

Chapter 5. Monitoring Strategy

Introduction

The purpose of monitoring and evaluation is to evaluate, document, and report how the land management plan is applied, how well it works, and if its purpose and direction remain appropriate. Monitoring determines actual conditions and compares them with desired conditions. Evaluation of monitoring results may identify that desired conditions are not met and propose alternative management strategies that respond to changing conditions or new information, including research and scientific papers. Monitoring and evaluating the effects of plan implementation is critical to adaptive management.

Given the uncertainty of future budgets and resources, the focus and intent of this monitoring strategy is to evaluate the progress of not only required monitoring elements, but also particular areas where the current condition at the time of the development of this plan was drastically different from desired conditions. In this way, the Forest can direct resources towards and evaluate progress of critical changes that need to occur on the Forest.

The monitoring plan consists of monitoring questions that focus on key plan decisions where carrying out projects and activities are likely to cause a change over time.

The forest supervisor annually evaluates the monitoring information displayed in the evaluation reports through a management review and determines if any changes are needed in management actions or the plan itself. In general, annual evaluations of the monitoring information consider the following questions:

- What are the effects of resource management activities on the productivity of the land?
- To what degree are resource management activities maintaining or making progress toward the desired conditions and objectives identified in the plan? Are costs of implementing programs occurring as predicted?
- What modifications are needed to account for unanticipated changes in conditions?

In addition to annual monitoring, the forest supervisor reviews 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. The plan is ordinarily revised on a 10-year cycle and the Forest Supervisor may amend the plan at any time. All of the monitoring and evaluation timeframes identified in this chapter begin from the date of the Record of Decision.

Monitoring Plan

The monitoring questions and potential monitoring methods that could be used to evaluate movement toward key plan desired conditions are displayed below (table XX).

For each monitoring question/performance measure listed in table XX, additional monitoring descriptors are included to provide context for the type of information to gather and how often to gather it. These descriptors are defined here:

- **Monitoring Question:** The question(s) that will be answered.
- **Scale:** The geographic scale at which the monitoring question will be evaluated.

- **Possible Monitoring Methods and Data Sources:** The possible methods and data sources available to evaluate the monitoring questions at the time of plan approval and are not the required method of measurement. As new tools become available, other methods may be used to answer the monitoring questions.
- **Frequency of Monitoring:** How often information is gathered or measured such as annually, every 5 years, or every 10 years.
- **Frequency of Evaluation:** How often the information is analyzed and reported. Depending upon the question being answered, analysis of the information may occur at longer time intervals than the frequency of monitoring. Some resources need to be monitored annually to produce trend data. Annually gathered data may be analyzed periodically (3, 5, or 10-year cycles), depending upon the time frame specified by each objective.
- **Data Precision and Reliability:** An indication of how rigorous the information used to evaluate the monitoring question are with respect to repeatability, reliability, accuracy, and precision. Two categories of precision and reliability are appropriate at the plan scale and because of varying methods and data sources used to evaluate the monitoring question, both classes may be indicated:
 - **Class A:** Methods that are generally well accepted for modeling or quantitative measurement. Results have a high degree of repeatability, reliability, accuracy, and precision.
 - **Class B:** Methods or measurements that are 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.

Monitoring and evaluation are identified, approved, and scheduled through the annual budget process. Actual budget levels, funding emphasis, and emergence of new issues may affect accomplishment of both management activities that make progress toward desired conditions as well as monitoring. Partnerships may be developed to accomplish monitoring and evaluation.

Table XX. Coconino NF’s Land Management Plan monitoring questions, monitoring methods, units of measure, and frequency of measurements are displayed.

Monitoring Questions	Scale	Possible Monitoring Methods and Data Sources	Frequency of Monitoring	Frequency of Evaluation	Data Precision and Reliability
Maintenance and Improvement of Ecosystem Health					
<p>How well have management activities contributed to maintaining or making progress toward ecological desired conditions? Particular focus in answering this question should be given to PNVTs and the elements of those PNVTs that were identified in the Ecological Sustainability Report as being highly departed and trending away from their reference conditions. Also include the following monitoring requirements: Lands restocked as specified in the plan, sec. 219.12(k)(4)(i)); Maximum size limits for harvest areas evaluated (sec. 219.12(k)(4)(iii))</p>	PNVT	<p>FACTS database(?), Review ground disturbing activities for compliance with Best Management Practices (BMPs) by project; allotment operating instruction implementation; proper functioning data or other approved Forest Service methodologies; and Section 18 reviews of allotment NEPA. Monitor riparian habitats for changes in ground cover, species composition, bank stability, and water quality. Review mid-scale vegetation assessment and percent change; stand exam data; FIA plots; change in species composition and soil condition (range data); and acres of restored grassland. Review mid-scale vegetation assessment and percent change; FIA plots; BAER assessments; and percent departure from desired condition by vegetation type.</p>	Every 5 years	Every 5 years	A, B
<p>Have the incidence of insect, disease, and invasive exotic species precluded the maintenance of or progress toward desired conditions? (sec. 219.12(k)(4)(iv))</p>	PNVT	<p>Forest health surveys and reports, stand exams, project inspections and reviews, and noxious and invasive exotic weed surveys and treatment reports.</p>	1 to 5 years	Every 5 years.	A
<p>Are long-term soil health and productivity desired conditions being</p>	PNVT	<p>Review soil disturbing activities for compliance with BMPs by project and</p>	Annually	Every 5 yrs	B

