitoring.
4. Summary of available information on MIS or comparable species/habitats.
5. Summary of large-scale or significant projects or programs.
6. Update of research needs.
7. Public participation/disclosure plan.

Public Involvement

The Forest Service mission will not be realized without public trust in our decision-making process. Even though agency decisions will not consistently please everyone, using an open process for making decisions should foster public understanding of the rationale for individual decisions. The same principle applies to monitoring. Moreover, since our approach incorporates an adaptive strategy, frequent public feedback is necessary to facilitate monitoring activity prioritization, protocols, evaluation, and ultimately better informed decisions. Subsequently a strategy for involving the public and other agencies in Forest monitoring planning, execution, and evaluation will be formulated each year. Partnerships with interest groups, volunteer groups, universities, and other federal, state and local agencies will be part of that strategy. Monitoring information trips are an option for the public to review monitoring findings and methods and address management implications. Other avenues of public involvement such as news releases, the internet, brochures, and public reports may also be used.

THE MONITORING MATRIX

Table IV-2 provides descriptions of the components that are used in The Monitoring Matrix, Table IV-3.

Table IV-2. Definitions of Components in the Monitoring Matrix

Component	Definition
Resource Area	A quantitative or qualitative parameter that can be assessed.
Monitoring Question	Specific monitoring question(s) developed to ensure that monitoring and evaluation addresses information essential to measuring the Forest Plan. These questions relate to the different purposes and rationales for monitoring. There may be more than one monitoring question per resource area.
Monitoring Driver	Drivers identify the reason(s) why we are monitoring a particular monitoring item. Following is a list of monitoring drivers: (1) Legal and regulatory requirements or Forest Service Manual direction, (2) Forest Plan direction, (3) Validation of assumptions and predictions, (4) Court rulings. Legal and regulatory drivers are described whereas desired conditions, goals, objective, and S and G's are referenced.
Measurement Frequency	Describes how often monitoring information is collected.
Evaluation and Reporting Frequency	Describes how often monitoring information is evaluated and reported.
Precision and Reliability	Two categories of precision and reliability are appropriate at the forest plan scale: Class A: Methods appropriate for modeling or quantitative measurement. Results have a high degree of repeatability, reliability, accuracy and precision. Class B: Methods based on project records, personal communications, ocular estimates, pace transects, informal visitor surveys and similar types of assessments. The degree of repeatability, reliability, accuracy and precision are not as high as Class A methods, but they still provide valuable information.

Table IV-3 is in two parts. The first part, IV-3a, displays monitoring items that are required through the NFMA.

Table IV-3a. Monitoring Matrix - Required Monitoring Items

Resource, Activity, Practice, Effect To Monitor	Monitoring Question	Driver - NFMA	Precision and Reliability	Measuring Frequency	Evaluation and Reporting Frequency
1. Outputs and Services	How close are outputs and services projected for Forest Plan implementation to actual outputs and services?	A quantitative estimate of performance comparing outputs and services with those projected by the forest plan.	A	Annual	Annual
2. Costs	How close are projected costs to actual costs?	Documentation of costs associated with carrying out planned management prescriptions as compared with costs estimated for forest plan implementation.	A	Annual	Annual
3. Insects and Disease	Are insect and disease populations compatible with objectives for restoring or maintaining healthy forest conditions?	Destructive insects and disease organisms do not increase to potentially damaging levels following management activities.	A/B	Annual	Annual
4. Insects, Diseases, and Disturbance Processes	To what extent is the Forest managing undesirable occurrences of fire, insect and disease outbreaks through prevention, suppression, and integrated pest management?	Wildfires, destructive insects and disease organisms do not increase to potentially damaging levels following management activities.	A/B	1-5 years	1-5 years
5. Recreation Motor Vehicles	To what extent is the Forest providing RMV opportunities; what are the effects of RMVs on the physical and social environment; and how effective are forest management practices in managing RMV use?	Off-road vehicle use shall be planned and implemented to protect land and other resources, promote public safety, and minimize conflicts with other uses of the NFS lands. Forest planning shall evaluate the potential effects of vehicle use off roads and classify areas and trails of NFS lands as to whether or not off-road vehicle use may be permitted.	A/B	1-5 years	1-5 years
6. Forest Productivity	Are the effects of Forest management,	Documentation of the measured prescriptions	A/B	1-5 years	1-5 years

Resource, Activity, Practice, Effect To Monitor	Monitoring Question	Driver - NFMA	Precision and Reliability	Measuring Frequency	Evaluation and Reporting Frequency
	including prescriptions, resulting in significant changes to productivity of the land?	and effects, including significant changes in productivity of the land.			
7. Timber	Are regeneration harvest units adequately restocked after five years?	Lands are adequately restocked as specified in silvicultural prescriptions.	A	Annual	Annual
8. Timber	To what extent is commercial harvest occurring on lands suited or not suited for timber production? Is there any need to adjust the suitable timberlands on the Forest?	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.	A	10 years	10 years
9. Timber	Are even-aged harvest units, particularly clearcuts, exceeding the 40-acre size limit established under the NFMA? If they are, is there a need to adjust the size limit to better accommodate Forest Plan management objectives and practices?	Maximum size limits for even-aged harvest areas are evaluated to determine whether such size limits should be continued.	B	Years 5 and 10	Years 5 and 10
10. Management Indicator Species (MIS)	To what extent is Forest management moving toward desired habitat conditions for MIS and species associated with MIS habitats?	Monitor management indicator species and their relationships to habitat affected by management. This monitoring will be done in cooperation with state fish and wildlife agencies, to the extent practicable.	A/B	Annual	1-5 years

