Chapter 4 Monitoring and Evaluation

Introduction..... 4-2
Legal and Regulatory Requirements..... 4-3
Monitoring Guidelines and Components..... 4-5
Monitoring Matrix..... 4-7

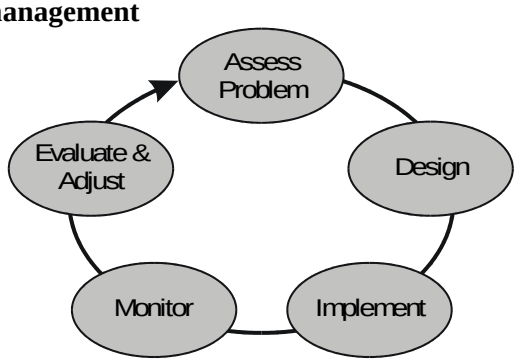
INTRODUCTION

Monitoring and evaluation (M and E) are separate, sequential activities required by NFMA regulations. Monitoring involves collecting data by observation or measurement. Evaluation involves analyzing and interpreting monitoring data. The information gained from M and E 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-do-date and responsive to changing conditions and issues, which provides the feedback mechanism for adaptive management (Fig. MON1). The results are used to identify if and when changes are needed to either the forest plan itself or the way it is implemented.

Figure MON 1

Monitoring and Adaptive Management

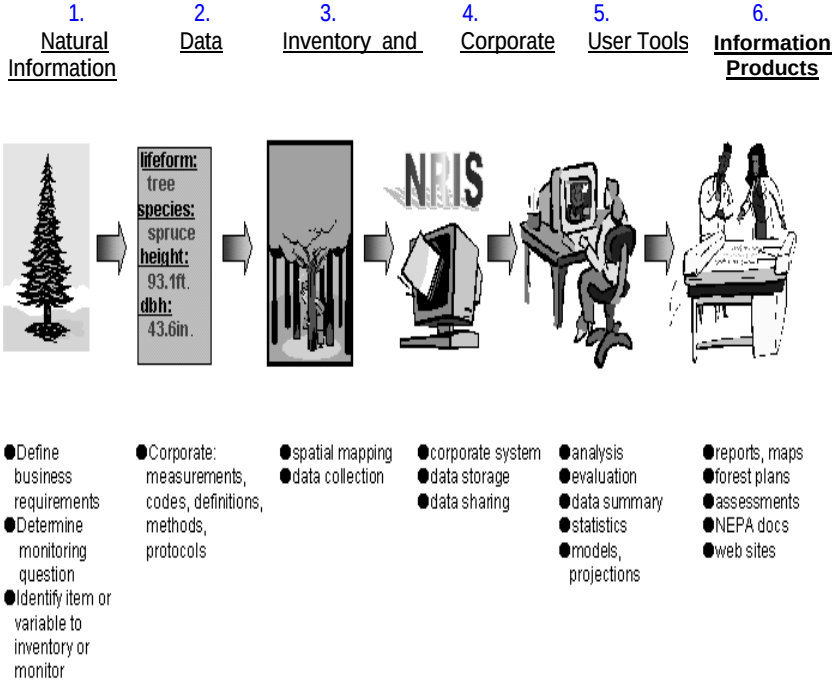
Evaluation and monitoring provide the feedback mechanism for adaptive forest management



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 and should be developed early in the planning process. (See Figure MON 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 (Steps 5 and 6) that would be available for internal and external review.

Figure MON 2: Elements of Information Management



Legal and Regulatory Requirements

The forest plan addresses several types of monitoring as required in the 1982 regulations. These requirements fall into four broad categories:

- Category 1: Required monitoring items (36 CFR 219.12(k) and 219.19(a)(6),
- Category 2: Attainment of goals and objectives (36 CFR 219.12(k)),
- Category 3: Implementation of standards and guidelines (36 CFR 219.12(k)), and
- Category 4: Effects of prescriptions, management practices, and off-road vehicles (36 CFR 219.11(d), 219.12(k)(2), and 219.21(g)

Required Category 1 monitoring items (Table MON-1) are mandatory components of every forest plan, whereas Category (2) through (4) monitoring items are more flexible and are tailored to address issues raised through public scoping and interdisciplinary team review. A more complete description of Category 1 through 4 monitoring items is shown in the Monitoring Matrix section.

