Annual Monitoring Report
for Implementing the
Kaibab National Forest Land Management Plan

Fiscal Year 2003

Forest Supervisor Certification

I certify that the Kaibab National Forest Plan as amended is sufficient to guide management of the Forest over the next year. Changes necessary to maintain the viability of the Plan are identified in this document.

/s/ Michael R. Williams _____ September 9, 2004

MIKE WILLIAMS Date

Forest Supervisor

Introduction

The Monitoring Plan for the Kaibab National Forest Plan identifies 58 items to be tracked as measures of the effectiveness of the Forest Plan. These items are reported and evaluated every five years. The next evaluation will be for the Fiscal Year (FY) 2004 report in preparation for Plan Revision. In preparation for Forest Plan revision, scheduled for 2006-2008, we are analyzing needs for forest plan amendment(s) to bring the monitoring requirements up to date. Major progress in this effort is expected to begin in 2005.

The following sections report what is being or has been accomplished recently by particular issue or concern areas, and what potential may exist to accomplish additional monitoring work, if necessary. Items directly tied to the Forest Plan Monitoring Plan are noted. For details on the last five-year monitoring efforts, please see the Fiscal Year 1999 Monitoring Report.

Forest Plan Amendment

On 02/24/03, the Plan was amended to reallocate 1,355 acres of suitable pine to grassland (unsuitable for timber production) to be managed as antelope habitat. Prior to circa 1920, these sites were savannahs and grasslands. Over time, trees gradually invaded the sites following fire exclusion.

The issue of the need for grassland restoration addressed by this amendment is identified programmatically in an assessment of grassland/savannah invasion by trees on the Williams Ranger District that was in process in 2003. Over 17,000 acres of former grasslands and savannahs now invaded by trees due to fire exclusion have been tentatively identified on the Williams RD. Additional areas could logically be expected on the other Ranger Districts as well because the same forces that lead to fire exclusion on Williams are present there as well.

The change in the area of land allocated to timber production with this amendment was insignificant, falling well within the bounds specified in the Monitoring Plan in the Kaibab National Forest Land and Resource Management Plan (Monitoring Plan Item "Timber 10"). If all of these areas were restored to grasslands and savannahs, the area of suitable timber on the Forest could drop below 75% of the amount identified in the initial Plan, triggering a need to evaluate the effect this might have on Plan goals and objectives. To date this condition has not occurred and no evaluation is called for.

Research Activities

Bridger-Knoll Fire Monitoring (Charles W. McHugh, RMRS, and Thomas Kolb, NAU)

As reported in a { HYPERLINK "http://www.publish.csiro.au/?act=view_file&file_id=WF02054.pdf" } (*McHugh, C., and T.E. Kolb. 2003. Ponderosa pine mortality following fire in northern Arizona. International Journal of Wildland Fire* ***12****, 7-22*.), sampling of ponderosa pine trees was conducted on three fires in Northern Arizona, including the Bridger-Knoll fire on the North Kaibab RD. Three year post-fire mortality was 13.9% on the Bridger-Knoll fire. Seventy-six percent of the post-fire mortality occurred by year two on that fire. Compared to trees that lived for three years after fire, dead trees had more crown scorch, crown consumption, bole scorch, ground char, and bark beetle attacks. A model using total crown damage by fire (scorch + consumption) and bole char severity as independent variables was the best two-variable model for predicting tree mortality for all fires in the study. The amount of total crown damage associated with tree mortality decreased as bole char severity increased.

Contrary to most studies of conifers, the study also found a U-shaped DBH-mortality distribution, suggesting that there was higher mortality for the smallest and largest trees compared with intermediate-sized trees. The study also found higher tree mortality for larger than smaller trees at a given level of

total crown damage. This suggests that the largest trees are physiologically disadvantaged to survive heavy crown damage by fire.

Pumpkin Fire Monitoring: Insects (Joel McMillin, R3, Forest Health, Arizona Zone, et.al.)

A study entitled "The Role of Wildland Fire and Subsequent Insect Attack on Ponderosa Pine Mortality", conducted by the Rocky Mountain Research Station and Forest Health Protection specialists in Regions 1, 2, and 3, is currently in progress and includes study plots on the Pumpkin Fire, located on the Kaibab and Coconino NFs. The intent of the project is to help define the impact caused by insects in association with wildfire effects on ponderosa pine trees. It will formulate models and visual guides that will permit land managers to make more informed decisions regarding salvaging and insect control.