The second part of the table displays monitoring items that are tied to achieving Forest-wide direction and management practices found in Chapters II and III of the 2006 Forest Plan. There are undoubtedly items in this table that potentially overlap each other or items found in Table IV-3a, and we may adjust these in time as the monitoring plan is implemented and evaluated. This matrix and the Monitoring Implementation Guide are, to a certain degree, intended to be dynamic and flexible, as one of the important keys to an effective monitoring and evaluation plan is the ability to determine a need for change and to adapt to that need over time.

Table IV-3b. Monitoring Matrix - Forest Plan Direction Monitoring Items

Resource, Activity, Practice, Effect To Monitor	Monitoring Question	Driver - Forest Plan Direction	Precision and Reliability	Measuring Frequency	Evaluation and Reporting Frequency
11. Air Quality	To what extent is Forest management contributing or responding to air pollution effects on ecosystems and visibility?	AQ01 AQ04	A/B	1-5 years	1-5 years
12. Air Quality	Are Air Quality Related Values of the Dolly Sods and Otter Creek Wildernesses improving over current adversely affected levels?	AQ02	A/B	1-5 years	1-5 years
13. Air Quality	What are the trends in ambient air pollutant concentrations near the Forest?	AQ02	A/B	1-5 years	1-5 years
14. Fire	To what extent is unwanted wildland fire on the Forest being successfully suppressed?	FM02, FM03, FM11	A/B	1-5 years	1-5 years
15. Fire	How, where, and to what extent are desired fuel conditions being met by lowering Fire Regime Condition Classes 3 and 2?	FM03, FM09, FM10, FM16	A/B	1-5 years	1-5 years
16. Fire	How, where, and to what extent is prescribed fire being used to mimic natural processes, or maintain/improve vegetation conditions, or restore natural processes and functions to fire-adapted ecosystems?	FM05, FM06, FM09	A/B	1-5 years	1-5 years
17. Fire	Are smoke management practices effective in protecting human health and public safety from potential adverse impacts of prescribed fire emissions?	FM13	A/B	1-5 years	1-5 years
18. Heritage Resources	Are project-specific mitigation measures being followed as recommended in project designs? If so, are they providing effective protection for heritage resources?	HR01, HR04, HR05	A	1-5 Years	1-5 Years
19. Heritage Resources	Are heritage resources being affected in non-project areas from activities	HR01, HR04, HR05	A	1-5 Years	1-5 Years

Resource, Activity, Practice, Effect To Monitor	Monitoring Question	Driver - Forest Plan Direction	Precision and Reliability	Measuring Frequency	Evaluation and Reporting Frequency
	such as looting, OHV use, or erosion?				
20. Minerals	Are mineral exploration, development and production mitigation measures being followed and are they effective in reducing impacts?	MG01, MG02, MG04, MG08, MG09, MG15, MG17, MG19, MG21, MG28, MG32, MG34-MG38	A/B	1-5 years	1-5 years
21. Minerals	How close are projected estimates of National Forest System land that could be impacted by natural gas development to actual amounts?	MG01, Forest Plan assumptions for mineral-related impacts to Forest resources.	A	1-5 years	1-5 years
22. Minerals	Are minerals, especially energy-producing minerals, available for exploration, development, and production at predicted levels?	MG01, MG03, MG06	A	1-5 years	1-5 years
23. Public Health and Safety	Are Forest facilities and recreation sites safe for employee and public use and enjoyment?	RC02, RC11, RC15, RC16, RF26	A	1-5 Years	1-5 Years
24. Recreation	To what extent is the Forest providing a range of motorized and non-motorized recreation opportunities that incorporate diverse public interests yet achieve applicable MP goals?	RC01, RC03, RC08	A/B	1-5 years	1-5 years
25. Recreation	To what extent are Forest management activities within the Recreation Opportunity Spectrum Objectives (ROS)?	RC02, RC03, RC08, RC24, RC26, RC29, RC34, SM01-SM08	A/B	1-5 years	1-5 years
26. Recreation	To what extent do Forest recreation facilities and opportunities meet accessibility, cost, and maintenance needs to achieve resource and social objectives?	RC02, RC06, RC07, RC08, RC11, RC12, RC24, RC29, SM01-SM08	A	1-5 years	1-5 years
27. Scenic Resources	Are forest management activities providing scenic quality as defined by the Scenic Integrity Objectives?	SM01-SM08	B	1-5 years	1-5 years
28. Special Uses	Does management of special forest products,	LS21, LS23, LS27, LS18	A/B	1-5 years	1-5 years

