

Chapter 3 – Monitoring

Monitoring Under the 2012 Rule

The 2012 Planning Rule includes a requirement that all Forests that are not in plan revision update their forest plan monitoring within four years, or as soon as is practicable (36 CFR 219.12c). This document updates our forest plan monitoring to meet this requirement of the 2012 rule.

The Role of Monitoring under the 2012 Planning Rule

The NFMA requires “continuous monitoring and assessment in the field” to evaluate “the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land” (16 USC 1604(g)(3)(C)). The 2012 rule includes a three-part iterative cycle of assessment, planning, and monitoring in a continuous feedback loop. Monitoring is meant to support the assessment process and evaluate plan implementation over time. This planning framework is designed to “inform integrated resource management and allows the Forest Service to adapt to changing conditions, including climate change, and improve management base on new information and monitoring” (§ 219.5 (a)).

Specific Requirements for Monitoring under the 2012 Rule

A monitoring plan will consist of “monitoring questions and associated indicators” which “must be designed to inform the management of resources on the plan area, including by testing relevant assumptions, tracking relevant changes, and measuring management effectiveness and progress toward achieving or maintaining the plan’s desired conditions or objectives” (219.12 (a)(2)). The monitoring program must also be “coordinated with the regional forester and Forest Service State and Private Forestry and Research and Development” (§ 219.12 (a)(1)) and support and align with a broader-scale monitoring program, to be developed at the regional level, that will address monitoring questions at a geographic scale broader than one plan area (§ 219.12 (b)). Furthermore, in developing the monitoring plan, the responsible official should also provide opportunities for public participation, “taking into account the skills and interests of affected parties”, as well as the scope, methods, forum and timing of those opportunities (§ 219.4 (a)).

Monitoring may involve evaluating: if standards and guidelines are implemented (implementation monitoring); if management actions and standards and guidelines are effective in achieving goals and objectives (effectiveness monitoring); the long term trend and condition of key resources (condition or surveillance monitoring). At a minimum, the plan monitoring program must contain one or more monitoring questions and associate indicators addressing the following eight items (see §219.12[a][5][i-viii]):

- (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 the ecological conditions required under § 219.9;
- (iv)—The status of a select set of the 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;
- (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 in 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 (16 U.S.C. 1604(g)(3)(C)).

A monitoring evaluation report is to be produced and made available to the public every two years (§ 219.12 (d)). It “must indicate whether or not a change to the plan, management activities, or the monitoring program, or a new assessment, may be warranted based on the new information... [and] must be used to inform adaptive management of the plan area” (§ 219.12 (d)(2)). The monitoring program and evaluation report are part of the administrative record (§ 219.14 (b)) and the Forest Supervisor must document “how the best available scientific information was used to inform planning, the plan components, and other plan content, including the plan monitoring program” (§219.13 (a)(4)).

Monitoring strategy

Effective forest plan monitoring and evaluation fosters improved management and more informed planning decisions. It helps identify the need to adjust desired conditions, goals, objectives, standards, and guidelines as conditions change. Monitoring and evaluation help the Forest Service and the public determine how the Plan is being implemented, whether Plan implementation is achieving desired outcomes, and whether assumptions made in the planning process are valid.

The purpose of the monitoring strategy is to provide direction in order to facilitate successful monitoring and evaluation. The focus of the Shoshone’s monitoring strategy is:

- **Establish monitoring priorities:** Criteria from the goals and objectives are used to establish priorities for monitoring within the expected program of work and budget constraints.
- **Identify responsible parties and potential cooperators:** Resource program managers accept responsibility for ensuring that monitoring is completed and identify ways to gather and evaluate data in conjunction with other agencies or with other interested parties.
- **Analyze the data:** Resource managers will analyze the data collected, with the goal of answering the monitoring questions, and determine if changes are needed in plan direction or outputs.
- **Publish and distribute the biennial monitoring and evaluation report:** Resource program managers will write the monitoring report for the Forest

supervisor's review. After review, it will be distributed to the public. This report will summarize the information collected and the relevant evaluations.