Table MON-1. Monitoring Regulatory Requirements

Monitoring Description	Annual Posting of Results?	Five-Year Evaluation Report?
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 from activities on nearby lands managed by other Federal or other government agencies or under the jurisdiction of local governments. (36 CFR 219.7(f)		X
The Forest Supervisor shall review the conditions on the land covered by the plan at least every 5 years to determine whether conditions or demands of the public have changed significantly. (36 CFR 219.10(g)		X
Monitoring and evaluation requirements will provide a basis for a periodic determination of the effects of management practices. 36 CFR 219.11(d)		
At intervals established in the plan, implementation shall be evaluated on a sample basis to determine how well objectives have been met and how closely management standards and guidelines have been applied. Based upon this evaluation, the interdisciplinary team shall recommend to the Forest Supervisor such changes in management direction, revision, or amendments to the forest plan as are deemed necessary. (36 CFR 219.12(k)		X
Monitoring requirements identified in the forest plan shall provide for—(36 CFR 219.12(k) [1] A quantitative estimate of performance comparing outputs and services with those projected by the forest plan;	X	
[2]Documentation of the measured prescriptions and effects, including significant changes in productivity of the land; and		X
[3]Documentation of costs associated with carrying out the planned management prescriptions as compared with costs estimated in the forest plan.	X	
[5] A determination of compliance with the following standards: [i] Lands are adequately restocked as specified in the forest plan;		X

Table MON-1. Monitoring Regulatory Requirements		
Monitoring Description	**Annual Posting of Results?**	**Five-Year Evaluation Report?**
[ii] Lands identified as not suited for timber production are examined at least every 10 years to determine if the have become suited; and that, if determined suited, such lands are returned to timber production; {Note: See also 219.14(d): …Designation in the plan of lands not suited for timber production shall be reviewed at least every 10 years. ..}		X
[iii] Maximum size limits for harvest areas are evaluated to determine whether such size limits should be continued; and		X
[iv] Destructive insects and disease organisms do not increase to potentially damaging levels following management activities.		X
(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 practicable.	X	
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 295 part of this chapter, classify areas and trails of National Forest System lands as to whether or not off-road vehicle use may be permitted.	X	

Monitoring Guidelines and Components

Monitoring Framework

Many approaches to Forest Plan monitoring are currently being used throughout the agency. However, each monitoring chapter must: 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 Superior National Forest's monitoring framework has four components:

1) Forest Plan (Chapter 4) 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 Mon-2.

Monitoring Prioritization

Within any agency or institution, necessary or desirable work demands often exceed available funding. Forest Plan monitoring is no exception. Consequently a prioritization process for Chapter 4 and the Monitoring 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 regulation or court order?
-Is there a high degree of uncertainty associated with management assumptions? (Management Significance).
-Is there a high degree of disparity between existing and desired conditions?
-Are proposed management activities likely to affect resources of concern? (Ecological Significance).
-How do monitoring items fit into National and Regional priorities?
-How well do monitoring items fit with Public Comments?
-What are the consequences of not knowing resource conditions?
-Will monitoring respond to a key issue?

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

Table Mon-2. Monitoring Framework

Forest Plan Monitoring (Chapter 4)	Monitoring and Evaluation Implementation Guide	Annual Monitoring Schedule	Annual Monitoring Evaluation Review
Broad and Strategic. 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.	Focused and Technical; 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.	Specific, Technical, and Prescriptive. 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 and monitoring guide.	Specific, Technical, and Prescriptive. The 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. .

Information Management

There will 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. Information management will consist of: (1) Management of the collection and storage of data (2) Evaluation and interpretation of data (3) Sharing of information internally and externally

Manage the Collection and Storage of Data

The interdisciplinary team review will work with Forest Service employees and cooperators to see that data is collected using standard methods found in the Monitoring Guide and is 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 moving the Forest toward desired conditions.