Preliminary findings for the Pumpkin Fire were that insects caused an additional 5% mortality in both 2001 and 2002. The expected completion date of the study is 2005.

Pumpkin & Outlet Fire Monitoring: Burn Severity/Birds (Sandra Haire, USGS)

Results of a study of six large fires in 2000 (including the Pumpkin and Outlet Fires on the Kaibab) were summarized in a poster session in FY 2003 (the poster and additional information are available at { HYPERLINK "http://firescience.cr.usgs.gov/html/kotliar_abs02.html" }). Burn severity patterns were analyzed using a change detection algorithm using Landsat Thematic Mapper satellite imagery to present a gradient of ecological change following fire (see the FY2002 Monitoring report for details on the methodology). Fire severity mapping indicates that a large proportion of the Pumpkin and Cerro Grande fires were within the historic range of variability. High severity patches were not prevalent in these burns, but probably exceeded the size of high-severity patches historically.

Burns in mixed conifer (Outlet Fire) and upper elevation ponderosa pine (Hi Meadow and Bobcat fires in Colorado) are mixed severity burns.

Avian species vary in response to fire from those much more abundant in burned forest (e.g. olive-sided flycatcher) to those much more abundant in unburned forest (e.g. mountain chickadee). Many species show considerable variation among studies, which may reflect, in part, variation in burn severity. The broad spectrum of responses among species indicates that fire management that does not maintain the full range of historic variation of fire regimes (including extreme events) will not protect the integrity of western forests.

Conclusions reached were 1) much of the area burned by large fires in 2000 appears to be within the historic range of variability, and 2) patches of high-severity burns may be larger than the historic range of variability in some areas, but long-term ecological consequences of such departures are unknown.

These conclusions appear to be in direct opposition to other current local research such as those by { HYPERLINK "http://www.for.nau.edu/research/pzf/Fule_web/reprints/Moore_ForSci2004.pdf" }, { HYPERLINK "http://www.for.nau.edu/research/pzf/Fule_web/reprints/Fule_RestEcol2004.pdf" }, and { HYPERLINK "http://www.for.nau.edu/research/pzf/Fule_web/reprints/Fule_EcolMod2004.pdf" }, relative to historic range of variation and perhaps to a closely associated attribute, { HYPERLINK "http://www.for.nau.edu/research/pzf/Fule_web/reprints/Fule_IJWF_2003.pdf" }.

All three of these research efforts are relevant to implementation of timber salvage or restoration project following crown fires. They should help the Forest develop more accurate predictions of burn severity, which trees will live and which will die, and wildlife responses (including management indicator species) to these disturbances, thus facilitating more certain progress toward establishing desired conditions in burned-over areas. Since studies appear to reach conclusions contrary to other, recent research, particularly with regard to historic range of variation, the agency may not have a certain direction to proceed other than adaptively implementing projects.

Ips and Chips (Christopher Fettig, Pacific Southwest Research Station, et. al.)

A study to determine the most effective means of minimizing impacts caused by pine beetles (*Ips spp.)* when treating slash by chipping is underway on the Williams RD, the Tahoe NF in California and the Apache-Sitgreaves NF. The study will 1) determine the effects of slash management treatments (chipping and lop-and-scatter) on *Ips*-caused mortality, 2) determine the effects of timing of thinning and stand density on *Ips*-caused mortality, and 3) determine the effects of distance between chipped material and potential host trees on *Ips*-caused mortality. Preparation of management guidelines should be completed by 2005.

This report will provide valuable information for the Districts, which are already using chipping as a fuels reduction tool in areas with high *Ips* populations. The results of this study should allow the Forest to evaluate the effectiveness of current and other possible management practices in making progress toward desired conditions.

Birds and Burns (William M. Block, RMRS)

A study to determine the effects of prescribed fire on birds is underway on the Williams RD. The study is part of a larger effort to examine fire effects on populations and habitats of wildlife in ponderosa pine forests in eight states across the western U.S. The Southwest component of the research focuses on cavity-nesting bird community response to vegetative change following fire.

There are three study plots located on the Kaibab NF and two on the Coconino NF. In FY 2003, pre-burn vegetation and avian data were collected in the study area. A total of 54 species of birds were detected on these study plots; of these 54 species, eight species are cavity-nesters whose nests were detected in the study plots. A total of 86 nests of those 8 species were monitored; of these, 52 nests were successful (i.e., fledged at least one young). Vegetation was measured at each of the successful nest locations.