Biennial monitoring and evaluation report

The Shoshone will document its monitoring and evaluation process in a periodic monitoring report. The monitoring report serves several purposes including:

- Documenting monitoring and evaluation accomplishments;
- Providing an assessment of the current state of ecological conditions on the Shoshone and socioeconomic contributions to local communities;
- Providing feedback to responsible officials of any needed changes to the Plan, or of any needed adjustments to management actions; and
- Providing the public with relevant information about the management of the public lands within the planning area.

The monitoring and evaluation report will contain the following sections:

- The introduction contains an update on monitoring activities on the Shoshone and any regional monitoring efforts.
- The monitoring results describe the results of monitoring the items described in the Plan's monitoring strategy table.
- Evaluation and recommendations evaluate the monitoring results including any results of particular concern. A list of responsive actions may be included and any needed changes to Plan direction or implementation activities may be discussed.

A strategy for involving the public, other agencies, and interest groups in our monitoring activities should be considered each year. This may be accomplished through partnerships with interest groups; volunteer groups; other Federal, state, and local agencies; and universities.

Monitoring Meetings

Biannual monitoring and evaluation meetings with the Forest plan revision cooperating agencies (state of Wyoming, County Commissioners, and Conservation District Board members) will be offered. The meetings will be open to the public.

Cooperating agencies can help Forest personnel in monitoring Forest plan and project implementation, in evaluating biological, social, and economic impacts; and by identifying amendment needs and proposed solutions. Maintaining the knowledge base and relationship with state agencies and local elected officials will provide continuity in the adaptive management cycle, from development of the revised plan to plan implementation, monitoring, evaluation, and amendment through to the next plan revision.

Components of the monitoring strategy

Monitoring driver

The monitoring driver relates specifically to goals or objectives identified in the Plan.

Monitoring question

The monitoring questions are developed to address information essential to measuring the effectiveness of plan implementation in moving towards desired conditions described in the Plan.

Monitoring priorities

- **High priority:** These items have been identified by resource specialists as essential for assessing trends in ecosystem health. Monitoring elements required by law and/or by regulation are also ranked as high priority.
- **Medium priority:** This indicates that the monitoring element is directed by the Plan, as developed in the goals and objectives section (which may or may not be directly associated with required laws or regulations).
- **Low priority:** This indicates that the monitoring element involves questions of a more indirect nature, or that it does not fall under one of the above classifications.

Potential monitoring items

A monitoring item may be a quantitative or qualitative parameter that is measured or estimated. One or more monitoring items are selected in order to answer a monitoring question.

Monitoring precision/reliability

The precision and reliability with which a monitoring item is collected is dependent upon the activity and associated issue(s). There are two classes of precision and reliability considered in the monitoring guide:

- **Class A:** In this case, the methods are generally well accepted for modeling or measuring the resource or condition. They produce repeatable results and are often statistically valid. Reliability, precision, and accuracy are very good. These methods are often quantitative.
- **Class B:** In this case, the methods are based on project records, communication, on-site visual estimates, and/or less formal measurements. Reliability, accuracy, and precision are good; however, they are less than those for class A methods. Class B methods are often qualitative; however, they still provide valuable information on the status of the resource.

Scale

Scale describes the level of analysis with respect to land size. This measure is important in describing impacts dealing with habitat heterogeneity and viability issues as well as describing cumulative impacts related to, or resulting from, management actions.

Frequency of recording

Frequency of recording describes the timing of monitoring and evaluation efforts. Much data are collected annually, while other data are collected less frequently based on the length of time needed to discern a measureable change.