The 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.

Sharing of Monitoring Information and Findings Information gathered through monitoring will be summarized in various reports (most notably the annual Monitoring and Evaluation Report) and publications and 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 (M and E) provides an opportunity to track progress towards the implementation of revised forest plan decisions and the effectiveness of specific management practices. The focus of the evaluation is in providing short and long term guidance to ongoing management. The M and E 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.
(5) Summary of large scale or significant projects or programs (ie Storm Recovery).
(6) Update of research needs
(7) Public participation/disclosure plan

Public Involvement

The Forest Service mission "Caring for the Land and Serving the People" 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 attempted each year. Partnerships with interest groups, volunteer groups, other federal, state and local agencies, and universities will be part of that strategy. Monitoring information trips for the public will be encouraged to review monitoring findings and methods and address subsequent management implications. Other avenues of public involvement such as news releases, the internet, brochures, and public reports will also be used.

MONITORING MATRIX

Category #1 (Required), #2 (Desired Conditions, and Objectives) and #4 (effects of prescriptions, management practices, and off-road vehicles) are outlined in the matrix. The more prescriptive Standards and Guides (Category #3) will be addressed in the Monitoring Guide. The focal point for each monitoring item will be the Monitoring Question. Each Monitoring Question is derived from one or more Monitoring Drivers (Legal Requirements, Desired Conditions or objectives etc. See table MON-2 for definitions). Not all monitoring drivers will be monitored each year. Annually drivers that best answer the monitoring question for each resource area will be identified through the Annual Monitoring Schedule process.

As previously mentioned, public involvement with Forest Plan monitoring (beyond comments received on Draft Forest Plan) will be sought. The intent is to continue public participation beginning with development of the Monitoring Guide.

Modifying direction for the BWCAW was not part of the Plan revision process. Therefore, the monitoring items below appear as they did in the 1993 BWCAW Management Plan and Implementation Schedule.

Table MON-3. 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	Monitoring drivers identifies the reason or why we are monitoring a particular monitoring item. Following is a list of monitoring drivers: (1) Legal and regulatory requirements and Forest Service Manual direction and (2) Forest Plan desired conditions, goals, objectives standards and guidelines (S and G's). (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. Refer to chapters 2 and 3 for full description of these drivers.
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 MON-4. Chapter 4 Monitoring Matrix

REQUIRED MONITORING ITEMS

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/ Reporting Frequency	Precision and Reliability
All	How close are projected outputs and services to actual?	(36 CFR 219.12(k)[1]. A quantitative estimate of performance comparing outputs and services with those projected by the forest plan;	Annual	Annual	A
All	How close are projected costs with actual costs?	(36 CFR 219.12(k) [3]. Documentation of costs associated with carrying out the planned management prescriptions as compared with costs estimated in the forest plan.	Annual	Annual	A
Insects & Disease	Are insects and diseases populations compatible with objectives for restoring or maintaining healthy forest conditions?	(36 CFR 219.12(k)[5][iv]. Destructive insects and disease organisms do not increase to potentially damaging levels following management activities. D-ID-3, O-ID-1, D-VG-5, D-VG-8, O-VG-10-12	Annual	Annual	A/B
Insects, Diseases and Disturbance Processes	To what extent is Forest management managing undesirable occurrences of fire, insect and disease outbreaks?	(36 CFR 219.12(k)[5][iv]. Destructive insects and disease organisms do not increase to potentially damaging levels following management activities. D-ID-1-2, O-ID-1	1-5 years	1-5 years	A/B
Recreation Motor Vehicles	To what extent is the Forest providing RMV opportunities; what are the effects of RMV's on the physical and social environment; and how effective are forest management practices in managing RMV use?	36 CFR 219.21[g]. 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 National Forest System lands. Forest planning shall evaluate the potential effects of vehicle use off roads and, on the basis of the requirements of 36 CFR 295 part of this chapter, classify areas and trails of National Forest System lands as to whether or not off-road vehicle use may be permitted. D-RMV-1, 2. O-RMV-1.	Annual	1-5 years	A, B

