Errata

Administrative Changes to the Kaibab National Forest Plan

This errata specifies the changes that were made to the Kaibab National Forest Land and Resource Management Plan through an administrative change on August 31, 2016.

Page i. Update link to Kaibab Forest Plan and supporting material updated to http://bit.ly/KaibabForestPlan"

Page iii-iv. Page numbers updated.

Page iii. Update Section titled "Rare and Narrow Endemic Species" to "Restricted and Narrow Endemic Species".

Pages 52, 54, 58, 59, 104, 153, and 215. Replace the word "rare" with the word "restricted".

Page 7. In the section defining Potential Natural Vegetation Type (PNVT), added the sentence "This term is synonymous with the term Ecological Response Unit used by Forests in the Southwestern Region."

Page 52. In the Management Approach for Restricted and Narrow Endemic Species section, added the phrase "…a reference containing the best available information. It is…" and deleted the words "This guidebook will be"

Page 57. Replace the word 'calceric" with "calcareous"

Page 71. In the section **Guidelines for Personal Firewood Collection**, moved the words "Standing dead juniper without green foliage" to a new line. Added the words "Standing dead" in front of the words "Gambel oak less than 8 inches d.r.c." to clarify that "Standing dead" applied to the entire list that followed.

Updated Chapter 5, "Monitoring and Evaluation." Replacement language can be viewed in detail in Appendix below, Appendix A. *Administrative Changes to the Land and Resources Management Plan for the Kaibab National Forest Monitoring Plan". S*ummary of these changes is as follows:

Pages 123-127, Introductory section: non-substantive revisions to the introductory narrative to better highlight key concepts of the 2012 planning rule, identify specific planning rule criteria for monitoring, and to incorporate new references completed after the plan was signed in 2014.

Pages 123-154. Matrix for the Kaibab NF Monitoring Plan. Sixteen new questions were added to the Monitoring Plan matrix, page128-154: 3 questions from Rapid Plot data, 11 questions answered by Existing Data and reporting, and 2 resource specific (Intensive) questions**.** Referenced numbers correlate to matrix.

Rapid Plot

3. *Ponderosa Pine and Frequent Fire Mixed Conifer: Does height to live crown and crown bulk density put the forest at risk for uncharacteristic high severity fire at the mid-scale and above?*

4. *Ponderosa Pine Is regeneration occurring at a rate that will support uneven aged forests over time?*

7. Soils and Watersheds: What is the percentage and pattern of plots that have evidence of soil disturbance from activities that used mechanical equipment?

Existing Data

24. Ponderosa Pine, Frequent Fire Mixed Conifer, Mesic Mixed Conifer/Spruce Fir, Pinyon-juniper Communities, Grassland Communities, and Non-native Invasive Species: What is the trend in Normalized Difference Vegetation Index (NDVI)? How does this compare to regional trends?

30. Soils and Watersheds: How many 6th code watersheds were moved to an improved condition this year?

31. Soils and Watersheds: Did any project or site require corrective action in the BMP monitoring database?

32. Soils and Watersheds: Was adaptive management recommended for any BMP monitoring item and what were the monitoring results?

33. Soils and Watersheds: Were at least half the composite ratings for BMP effectiveness "excellent"?

34. Air Quality: How many days did fine particle concentrations exceed 10 µgm/ m3?

35. Air Quality: What is the 10-year trend of particle concentrations?

36: Recreation and Scenery: What are the trends in visitor use?

37. Recreation and Scenery: What is the overall satisfaction rating for National Forest visits on the Kaibab?

38. Recreation and Scenery, Wilderness Areas: What was the percent of good and very good rating for visitor safety at Developed Sites, Undeveloped Sites (GFAs) and Designated Wilderness?

39. Recreation and Scenery, Wilderness Areas: What are the areas identified as "concentrate here" in the NVUM?

Intensive

61. Restricted and Endemic Species: What design features were incorporated to protect restricted and endemic species?

66. Soils and Watersheds: What is the trend in soil moisture? How does this compare to regional trends?

The following question was removed as a Plan Monitoring question because Management Indicator Species as a concept was not carried forward in the 2012 Planning Rule. Pronghorn are still considered an important native game species and populations continue to be monitored and reported by the Arizona Game and Fish Department:

23: Wildlife (MIS): What is the estimated population trend of pronghorn?

The following questions were renumbered and revised in content:

Questions 1-2, 5-6, 8 (Rapid Plot); 9-15 (Remotely Sensed); 16-22, 25-29, 40-48 (Existing Sources); 49-60 (Interviews); 62-65, 67, 68, 70-72 (Intensive).

The following questions were revised, renumbered, and moved to a more appropriate section: Q*uestions 65, 69 (Intensive).*

Page 154. Three footnotes were added to clarify terminology associated with the new or revised questions.

Changes to *Appendix D. Kaibab National Forest's Plan Revision Climate Change Approach*

Page 205. Added the following language to the introduction. "Climate change was one of several key factors spurring development of the 2012 planning rule that would allow the USFS to more effectively fulfill its NFMA mandate. Climate science is an emerging discipline and the Forest Service understanding of climate science has expanded since this plan was originally drafted. New literature, new strategic documents, and new climate adaptation tools and approaches have come on line. The Forest Service is moving beyond the broad adaptation concepts originally used to develop the forest plan, to implementing specific management actions. This Appendix has been updated to expand upon earlier strategies to include emerging information on adaptation, and mitigation strategies."

Added "Climate adaptation is a type of "risk management" used to prepare for and cope with, or adjust to climatic changes and associated impacts whereby decision-makers are often faced with incomplete information or unpredictable outcomes (Stein et al. 2014)."

Replaced the language "This appendix summarizes how the Kaibab NF intends to incorporate current and possible future climate change into the land management planning process. The primary consideration for evaluating responses to climate change" with "This appendix summarizes how the Kaibab NF intends to incorporate current and possible future climate change into plan and its implementation. The primary focus of the Kaibab's efforts to evaluate and manage for climate change effects"

Pages 205. Added the language "with monitoring questions developed to assess the plan's progress in meeting them."

Page 206. Added "The climate change roadmap directs National Forests and Grasslands to develop climate change vulnerability assessments and identifies monitoring strategies. In a recent draft Climate Vulnerability Assessment (CVA) developed for the Kaibab NF (USDA 2015), 37 % of the plan area is moderately vulnerable, 33 % is highly vulnerable and 29 % is very highly vulnerable to climate change. The report further describes vulnerability by ecosystem type, watershed unit and ranger district across the forest. Within the tree-shrub component, frequent fire mixed conifer, ponderosa pine and pinyon juniper grassland are all moderately to highly departed from reference conditions with both high resistance to, and resilience from disturbance events. Riparian systems, spruce fir forest and mixed conifer with aspen have low resistance to disturbance but are expected to be moderately to highly resilient to these events once they have occurred. Within in the herbaceous component of these systems, the majority of the forest is moderately departed with low resistance to disturbance, and moderate to high resilience from disturbance. These measures of resistance and resilience are important complementary concepts that can help to guide climate smart conservation strategies on the Kaibab NF. Nimmo et al. (2015), note that by adopting a 'resistance–resilience' framework, important insights for conservation can be gained such as determining what specific characteristics certain ecological systems have that are associated with both resilience and resistance. While 'resistance' is the ability to persist during the disturbance, 'resilience' is the capacity to recover or 'bounce back'

following alleviation of the disturbance. Systems with low resistance and resilience are most at risk, while systems with high resistance and high resilience. Considering these factors along with other resource values can be an important strategy in prioritizing management action."

Page 206. Added "These desired conditions support and complement current climate adaptation strategies which include: sustaining functional ecological conditions, (with respect to soil and hydrology), reducing the impact of existing biological stressors (e.g. insects, pathogens, invasives), protecting forests from severe fire and wind disturbance, maintaining or creating refugia, maintaining and enhancing species structural diversity, increasing ecosystem redundancy across the landscape (e.g. areal extent), promoting landscape connectivity, enhancing genetic diversity, and facilitating community adjustments through species transitions (USDA 2012)."

Page 207. Added "Although this forest plan was developed using provisions of the 1982 planning rule, it has been updated to comply with monitoring direction under the 2012 Planning Rule. The 2012 Planning Rule requires that the plan monitoring program contain one or more monitoring questions associated with indicators to determine whether there are measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area ((219.12(a)(5)(vi)). Taken together, the planning framework and these requirements will ensure that information related to climate change will be addressed in a consistent and strategic fashion. This monitoring requirement may relate to other monitoring requirements or to interacting stressors that individually or collectively may be affecting the plan area. Interacting stressors may include fire, insects, invasive species, loss of spatial connectivity, disruption of natural disturbance regimes, geologic hazards and water withdrawals and diversions that affect the plan area, among others (see above desired conditions).

Carefully designed monitoring is critical to discerning what changes may be a result of climate change and for determining if management actions that were implemented were effective in adapting ecosystems for future conditions. Climate change is a global process, and…"

Pages 207- 208. Added. "Administrative changes that better align monitoring with the 2012 planning rule included modifications to some of the plan's existing monitoring questions to better highlight the relationship with climate.

Key Kaibab NF monitoring plan questions that address climate change effects include the following (new or modified questions are in bold) below:

- Are snags, downed logs and old trees at desired levels?
- Is the course woody debris within the desired range?
- Does crown height and crown bulk density put the forest at risk for uncharacteristic high severity fire at the mid-scale and above?
- Is regeneration occurring at a rate that will support uneven aged forests over time?
- Is the stand density within the range that will allow for a robust understory?
- How many acres of the Kaibab NF are in an uneven-aged open state, at the midscale (above 100 acres)?
- How many acres burned with desired and undesired fire behavior and effects?
- How many acres are predicted to support active crown fire as modeled under typical peak fire danger conditions at the mid-scale?