(i) *Status of Select Watershed Conditions*

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Water and Soil						
Soil, water, and aquatic habitat improvement/restoration projects are implemented annually to improve or maintain watersheds so conditions are trending toward a higher condition	Is the Shoshone National Forest improving condition in priority watersheds?	High	Completion of essential projects identified in Watershed Restoration Action Plan.	B	Forestwide	Annually
	Are BMPs implemented, and are they effective at protecting water quality?	High	Monitoring protocols rating system.	B	Forestwide	Annually
	Does reference data collected validate watershed condition and trend?	High	Soil disturbance, stream health, aquatic and riparian health.	A	Forestwide	3 to 5 years

(ii) *Status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems*

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Air						
Air quality meets Clean Air Act and Wilderness Act requirements in Class I and Class II areas and Wyoming National air quality standards	What are the conditions and trends for visibility in Class I and selected Class II areas on the Shoshone National Forest?	High	Visibility on the haziest and clearest days. Deciview graph displaying trend data for visibility.	A	Regional Impacts	5 Years
		High	Acid neutralizing capacity: Lower Saddlebag and Ross Lakes	A	Regional Impacts	5 Years
		Vegetation				
Restore and maintain a diverse range of forested and non-forested ecosystems	What are the status and trends of aspen and willow on the Shoshone?	Medium	Acres of willow and aspen	B	Forestwide	5 Years
	Is whitebark pine being restored?	Medium	Acres of whitebark pine restoration	B	Forestwide	10 Years
	What is the health of whitebark pine?	High	Blister rust Amount of mountain pine beetle mortality Recruitment of whitebark pine	B	Forestwide	5 Years
	What are the status and trends of insects and disease in and around the Shoshone National Forest that contribute to forest health?	High	Type of outbreak, acres, and location.	B	Forestwide	Annually

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
	What is the status and trend of rangeland vegetation?	Medium	Rangeland vegetation condition	B	Greater Yellowstone Area (interagency)	Annually
Fire and Fuels						
Disturbance processes have moved 60,000 to 165,000 acres from fire regime condition classes 2 or 3 to fire regime condition class 1	What is the status and trend of fire departure on the Shoshone National Forest?	Medium	Acres by fire regime condition class	B	Forestwide	5 Years
Disturbance processes have maintained 86,000 to 176,000 acres in fire regime condition class 1						
Reduce hazardous fuel ratings on 100,000 to 250,000 acres, including 60,000 to 90,000 acres in management area categories 4, 5, and 8	How many acres of hazardous fuels were treated to reduce the rating?	Medium	Acres treated & Acres treated in management area categories 4, 5, and 8	B	Forestwide	5 years
Aquatic Ecosystems						
Beaver have been restored to five suitable stream segments.	Are beavers expanding to other suitable stream segments?	Medium	Distribution of streams supporting beavers.	B	Forestwide	5 Years
Invasive Species						
Reduce invasive plant density, infestation size, and/or occurrence on at least 2000 acres annually	What is the status and trend of management response to invasive plant species?	Medium	Acres of invasive plants treated.	B	Forestwide & Greater Yellowstone Area	Annually

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Treat 25 to 50 acres of cheatgrass in sagebrush communities each year, with particular emphasis on big game winter range.	How many acres of cheatgrass have been treated? How many acres have been treated on big game winter range?	Medium	Acres of cheatgrass treated.	B	Forestwide	Annually

(iii) *Status of focal species to assess the ecological conditions required under 219.9*

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Focal Species						
Maintain or improve habitat capable of supporting the viability of focal species.	To what extent are management activities in aspen habitat contributing to the conservation of the warbling vireo?	Medium	Population trend of the warbling vireo.	B	Forestwide	5 Years

(iv) *Status of a select set of the ecological conditions required under 219.0 to contribute to the recovery of federal listed threatened and endangered species, conserve proposed candidate species, and maintain a viable population of each species of conservation concern.*