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/ Reporting Frequency	Precision and Reliability
Social & Economic Stability	To what extent do output levels and location of timber harvest and mix of saw timber and pulpwood compare to those levels projected ?	CFR 219.19.12(k)[1]. A quantitative estimate of performance comparing outputs and services with those projected by the forest plan;. 36CFR 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 from activities on nearby lands managed by other Federal or other government agencies or under the jurisdiction of local governments. D-TM-1, O-TM-1	Annual	Annual	A, B
Soils	Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land?	36 CFR 219.12 (k) [2], Documentation of the measured prescriptions and effects, including significant changes in productivity of the land; D-WS-3, D-WS-12, O-WS-9, O-WS-10	1-5 years	1-5 years	A/B
Timber	Are harvested lands adequately restocked after five years?	(36 CFR 219.12(k)[5][i]. Lands are adequately restocked as specified in the forest plan	Annual	Annual	A
Timber	To what extent is timber management occurring on lands suitable for such production?	(36 CFR 219.12(k)[5][ii]. Lands identified as not suited for timber production are examined at least every 10 years to determine if the have become suited; and that, if determined suited, such lands are returned to timber production;	10 years	10 years	A
Timber	How much even-aged management (especially clear cutting) should be used, and in what forest types should it be used?	(36 CFR 219.12(k)[5][iii]. Maximum size limits for harvest areas are evaluated to determine whether such size limits should be continued.	Years 5 and 10	Years 5 and 10	B
Wildlife: Management Indicator Species	What are the population trends of management indicator species?	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 practicable. O-WL-1, O-WL-16, O-WL-17, O-WL-31, and O-WL-32.	Annual	1-5 years	A/B

DESIRED CONDITION and OBJECTIVE MONITORING ITEMS

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/ Reporting Frequency	Precision and Reliability
Air Quality	To what extent is Forest management contributing or responding to air quality effects on ecosystems, human health or human enjoyment?	D-AQ-1, D-AQ-2, D-WS-4, D-WS-5, D-REC-3, D-SC-1 and O-AQ-1.	1-5 years	1-5 years	A/B
Air Quality	Are air quality related values of the Boundary Waters Canoe Area Wilderness being maintained?	D-AQ-1, D-AQ-2, D-WS-4, D-WS-5, D-REC-3, D-SC-1 and O-AQ-1.	1-5 years	1-5 years	A/B
Cooperation	To what extent does the Forest emphasize agency, tribal, and public involvement and inter-governmental coordination with federal, state, county governments and agencies?	D-CM-1. D-SE-4, D-REC-6.	5 Years	5 Years	A/B
Fire	What level of wildland fire on the landscape is appropriate and desirable and , to what extent is unwanted wildland fire on the landscape suppressed?	D-ID-6	1-5 years	1-5 years	A/B
Fire	How, where, and to what extent will prescribed fire be used to maintain desired fuel levels, and/or mimic natural processes, and/or maintain/ improve vegetation conditions, and/or restore natural processes and functions to ecosystems?	D-ID-4-5, O-ID-2-4	1-5 years	1-5 years	A/B
Heritage Resources	1) Are avoidance or mitigation measures effective and being followed as recommended in project designs? 2) Are heritage resources being affected in non-project areas?	O-HR-1 and O-HR-2.	5 Years	5 Years	A
Land Adjustment	How successful is the Forest's land adjustment program in support and enhancement of Forest Plan desired conditions and objectives and contributing to efficient and effective stewardship?	D-LA-1, O-LA-1, O-LA-2, and O-LA-3	2 years	2-5 years	A
Landscape Ecosystems	To what extent is the Forest meeting vegetation composition and age class objectives for each of the Landscape Ecosystems?	Composition and Age Class objectives by LE	5 Years	5 Years	A
Minerals	Are mineral exploration, development and production avoidance or mitigation measures effective and being followed as recommended in project designs?	D-MN-1 and D-MN-2	1-5 years	1-5 years	A/B