The study, when concluded, will increase our understanding of the effects of prescribed fire on cavity-nesting birds, including the hairy woodpecker and pygmy nuthatch, which are Kaibab NF Forest Plan management indicator species (MIS).

Fire and Fire Surrogate Study (Carl Edminster, RMRS)

A nation-wide USDI/USDA-FS Joint Fire Science Program study in fire-adapted ecosystems was begun in FY 1999 to assess the ecological consequences and trade-offs of various management practices to reduce hazardous fuels. The work involves measurement of vegetation, fuels, wildlife, soils/hydrology, insects, economics, and social variables. Each replicate contains three treatment areas encompassing 160 acres and contains the following treatments: burn only, thin only, thin and burn, and a control plot. Of the eleven study sites nationally, one is located jointly on the Kaibab and Coconino NFs. Treatments should be complete in 2004.

This study should provide us with valuable information regarding what management activities are most effective at regaining resiliency in the ponderosa pine ecosystem and what the various trade-offs (i.e., costs and benefits) of several fuels reduction techniques are on a scientific, comparative basis.

Related Work Accomplished On-Forest in Fiscal Year 2003

Forest-wide:

Management Indicator Species. Bill Noble, Kaibab NF

The document *Management Indicator Species for the Kaibab National Forest* was completed in FY 2003. Species accounts were begun in FY 2001 and the habitat sections were written in 2002 and 2003.

Work completed in FY 2003 included a review and analysis of the state of piñon-juniper woodlands, grasslands, and riparian associations on the Kaibab NF. Changes in habitat variables since the signing of the Forest Plan in 1987 are assessed and reviewed. The document is available on the Kaibab NF website at { HYPERLINK "http://www.fs.fed.us/r3/kai/business/manage_wl.html" }.

This document adresses the following Forest Plan Monitoring Plan wildlife items: #4, 8, 13, 15, 20, 22, 24, and 25.

This assessment makes it clear that some of the Management Indicator Species (MIS) selected for the original Forest Plan are not good indicators of management on the Forest. Many MIS species (especially game species and migratory birds) are subject to numerous actions beyond either the boundaries of the Forest, the Forest's management authority, or both. Other MIS species' have ranges peripheral to the Forest (e.g. Lincoln's sparrow) or are more affected by the vagaries of weather than management activities (e.g. cinnamon teal). The Forest is assessing the possibility of amending the Plan to select new MIS. Alternatively, this issue would be a "need for change" in the upcoming Forest Plan Revision.

Wildlife, Watershed, and Ecosystem Functions

The following itemized list displays accomplishments in FY 2003 in restoring/enhancing wildlife habitat and in improving watershed condition on the Forest. As in past years, emphasis has being placed upon grassland habitats and species.

-Threatened, Endangered, & Sensitive Species Habitat Restored or Enhanced (acres)	0
-Streams Enhanced for Fisheries Habitat (miles)	1
-Lakes Enhanced for Fisheries (acres)	1
-Wildlife Habitat Restored of Enhanced (acres)	3000
-Watershed Improvement: Grassland Restoration (acres)	1425

Quantities of outputs for structural and non-structural wildlife treatments and for watershed improvement are items that are identified to be monitored in the Forest Plan Monitoring Plan, Items "Wildlife 1," "Wildlife 2," and "Soil 1." Availability of adequate wildlife and watershed funding to accomplish improvement work to the level anticipated in the Forest Plan is an issue, as accomplishments in these areas are significantly below the levels anticipated when the plan was developed.

North Kaibab RD:

I. *Snag dynamics, use and associated bird communities in wildfire-burned ponderosa pine landscapes*. Carol Chambers, Assistant Professor, NAU.

A. Summary of monitoring activities

The focus of this project is to investigate bird community response to recent fires (<5 years old) and older fires (>10 years previous). The study will identify bird use of snags, snag longevity, snag spatial pattern, and other characteristics of snags that are selected by wildlife for nesting or foraging. Bird community response will include effects on Neotropical migrants (this ties back to Bridger-Knoll Fire Monitoring and collaborative questions asked concerning Neotropical migrants).

B. What we are learning

This is an ongoing study leading to useful information on snag longevity and wildlife use of snags over time. Preliminary results of the study will be reported in a research publication.