- What is the total area within the desired range for basal area and openings?
- What percent of the grasslands PNVT has < 10 percent canopy cover? What is the relative composition and cover for grasslands?
- What is functional condition of the lakes and wetlands on the Kaibab NF?
- In treated/protected areas, are waterflow patterns and vegetation intact?
- What is the areal extent of priority nonnative invasive plants on the Kaibab NF?
- What is the frequency of area occupied by noxious weeds by species?
- How many acres are at high risk of climate related disturbance events such as insect outbreaks?
- Were there any incidences of insect outbreaks in recently treated areas? If so, where?
- What is the acreage of outbreaks of insects and disease? Does this follow regional patterns?
- Was a robust crop of pinyon nuts produced on any of the districts?
- What is the trend in Normalized Difference Vegetation Index (NDVI)? How does this compare to regional trends?
- Does habitat configuration provide functional connectivity which is resilient to climate related changes, for species like pronghorn?
- What is the trend in soil moisture? How does this compare to regional trends?

These monitoring questions support the Kaibab CVA; plan desired conditions and adaptation strategies as recommended in GTR NRS-87 (USDA 2012). The 2012 planning rule also emphasizes a broad-scale monitoring strategy which should allow for comparison of local and regional trends. The broad-scale monitoring is meant to address monitoring questions that are more appropriately answered at scales beyond NFS boundaries. Monitoring at these larger scales can be complementary to monitoring at local scales, allowing managers to better assess the effects of forest management vs regional climate phenomena."

Pages 208-209. Added "The 2015-2020 strategic plan (USDA 2015) builds upon that initiative and explicitly identifies the following key climate related objective that should help to sustain the nation's forests and grasslands:

- Strategic Objective A: Foster resilient, adaptive ecosystems to mitigate climate change

Healthy ecosystems have the capacity for renewal, for recovery from a wide range of disturbances, and for retention of ecological resilience while meeting current and future needs. Continued investment in restoration work and managing the land will help ensure that forests and grasslands continue to deliver values, uses, products, and services that people want and need, such as clean air and water; high-quality recreation settings and opportunities; scenic character; forest products; cultural sites; and a full suite of habitats for plant, aquatic, and wildlife species (including threatened and endangered species). Working with our partners, the Forest Service's ecological restoration projects will support the growth and development of healthy ecosystems and vibrant, resilient communities.

The strategic plan goes on to list several means and strategies for achieving this objective which include: Coordinate inventory, monitoring, and assessment activities across all lands to improve our adaptive management of natural resources. The Kaibab NF is actively engaging with its partners (including the landscape scale restoration project called 4FRI-The Four Forest restoration Initiative) to leverage capacity and improve monitoring efficiencies that will better monitor the interactive effects of management and climate related change.

Decision Documents"

Pages 211-212. Added "Identifying climate refugia will also play an important role in conserving species at risk, as well as other resource values (e.g. recreation, sacred sites). Morelli et al. (in press) have developed an adaption approach to help land managers identify and prioritize key ecological systems that may be or become important climate refugia, with suggested adaptation and monitoring strategies. For example, montane meadows on the Kaibab NF may become increasingly important as a climate refugium, especially in such an arid region, as they are botanically diverse, important to animal communities, and critical to hydrologic function."

Page 213. Added "and also complements the FS 2015-2020 Strategic Plan Objective B: Mitigate wildfire risk, so that the Nation's forests, grasslands, and adjacent communities and property are resilient to the impacts from wildfire."

Pages 213-214. Added "Following a review of 42 different climate adaptation approaches Schmitz et al. (2015) developed 6 distinct strategies in the form of a climate adaptation framework for conserving biodiversity in land use planning. This framework focuses on strengthening current conservation efforts but also anticipates and responds to future conditions from the species and population level to the landscape scale. Adaptation approaches include; 1) Protect current patterns of diversity, 2) Protect large, intact natural landscapes, 3) protect the geophysical setting, 4) Maintain and restore ecological connectivity, 5) Identify and appropriately manage areas that will provide future climate space for species expected to be displaced by climate change, and 6) Identify and protect climate refugia."

Page 214. Deleted "On the Kaibab NF, existing collaborations between the AGFD and Coconino County generally encourage the protection of open lands and the preservation of the land's natural character within local and regional contexts. These collaborative strategies should decrease the potential for future land fragmentation while improving the overall integrity of the landscape. This should also provide for more resilience with regard to climate change for those wildlife species that may need to adjust migration routes, foraging corridors, or breeding grounds."

Page 214. 214 Added **"and Adaptation"**

Page 214. Added "Taking this one step further, Janowiak and others (2012, 2014) have developed a practical approach for translating climate change adaptation principles into forest management actions. This approach facilitates a structured and repeatable process which identifies climate change opportunities and challenges/risks early in the planning process. It then facilitates development of specific "tactics" that can be tracked by interdisciplinary teams during project development. Clear identification of values "at risk" and subsequent mitigation strategies improves transparency by clearly linking project goals to planning objectives, climate change adaptation strategies and facilitates subsequent monitoring and adaptive management strategies. This approach emphasizes monitoring, which is frequently overlooked, early on in the planning process. Meaningful monitoring items and associated metrics which are realistic to monitor over

time are identified by the planning team a priori. This tool also has a web interface and can be used by various partners, offering a flexible approach: http://www.adaptationworkbook.org/"

Page 214. Added "an information clearing house. This website features science-based climate change information and tools intended to assist resource managers with ecosystem management decisions. It provides original, short, peer reviewed syntheses of climate change adaptation and mitigation strategies for forests and wildlands. The site also offers a range of decision-support models, maps, simulations, case studies, basic science modules and toolkits."

Page 214. Deleted "a clearinghouse for climate change related information."

Page 215. Added "

Science-Management Partnerships

Science that is collaboratively developed by scientists and managers can be highly effective in overcoming informational barriers (Kemp et al 2015) while improving transparency with the public and non-governmental organizations. Science provides a common platform through which sound management and monitoring can be enabled.

The new planning rule " provides a process for planning that is adaptive and science-based, engages the public, and is designed to be efficient, effective, and within the Agency's ability to implement…..the planning rule requires the use of best available scientific information to inform planning and plan decisions. Specifically, the Rule identifies 1) restoration of natural resources to make NFS lands more resilient to climate change, protecting water resources, and improving forest health and 2) Ensuring planning takes place in the context of the larger landscape by taking an ''all-lands approach.'' among its purpose and need. Climate change is a cross jurisdictional process and effective collaborations are necessary for long term success. The Kaibab NF already maintains partnerships which should improve the local and regional knowledge base. Key partners include The US Fish and Wildlife Service, The Arizona Game and Fish Department, The Grand Canyon Trust, The Nature Conservancy, Northern Arizona University's Lab of Landscape Ecology and Conservation Biology and the Landscape Conservation Initiative, Bird Conservancy of the Rockies, Bat Conservation International, The Museum of Northern Arizona (Springs Stewardship Institute), the Flagstaff Arboretum, the Desert Botanical Garden, and various Tribes. The forest will continue to leverage these resources while also seeking new partnership opportunities that will increase efficiency and help to mitigate climate risk and improve forest resiliency.

Existing collaborations between the AGFD and Coconino County generally encourage the protection of open lands and the preservation of the land's natural character within local and regional contexts. These collaborative strategies should decrease the potential for future land fragmentation while improving the overall integrity of the landscape. This should also provide for more resilience with regard to climate change for those wildlife species that may need to adjust migration routes, foraging corridors, or breeding grounds. This complements the FS Strategic **Plan Objective C. Conserve open space**. Crucial open space is protected from conversion to developed uses through strategic partnerships and investments."

Pages 216-217. Added the following references:

Janowiak, M. K., Swanston, C. W., Nagel, L. M., Brandt, L. A., Butler, P. R., Handler, S. D., & Peters, M. P. (2014). A practical approach for translating climate change adaptation principles into forest management actions. Journal of Forestry, 112(5), 424-433.

Kemp, K. B., J. J. Blades, P. Z. Klos, T. E. Hall, J. E. Force, P. Morgan, and W. T. Tinkham. 2015. Managing for climate change on federal lands of the western United States: perceived

usefulness of climate science, effectiveness of adaptation strategies, and barriers to implementation. Ecology and Society 20(2): 17.

Nimmo, D.G., Mac Nally, R., Cunningham, S., Haslem, A., Bennett, A.F. (2015) Vive la resistance: reviving resistance for 21st century conservation. Trends in Ecology and Evolution. Vol 30, Iss.9. pp 516-523

Schmitz, O. J., Lawler, J. J., Beier, P., Groves, C., Knight, G., Boyce Jr, D. A., and Pierce, D. J. (2015). Conserving biodiversity: Practical guidance about climate change adaptation approaches in support of land-use planning. Natural Areas Journal, 35(1), 190-203.

Stein, B.A., P. Glick, N. Edelson, and A. Staudt (eds.). 2014. Climate-Smart Conservation: Putting Adaptation Principles into Practice. National Wildlife Federation, Washington, D.C.

USDA 2012. Forest adaptation resources: Climate change tools and approaches for land managers. Swanston, Chris; Janowiak, Maria, eds. GTR-NRS-87. 121 p.

USDA Forest Service 2015. USDA Foest Service Strategic Plan: FY 2015-2020. FS--1045 June 2015. 60 p.