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/ Reporting Frequency	Precision and Reliability
Public Health and Hazardous Materials	Does water in Forest-provided drinking water sources and swimming beaches meet standards of quality protective of human health and aesthetics?	O-PH-1.	5 Years	5 Years	A
Public Health and Hazardous Materials	Does hazardous material storage on NF meet standards of quality protective of human health?	O-PH-2.	5 Years	5 Years	A
Public Health and Hazardous Materials	Are Forest facilities and recreation sites safe for employee and public use and enjoyment?	O-PH-4.	5 Years	5 Years	A
Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/Reporting Frequency	Precision and Reliability
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 MA and LE objectives.	D-REC-1, 7, 9, 10, 11, 12, 13. O-REC-1. D-RTL-1,3. O-RTL-1. D-RWA-1, O-RWA-1.	1-5 years	1-5 years	A/B
Recreation	To what extent are Forest management activities within the Recreation Opportunity Spectrum Objectives (ROS)?	D-REC-2. O-REC-2, 3.	1-5 years	1-5 years	A/B
Recreation	To what extent do Forest recreation facilities and opportunities meet accessibility, health, safety, cost, and maintenance requirements and achieve resource and social objectives?	D-REC-3, 4, 8. O-REC-4. D-RTL-2.	1-5 years	1-5 years	A
Scenic Resources	Are forest management activities providing scenic quality as defined by the Scenic Integrity Objectives (SIO)?	D-SC-1, 2, 3. O-SC-1.	1-5 years	1-5 years	B
Social & Economic Stability	To what extent does the Forest provide commodity resources and non commodity opportunities in an environmentally acceptable manner that contribute to the social and economic sustainability and diversity of local communities?	D-SE-1 and 2. . O-SE-1.O-SE-3. O-SE-4.O-SU-2.O-SU-3. O-SU-4. O-SU-5.	5 Years	5 Years	A, B
Social & Economic Stability	Are forest management activities maintaining the desired characteristics of the areas and species of interest (traditionally and culturally) as identified in research and/or by interested communities and individuals?	D-SE-3.	1-5 years	1-5 years	A, B

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/ Reporting Frequency	Precision and Reliability
Special Uses	Does Forest management of forest product, recreation/wilderness, and other special use permits meet Forest Plan and agency direction?	D-REC-5. O-SU-1, 2, 3, 4, 5. D-TS-5.	1-5 years	1-5 years	A/B
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.	D-TS-1, 2, 3, 4. O-TS-1, 2, 6, 7, 8.	1-5 years	1-5 years	A
Tribal Rights and Interests	Is Forest management helping to sustain American Indians' way of life, cultural integrity, social cohesion, and economic well being?	D-TR-1. O-TR-1. O-TR-3.	Throughout the year	Annual	B
Tribal Rights and Interests	Are government to government relationships functional?	D-TR-2. O-TR-2. O-TR-4.	Throughout the year	Annual	B
Tribal Rights and Interests	Is the Forest facilitating the right of the Tribes to hunt, fish, and gather as retained via treaty?	D-TR-3.	Throughout the year	Annual	B
Vegetation	To what extent is the Forest providing a full range of vegetative communities that address diverse public interests and needs while contributing to ecosystem sustainability and biological diversity?	D-VG-1, -2,-3, -4	1-5 years	1-5 years	A/B
Vegetation Composition & Structure	To what extent are Forest management, natural disturbances, and subsequent recovery processes changing vegetation composition and structure? To what extent are conditions moving toward short-term (1-20 years) and long-term (100 years) objectives at Landscape Ecosystem, Management Area, and other appropriate landscape scales?	D-VG-1-6. O-VG-1-16.	1-5 years	1-5 years	A/B
Vegetation Ecological Processes	To what extent is Forest management maintaining or restoring conditions that result from or emulate natural ecological processes of fire, wind, flooding, and insects and disease outbreaks.	D-VG-8, O-VG-6-11, 36 CFR 219.12(k)[5](iii).	5 Years	5 Years	A/B
Vegetation Spatial Patterns	To what extent are Forest management, natural disturbances, and subsequent recovery restoring vegetation spatial landscape patterns and moving conditions toward both short-term (1-20 years) and long-term (100 years) objectives at Landscape Ecosystem, Spatial Zone (SNF), Management Area, and other appropriate landscape scales?	D-VG-1-5, O-VG-17-25.	5 Years	5 Years	A/B