Resource, Activity, Practice, Effect To Monitor	Monitoring Question	Driver - Forest Plan Direction	Precision and Reliability	Measuring Frequency	Evaluation and Reporting Frequency
	recreation/wilderness, and other special use permits meet Forest Plan and agency direction?				
29. Transportation System	To what extent is the Forest, in coordination with other public road agencies, providing safe, cost effective, minimum necessary road systems for administrative and public use?	Forest Plan Desired Conditions, RF01-RF04, RF07-RF13	A/B	1-5 years	1-5 years
30. Transportation System	To what extent are road and trails closures effective in prohibiting unauthorized motor vehicle use and associated impacts?	RF01, RF16, RF17, RF19, WF02, WF16	A/B	1-5 years	1-5 years
31. Soils	Is soil detrimental disturbance associated with land management activities below the 15% soil productivity loss threshold?	SW03, SW04, SW06, SW07, SW11, SW14, SW15, SW 16, SW18	A/B	1-5 years	1-5 years
32. Soils	Is acid deposition affecting soil productivity loss and if so, is it affecting land sustainability?	SW08, SW10, SW12, SW13	A/B	1-5 years	1-5 years
33. Vegetation	Is timber harvesting sustainable over the long-term and maintained at predictable and dependable levels?	Forest Plan Desired Conditions	A	1-5 years	1-5 years
34. Vegetation	To what extent is the Forest providing a range of vegetative communities that address diverse public interests and needs while contributing to ecosystem sustainability and biological diversity?	VE01, VE02, VE06, TE01, Forest Plan Desired Conditions	A/B	1-5 years	1-5 years
35. Vegetation Composition and Structure	To what extent are Forest management, natural disturbances, and subsequent recovery processes changing vegetation composition and structure?	VE01, VE06	A/B	1-5 years	1-5 years
36. Vegetation Composition and Structure	To what extent is the Forest meeting vegetation composition and age class objectives and desired conditions for MPs 3.0, 4.1, and 6.1?	Composition and age class desired conditions and goals for MPs 3.0, 4.1, and 6.1	A	5 Years	5 Years

Resource, Activity, Practice, Effect To Monitor	Monitoring Question	Driver - Forest Plan Direction	Precision and Reliability	Measuring Frequency	Evaluation and Reporting Frequency
37. Vegetation	Are non-native invasive plants located and treated to prevent or limit further spread?	Forest Plan Desired Conditions	A/B	1-5 years	1-5 years
38. Threatened and Endangered Species	To what extent is Forest management contributing to the protection and recovery of threatened and endangered species?	TE01-TE04, TE38	A/B	1-5 years	1-5 years
39. Regional Forester Sensitive Species	To what extent is Forest management contributing to the conservation of sensitive species and maintaining or restoring their habitat conditions?	VE07, VE11, VE14, WF01, WF11, WF17	A/B	1-5 years	1-5 years
40. Watershed, Riparian and Aquatic Ecosystem Health	To what extent are Forest management and other external influences, such as acid deposition, beneficially or adversely affecting water quality or quantity?	SW01, SW20, SW21, SW22, SW26, SW30	A/B	1-5 years	1-5 years
41. Watershed, Riparian and Aquatic Ecosystem Health	To what extent is Forest management beneficially or adversely affecting soil erosion and stream sedimentation processes?	SW01, SW20, SW21	A/B	1-2 years	1-2 years
42. Watershed, Riparian and Aquatic Ecosystem Health	To what extent is Forest management beneficially or detrimentally affecting the physical conditions of aquatic ecosystems, including riparian ecosystem function and health?	SW01, SW13, SW20, SW26, SW29, SW30, SW36, SW34, SW39, SW46, WF01, WF04, WF18, WF20, WF22	A/B	1-5 years	1-5 years
43. Wildlife, Fish, and Plants	To what extent is Forest management influencing the viability of native and desired non-native species, or otherwise affecting species composition and habitat productivity?	WF01, WF04, WF23	A/B	1-5 years	1-5 years
44. Wildlife and Fish Non-native Invasive Species	To what extent is management on Forest lands influencing populations of terrestrial or aquatic non-native species that threaten native ecosystems?	VE15, VE18, VE20	A/B	1-5 years	1-5 years
45. Wildlife Habitat: Retained	Is Forest management providing adequate habitat diversity and structure	TE31-TE33, TE41, TE42, TE44, TE45, TE	A/B	1-5 years	1-5 years

Resource, Activity, Practice, Effect To Monitor	Monitoring Question	Driver - Forest Plan Direction	Precision and Reliability	Measuring Frequency	Evaluation and Reporting Frequency
Features	through maintenance or enhancement of snags, culls, leave trees, and downed woody debris?	49, TE50, TR14, specific direction in management prescriptions relating to snags, culls, leave clumps, etc.			
46. Wildlife Habitat: Social and Recreational Opportunities	Is the Forest providing adequate habitat to meet the demand for wildlife and fisheries related social and recreational opportunities?	WF03	A/B	1-5 years	1-5 years