Appendix A. Administrative Changes to the Land and Resources Management Plan for the Kaibab National Forest Monitoring Plan

This document is an excerpt from the 2014 Kaibab National Forest (KNF) Land and Resource Management Plan which has been edited to show changes made in an administrative correction dated August 31, 2016. Additions to the text of the plan are underlined, proposed deletions are indicated by ~~strike-through~~ text. For more information on these changes and monitoring requirements under the 2012 planning rule please see the white paper at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd500834.pdf

Chapter 5. Monitoring and Evaluation

Introduction

~~Monitoring and evaluation are required by the 1982 Planning Rule Revisions.~~ Monitoring and evaluation documents and reports how well a plan is being implemented, how well it is working, and if its direction is still appropriate. Evaluation examines altered conditions that result from management, identifies possible reasons desired conditions are not being met, and proposes alternative solutions. Monitoring is essential to provide information to the responsible official so he or she can decide if a change in plan components or other plan content may be needed to respond to changing conditions and issues. Monitoring is the feedback that enables adaptive management.

Monitoring and evaluation are fundamental to good program management and they:

- Provide data on project implementation and effectiveness
- Improve decision making
- Allow for accountability to stakeholders
- Help identify needed changes in management
- Inform further information needs

The monitoring plan outlines the general framework for achieving forest plan monitoring objectives. It is strategic in nature and contains specific questions that ask how well the Kaibab NF is moving toward and achieving its desired conditions and objectives within a given resource area. The monitoring plan uses a multi-scaled approach to monitor short and long-term changes. Monitoring is not completed on every activity. It does not address project level compliance monitoring, which is conducted to evaluate consistency with law, regulation, or policy, unless such monitoring answers a forest-wide question. It is not intended for research purposes and may have varying degrees of statistical rigor.

This monitoring plan is intended to be adaptive in nature and incorporates strategies that are holistic, collaborative, and grounded in science. This approach should provide the Kaibab NF with the best chance for achieving long-term sustainability of its natural resources, as well as the natural resources of the greater landscape.

~~Although~~ This monitoring plan was originally developed under the 1982 Planning Rule. Current Forest Service policy required that it be compliant with the new (2012) Planning Rule within 4 years. Section 36 CFR 219.12 (c)(1) states "…*The responsible official shall develop the plan monitoring program as part of the planning process for a new plan development or plan revision.*

Where a plan's monitoring program has been developed under the provisions of a prior planning regulation and the unit has not initiated plan revision under this part, the responsible official shall modify the plan monitoring program within 4 years of the effective date of this part, or as soon as practicable, to meet the requirements of this section…" The initial ~~In an effort to streamline this process, this~~ monitoring plan was developed to proactively ~~and~~ consider~~ed~~ many of the key monitoring components outlined under the new planning rule. As such, it originally included concepts such as effectiveness monitoring, adaptive management, and the integration of local scale (e.g. plan-level) monitoring with broader landscape-level strategies (e.g. across multiple units, regions). Further, it is supportive of multi-party monitoring and intends to leverage existing data sets and the inventory and monitoring efforts of other partners and agencies. ~~When additional changes to the monitoring plan are necessary to better align it with bring it in further compliance with the new planning rule, these changes will be addressed through administrative corrections or plan amendments. Additional information can be found in Appendix A of the Final Programmatic Impact Statement for the 2012 Planning Rule, §219.12;Monitoring.~~ As a result, changes to the monitoring plan are necessary to better align it with the new planning rule. These changes are limited in nature and able to be addressed through administrative corrections. Further guidance on monitoring program development for individual forest units can be found under Chapter 30-Monitoring, in the ~~Draft~~ Forest Service Land Management and Planning Handbook (FSH 1909.12). Monitoring plan questions that align with the 2012 planning rule have been noted in the matrix below, and are defined as follows:

I. The status of select watershed conditions (219.12(a)(5)(i)

II. The status of select ecological conditions (including key characteristics of terrestrial/aquatic ecosystems) (219.12(a)(5)(ii)

III. The status of Focal Species to assess ecological conditions (219.12(a)(5)(iii)

IV. The status of select ecological conditions that contribute to the recovery of T&E species, conserve proposed & candidate species, and maintain a viable population of species of conservation concern (219.12(a)(5)(iv)

V. The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives (219.12(a)(5)(v)

VI. Measureable changes on the plan area related to climate change and other stressors (219.12(a)(5)(vi)

VII. Progress toward meeting desired conditions and objectives (including those for multiple uses) (219.12(a)(5)(vii)

VIII. The effects of management systems so that they do not substantially and permanently impair the productivity of the land (219.12(a)(5)(viii) and 16 U.S.C. 1604(g)(3)(C) – NFMA)

FSH 1909.12 sec 32.13(f) Indicators addressing the plan contributions to communities, social and economic sustainability of communities, multiple use management in the plan area, or progress toward meeting the desired conditions and objectives related to social and economic sustainability.

An interdisciplinary team developed this monitoring plan to: (1) meet legal requirements, including the 2012 Planning Rule (2) be consistent with corporate data standards and protocols, and (3) address the various aspects of forest management in an integrated manner.

This chapter of the Forest Plan provides the overall monitoring strategy, which is one of three components that comprise the monitoring and adaptive framework. The three components have distinct and complimentary roles.

Forest Plan Direction provides broad, strategic guidance and specifies the monitoring requirements in the plan itself. It provides the overall monitoring strategy, including specific questions that need to be answered, what will be monitored, timetables for reporting, and other information.

Monitoring and Evaluation Implementation Guide provides specific, technical guidance. It describes how, where, and when to accomplish the monitoring prescribed in the plan and provides the specific methods, protocols, and analytical procedures. The guide is not part of the forest plan so that it may be more flexible and responsive to new information, updated procedures, emerging issues, and budgetary considerations without amending the plan.

Biannual Monitoring Evaluation Review provides a regular process for reviewing recent findings and evaluating the need for modifications in the plan, monitoring plan and practices. This evaluation provides an opportunity to dig deeper into the data and ask additional detailed follow up questions. Examples of these will be documented in the Monitoring and Evaluation Implementation Guide. A monitoring report will be published every two years, however, depending on the measurement interval of each variable, may not be evaluated in every report.

Monitoring Strategies

These strategies employ and build on existing methodologies and sources of information, but can be expanded and modularized to increase the robustness and comprehensiveness of data collection and processing when additional need and capacity arise. These strategies are intended to achieve statistically valid outputs through transparent data collection, processing, and analyses, as well as facilitate consistency in data collection methods by partners (e.g., adjacent landowners, stakeholders, tribes, etc.). This will foster greater efficiency, accountability, comparability of data, and the ability to better leverage monetary resources.

The Kaibab NF works with Rocky Mountain Research Station, Forest Service State and Private Forestry, and Research and Development, Northern Arizona University, as well as other partners e.g. 4FRI collaborative, Bird Conservancy of the Rockies (formerly Rocky Mountain Bird Observatory), Springs Stewardship Institute, Museum of Northern Arizona, and The Nature Conservancy and interested organizations to assess research needs, opportunities, and methods relevant to current and future forest management. Research organizations help the Kaibab NF fill knowledge gaps and develop a better understanding of ecosystem processes, structure, pattern, and composition and additional avenues of investigation necessary to validate desired conditions and/or improve implementation practices.

Information Management

Data will be designed and collected according to appropriate data standards and entered into corporate databases such as Natural Resource Inventory System or GIS. The information can then be accessed and analyzed to produce information products such as monitoring reports that would be available for internal and external review. These reports should provide the information necessary to make informed management decision.

Monitoring and Evaluation Implementation Guide

A more prescriptive implementation guide ~~is being~~ has been drafted that will describe "the how" in terms of specific sample designs and strategies, ~~identify~~ indicator variables and models to be

used, and appropriate target thresholds/benchmarks to be met. This guide will be tested and likely modified over time. The implementation guide is not part of the plan; rather it is supplemental information to improve effective implementation of the plan and to identify adaptive management strategies. As such, it can be adjusted as needed to improve efficiency and updated to be adaptive and responsive to address emerging issues, new science, changes to recommended survey methodologies and techniques, and fluctuations in budget without a plan amendment. The guide is being ~~was~~ developed collaboratively with area experts and statisticians in order to reflect the best available science, while yielding statistically valid, robust, and contemporary data sets to the extent possible. The implementation guide ~~will~~ builds off of and integrates methodologies specified in the background reports for the rapid plot monitoring design and remotely sensed tools for determining changes in forest structural conditions (Dickson et al. 2011, Ray, et al. 2012, Horncastle and Dickson 2015).

Monitoring Matrix

This monitoring matrix contains the plan decisions of the monitoring plan. It includes a combination of effectiveness and implementation monitoring. It is organized by five primary methods of data acquisition. Each matrix subheading is described in detail below. The order of monitoring items within each subheading follows the order of each resource area within the plan.

In many cases, data collected on one ~~metric~~ indicator may help to answer several questions, and meet multiple monitoring requirements of the 2012 Rule, improving efficiency and utility of the data. Efficiency is also achieved by leveraging existing and complimentary data sources from internal as well as external parties to the extent practicable. Frequency of data collection, evaluation, and reporting varies by resource area and monitoring question. That is, not every item identified in the matrix is monitored or reported out on every year.

Data Acquisition Methods

Specific monitoring questions require that data be gathered at multiple scales. As a result, a combination of strategies for obtaining data are used, including existing methodologies and sources of information, rigorous field assessment protocols, remote sensing techniques, and existing monitoring efforts and other sources of information. Additionally, data collected for other purposes that can be used to answer monitoring questions are specified, obtained, and evaluated as part of the monitoring plan.

Rapid Plots indicate status of key ecological attributes for a focal ecological resource at the mid to fine spatial scales, although measurements in multiple locations may provide wide spatial coverage. Data include relatively simple field based metrics. Examples include snags, down logs, large trees, presence of nonnative invasive species, and soil conditions.