C. Recommendations

Continue monitoring every 5 years; this study ties to habitat needs of several Kaibab NF Forest Plan management indicator species (MIS) and to Forest Plan Monitoring Plan Items "Wildlife 6" and "Wildlife 16."

III. ***Northern goshawk demographics on the Kaibab Plateau of northern Arizona***. Richard T. Reynolds, RMRS

A. Summary of monitoring activities

This study began in 1992 and has completed its eleventh year in examining territory occupancy, fecundity, site fidelity, reproduction and other demographic parameters. This study is expanding into the effects of prey densities on reproduction. This study is of extreme importance because the Kaibab Plateau hosts the largest known population of goshawks in North America. This study may have a major influence on the status of goshawks in the West.

B. What we are learning

Researchers have identified 147 post-fledgling family areas (PFAs). Enough information has been gathered to begin determination of the impact of management activities on the goshawk population. Researchers have observed a possible cycle in small mammal populations, and goshawk occupancy and reproduction. Goshawk fecundity (reproduction) is highly dependent on prey populations, while prey populations appear to be dependent on cone crop and weather factors. Researchers observed 10 active goshawk nests in FY 2003. Of those nests, 6 were successful and fledged young. These low numbers are primarily due to low prey populations due to drought.

C. Research needs identified

1. Effects of implementation of the goshawk guidelines on goshawk reproduction.
2. Effects of human disturbance (e.g., logging activities, recreational activities, etc.) on goshawk reproduction.

D. Barriers to effective monitoring

Consistent, long-term funding.

E. Emerging issues

3. Development of a post-study plan for monitoring reproduction and nest occupancy is needed.
4. Effects of implementation of the goshawk guidelines on reproduction are a major issue raised by external groups.
5. Effects of prescribed fire and wildland/urban interface treatments on goshawk reproduction should be examined.

F. Recommendations

1. Continue demographic study for a minimum of 1-2 years; this study involves a Forest Plan MIS species and ties directly to Forest Plan Monitoring Plan item "Wildlife 4."
2. Encourage R.T. Reynolds to expand the study to examine effects of prescribed fire and wildland/urban interface treatments on goshawk reproduction.
3. Develop and implement a post-study reproductive/occupancy monitoring plan with R.T. Reynolds and other goshawk biologists (e.g., P.L. Kennedy, Colorado State University)
4. Develop and implement a study to evaluate the effects of implementation of goshawk guidelines on goshawk reproduction. A major commitment from the Forest, Region, and Research Station is required in order to facilitate a long term study of this magnitude.

IV. ***Northern goshawk habitat on the Kaibab National Forest in Arizona: factors affecting nest locations and territory quality.*** Richard T. Reynolds and Suzanne M. Joy, RMRS.

A. Summary of monitoring activities

This study focuses on the effects of habitat compostion and structure on the demographic performance of northern goshawks on the Kaibab Plateau.

B. What we are learning

This study provided the North Kaibab Ranger District with fine-scale GIS models of goshawk habitat, which have been used to improve monitoring efforts. It also provided information relevant to Forest Plan Monitoring Plan Items "Wildlife 3" and "Wildlife 4." The results of this study were presented in a PhD dissertation in FY 2003.

C. Recommendations

The study was completed in FY 2003. Consider it's utility for Forest Plan guidance in Forest Plan Revision.

V. ***Effects of seral stage and forest structure on goshawk prey species.*** Richard T. Reynolds and Susan Salafsky, RMRS.

A. Summary of monitoring activities

This study focuses on the effects of forest structure on goshawk prey population dynamics and habitat use. Data was collected annually from 1999 through 2003 on eleven bird species and six mammal species.

B. What we are learning

A draft Master's thesis was defended in FY 2003 and should be available in FY 2004. Annual densities for a number of these species (including several Forest Plan MIS: hairy woodpecker, red squirrel, and tassel-eared squirrel) in the study area can be estimated, which will be important information for North Kaibab project analysis for MIS as well as for the next update of the Forest's Management Indicator Species report.

Other information that should be available when the study is complete includes 1) density estimates by forest type, and 2) density estimates by management strategy (individual tree selection vs. shelterwood). This information should also be valuable for future District project analyses for MIS and other wildlife species.

Information from this study ties to several items in the Forest Plan Monitoring Plan: "Wildlife 9," "Wildlife 14," "Wildlife 15," and "Wildlife 16."