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/ Reporting Frequency	Precision and Reliability
Watershed Health & Riparian-	To what extent is Forest management affecting water quality, quantity, flow timing and the physical features of aquatic, riparian, or wetland ecosystems?	All WS Desired Conditions and Objectives with the possible exception of D-WS-14, plus O-RWA-1 D-PH-3, D-PH-4, O-PH-3, O-TS-4 and O-TS-5	1-5 years	1-5 years	A/B
Wildlife	To what extent is Forest management providing ecological conditions to maintain viable populations of native and desired non-native species.	D-WL-3b, O-WL-1, O-WL-2, CFR 219.19 (6).	1-5 years	1-5 years	A/B
Wildlife: Non-native Invasive Species	To what extent is Forest management contributing or responding to populations of terrestrial or aquatic non-native species that threaten native ecosystems?	D-WL-9. O-WL-37 and 38.	1-5 years	1-5 years	A/B
Wildlife: Sensitive Species	To what extent is Forest management contributing to the conservation of sensitive species and moving toward short term (10-20 years) and long-term (100 years) objectives for their habitat conditions?	D-WL-1-9, O-WL-1-3. O-WL-18-31.	1-5 years	1-5 years	A/B
Wildlife: Management Indicator Species	To what extent is Forest management moving toward short term (10-20 years) and long-term (100 years) objectives for habitat conditions for management indicator species and species associated with management indicator habitats?	D-WL-1-9, O-WL-1-3, O-WL-16,17, 31, 32, 34, 35, 36, and LE MIH objectives 1-9.	1-5 years	1-5 years	A/B
Wildlife: Threatened and Endangered Species	To what extent is Forest management contributing to the conservation of threatened and endangered species and moving toward short term (10-20 years) and long-term (100 years) objectives for their habitat conditions and population trends?	D-WL-1-8, O-WL-4-17.	1-5 years	1-5 years	A/B
Wildlife: Threatened and Endangered Species	To what extent are road and trails closures effective in prohibiting unauthorized motor vehicle use?	G-WL-7, G-RMV-4, O-TS-3, O-TS-7, S-TS-3, S-TS-7, and G-TS-12 , G-TS-16	1-5 years	1-5 years	A/B
Wildlife: Threatened and Endangered Species	To what extent is the Forest maintaining no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas?	S-WL-2	1-4 years	1-4 years	A/B

1993 BWCA WILDERNESS MANAGEMENT PLAN MONITORING ITEMS

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/Reporting Frequency	Precision and Reliability
SOCIAL 1964 Wilderness Act	Visitor use -Use Levels -Travel Patterns -Use levels by time of year -Average party size -Origin of party	Use levels Wilderness experience	Various	Annual	High
	Compliance with rules, regulations reserving/issuing permits -Cancellations -Party leader names -Alternates -Entrance date -Entrance point -Mode of travel	Integrity of permit and reservation system	Various	Ongoing	Moderate/high
	No show rate for overnight and day use motor permits.	Permit check - percent (%) no show built into system.	% no show	Various	Moderate
	Social encounters - Levels of crowding	Use levels Wilderness experience	Visitor satisfaction	Various	Moderate
ECOSYSTEM Bald Eagle Recovery Act & Endangered Species Act	Eagle population levels and reproduction trends	Bald Eagle	Number of birds	Annual	Moderate/high
Endangered Species Act	Wolf density and population levels	Gray Wolf	Wolves/sq. mi.	Annual	Moderate
Threatened & Endangered Plants	Population trends - prevent habitat loss	Plant communities; Campsites, Trail mtce and construction	Population trends	As needed	Moderate/high
Fisheries	Cooperate with State on inventories and assessments	Fish	Various	Ongoing	High
Air & Water Quality Resources	Effectiveness of State and federal laws related to air and water pollution	Concentration of pollutants in air and precipitation	Various	Continuous	High
	Acid deposition impacts to lakes	Loss of acid neutralizing capacity	Various	Three times a year	High

