Chapter 4 Monitoring and Evaluation

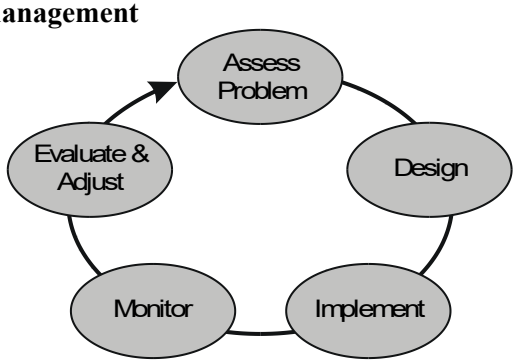
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INTRODUCTION

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-to-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

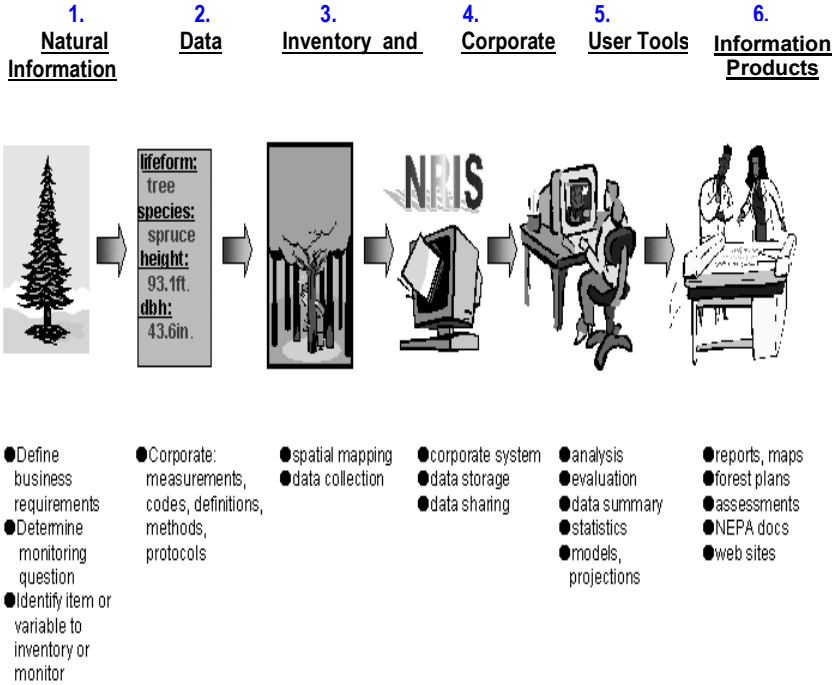
Evaluation and monitoring provide the feedback mechanism for adaptive forest management



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. 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 2012 Planning Rule went into effect in March 2012 with transition specified by May 9, 2016. The Planning Rule requires that the monitoring program address eight elements which are listed in Table MON-1. This section of Chapter 4 has been updated to comply with the 2012 Planning Rule. The 2012 Planning Rule supersedes the 1982 planning regulations.

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

- Category 1: Required monitoring items (36 CFR 219.12(a)(5)),
- Category 2: Attainment of goals and objectives (36 CFR 219.12(a)(2)),
- Category 3: Implementation of standards and guidelines, and
- Category 4: Effects of prescriptions, and management practices.

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.

A biennial evaluation of information gathered through the plan monitoring program and relevant information from the broader-scale strategies shall be conducted. The forest shall issue a written report of the evaluation and make it available to the public (36 CFR 219.12 (d)(1)). Monitoring forms the basis for continuous improvement of the plan and provides information for adaptive management.

Table MON-1. Monitoring Regulatory Requirements
Monitoring Description
Monitoring informs the management of resources on the plan area, through means such as testing relevant assumptions, tracking relevant changes, and measuring management effectiveness and progress toward achieving or maintaining the plan's desired conditions and objectives (36 CFR 219.12 (2)). Monitoring program includes plan-level and broader-scale monitoring.
The plan monitoring program must contain one or more monitoring questions and associated indicators addressing (36 CFR 219.12(a)(5)). (i) The status of select watershed conditions.
(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.
(iii) The status of focal species to assess ecological conditions required for diverse plant and animal communities (36 CFR 219.9).
(iv) The status of a select set of ecological conditions required that contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintains a viable population of each species of conservation concern.
(v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.
(vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.
(vii) Progress toward meeting the desired conditions and objectives of the plan, including for providing multiple use opportunities.
(viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land.
There is reasonable assurance that timber suitable lands can be adequately restocked within 5 years after final regeneration harvest. 36 CFR 219.11 (a) (v)

Table MON-1. Monitoring Regulatory Requirements
Monitoring Description
Review lands identified in the Plan as not suited for timber production at least once every 10 years to determine whether conditions have changed so that they become suitable for timber production. 36 CFR 219.11 (a)(2)

Monitoring Guidelines and Components

Monitoring Framework

Many approaches to Forest Plan monitoring are currently being used throughout the agency. However, each monitoring component 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 Chippewa 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) A biennial Monitoring Evaluation Review that provides a forum to review findings from the previous two years 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.