Rapid plot data would be collected on key parameters using a systematic sampling framework superimposed across the entire Kaibab NF. Planned and existing projects would help guide the plot placement process with the intent that data collected at the project level would be aggregated with other rapid plot data to make inferences at the Forest level. The Rapid Plot Monitoring Design and Statistical Guide for the Kaibab NF (Ray et al. 2012) supports the monitoring plan and provides more detailed information.

Remotely Sensed monitoring indicates status of key ecological attributes for a focal ecological resource at landscape scales and/or at coarser spatial resolution. Data sources include GIS and remote sensing imagery, which would indicate changes in land cover across the entire Kaibab NF, as well as adjacent and nearby lands. Examples of outputs include landscape composition, pattern, and fragmentation. Some data collected through rapid plots may be used to validate and improve the accuracy of remote sensing data.

Existing Sources are existing data the Kaibab NF or its partners already collect and report. Much of these data are managed under the Natural Resource Manager system, a system of database tools for managing Agency data across the Forest Service. Natural Resource Manager includes Forest Service Activity Tracking System, Infrastructure, and the Natural Resource Information System databases, among others. Data routinely collected by the Arizona Department of Environmental Quality, Arizona Game and Fish Department, and USDA Animal and Plant Health Inspection Service are other sources of existing data that can be leveraged to answer Forest-wide questions.

Interviews are largely qualitative in nature and may be subjective. These may include questions posed to resource specialists or partners or during tribal discussions. Follow-up interpretation of the results is required to ~~obtain information~~ inform adaptive management.

Intensive monitoring indicates status of key ecological attributes for focal ecological resources at fine spatial scales or spatial resolution, although measurements in multiple locations can provide wide spatial coverage. Data sources might include simple to complex field-based metrics that are usually quantitative and collected within a statistical sampling design. Examples include surveys of birds to assess density levels, analyses involving specific soil and water chemistry parameters, and quantitative vegetation structure measurements.

Matrix Data Fields

Resource area: A quantitative or qualitative resource, use, or activity parameter that can be assessed, e.g., vegetation communities, wildlife species, invasive species, recreation, etc.

Monitoring question: Specific monitoring questions ensure that the information essential to measuring progress toward meeting the plan objectives and desired conditions is collected and evaluated. Monitoring questions focus on key plan components where carrying out projects and activities are planned and changes are likely to result over time.

~~Metric~~ Indicator: Indicators or metrics that are key attributes for a particular resource area. Indicators were selected that are specific and measurable, and occasionally include multiple metrics. In some cases, one metric can answer several different questions. These attribute measurements can be quantitative and/or qualitative and should provide enough information to answer the monitoring question(s). Indicators should be conducive to effective and systematic repeatable monitoring with existing survey methodology and within budgetary constraints.

Driver: Monitoring drivers identify the reasons for monitoring a particular item. Drivers can be: (1) legal and regulatory requirements and Forest Service Manual direction; (2) forest plan desired conditions, goals, objectives, standards, and guidelines; (3) validation of assumptions and predictions; or (4) court rulings or legal and regulatory compliance. The matrix below lists the primary drivers associated with the forest monitoring questions; it is not an exhaustive list.

Measurement interval: Describes how often monitoring information is collected. This varies based on the resource area, monitoring drivers, and questions.

Evaluation and reporting interval: Describes how often monitoring information is evaluated and reported. The initial data will be assessed to establish a "baseline" against which change can be compared. Monitoring reports will be prepared on a~~n annual~~ biannual basis with a comprehensive review occurring approximately every ~~five~~ six years. This would allow the Kaibab NF to evaluate the overall monitoring program and management actions and to identify any conditions that would trigger a change in management or prompt further investigation, either internally or externally. This evaluation would allow the Kaibab NF to add, modify, or delete existing questions no longer needed in the monitoring plan. It would also assess plan components and

implementation effectiveness, and whether or not the Kaibab NF is achieving and maintaining desired conditions.

Precision and Reliability: Two categories of precision and reliability are appropriate at the plan scale:

Class A (Quantitative) are methods appropriate for modeling or quantitative measurement. Results have a high degree of repeatability, reliability, accuracy, and precision.

Class B (Qualitative) are 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 and are more appropriate for some resource areas.

Table 1. Matrix for the Kaibab NF Monitoring Plan (Note: underlined words are ***proposed*** new text, ~~strikethrough~~ indicates ***proposed*** deleted text)