C. Recommendations

Field work has been completed. Use information and possible sampling designs to continue to monitor selected species.

VII. ***Development and Testing of Artificial Bat Roost Structures: Bat Bark.*** Mikele Painter, NKRD

A. Summary of monitoring activities

Artificial bat roost structures (Bat Bark) on 67 trees were monitored for bat use during summer by ocular estimation.

B. What we are learning

Bats continue to use Bat Bark. We continue to monitor the multi-chamber bat bark design to

determine if it will be used by larger colonies.

C. Barriers to effective monitoring

1. Funding.
2. Need technical expertise to better monitor roosts for species, amount, and type of use.

D. Emerging issues

Interest exists in purchasing Bat Bark for institutional and private use.

E. Recommendations

Continue monitoring and development for the next one to two years. Enter data into Fauna database. Evaluate the usefulness of this technique for creating artificial roost habitat, particularly where natural habitat is most limited.

VIII. ***Peregrine falcon monitoring***.

A. Summary of monitoring activities

One of nine peregrine eyries (North Canyon) located on the North Kaibab Ranger District was monitored in FY 2003 for occupancy.

B. What we are learning

The North Canyon site was occupied (adults seen on territory).

C. Barriers to effective monitoring

Funding and/or locating skilled volunteers.

D. Emerging issues

1. The peregrine falcon has been delisted from its "Threatened" status; however, monitoring must continue for five years post-delisting. A new monitoring protocol is being developed.
2. Support/funding for monitoring in FY 2003 was not provided.

E. Recommendations

1. Continue monitoring this and other eyries for 5 years (as per post-delisting requirements of the US Fish and Wildlife Service) to determine activity for all known eyries.
2. Work cooperatively with the Arizona Game and Fish Department and/or recruit volunteers in order to conduct monitoring with limited funding.

XI. ***Intraspecific reservoirs: complex life history and the persistence of a lethal ranavirus in tiger salamander populations.*** Amy Greer, M.Sc. ASU.

A. Summary of monitoring activities

This is an on-going study that focuses on the epidemiology of a ranavirus which is generally lethal to tiger salamanders. In FY 2003, tiger salamanders in water sources located on the North Kaibab Ranger District were tested for the virus through genetic sampling.

B. What we are learning

The virus is present in salamander populations on the North Kaibab Ranger District. Results of the study were presented in a draft PhD thesis in 2003.

C. Recommendations

The study was completed in FY 2003.

XII. ***Goshawk inventories.***

A. Summary of monitoring activities

Surveys for goshawks were conducted on 29,965 acres in portions of the Apache Trout, Holy Hollow, Big Saddle, Little Mountain, and Billy West project areas.

B. Recommendations

Continue surveys in project areas as per Forest Plan guidelines for this species with both MIS and sensitive status.

XIII. ***Mexican spotted owl inventories.***

A. Summary of monitoring activities

Surveys for Mexican spotted owls were conducted according to US Fish and Wildlife Service protocol on 45,553 acres in the East Rim, Holy Hollow, Burnt Saddle, Lookout Canyon, North Canyon, Country Store, and Dry Park project areas. No owls were detected during the surveys.

B. Recommendations

Continue surveys in project areas as per requirements of the Mexican Spotted Owl Recovery Plan and the Endangered Species Act.

XIV. ***Foraging ecology of spotted bats.*** Carol Chambers, Assistant Professor, NAU.

A. Summary of monitoring activities

A master's thesis on the foraging ecology of spotted bats on the Kaibab Plateau was defended in FY 2003. Additional work on this species in FY 2003 included the netting and fitting with a transmitter of four male spotted bats outside a cave on the Navajo Reservation. In two weeks of intensive radio tracking, foraging patterns were monitored. Most of the bats' time was spent on Bureau of Land Management lands and on the Buffalo Ranch. They also used piñon-juniper along the foothills of the Kaibab Plateau, on Forest lands. The bats roosted in or near Marble Canyon.

B. Recommendations

The spotted bat, formerly on Region 3's sensitive species list, is now managed by the Forest as a species of local concern. Continued monitoring of this species adds to our knowledge of habitat use by this uncommon bat.

South Zone (Williams & Tusayan RDs):

I. Snag Production from Basal Burning. Chuck Nelson, Kaibab NF.

A. Summary of monitoring activities

The bases of eight trees were burned in 1996 to create wildlife snags. All trees have died. As of FY 2003, six of the snags had completely fallen over, and the top half of a seventh had broken off. Cavities were documented in the remaining one-and-a-half trees, but no bird activity was observed.