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Threatened, endangered, proposed, and candidate species						
Suitable habitats for threatened, endangered, proposed, and candidate species are managed consistently with established and approved recovery plans and conservation strategies	To what extent is management contributing to the conservation of federally listed species and moving toward goals and objectives for their habitat conditions and population trends?	High	Required monitoring items in appendix 1, Northern Rockies Lynx Management Direction	B	Forestwide	5 years
	Are habitat standards for conservation of the Yellowstone population of grizzly bears being met?	High	Tracking and reporting annual changes in motorized access, livestock grazing allotments, and developed sites	A	Regional (ecosystem wide)	Annually
	What is the status of key food sources for the Yellowstone population of the grizzly bear?	High	Whitebark pine cone production Moth sites	A	Regional (ecosystem wide)	Annually
	What is the status and trend of the grizzly bears?	High	Population distribution and trend, whitebark pine cone production, moth sites	A	Regional (ecosystem wide)	Annually
Sensitive Species						
The Yellowstone cutthroat trout population has expanded to at least four suitable	Is the Yellowstone cutthroat trout population expanding to other suitable stream reaches?	High	Miles and distribution of streams supporting genetically pure Yellowstone cutthroat trout populations	A	Yellowstone cutthroat trout range-wide	Annually

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
stream reaches within priority watersheds						
Provide habitat capable of contributing to conservation and viability of sensitive species, which will keep sensitive species from being listed under the ESA.	To what extent are management activities in sagebrush habitat contributing to the conservation of the Brewer's sparrow?	Medium	Population trend of Brewer's sparrow.	B	Forestwide	5 years

(v) Status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Recreation						
A diversity of year-round opportunities attract increasing numbers of visitors to the Shoshone	What is the percent satisfaction for recreational visits on the unit?	High	Percent satisfaction for 1) very satisfied; 2) somewhat satisfied; and 3) total satisfaction	B	Forestwide	5 years

(vi) *Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.*

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Precipitation and Snow Water Equivalent						
	What are the status and trends of snowpack and precipitation in the planning area?	High	Elevation, snow depth inches, and SWE; precip (in)	A	Watershed	Annually

(vii) *Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities*

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Social and Economic Sustainability						
Permitted Animal Unit Months range between plus or minus 10 percent of 60,000 annually	What are the contributions from range program to the plan area?	Medium	Employment, income, and contribution to GDP.	A	Forestwide	Annually
Forest products produced from the Shoshone average at least 16,500 Ccf annually	What are contributions from timber program to the plan area?	Medium	Employment, income, and contribution to GDP.	A	Forestwide	Annually
Special use authorizations benefit local economies through associated employment opportunities, services, and visitation	What are contributions for the recreation program to the plan area?	Medium	Employment, income, and contribution to GDP.	A	Forestwide	Annually

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Help meet energy resource needs	What are the contributions from minerals to the plan area?	Medium	Employment, income, and contribution to GDP.	A	Forestwide	Annually
Indicators of forest value to local residents	How many permits are sold?	Medium	Firewood permits sold Christmas tree permits sold	A	Forestwide	Annually
Heritage						
At least 200 acres with high archaeological potential will be inventoried annually under Section 110 of the National Historic Preservation Act	Were 200 acres of National Forest System land with high archaeological potential inventoried?	Medium	Acres inventoried	B	Forestwide	Annually
A historic property plan is completed for at least three National Register eligible or listed properties or property types.	Was a historic property plan completed during the planning period?	Medium	Number of historic property plans completed	A	Forestwide	5 Years
Survey at least 5% of land burned by wildfires greater than 50 acres within one year of being burned	What resources were impacted by the fire?	High	Number of historic properties impacted	B	Forestwide	Annually
	How many burned acres were surveyed?					
Roads and Trails						
Wilderness						
Wilderness character will be protected,	What is the state of wilderness character?	Medium		B	Forestwide	Annually