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
RAPID PLOT							
01	**Ponderosa Pine and Frequent Fire Mixed Conifer** **Soils and Watersheds,** **Threatened, Endangered and Sensitive Species (TES): Mexican spotted owl, Northern goshawk, Pale Townsend's big-eared bat** **Focal Species[1]: Western bluebird, Graces Warbler**	Are snags, ~~course woody debris~~, downed logs and large old trees at desired levels at the midscale (100-1,000 acre average)?	Number per acre	**Ponderosa Pine Midscale Desired Condition (DC)s:** Snags 18 inches d.b.h. or greater average 1 to 2 snags per acre. Snags and green snags of variable size and form are common. Downed logs (greater than12 inches diameter at mid-point and greater than 8 feet long) average 3 logs per acre. Coarse woody debris greater than 3 inches in diameter (including downed logs) ranges from 3 to 10 tons per acre (Ponderosa Pine). Coarse woody debris, including downed logs, ranges from 5 to 15 tons per acre (Frequent Fire Mixed Conifer). **Ponderosa Pine, Frequent Fire Mixed Conifer Landscape scale DCs:** Old growth occurs throughout the landscape, generally in small areas as individual old growth components, or as clumps of old growth. Old growth components include old trees, snags, coarse woody debris, and structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). **Soils DC:** Logs and other woody materials are distributed across the surface to maintain soil productivity. **MSO Recovery Plan** **2012 Planning Rule 219.12(a)(5)(ii, iii, iv, vi, vii)**	1-5	2-~~5~~6	A
02	**Ponderosa Pine and Frequent Fire Mixed Conifer** **TES: MSO, Northern goshawk**	Is the coarse woody debris ~~fuel loading~~ within the desired range?	Tons per acre	**Ponderosa Pine Midscale DC:** Coarse woody debris greater than 3 inches in diameter (including downed logs) ranges from 3 to 10 tons per acre.**Frequent Fire Mixed Conifer Midscale DC:** Coarse woody debris, including downed logs, ranges from 5 to 15 tons per acre.**MSO Recovery Plan** **2012 Planning Rule 219.12(a)(5)(ii, iv, vi, vii)**	1-5	2-~~5~~6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
03	**Pondersoa Pine and Frequent Fire Mixed Conifer**	Does height to live crown and crown bulk density put the forest at risk for uncharactic high severity fire at the mid-scale and above?	Height to live crown, crown bulk density	**Ponderosa Pine Midscale DC:** Fires burn primarily on the forest floor and typically do not spread between tree groups as crown fire. **Ponderosa Pine Landscape scale DC:** Forest vegetation conditions are resilient to the frequency, extent, and severity of disturbances and climate variability. The risk of uncharacteristic high-severity fire and associated loss of key ecosystem components is low. **Frequent Fire Mixed Conifer Midscale DC:** Fires burn primarily on the forest floor and typically do not spread between tree groups as crown fire. **2012 Planning Rule 219.12(a)(5)(ii, iv, vi, vii)**	1-5	2-6	A
04	**Ponderosa Pine**	Is regeneration occurrring at a rate that will support uneven aged forests over time?	Seedling and sapling count/per arcre	**Ponderosa Pine Landscape Scale DC:** The ponderosa pine forest vegetation community is a mosaic of forest conditions composed of structural stages ranging from young to old trees **2012 Planning Rule 219.12(a)(5)(ii, vi, vii)**	1-5	2-6	A
05	**Soils and Watersheds**	What is the percent of effective ground cover? What is the proportion of live and dead vegetation,litter, rock, and bare ground?	Percent cover	**Soils DC:** Vegetative ground cover is well distributed across the soil surface to promote nutrient cycling and water infiltration. **LandscapePonderosa Pine, Frequent Fire Mixed Conifer, Mesic Mixed Conifer/Spruce Fir Finescale DC:** Organic ground cover and herbaceous vegetation provide for soil and moisture infiltration, and contribute to plant and animal diversity and to ecosystem function. **2012 Planning Rule 219.12(a)(5)(i, ii, iv, vii)**	1-5	2-~~5~~6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
06	**Soils and Watersheds**	~~Are the effects of forest management resulting in changes to the productivity of soils~~ Is there evidence of erosion (~~e.g. evidence of platy structures,~~pedastalling of vegetation or rock, rills, sheet flow, or deposition)?	Presence/ absence	**Soil DC:** Soils can readily absorb, store, and transmit water vertically; accept, hold, and release nutrients; and resist erosion. **National Forest Management Act**, 1976 (16 U.S.C. 1604(g)(3)(C)) **2012 Planning Rule 219.12(a)(5)(i, ii, vi, vii, viii)**	1-5	2-~~5~~6	A/B
07	**Soils and Watersheds**	What is the percentage and pattern of plots that have evidence of ~~mechanical~~ soil disturbance from activities that used mechanical equipment?	Percent	**Soil DC:** Soils can readily absorb, store, and transmit water vertically; accept, hold, and release nutrients; and resist erosion. **National Forest Management Act**, 1976 (16 U.S.C. 1604(g)(3)(C)) **2012 Planning Rule 219.12(a)(5)(i, ii, vi, vii, viii)**	1-5	2-~~5~~6	A/B
08	**Nonnative Invasive Species**	What is the ~~percent cover~~ frequency of area occupied by noxious weeds[2] by species?	Percent cover	**Nonnative Invasive DC:** Invasive species are contained and/or controlled so that they do not disrupt the structure or function of ecosystems or impact native wildlife. **Nonnative Invasive Guideline (GD):** New populations should be detected early, monitored, and treated as soon as possible. **2012 Planning Rule 219.12(a)(5)(i, ii, vi, vii, viii)**	1-5	2-~~5~~6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
REMOTELY SENSED							
09	**Ponderosa Pine and Frequent Fire Mixed Conifer**	How many acres of the Kaibab NF is in an uneven aged open state, at the midscale (above 100 acres)?	Acres	**Ponderosa Pine and Frequent Fire Mixed Conifer Landscape DC:** The ponderosa pine/frequent fire mixed conifer forest vegetation community is a mosaic of forest conditions composed of structural stages ranging from young to old trees. The forest is generally uneven aged and open. **Frequent Fire Mixed Conifer DCs:** The frequent fire mixed conifer forest vegetation community is characterized by variation in the size and number of tree groups depending on elevation, soil type, aspect, and site productivity. Forest appearance is variable, but generally uneven-aged and open; occasional patches of even-aged structure are present. **Frequent Fire Mixed Conifer and Ponderosa Pine Midscale DC:** Forest conditions in some areas contain 10 to 20 percent higher basal area in mid-aged to old tree groups than in the general forest (e.g. goshawk post-fledging family areas, MSO nesting/roosting habitat, drainages, and steep north-facing slopes). **MSO Recovery Plan (2012)** **2012 Planning Rule 219.12(a)(5)(ii, iii, vi)**	~~3~~1-5	~~3-5~~ 2-6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
10	**Ponderosa Pine and Frequent Fire Mixed Conifer**	How many acres are predicted to support active crown fire as modeled under typical peak fire danger conditions at the midscale?	Acres	**Ponderosa Pine and Frequent Fire Mixed Conifer Midscale DC:** Fires burn primarily on the forest floor and typically do not spread between tree groups as crown fire. **Ponderosa Pine Objective (OBJ):** To reduce the potential for active crown fire in ponderosa pine communities: Mechanically thin 11,000 to 19,000 acres annually; Burn an average of 13,000 to 55,000 acres annually using a combination of prescribed fire and naturally ignited wildfires. **Frequent Fire Mixed Conifer OBJs:** Burn an average of 1,000 to 13,000 acres annually using prescribed fire and/or naturally ignited wildfires. Mechanically thin 1,200 to 2,100 acres per year. **2012 Planning Rule 219.12(a)(5)(ii, vi, vi, vii)**	~~3~~1-5	~~3-5~~ 2-6	A
11	**Ponderosa Pine and Frequent Fire Mixed Conifer** **Focal Species:** Western bluebird	Is the stand density within a range that will allow for a robust understory?	Acres, SDI^3	**Finescale DC:** Organic ground cover and herbaceous vegetation provide protection for soil and moisture infiltration, and contribute to plant and animal diversity and to ecosystem function. **2012 Planning Rule 219.12(a)(5)(ii, iii, vi, vii)**	~~3~~1-5	~~3-5~~ 2-6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
12	**Ponderosa Pine, Mixed Conifer, Spruce fir, and Pinyon-juniper Communi-ties.**	How many acres are at high risk for insect outbreaks?	Acres, SDI	**Ponderosa Pine Landscape DC:** The landscape is a functioning ecosystem that contains all components, processes, and conditions associated with endemic levels of disturbances (e.g. fire, dwarf mistletoe, insects, diseases, lightning, drought, and wind). Forest vegetation conditions are resilient to the frequency, extent, and severity of disturbances and climate variability. **Frequent Fire Mixed Conifer Landscape DC**: The landscape is a functioning ecosystem that contains all components, processes, and conditions that result from endemic levels of disturbances (e.g., fire, insects, diseases, and wind). **Mesic Mixed Conifer/Spruce Fir Landscape DCs**: The forest landscape is a functioning ecosystem that contains all components, processes, and conditions that result from endemic levels of disturbances (e.g. insects, diseases, wind, snow, and fire), including snags, downed logs, and old trees. The composition, structure, and function of vegetative conditions are resilient to the frequency, extent, and severity of disturbances and climate variability. **Pinyon-juniper Communities DC**: The composition, structure, and function of vegetative conditions are resilient to the frequency, extent, and severity of disturbances (e.g. insects, diseases, and fire) and climate variability.	1-2	2-~~5~~6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
13	**Ponderosa Pine and Frequent Fire Mixed Conifer** **Focal Species:** Western bluebird and Grace's warbler **TES:** Northern goshawk	What is the total area within the desired range for basal area and openings?	BA, Open Canopy	**Ponderosa Pine Midscale DCs:** Basal area within forested areas generally ranges from 20 to 80 sq ft/acre, with larger trees (i.e. >18 inches in diameter) contributing the greatest percent of the total basal area. Interspaces with native grass, forb, and shrub vegetation are variably shaped and typically range from 10 to 70 percent, with the more open conditions typically occurring on less productive sites. **Frequent Fire Mixed Conifer Midscale DCs:** Basal area within forested areas generally ranges from 30 to 100 sq ft/acre, with larger trees contributing the greatest percent of the total basal area. Interspaces with native grass, forb, and shrub vegetation typically range from 10 to 50 percent of the area. **2012 Planning Rule 219.12(a)(5)(ii, iii, vi, vii)**	~~3~~1-5	~~3-5~~ 2-6	A
14	**Aspen**	What is the areal extent and configuration of aspen on the Kaibab NF?	Acres	**Aspen DC:** Aspen occurs in natural patterns of abundance and distribution at levels similar to or greater than those at the time of plan approval. **2012 Planning Rule 219.12(a)(5)(ii, vi, vii)**	~~3~~1-5	~~3-5~~ 2-6	A
15	**Grasslands**	What percent of the grassland PNVT has <10 percent canopy cover?	Percent cover	**Grassland DC:** Tree and shrub canopy cover are each less than 10 percent. **2012 Planning Rule 219.12(a)(5)(ii, vi, vii)**	~~3~~1-5	~~3-5~~ 2-6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
EXISTING SOURCES							
16	**Fire Adapted Ecosystems (pinyon-junper, ponderosa pine, mixed conifer forests, grasslands, Gambel oak wodlands, and some sagebrush shrublands)**	How many acres were burned with desired and undesired fire behavior and effects?	Acres	**Ponderos Pine and Frequent Fire Mixed Conifer Finescale DC:** Fires generally burn as surface fires, but single tree torching and isolated group torching is not uncommon. **Ponderos Pine and Frequent Fire Mixed Conifer Midscale DC:** Fires primarily burn on the forest floor and typically do not spread between tree groups as crown fire. **Ponderos Pine and Frequent Fire Mixed Conifer Landscape DC:** Fire and other disturbances are sufficient to maintain desired overall tree density, structure, species composition, coarse woody debris loads, and nutrient cycling. Frequent, low severity fires (Fire Regime I) occur across the entire landscape with a return interval of 0 to 35 years. **2012 Planning Rule 219.12(a)(5)(ii, vi, vii)**	1-2	~~5~~ 2-6	A
17	**Fire Adapted Ecosystems**	How many acres were treated with mechanical thinning by PNVT?	Acres	**Ponderosa Pine OBJ:** To reduce the potential for active crown fire in ponderosa pine communities: Mechanically thin 11,000 to 19,000 acres annually. **Frequent Fire Mixed Conifer OBJ:** Mechanically thin 1,200 to 2,100 acres per year. **Grasslands OBJ:** Reduce tree density to less than 10 percent on 5,000 to 10,000 acres of historic grasslands annually. **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	~~2-5~~ 2-6	A
18	**Fire Adapted Ecosystems**	How many acres of conifer species were planted? ~~Were they~~Was planting successful?	Acres	**Activies Following Large-Scale Disturbance OBJ:** Plant 300 to 700 acres annually **NFMA 16 U.S.C. 1604(g)(3)(C)** **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	~~2-5~~ 2-6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
19	**Aspen (Tusayan and Williams Ranger Districts)**	What was the total area of aspen fenced?	Acres	**Aspen OBJ:** Fence 200 acres of aspen within 10 years of plan approval. **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	~~2-5~~ 2-6	A
20	**Aspen**	How many acres were treated for conifer encroachment?	Acres	**Aspen OBJ:** Reduce conifer encroachment on 800 acres of aspen within 10 years of plan approval. **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	~~2-5~~ 2-6	A
21	**Grasslands**	What is the relative composition and cover of grasslands?	Frequency	**Grassland DCs:** Vegetation is dominated by herbaceous plants composed of a mix of native grasses and forbs. The structure, composition, and distribution of vegetation are within the range of natural variability and occur in natural patterns of abundance and diversity, which may vary depending on soil type and microclimate. Organic litter varies between 30 and 50 percent of the ground cover. Vegetation composition will average 40 to 60 percent grass, and 10 to 30 percent forbs. Understory vegetation reflects the site potential. **2012 Planning Rule 219.12(a)(5)(ii, iv, vi, vii)**	1-2	~~2-5~~ 2-6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
22	**Grasslands**	How many miles of fence were modified for pronghorn?	Miles	**Grasslands OBJ:** Modify fences and/or install crossings to facilitate pronghorn movement on 50 miles of fence within 10 years of plan approval. **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	~~2-5~~ 2-6	A
~~**23**~~	~~**Wildlife (MIS)**~~	~~What is the estimated population trend of pronghorn?~~	~~Trend~~	~~**FSM Policy:** Population trends of the management indicator species will be monitorred and the relationships to habitat changes determined. This monitoring will be done in cooperation with state fish and widllife agencies to the extent practicable.~~ ~~**1982 Planning Rule: 219.19**~~	~~1-2~~	~~2-5~~	~~A/B~~
23	**Ponderosa Pine, Frequent fire Mixed Conifer, Mesic Mixed Conifer/Spruce-fir, and Pinyon-juniper**	What is the acreage of outbreaks of insects and disease? Does this follow regional patterns?	Acres	**Ponderosa Pine Landscape DC**: The landscape is a functioning ecosystem that contains all components, processes, and conditions associated with endemic levels of disturbances (e.g. fire, dwarf mistletoe, insects, diseases, lightning, drought, and wind). Forest vegetation conditions are resilient to the frequency, extent, and severity of disturbances and climate variability. **Pinyon-juniper Communities DC**: The composition, structure, and function of vegetative conditions are resilient to the frequency, extent, and severity of disturbances (e.g. insects, diseases, and fire) and climate variability. **2012 Plannning Rule 219.12(a)(5)(ii, vi, vii)**	1-2	~~2-5~~ 2-6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
24	**Ponderosa Pine, Frequent Fire Mixed Conifer ,Mesic Mixed Conifer/Spruce Fir, Pinyon-juniper Communities, Grassland Communities, Non-native Invasive Species**	What is the trend in Normalized Difference Vegetation Index (NDVI[4])? How does this compare to regional trends	NDVI trend, .	**Ponderosa Pine Landscape DC:** Forest vegetation conditions are resilient to the frequency, extent, and severity of disturbances and climate variability. **Mesic Mixed Conifer/Spruce Fir Landscape DCs**: The forest landscape is a functioning ecosystem that contains all components, processes, and conditions that result from endemic levels of disturbances (e.g. insects, diseases, wind, snow, and fire), including snags, downed logs, and old trees. The composition, structure, and function of vegetative conditions are resilient to the frequency, extent, and severity of disturbances and climate variability. **Pinyon-juniper Communities DC**: The composition, structure, and function of vegetative conditions are resilient to the frequency, extent, and severity of disturbances (e.g. insects, diseases, and fire) and climate variability. **All Grassland Communities DCs**: Vegetation is dominated by herbaceous plants composed of a mix of native grasses and forbs. The structure, composition, and distribution of vegetation are within the range of natural variability and occur in natural patterns of abundance and diversity, which vary depending on soil type and microclimate. **Non-native Invasive species DC**: Invasive species are contained and/or controlled so that they do not disrupt the structure or function of ecosystems or impact native wildlife. **2012 Planing Rule 219.12(a)(5)(vi, vii)**	1-5 years	4-10 years	A
25	**Nonnative Invasive Species**	What is the areal extent of priority nonnative invasive plants on the Kaibab NF?	Acres	**Nonnative Invasive Species GD:** New populations should be detected early, monitored, and treated as soon as possible. **2012 Planning Rule 219.12(a)(5)(i, ii, iii, vi, vii, viii)**	1-2	~~2-5~~ 2-6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
26	**Nonnative Invasive Species**	How many acres of invasive plants were treated?	Acres	**Nonnative Invasive Species OBJ:** Treat 2,000 to 3,000 acres invaded by nonative plants annually. **2012 Planning Rule 219.12(a)(5)(i, ii, vii, viii)**	1-2	~~2-5~~ 2-6	A
27	**Natural Waters**	How many springs were protected and restored?	Count	**Natural Waters OBJ:** Protect and/or restore at least 10 individual springs within 5 years of plan approval. **2012 Planning Rule 219.12(a)(5)(i, ii, vii)**	1-2	~~2-5~~ 2-6	A
28	**Wetlands/ Cienegas**	How many acres of wetlands were restored?	Acres	**Wetlands/Cienegas OBJ:** Restore native vegetation and natural water flow patterns on at least 6 acres of wetlands within 5 years of plan approval. **2012 Planning Rule 219.12(a)(5)(i, ii, viii)**	1-2	~~2-5~~ 2-6	A
29	**Soils and Watersheds**	Are there any water bodies not meeting Arizona water quality standards? Are there existing TMDLs[5] or are there any in prep? What aspect of the TMDL has been implemented?	Count	**Watershed DC:** Water quality meets or exceeds State of Arizona or Environmental Protection Agency water quality standards for designated uses. Water quality meets critical needs of aquatic species. **2012 Planning Rule 219.12(a)(5)(i, ii, v, vii)**	2~~-5~~ 6	2~~-5~~ 6	A