B. Recommendations

Continue monitoring; this study ties to habitat needs of several Kaibab NF Forest Plan management indicator species and to Forest Plan Monitoring Plan Items "Wildlife 6" and "Wildlife 16."

II. Snag Production from Inoculation. Chuck Nelson, Kaibab NF, and Mary Lou Fairweather, R3 Forest Health, Arizona Zone Pest Management Specialist.

A. Summary of monitoring activities

In 1996, 60 ponderosa pine trees were inoculated with heart rot fungi to promote cavity-nesting habitat. After six years, four trees have died, and five trees have cavities started, but no apparent nesting has begun. There were no cavities in 55 trees. There is some uncertainty as to whether the heart rot fungi inoculation was successful.

B. Recommendations

Continue monitoring; this is a ten-year study in cooperation with the R3 Arizona Pest Management Zone. The study has broad implications, as the technique could be applied wherever cavity-nester habitat is deficient. This study ties to habitat needs of several Kaibab NF Forest Plan management indicator species and to Forest Plan Monitoring Plan Items "Wildlife 6" and "Wildlife 16."

III. Mexican Spotted Owl Surveying and PAC Monitoring. Bonnie Nielsen, Chuck Nelson, Steve Vannote, and Kevin Whelan, Kaibab NF.

A. Summary of monitoring activities

In FY2003, a total of 17,400 acres were surveyed to Region 3 protocol in two areas on the Williams Ranger District. No owls were detected during the surveys. Additionally, three protected activity centers (PACs) on the District were monitored. Two PACs (Big Springs and Tule) were occupied; no response was heard in the third PAC (Eagle Rock) on the one visit made to the area. No follow-up was made to the occupied PACs to determine if there was reproductive success.

B. Recommendations

Continue monitoring; the spotted owl is a federally-listed species as well as a Kaibab NF Forest Plan management indicator species (MIS). The monitoring also ties to Forest Plan Monitoring Plan Item "Wildlife 4."

IV. Monitoring of Wildlife Habitat Improvements. Chuck Nelson, Kevin Whelan, and Steve Vannote, Kaibab NF.

A. Summary of monitoring activities

In FY 2003, thirty-six existing wildlife improvements were monitored on the Williams and Tusayan Ranger Districts for condition and repair needs. Five aspen exclosures and thirty-one trick tanks were repaired.

B. Recommendations

Implement needed repairs. Continue monitoring other improvements on the Districts. Ties to Forest Plan Monitoring Plan Item "Wildlife 2."

V. Elk, Mule Deer, and Pronghorn Antelope Monitoring. Chuck Nelson, Kaibab NF and John Goodwin, Arizona Game and Fish.

A. Summary of monitoring activities

Surveys of elk, mule deer, and pronghorn antelope within the Kaibab National Forest (Units 7, 8, and 9 on the South Zone) were accomplished by the Arizona Game and Fish Department. The surveys resulted in the following information:

Species	Unit	Bulls/Bucks : 100 Cows/Does	Calves/Fawns : 100 Cows/Does
Elk	7	43	26
Elk	8	19	44

Elk	9	48	36
Mule Deer	7	11	32
Mule Deer	8	19	39
Mule Deer	9	16	48
Pronghorn	7	26	48
Pronghorn	8	25	25
Pronghorn	9	35	25

In addition to these estimates, the Arizona Game & Fish Department population trend models for pre-hunt adult elk in Hunt Units 7, 8, and 9 show a significant decline from peaks reached in the mid-to-late 1990s. This is due to a significant increase in the number of hunting permits issued for these units in the past several years in response to concerns over resource impacts due to historic high numbers of elk and, more recently, to concerns over the impact of the recent drought on the forage base and the health of the rangeland ecosystem.

B. Recommendations

Continue monitoring; these species are all Kaibab NF Forest Plan MIS. Furthermore, elk and deer population trends are to be monitored as per the Forest Plan Monitoring Plan, Item "Wildlife 13," and antelope trends are to be monitored as per Item "Wildlife 20."