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/Reporting Frequency	Precision and Reliability
	Mercury concentration in fish	Basis for recommending limits for human consumption	ppm Hg	Annual	High
	Mercury concentration in water and zooplankton	Mercury bioaccumulation	ppm Hg	Three times a year	High
Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/Reporting Frequency	Precision and Reliability
SOCIAL 1964 Wilderness Act	Visitor use -Use Levels -Travel Patterns -Use levels by time of year -Average party size -Origin of party	Use levels Wilderness experience	Various	Annual	High
	Compliance with rules, regulations reserving/issuing permits -Cancellations -Party leader names -Alternates -Entrance date -Entrance point -Mode of travel	Integrity of permit and reservation system	Various	Ongoing	Moderate/high
	No show rate for overnight and day use motor permits.	Permit check - percent (%) no show built into system.	% no show	Various	Moderate
	Social encounters - Levels of crowding	Use levels Wilderness experience	Visitor satisfaction	Various	Moderate
ECOSYSTEM Bald Eagle Recovery Act & Endangered Species Act	Eagle population levels and reproduction trends	Bald Eagle	Number of birds	Annual	Moderate/high
Endangered Species Act	Wolf density and population levels	Gray Wolf	Wolves/sq. mi.	Annual	Moderate
Threatened & Endangered Plants	Population trends - prevent habitat loss	Plant communities; Campsites, Trail mtce and construction	Population trends	As needed	Moderate/high
Fisheries	Cooperate with State on inventories and assessments	Fish	Various	Ongoing	High

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Measurement Frequency	Evaluation/Reporting Frequency	Precision and Reliability
Air & Water Quality Resources	Effectiveness of State and federal laws related to air and water pollution	Concentration of pollutants in air and precipitation	Various	Continuous	High
	Acid deposition impacts to lakes	Loss of acid neutralizing capacity	Various	Three times a year	High
	Mercury concentration in fish	Basis for recommending limits for human consumption	ppm Hg	Annual	High
	Mercury concentration in water and zooplankton	Mercury bioaccumulation	ppm Hg	Three times a year	High
	Passive monitoring for ozone, sulphur dioxide and fluoride	Air pollution effects to vegetation	Various	Continuous	Moderate
	Mercury concentrations in select animals, including loons and eagles	Mercury bioaccumulation	ppm Hg	Ongoing	High
	Plant plots with known sensitivity to ozone, sulphur dioxide and fluoride to measure air pollutant-caused damage	Air pollution effects to vegetation	Visual symptoms, laboratory measured concentrations	Weekly	High
	Nutrient impacts on lakes	Human induced eutrophication	Various	Representative lakes, variable intervals	Moderate
Forest Plan (NFMA)	Implementation of the Forest Plan as it pertains to the Wilderness	ID Team; Campsites and trails; Prescribed natural fires	Reports	Annual	High
Forest Plan/LAC Standards	Campsite, trail and lakeshore condition	Inventory and monitor changes	Vegetation loss; Erosion levels	Ten years	Moderate
National Historic Preservation Act	Loss of site integrity thru disturbance of physical characteristics	Visitor use, new construction, management activity, natural deterioration	NRHP eligibility	Ongoing	High
	Monitoring of unevaluated sites assessed as Priority #1	Visitor use, management activities, natural deterioration	NRHP eligibility	Every 5 years	High
	Assessment of identified sites	Visitor use, management activities, natural deterioration	NRHP eligibility	Ongoing	High
Identify Research Needs	Determine research implementation progress and opportunities. Revise needs and priorities of research.	Research needs identified in Plan	Report	Every 5 years	Moderate