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
maintained, and improved where possible; as measured by WSP.	How is Wilderness character changing over time?					
	How are stewardship actions affecting Wilderness character?					
Invasive plant density, infestation size, and occurrences are reduced.	How many acres of Wilderness were treated for invasive plants?	Medium	Acres of invasive plant treatments	B	Wilderness Areas	5 Years
Developed Recreation Areas						
Deferred maintenance needs are accomplished for the top 50 percent of fee campgrounds	Are the top 50-percent campgrounds "Maintained to Standard"?	Medium	Yes/No	B	Forestwide	5 Years

(viii) *Effects of each management system to determine that they do not substantially and permanently impair the productivity of the land*

Monitoring Driver	Monitoring Questions	Monitoring Priority	Monitoring Indicators	Precision and Reliability	Scale	Frequency of Reporting
Soils and Hydrologic Function						
	What are the status and trends of soil productivity and hydrologic function?	High	Type, degree and extent of soil disturbance and risk to rating to determine the effect of soil productivity and hydrologic function	B	Forestwide	5 years

Appendix A:

Comments and responses to changes made to the Forest Plan Monitoring requirements

General comments –

With so many details not yet developed, it's difficult to comment on the fine points of the plan or on the time and expense of implementation. We recommend that the details of the new monitoring plan be designed to ensure it does not require more time and expense by the SHNF than the existing monitoring plan. We also encourage you to ensure that the monitoring plan utilizes data already being collected, on data that is, or can be, collected by State and local governments, on data that can be collected more efficiently by non-Forest Service entities, and on data that is, or can be, collected by various partners. As you refine the SHNF Monitoring Plan, we request an opportunity to stay involved in development of those details.

The Shoshone National Forest Monitoring Plan transition to the 2012 Planning Rule requirements is striving to streamline Forest Plan monitoring to ensure that monitoring commitments do not require more resources than the Shoshone could allocate towards those efforts. To do so, the Monitoring Plan will focus on monitoring that will address the eight items required by the 2012 Rule. Where appropriate, the Shoshone will utilize monitoring data collected in conjunction with our partners.

Monitoring Category i.

We recommend that you also consider results of the Wyoming State Forestry Division's periodic audits of Silviculture BMP implementation and effectiveness.

The Shoshone is an active participant in BMP audits and has included a monitoring question addressing BMPs.

Monitoring Category iii.

We recommend that you add the following monitoring question – “How do cover types and age class diversity by cover type compare to desired conditions in forest plan Tables 1 and 3?” We encourage you to utilize FIA data to the extent possible; use of FIA data may require a review of how to ensure that FIA data collection and compilation can be most effective and we would welcome a chance to be part of that discussion.

Within Category ii under the heading **Vegetation** several monitoring questions are intended to address the status of various cover types on the Shoshone. Where appropriate the Shoshone will utilize FIA data understanding the limitations due to the frequency at which the data is collected (one plot per approximately 6,200 acres).

We also recommend that you add the following monitoring question - “How many acres of precommercial thinning have been accomplished?” Precommercial thinning is an important indicator of future HSS distribution and forest productivity.

Category iii is intended to monitor the *Status of focal species to assess the ecological conditions required under 219.9*. It is unclear as to how monitoring pre-commercial thinning would act as an indicator of the status of focal species.

We also recommend that you add the following Monitoring Question - "What is the number of acres infested by invasive plants?"

Within Category ii under the heading **Invasive Species** there are two questions directly related to monitoring the status of invasive plants.

Monitoring Category iv.

We recommend that you add the following Monitoring Question – "What is the status and trend of Canada lynx across the planning area?" We recommend Monitoring Indicators of "Population distribution and trend". We recommend against using acreages of various forest types as a Monitoring Indicator unless some correlation is supported by best available science.

Monitoring items have been established by the Northern Rockies Lynx Amendment. Those monitoring items were created using the best available science.

Monitoring Category vii.

We recommend adding annual timber volume (sawtimber, roundwood, biomass, etc.) sold as one of the indicators of the Shoshone NF's contribution to social and economic health and sustainability of local communities.

Under the heading **Social and economic sustainability** forest products from the Shoshone are included as a Monitoring Driver.