VI. Range Monitoring on 31 Allotments on the South Zone. Gary Hase, Paul Webber, Kaibab NF.

A. Summary of activities

Below-normal precipitation continued in FY 2003 and resulted in conservative stocking levels for livestock for the second year in a row. A South Zone drought policy was developed in consultation with grazing permittees, University of Arizona Extension specialists, and the Arizona Game & Fish Department. In order to monitor effects of grazing on drought-stressed rangeland and to ensure compliance with utilization standards, several hundred individual pasture inspections were made, resulting in a total of 162 individual range monitoring records that were entered into the INFRA database. (Note that the database does not accommodate certain activities such as pre-stocking range assessments, that allotments not stocked during the year - totaling nine allotments - generated no monitoring records, and that several allotments were stocked only briefly in the fall, then de-stocked due to drought conditions, generating few inspection records.)

B. Recommendations

Continue monitoring. Range monitoring is essential to meeting the Forest Plan goal of managing for satisfactory range conditions.

VII. Pronghorn Antelope Crossings. Kevin Whelan, Steve Vannote, and Chuck Nelson, Kaibab NF.

A. Summary of activities

In FY2003, approximately 30 miles of fence were inspected on the southern portion of the Tusayan Ranger District to determine if they allowed for pronghorn access. As a result of the inspection, forty-five antelope crossings were installed in order to facilitate pronghorn passage.

B. Recommendation

Continue installation of fence crossings on both Williams and Tusayan Ranger Districts, and monitor use of installed crossings. Antelope are a Kaibab NF Forest Plan MIS, and antelope access was one of the issues identified in the Forest Plan as needing attention.

VIII. Arizona Bugbane Monitoring. Lauren Johnson, Kaibab NF, and Barb Phillips, Kaibab/Coconino/Prescott Zone Botanist.

A. Summary of activities

Annual monitoring of the Forest's only known population of Arizona Bugbane (Cimicifuga arizonica), located on Bill Williams Mountain, occurred. The plants were large and vigorous, with most bearing plentiful fruit. The extent and density of stems was comparable to other years with good spring precipitation.

B. Recommendation

Continue annual monitoring as per the 1999 Conservation Agreement with U.S. Fish & Wildlife Service. Arizona Bugbane is a Kaibab NF Forest Plan MIS, and had been a candidate for federal listing until the Conservation Agreement was developed.

IX. Scott Prescribed Burn Monitoring. Linda Wadleigh, Regional Fire Ecologist.

A. Summary of Activities

In 2001, 12 permanent plots were placed in the Scott Prescribed Burn project area in order to assess levels of Gambel oak mortality from prescribed fire. The burning of the area encompassing the plots was completed in FY 2003. Plots will be re-measured in FY 2004.

B. Recommendation

Monitoring the plots in FY 2004 is essential to determine levels of mortality to Gambel oak from prescribed fire in the Scott area and will provide valuable information on prescribed fire effects in other project areas. Information from this study could prove useful in designing future fire use guidance elsewhere and in assessing the role of fire in meeting Forest Plan desired conditions.

X. Assessment of Grassland/Savannah Invasion by Trees. Bruce Higgins, Kaibab NF.

A. Summary of Activities

Post-settlement changes to the landscape include a greatly increased tree density on the Kaibab NF, reducing the extent and function of grasslands and savannahs on the Forest. Some level of restoration of these areas is desirable to provide essential habitat for maintenance of native species diversity.

The Forest Plan established a number of resource management objectives involving the treatment of many thousands of acres of piñon-juniper woodland and seral grassland/piñon-juniper woodland for wildlife, watershed, and range benefits. The Williams RD has treated more than 14,000 acres of invaded grasslands and savannahs since the Forest Plan was approved. A variety of cooperators, including grazing permittees, Arizona Game & Fish Department, Rocky Mountain Elk Foundation, Quail Unlimited, etc. have contributed time and/or dollars to this effort. Multiple objectives for watershed restoration, wildlife habitat improvement, and forage production have been met.

A Geographic Information System (GIS) exercise to identify former grassland and savannah areas and help prioritize future grassland/savannah restoration treatments on the Williams RD has been initiated and is expected to result in a draft assessment in FY 2004

B. Recommendations

Continue with the assessment, expanding it to other Ranger Districts. The assessment should contribute to meeting the goals and objectives of the Forest Plan in several resource areas. One key species affected by the loss of grasslands on the Forest is the pronghorn, a Forest Plan MIS. The assessment also ties to Forest Plan Monitoring Plan Items "Range 4" and "Soil 1."