30	**Soils and Watersheds**	How many 6th code watersheds were moved to an improved condition this year?	Count	**Watersheds DC:** Water quality meets or surpasses State of Arizona or Environmental Protection Agency water quality standards for designated uses. **2012 Planning Rule 219.12(a)(5)(i,ii,vii)**	1-2	2-6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
31	**Soils and Watersheds**	Did any project or site require corrective action in the BMP monitoring database?	Yes or no	**Watersheds DC:** Water quality meets or surpasses State of Arizona or Environmental Protection Agency water quality standards for designated uses. **Soils and Watershed Management Gds:** Projects should incorporate the national best management practices for water quality management and include design features to protect and improve watershed condition. **2012 Planning Rule 219.12(a)(5)(i, ii,vii)**	1-2	2-6	B
32	**Soils and Watersheds**	Was adaptive management recommended for any BMP monitoring item and what were the monitoring results?	Yes or no	**Soils and Watershed Management GDs:** Projects should incorporate the national best management practices for water quality management and include design features to protect and improve watershed condition. **2012 Planning Rule 219.12(a)(5)(i, ii,vii)**	1-2	2-6	B
33	**Soils and Watersheds**	Were at least half the composite ratings for BMP effectiveness "excellent"?	Yes or no	**Watersheds DC:** Water quality meets or surpasses State of Arizona or Environmental Protection Agency water quality standards for designated uses. **Soils and Watershed Management GDs:** Projects should incorporate the national best management practices for water quality management and include design features to protect and improve watershed condition. **2012 Planning Rule 219.12(a)(5)(i, ii,vii)**	1-2	2-6	B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
34	**Air Quality**	How many days did fine particle concentrations exceed 10 µgm/ m^3?	Count	**Air Quality DC:** Air quality meets or surpasses all state and federal ambient air quality standards. Management activities on the Kaibab NF do not adversely impact Class I airshed visibility as established in the Clean Air Act. **Air Quality DC**: Project design for prescribed fires and strategies for managing wildfires should incorporate as many emission reduction techniques as feasible, subject to economic, technical, safety criteria, and land management objectives. **2012 Planning Rule 219.12(a)(5)(i, v,vii)**	1-2	2-6	A
35	**Air Quality**	What is the 10-year trend of particle concentrations?	Trend	**Air Quality DC:** Air quality meets or surpasses all state and federal ambient air quality standards. Management activities on the Kaibab NF do not adversely impact Class I airshed visibility as established in the Clean Air Act. **Air Quality DC**: Project design for prescribed fires and strategies for managing wildfires should incorporate as many emission reduction techniques as feasible, subject to economic, technical, safety criteria, and land management objectives. **2012 Planning Rule 219.12(a)(5)(i, v,vii)**	1-2	2-6	B
36	**Recreation and Scenery**	What are the trends in visitor use?	Trend	**Recreation DCs:** A wide spectrum of high-quality recreation settings exists. Users have access to a variety of developed and dispersed opportunities. The Kaibab NF provides sustainable recreation consistent with public demand. Use levels are compatible with other resource values. User conflicts are infrequent. **2012 Planning Rule 219.12(a)(5)(v,vii)**	5	10	B
37	**Recreation and Scenery**	What is the overall satisfaction rating for National Forest visits on the Kaibab?	NVUM[6] Rating	**Recreation DCs:** A wide spectrum of high-quality recreation settings exists. Users have access to a variety of developed and dispersed opportunities. The Kaibab NF provides sustainable recreation consistent with public demand. Use levels are compatible with other resource values. User conflicts are infrequent. **2012 Planning Rule 219.12(a)(5)(v,vii)**	5	10	B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
38	**Recreation and Scenery, Wilderness Areas**	What was the percent of good and very good rating for visitor safety at Developed Sites, Undeveloped Sites (GFAs) and Designated Wilderness?	NVUM Rating	**Recreation DCs:** A wide spectrum of high-quality recreation settings exists. Users have access to a variety of developed and dispersed opportunities. The Kaibab NF provides sustainable recreation consistent with public demand. Use levels are compatible with other resource values. User conflicts are infrequent. **Recreation (front country) DC**: Service centers such as district offices, visitor information centers, developed campgrounds, and other staffed recreation sites provide information and services in communities and along primary forest access corridors and scenic byways. Front-country areas are safe, orderly, and capable of supporting moderate to high visitor use. **Recreation (Back country) DC:** Main access corridors to NFS lands and contact points such as developed trailheads and observation points have information available and provide a transition and orientation place for forest users as they enter back-country areas. Visitors can find information on recreation opportunities in the area. Informal interpretive and educational information is available at secondary visitor contact points and focus on appropriate use of the Kaibab NF, incorporating natural and cultural resource conservation messages. **Wilderness Area DCs:** Wilderness boundary postings are well maintained. Maps, information, and educational material are provided at wilderness access points. The materials encourage understanding of wilderness philosophy and support for its ecological and social benefits. **Wilderness Areas OBJs:** Inspect and maintain at least 10 percent of wilderness trails and signs annually. Monitor 10 percent of wilderness campsites each year. **2012 Planning Rule 219.12(a)(5)(v,vii)**	5	10	B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
39	**Recreation and Scenery, Wilderness Areas**	What are the areas identified as "concentrate here" in the NVUM?	NVUM, count	**Recreation DCs:** The Kaibab NF provides sustainable recreation consistent with public demand. Use levels are compatible with other resource values. User conflicts are infrequent. **Activities Affecting Rcereation and Scenery GD:** Group uses should be concentrated in front-country areas. **Wilderness Areas OBJs:** Inspect and maintain at least 10 percent of wilderness trails and signs annually. Monitor 10 percent of wilderness campsites each year. **2012 Planning Rule 219.12(a)(5)(v,vii)**	5	10	B
40	**Recreation**	How many acres of the Kaibab NF had a change in ROS or SMS ~~re~~classification and what were the classification changes?	Acres	**Recreation DCs:** A wide spectrum of high-quality recreation settings exists. Users have access to a variety of developed and dispersed opportunities. The Kaibab NF provides sustainable recreation consistent with public demand. Use levels are compatible with other resource values. User conflicts are infrequent. **2012 Planning Rule 219.12(a)(5)(v,vii)**	1-2	2-~~5~~ 6	B
41	**Recreation**	How many miles of trails were maintained to standard?	Miles	**Recreation DCs:** Recreation use levels are compatible with other resource values. **Bugbane Botanical Area OBJ**: Annually inspect the recreation trails and maintain to manage hiking use. **Bugbane Botanical Area GD:** Trail maintenance and any other potentially disturbing activities in the botanical area should be evaluated, and protective measures should be implemented to protect the population. **2012 Planning Rule 219.12(a)(5)(ii, iv,v,vii)**	1-2	2-~~5~~ 6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
42	**Cultural Resources**	How many acres of non-project related cultural resource surveys were conducted?	Acres	**Cultural Resource OBJ:** Non-project related cultural resource survey (Section 110 survey) is conducted in areas with a high likelihood of historic properties on at least 200 acres per year. **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	2-~~5~~-6	A
43	**Forestry and Forest Products**	How many acres of suitable timberlands were managed (TSI, harvest, etc.) for timber production?	Acres	**National Forest Management Act (1976)** **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	2-~~5~~-6	A
44	**Forestry and Forest Products**	Have much wood was offered?	CCF[7]	**Forestry and Forest Products DCs:** Wood products (e.g., wood pellets for home and industrial heating, oriented strand board, animal bedding, wood moulding, pallets, structural lumber, firewood, posts, poles, biomass for electricity.) are available to businesses and individuals in a manner that is consistent with other desired conditions on a sustainable basis within the capacity of the land. A sustainable supply of wood is available to support a wood harvesting and utilization industry of a size and diversity that can effectively and efficiently restore and maintain the desired conditions for ponderosa pine and frequent fire mixed conifer communities. **2012 Planning Rule 219.12(a)(5)(vii)** **FSH 1909.12 (32.13) (f) plan contributions to communities, social and economic sustainability of communities, multiple use management in the plan area, or progress toward meeting the desired conditions and objectives related to social and economic sustainability.**	1-2	2-~~5~~-6	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
45	**Forestry and Forest Products**	How many direct jobs does the Kaibab NF support/provide from harvesting and utilization of wood products?	Number of jobs	**Forestry and Forest Products DC:** A sustainable supply of wood is available to support a wood harvesting and utilization industry of a size and diversity that can effectively and efficiently restore and maintain the desired conditions for ponderosa pine and frequent fire mixed conifer communities. **2012 Planning Rule 219.12(a)(5)(vii)**	2-~~5~~ 4	2-~~5~~ 6	A
46	**Forestry and Forest Products**	Have there been significant investments in the wood har-vesting and util-ization infra-structure in the operating area?	Produc-tion capacity	**Forestry and Forest Products DC:** A sustainable supply of wood is available to support a wood harvesting and utilization industry of a size and diversity that can effectively and efficiently restore and maintain the desired conditions for ponderosa pine and frequent fire mixed conifer communities. **2012 Planning Rule 219.12(a)(5)(vii)**	2-~~5~~ 4	2-~~5~~ 6	B
47	**Forestry and Forest Products**	What was the average cost per acre to the Forest Service for mechanical treatments?	Dollars per acre	**National Forest Management Act (1976)** **2012 Planning Rule 219.12(a)(5)(vii)**	2-~~5~~ 4	2-~~5~~ 6	A
48	**Forestry and Forest Products**	What is the ratio of costs to revenues for mechanical thinning activities?	Cost: revenue	**National Forest Management Act (1976)** **2012 Planning Rule 219.12(a)(5)(vii)**	2-~~5~~ 4	2-~~5~~ 6	A
INTERVIEWS							
49	**Ponderosa Pine, Mixed Conifer, Spruce-fir, and Pinyon-juniper Communities**	Were there any incidences of insect outbreaks in recently treated areas? If so, where?	Presence/ absence, location	**National Forest Management Act (1976)** **2012 Planning Rule 219.12(a)(5)(ii,vi,vii)**	1-2	2-~~5~~ 6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
50	**Ponderosa Pine, Mixed Conifer, Spruce-fir, and Pinyon-juniper Communi-ties.**	What was the median and maximum size openings created through implementation of precribed mechanical treatments?	Acres	**Ponderosa Pine and Frequent Fire Mixed Conifer Finescale DC:** Regeneration openings occur as a mosaic and are similar in size to nearby groups. **Pinyon-juniper Communtities DCs:** Pinyon-juniper communities occur as a shifting mosaic interspersed with openings across the landscape. At the mid-scale and above, canopy cover is at least 10 percent with a mix of young and mature groups and clumps of trees. **Pinyon-juniper (persistant) woodlands DC**: is characterized by even-aged patches of pinyons and junipers that at the landscape level form uneven-aged woodlands. **2012 Planning Rule 219.12(a)(5)(iv, vii)**	1-2	2-~~5~~ 6	A
51	**Pinyon-Juniper Woodlands**	Was a robust crop of pinyon nuts produced on any of the districts?	Presence/ absence, location	**Pinyon-Juniper DC:** A robust crop of pinyon pine nuts is regularly produced. **2012 Planning Rule 219.12(a)(5)(ii, vi, vii)**	1-2	2-~~5~~ 6	B
52	**Recreation**	Did we receive any comments that reflect visitor satisisfaction? Were there common themes?	Yes or no, themes.	**Recreation DCs:** User conflicts are infrequent. Service centers such as district offices, visitor information centers, developed campgrounds, and other staffed recreation sites provide information and services in communities and along primary forest access corridors and scenic byways. Front-country areas are safe, orderly, and capable of supporting moderate to high visitor use. **2012 Planning Rule 219.12(a)(5)(v, vii)**	1-2	2-~~5~~ 6	B
53	**Wilderness**	Were the wilderness trails and campsites monitored? What were the results?	Yes or no; findings	**Wilderness OBJs:** Inspect and maintain at least 10 percent of wilderness trails and signs annually. Monitor 10 percent of wilderness campsites each year. **2012 Planning Rule 219.12(a)(5)(v, vii)**	1-2	2-~~5~~ 6	B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
54	**Recreation and Transpor-tation**	Are there areas of the Kaibab NF where recreation or vehicle use is causing detrimental resource effects that are in need of management? Where is it occurring?	Presence/ absence, location	**Recreation DCs:** A wide spectrum of high-quality recreation settings exists. Users have access to a variety of developed and dispersed opportunities. The Kaibab NF provides sustainable recreation consistent with public demand. Use levels are compatible with other resource values. **Transportation DCs:** Roads and culverts do not contribute to headcuts or downcuts in ephemeral drainages. Roads allow for safe and healthy wildlife movement in areas of human development. Vehicular collisions with animals are rare. **Transportation and Forest Access DC:** Resource impacts from roads and trails are balanced with the benefits of having the road or trail available for use. **2012 Planning Rule 219.12(a)(5)(ii, iv, v, vii, viii)**	2-~~5~~ 4	2-~~5~~ 6	A/B
55	**Cultural Resources**	Are cultural resources being protected in place?	Yes or no	**Cultural Resource DC**: Cultural resources, including known traditional cultural properties, are preserved, protected, or restored. **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	2-~~5~~ 6	B
56	**Livestock Grazing**	Are livestock numbers balanced with forage capacity on each allotment?	Yes or no	**Livestock Grazing DCs:** Grasses and forbs provide adequate forage for permitted livestock. Livestock use is consistent with other desired conditions. **2012 Planning Rule 219.12(a)(5)(ii, iv,vii**	1-2	2-~~5~~ 6	B
57	**Tribal Traditional and Cultural Uses**	Are plant species of known medicinal and cultural value being depleted?	Yes or no	**Tribal Traditional and Cultural Use DCs:** Traditional tribal uses such as the collection of medicinal plants and wild plant foods are valued as important uses. Traditionally used resources are not depleted and are available for future generations. **2012 Planning Rule 219.12(a)(5)(vii)**	1-2	2-~~5~~ 6	B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
58	**Arizona Bugbane Botanical Area, Threatened, Endangered, and Senstive Species**	Were the monitoring requirements met as identified in the AZ Bugbane conservation agreement?	Yes or no	**Bugbane Botanical Area DCs:** Arizona bugbane has a sustainable population and is at low risk for extirpation. **Other**: Arizona Bugbane Conservation Agreement **2012 Planning Rule 219.12(a)(5)(ii, iv,vii)**	5	5	B
59	**Pediocactus Conserva-tion Area,**	Were the monitoring requirements met as identified in the *Pediocactus paradinei* conservation agreement?	Yes or no	**Pediocactus Conservation Area DC:** Paradine plains cactus (*Pediocactus paradinei)* has a sustainable population and is at low risk for extirpation. **Other**: Pediocactus Conservation Agreement **2012 Planning Rule 219.12(a)(5)(ii, iv,vii)**	5	5	B
60	**Timber Suitability**	Were there any events or changed circumstances that would indicate a potential change to timber suitability?	Acres of suitable timber lands	**1982 Planning Rule:** 219.12 **2012 Planning Rule 219.12(a)(5)(vii)**	2 ~~5~~ 6	2 ~~5~~ 6	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
INTENSIVE							
61	**Restricted and Endemic Species**	What design features were incorporated to protect restricted and endemic species?	Count, Yes/No	**Restricted and Narrow Endemic Species DCs:** Habitat and refugia are present for narrow endemics or species with restricted distributions and/or declining populations. Locations and conditions of restricted and narrow endemic species are known. **Restricted and Narrow Endemic Species GDs:** Project design should incorporate measures to protect and provide for restricted and narrow endemic species where they are likely to occur. **2012 Planning Rule 219.12(a)(5)(ii, iv,vii)**	1-3	2-6	A/B
62	**Aspen**	Is aspen regenerating and becoming established in treated areas?	Regener-ation and recruit-ment	**Aspen DCs:** Aspen is successfully regenerating and recruiting into older and larger size classes. Size classes have a natural distribution, with the greatest number of stems in the smallest classes. Aspen occurs in natural patterns of abundance and distribution at levels similar to or greater than those at time of plan approval. **2012 Planning Rule 219.12(a)(5)(ii,vii)**	2-53	5-2-6	A/B
63	**Natural and Constructed Waters**	What is the functional condition of the lakes and wetlands on the Kaibab NF?	PFC[8]	**Natural Waters DC:** Water levels, flow patterns, groundwater recharge rates, and geochemistry are similar to reference conditions. **Constructed Waters DC:** Reservoirs maintain high water quality for parameters such as temperature, pH, and dissolved oxygen, and water levels are within the seasonal range of variable conditions. **2012 Planning Rule 219.12(a)(5)(i, ii, iv, vi,vii)**	3-5 2-10	5-2-10	A/B
64	**Natural Waters**	In treated/ protected areas, are waterflow patterns and vegetation intact?	Yes or no	**Natural Waters DC:** Water levels, flow patterns, groundwater recharge rates, and geochemistry are similar to reference conditions. **2012 Planning Rule 219.12(a)(5)(i, ii, iv, vi,vii)**	2-10	2-10	B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
65	**Soils and Watersheds**	Is there downcutting and/or embeddedness in intermittent or ephemeral drainages?	Presence/ absence	**Watershed DC:** Vertical down cutting and embeddedness are absent in drainages. **2012 Planning Rule 219.12(a)(5)(i, ii,vii,viii)**	1 ~~5~~ 3	2 ~~5~~ 6	B
66	**Soils and Watersheds**	What is the trend in soil moisture? How does this compare to regional trends?	Trend	**Soils DCs:** Vegetative ground cover is well distributed across the soil surface to promote nutrient cycling and water infiltration. Soils can readily absorb, store, and transmit water vertically; accept, hold, and release nutrients; and resist erosion. **LandscapePonderosa Pine, Frequent Fire Mixed Conifer, Mesic Mixed Conifer/Spruce Fir Finescale DC:** Organic ground cover and herbaceous vegetation provide for soil and moisture infiltration, and contribute to plant and animal diversity and to ecosystem function. **2012 Planning Rule 219.12(a)(5)(i, ii,vii,viii)**	Annually	2-10	A