Monitoring Questions	Scale	Possible Monitoring Methods and Data Sources	Frequency of Monitoring	Frequency of Evaluation	Data Precision and Reliability
maintained or met?		allotment operating instruction implementation.			
How well are management activities contributing to desired conditions or maintaining watersheds in a healthy state and meeting Arizona water quality standards? Particular focus in answering this question should be given to priority 5 th level HUC watersheds (Rio de Flag, Walnut Creek, and Upper Clear Creek) and 6 th level HUC watersheds identified in the Watershed Condition Assessment.	5 th level HUC watershed	Review soil disturbing activities for compliance with BMPs by project; allotment operating instruction implementation; Section 18 reviews of allotment National Environmental Policy Act (NEPA); burn area emergency rehab assessments (BAER); and Arizona Department of Environmental Quality water quality data.	Every 5 years	Every 5 years	B
Are habitats for threatened, endangered, sensitive, and other species for the forests being maintained or enhanced, meeting recovery objectives, moving towards desired conditions, and contributing to species viability?	Forest	Review implementation of biological opinion terms and conditions and aquatic habitat and population surveys using current approved methodologies. Review implementation and evaluate effectiveness of project mitigation measures affecting habitat.	Annually, on selected newly-implemented and ongoing activities	Every 5 years	A, B
How has management activities influenced habitat and trends of management indicator species?	Forest	Review AZGFD surveys and breeding bird surveys.	Every 5 years	Every 5 years	A
Has timber suitability classification changed on any forests' lands?	Forest	Re-apply timber suitability criteria and process.	Every 10 years	Every 10 years	A
Are Forest and woodland stands adequately restocked within 5 years of final harvest treatment?	Forest	Review annual reforestation needs report, stocking certifications, silvicultural prescriptions, timber/silviculture tracking database.	Every 5 years	Every 5 years	B

Monitoring Questions	Scale	Possible Monitoring Methods and Data Sources	Frequency of Monitoring	Frequency of Evaluation	Data Precision and Reliability
Managed Recreation					
Are recreation facilities in adequate condition to provide for the level of use appropriate under the ROS?	Forest	Percentage of sites surveyed that met national standards	Annually	Every 5 years	A, B
Are objectives for recreation settings and opportunities being achieved?	Forest	Miles and type of trails provided (INFRA database), NVUM	Every 5 years	Every 5 years	A, B
How well do recreational opportunities provide for Forest users' desires, needs, and expectations?	Forest	Review recreation use surveys and acres by recreation opportunity spectrum (ROS).	Every 5 years	Every 5 years	A, B
How are projects and programs affecting scenic integrity? Is scenic integrity being maintained in Very High Scenic Integrity areas?	Forest	Conduct management reviews and BAER assessments.	Every 5 years	Every 5 years	B
How are recreational activities affecting the physical and biological resources of the Forest?	Forest	Review law enforcement warnings and citations regarding resource damage; acres of noxious and invasive exotic weeds treated in developed campgrounds and dispersed camping areas, and trail condition surveys.	Annually	Every 5 years	B
Community-Forest Interaction					
How are partnerships contributing to maintaining or enhancing recreation resource opportunities?	Forest	Review number of grants and agreements and number of volunteers.	Every 5 years	Every 5 years	B
Other					
Have there been there changes that	Forest	Review the number of plan amendments	Every 5 years	Every 5 years	B

Monitoring Questions	Scale	Possible Monitoring Methods and Data Sources	Frequency of Monitoring	Frequency of Evaluation	Data Precision and Reliability
have resulted in unforeseen issues requiring plan amendments?		and conduct a content analysis on those amendments.			
Are the standards and guidelines prescribed being incorporated in NEPA documents and implemented on the ground?	Forest	Review a representative sample of NEPA decision documents for non-implementation of the plan. Conduct management reviews on selected newly-implemented and ongoing activities relative to compliance with the associated NEPA decision.	Annually	Annually	B
How do plan objectives compare with actual accomplishment of objectives? (comparison of projected and actual outputs and services, sec. 219.12(k)(1))	Forest	Annual accomplishment reports	Annually	Every 5 years	B
Lands not suited for timber are re-examined to determine if suitability has changed (and suited lands returned to timber production) (sec. 219.12(k)(4)(ii))	Forest	Reapply timber suitability criteria and process.	Every 10 years	Every 10 years	A