Table Mon-2. Monitoring Framework

Forest Plan Monitoring (Chapter 4)	Monitoring and Evaluation Implementation Guide	Annual Monitoring Schedule	Biennial 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 changing 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 monitoring and evaluation results. 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 monitoring and evaluation results at the end of each reporting period. 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 biennial Monitoring and Evaluation Report) and publications and shared internally and externally with cooperating agencies and organizations, interest groups, policy makers, and the general public.

Biennial Monitoring and Evaluation Report

The biennial 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 species.
(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 motto “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.

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.
Monitoring Indicator	A characteristic which, when measured repeatedly, demonstrates trends; or a measure of the current state or quality of the associated Monitoring Question.

Table MON-4. Chapter 4 Monitoring Matrix
DESIRED CONDITION and OBJECTIVE MONITORING ITEMS

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Indicator(s)
All & Multiple Use	How close are projected outputs and services to actual? To what extent do Forest recreation facilities and opportunities achieve resource and social objectives? To what extent is Forest management improving aquatic and terrestrial wildlife habitat?	36 CFR 219.12 (a)(5)(vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.	Timber: Table APP-2: Acres of timber harvest by treatment method comparing estimated to actual; volume sold and harvested annually; acres sold and harvested annually. Recreation: Recreation Site Analysis inventory results, Recreation partner projects, dispersed recreation inventories, significant recreation events and developed recreation improvements and projects Wildlife: Acres of terrestrial wildlife habitat treated; acres of lake habitat treated; miles of stream habitat treated
Climate Change	How is the frost free season changing across the plan area on an annual basis?	36CFR 219.12 (a)(5)(vi) Measureable changes on the plan area related to climate change and other stressors that may be affecting the plan area.	Period of time between the last frost of spring and the first frost of fall when the air temperature drops below the freezing point of 32 degrees F.
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.	Number or partnerships and agreements; Stewardship contracts, and Good Neighbor Authority projects.
Fire	What treatment methods are used, and to what extent, to reduce hazardous fuel conditions, to meet ecological objectives, or to maintain desired vegetation conditions?	D-ID-4-5, O-ID-2-4	Acres of prescribed fire, acres of fuels reduction, acres of site prep; acres of harvest.
Fire	What level of wildland fire occurs on the Forest's landscape?	D-ID-4, 5, 6	Planned (prescribed) acres which could be further broken down by type such as broadcast, underburning, pile burning, and unplanned (wildfire) acres further broken down by cause.

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Indicator(s)
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.	Compliance with avoidance mitigation measures, and effects on heritage resources.
Insects & Disease	Are insects and diseases populations compatible with objectives for restoring or maintaining healthy forest conditions?	D-ID-3, O-ID-1, D-VG-5, D-VG-8, O-VG-11-13	Acres of damage by agent; acres of damage by forest type; acres of damage by severity rating. Discussion of emerging insect and disease agents that may pose a threat, (e.g. gypsy moth, emerald ash borer) and pro-active treatment plans or efforts. Include acres of treatment when actions are taken.
Landscape Ecosystems & Ecological Conditions	To what extent is the Forest meeting vegetation composition and age class objectives for each of the Landscape Ecosystems?	36 CFR 219.12 (a)(5)(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.	Current forest-wide vegetation age class and vegetation composition acres and percentages compared to Forest Plan objectives for each landscape ecosystem (LE).
Recreation	What is the status and trend of visitor use, visitor satisfaction, and progress toward meeting recreation objectives in the plan?	36 CFR 219.12 (a)(5)(v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.	National Visitor Use Monitoring (NVUM) data report: Annual visitation estimates by type of visit, day use, developed, general forest area, Description of visit-- demographics, visit descriptions, activities Economic information--spending, substitute behavior, etc. Visitor Satisfaction
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.	Miles of trails, opportunities for new trails, partnerships opportunities, public meetings, road closure monitoring, track decisions on designation or closure, track citations for unauthorized use, monitor closures (winter and summer). Discussion of HWTs, and SPNM areas.
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.	Recreation Site Analysis inventory results, partner projects, dispersed recreation inventories, significant recreation events.