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
67	**Wildlife (~~MIS~~ Focal Species)**	What is the ~~estimated population trend for~~ area of forest occupied by Grace's warbler, and western bluebird ~~and ruby-crowned kinglet ?~~ How does this compare to regional trends?	Occupancy	**Priority Need for Change**: Modify stand structure and density towards reference conditions and restore historic fire regimes. **Ponderosa Pine DCs (Landscape-scale):** The ponderosa pine forest vegetation community is a mosaic of forest conditions composed of structural stages ranging from young to old trees. The forest is generally uneven-aged and open. Groups of old trees are mixed with groups of younger trees. Occasional areas of even-aged structure are present. Denser tree conditions exist in some locations such as north-facing slopes, canyons, and drainage bottoms. **Ponderosa Pine DCs (Mid-scale):** Basal area within forested areas generally ranges from 20 to 80 square feet per acre, with larger trees (i.e. >18 inches in diameter) contributing the greatest percent of the total basal area. Interspaces with native grass, forb, and shrub vegetation are variably shaped and typically range from 10 to 70 percent, with the more open conditions typically occurring on less productive sites. **2012 Planning Rule 219.12(a)(5)(iii)**	1-5	5-10	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
68	**Wildlife (Focal Species)**	What is the area of forest occupied by ruby-crowned kinglet? How does this compare to regional trends?	Occupancy	**Priority Need for Change**: Modify stand structure and density towards reference conditions and restore historic fire regimes. **Frequent Fire Mixed Conifer DCs (Fine-scale):** Trees typically occur in irregularly shaped groups and are variably spaced with some tight clumps. Trees within groups are of similar or variable ages, often containing more than one species. Crowns of trees within mid-aged and old groups are interlocking or nearly interlocking. **(Mid-scale):** The frequent fire mixed conifer forest vegetation community is characterized by variation in the size and number of tree groups depending on elevation, soil type, aspect, and site productivity. Forest appearance is variable, but generally uneven-aged and open; occasional patches of even-aged structure are present. The more biologically productive sites contain more trees per group and more groups per area. Basal area within forested areas generally ranges from 30 to 100 square feet per acre, with larger trees contributing the greatest percent of the total basal area. **2012 Planning Rule 219.12(a)(5)(iii)**	1-5	5-10	A/B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
69	**Wildlife**	For wide ranging species like pronghorn, does habitat configuration provide functional connectivity ~~for pronghorn~~? Does habitat configuration and availability allow wildlife populations to adjust their movements (e.g., seasonal migration, foraging, etc.) in response to climate related changes?	Suitability Index[8]	**Wildlife DCs:** Interconnected forest and grassland habitats allow for movement of wide ranging species. Habitat configuration and availability allows wildlife populations to adjust their movements (e.g. seasonal migration, foraging, etc.) in response to climate change and promote genetic flow between wildlife populations. **Grasslands OBJ:** Modify fences and/or install crossings to facilitate pronghorn movement on 50 miles of fence within 10 years of plan approval. **Grasslands GDs**: Pronghorn fence crossings should be installed along known movement corridors. **Livestock Grazing DC:** Allotment fencing allows for passage of animals susceptible to movement restrictions such as pronghorn.**Transportation DC**: Roads allow for safe and healthy wildlife movement in areas of human development. **2012 Planning Rule 219.12(a)(5)(ii, iv, vii)**	~~3~~-5-10	~~3~~-5-10	A/B
70	**TES**	Are Mexican spotted owls present in PACs?	Presence/absence	**Mexican Spotted Owl Recovery Plan** **2012 Planning Rule 219.12(a)(5)(ii, iv, vii)**	1-5	2-~~5~~ 6	B