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Indicator(s)
Social & Economic Stability	To what extent does output levels of timber harvest and mix of saw timber and pulpwood compare to those levels projected?	D-TM-1, O-TM-1	Timber target (MBF); volume sold (MBF), volume harvested (MBF), uncut volume under contract (MMBF), acres sold, acres harvested, ratios of sawtimber to pulpwood volume sold compared to FP estimated ratios.
Soils	Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land?	36 CFR 219.12 (5)(viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land. (16 U.S.C.1604(g)(3)(C). D-WS-3, D-WS-12, O-WS-9, O-WS-10	Summary of soil disturbance class from forest soil disturbance monitoring protocol (FSDMP).
Special Uses	Does Forest management of forest product, recreation and other special use permits meet Forest Plan and agency direction?	D-REC-5. O-SU-1, 2, 3, 4, 5. D-TS-5.	Types of permits and number by type (recreation residence, utility, road uses, resort). Identify needs to supplement or update expired or out of compliance permits. Highlight other issues that surface or big changes.
Timber	Are harvested lands adequately restocked after five years?	36 CFR 219.11 (a)(1)(v) and S-TM-4. …reasonable assurance that lands can be adequately restocked within 5 years after final regeneration harvest, as specified in the Forest Plan.	Acres of regeneration harvest; acres certified within 5 years of harvest; percent NFMA compliance.
Timber	To what extent is timber management occurring on lands suitable for such production?	36 CFR 219.11 (a)(2). Review lands identified in the Plan as not suited for timber production at least once every 10 years... to determine whether conditions have changed so that they become suitable for timber production.	Updates to Table APP-D1 (FP, pg. D-1)
Transporta-tion 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.	Miles of road inventoried by operational maintenance level (OML); Master road inventory every 5 years. Qualitative discussion of miles of road maintenance and improvements

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Indicator(s)
Tribal Rights and Interests	Is Forest management helping to sustain American Indians' way of life, cultural integrity, social cohesion, and economic well-being? Is the Forest facilitating the right of the Tribes to hunt, fish, and gather as retained via treaty?	D-TR-1. O-TR-1. O-TR-3, D-TR-3	Consultation on NEPA documents, and other FS proposed work; compliance with MOU, and summary of key info in Tribal Relations Report.
Tribal Rights and Interests	Are government to government relationships functional?	D-TR-2. O-TR-2. O-TR-4.	Compliance with MOU, NEPA, THPO
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?	36 CFR 219.12 (a)(5)(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems. D-VG-1, -2,-3, -4	Current vegetation composition, age class & MIH by landscape ecosystem (LE) compared to objectives
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 (LE), Management Area (MA), and other appropriate landscape scales?	36 CFR 219.12 (a)(5)(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems. D-VG-1-6. O-VG-1-18	Species composition, age class, & MIH objectives by LE compared to FP objectives. Analysis by Management Area. May include discussion of patch quality.
Vegetation Ecological Conditions	To what extent is Forest management contributing to the maintenance and establishment of white pine in appropriate landscape ecosystems?	36 CFR 219.12 (a)(5)(iii) The status of focal species to assess the ecological conditions required under CFR 219.9.	Acres and percent of white pine forest type by landscape ecosystem; and Amount of white pine as a component of other forest types based on frequency in regeneration and non-regeneration plots.
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 (1-15 years) and long-term (100 years) objectives at Landscape Ecosystem, Management Area, and other appropriate landscape scales?	D-VG-1-5. O-VG-19-24 S-VG-2 and G-VG-1	MIH 11, 12, 13 (acres & numbers of patches 300+ acres, 1000+ acres)

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Indicator(s)
Vegetation Spatial Patterns & Timber	Where ecologically appropriate, to what extent have the acres and number of patches of temporary openings up to and including 1000 acres been increased?	36 CFR 219.11(d)(4) S-TM-2 states "Harvest using even-aged regeneration methods (clearcutting, seed tree, shelterwood) may create a temporary forest opening no larger than 1,000 acres in size" . D-VG-7, D-VG-8, O-VG- 21, 23, 24	Acres and number of temporary openings > 40 acres, > 300 acres, created by even-aged harvest. May also include openings created by natural events such as wind or fire.
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?	36 CFR 219.12 (a)(5)(i) The status of select watershed conditions. 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	BMP monitoring on effectiveness of measures to protect water quality
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.	MIH 1-9 by age class and LE. MIH 11-13
Wildlife: Threatened, Endangered, and Sensitive Species & Ecological Conditions	To what extent is Forest management contributing to the conservation of Threatened, Endangered, and Sensitive (TES) species and moving toward short term (10-15 years) and long-term (100 years) objectives for their habitat conditions?	36 CFR 219.12 (a)(5)(iv) The status of a select set of ecological conditions required under 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern. D-WL-1-9, O-WL-1-3, O-WL-17-32; D-WL-1-8, O-WL-4-16	MIH 1-9 by age class and LE. MIH 11-13 and qualitative descriptions of mitigation measures, and individual habitat improvement projects. Current Forest-wide vegetation age class and vegetation composition acres and percentages, and MIH acres and trends compared to Forest Plan objectives for each Landscape Ecosystem (LE).

Resource Area	Monitoring Question(s)	Driver (Applicable CFR's, FP Desired Conditions, and FP Objectives)	Indicator(s)
Wildlife: Threatened and Endangered Species	To what extent are road and trails closures effective in prohibiting unauthorized motor vehicle use?	G-WL-7, G-ORV-4, O-TS-3, O-TS-7, S-TS-3, S-TS-7, and G-TS-12 , G-TS-16	Effectiveness of each type of closure; Effectiveness of road decommissioning. Results from road inventory (system roads, unauthorized roads, temp roads) and monitoring reviewed at RAP/TAP, NEPA. Include additional actions if travel change is needed.
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, G-WL-6,8	Density (miles/square mile) of roads and snow-compacting trails by Lynx Analysis Unit.

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