No.	Resource Area	Monitoring Question	Indicator	Driver (desired conditions, objectives, policy, etc.)	Measure-ment Interval (years)	Evaluation/ Report Interval (years)	Precision
71	**Threatened Endangered and Sensitive Species**	What is the population trend of *Pediocactus peeblesianus* var. *fickeisenii*?	Trend	**FSM 2670:** Determine distribution, status, and trend of threatened, endangered, proposed, and sensitive species and their habitats on Forest lands. **2012 Planning Rule 219.12(a)(5)(iv,vii)**	1-5	2-5 ~~6~~	A/B
72	**Double A Wild and Free Roaming Burro Territory**	What is the estimated burro population within the area?	Count	**Double A Wild and Free Roaming Burro Territory DC:** A biologically sound and genetically viable burro population is in balance with native wildlife, permitted livestock, and other resource values. **Other:** Wild Free-Roaming Horses and Burros Act of 1971: Forest Service Handbook sections 2263.1 Territory Plans and 2265.3 - Removal of Excess Animals. **2012 Planning Rule 219.12(a)(5)(vii)**	~~3~~ 1-5	~~3-5~~ 2-6	B

Key: [1] Focal Species are defined by the 2012 Planning Rule as "A small subset of species whose status permits inference to the integrity of the larger system to which it belongs and provides meaningful information regarding the effectiveness of the plan in maintaining or restoring ecological conditions to maintain the diversity of plan and animal communities… commonly selected based on their functional role in ecosystems (36 CFR §219.19, emphasis added).

[2] Noxious weed is a legal term applied to plants or plant parts regulated by Federal and State laws. Arizona Administrative Codes R3-4-244, R3-4-245 (Arizona Department of Agriculture 1999) regulate certain invasive species in the state: "A noxious weed is defined as any species of plant that is detrimental or destructive and difficult to control or eradicate and includes plant organisms found injurious to any domesticated, cultivated, native, or wild plant."

[3] Stand density index (SDI) is a relative measure of stand density that converts a stand's current density into a density at a reference size (Reineke 1933).

[4] The normalized difference vegetation index (NDVI) is a simple graphical indicator that can be used to analyze remote sensing measurements, typically but not necessarily from a space platform, and assess whether the target being observed contains live green vegetation or not. Applications examples: NDVI can be used to estimate the start and end of the growing season, the time of peak production, and seasonal productivity. Comparison of these attributes among years can indicate substantive changes in the extent of vegetation conditions, changes in the duration of the growing season, impacts due to drought, or large-scale natural or human-caused disturbances. In grassland systems, the shape of the NDVI curve can also indicate the relative extent of exotics (e.g., cheatgrass), because their phenology (timing of significant growth stages) tends to differ from that of native vegetation.

[5] A total maximum daily load (TMDL) is a regulatory term in the U.S. Clean Water Act, describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.

[6] The National Visitor Use Monitoring (NVUM) program surveys over 100,000 visitors to National Forest System lands every five years, with 20% of the national forests conducting surveys each year. This nationwide visitor use survey provides statistically sound estimates of visitation to each national forest and to each site type. The surveys also provide information about who these visitors are demographically, why they come to the national forests, how satisfied they are with the facilities and services provided, and how much money they spend on their visit.

[7] CCF: Wood volume (hundred cubic feet)

[8] Proper functioning condition: a methodology for assessing the physical function of riparian and wetland areas.

[9] Based on connectivity modeling (Hurteau20)