XI. Wild Burro Population Monitoring. Gary Hase, Jr., Kaibab NF.

A. Summary of Activities

The Kaibab NF Forest Plan specifies that the Double A Wild Burro Territory herd size will be maintained within capacity. Capacity is defined as a minimum of 22 animals and a maximum of 35 animals. Annual aerial surveys have been accomplished since FY 2001.

The FY 2003 survey took place on 07/30/03. Thirty-one adult burros were observed, compared to 23 observed in FY 2001 and 28 observed in FY 2002.

B. Recommendations

Continue with the surveys. The surveys meet Forest Plan Monitoring Plan Item "Range 1," which specifies monitoring of the Double A territory to ensure management of the population within the capacity of the territory.

XII. Pumpkin Fire Snags and Wildlife Use. Carol Chambers, NAU, et. al.

A. Summary of Activities

In FY 2003, plots were remeasured on the Pumpkin Fire, and the persistence of 400-500 individual snags was assessed. These snags were also inspected for wildlife use. The plots were last examined in FY 2001.

B. Recommendations

Continue the study. The study should provide information on post-fire snag persistence and on wildlife use of snags post-fire (including use by several MIS species) as well as help to meet Forest Plan Monitoring Plan Items "Wildlife 6" and "Wildlife 16."

XIII. Mexican Vole Abundance. Carol Chambers, et.al., NAU.

A. Summary of Activities

Four grasslands on the Williams RD were surveyed to assess the value of using vole sign to determine relative abundance of voles in a given area. This was the second year for the survey. A master's thesis is expected in FY 2004.

B. Recommendations

The study may provide valuable information for a simple methodology for determining population trends of the Navajo Mountain Mexican vole, a Forest Service Sensitive species. Information from the study may also help to meet Forest Plan Monitoring Plan Item "Wildlife 28."

XIV. Range Analysis. Lauren Johnson, et. al., Kaibab NF

A. Summary of Activities

Twenty-four permanent range clusters on seven allotments were monitored in FY 2003. This work occurred on the following allotments: Bellemont, Chalender, Ebert, Hat, Moritz, Smoot, and Sitgreaves. The one cluster inventoried on the Hat Allotment is a relict site cluster (i.e., it is inaccessible to livestock and wild ungulates and therefore has never been grazed by those species); it was inventoried with the purpose of determining effects of the current drought in the absence of grazing. This cluster showed a shift in grass abundance from perennial species to invasive annuals.

Data was gathered from these clusters, but not analyzed. Analysis will need to be accomplished before the results of this monitoring are known.

B. Recommendations

Analyze the data to determine if objectives of the allotment management plans are being met for these allotments.

Other Related Activities

Recreation

- The Kaibab NF is currently participating in a multi-Forest planning process to decide whether and how to limit off-road access to the Forest by wheeled, motorized vehicles.
- The Forest is also carrying out a roads analysis process with the Coconino National Forest to identify what roads are (and should be) managed for passenger vehicle use. This analysis will be used along with project-specific analysis in the future to determine the needs for and management of all roads in specific areas.
- The South Zone is working toward development of a description of a Recreation Desired Future Condition for the Williams and Tusayan RDs. It is anticipated that this effort may result in a programmatic recreation plan for the South Zone as well as a Forest Plan amendment. The Forest Plan amendment may adjust Recreation Opportunity Spectrum allocations and descriptions and incorporate Scenery Management System re-mapping, as well as modifying associated standards and guidelines.

Vegetation

- Additional plots necessary to replicate a 1990 forest inventory will be measured via a stand exam contract which was awarded at the end of FY 2003. Completing this replication will allow for a more robust assessment of habitat for several Forest Plan Management Indicator Species.
- The Forest continues to grow tree biomass at rates far exceeding losses due to all causes; catastrophic fires may have taken 15 to 20 percent of timber growth in the past decade.[1] When losses of significant magnitude do occur (such as the Bridger Fire in 1996, and Outlet Fire in 2000) they tend to be in relatively concentrated areas. While these changes create heterogeneity on the landscape, the patterns are probably little like those of pre-European landscapes, especially in woodlands, ponderosa pine and lower elevation mixed forests. The Forest considers the risk of catastrophic fire in planning treatments, such as management-ignited fire (prescribed fire) and tree thinning.
- The Forest participated in a multi-Forest process to decide whether and how to authorize the Arizona Department of Transportation (ADOT) to use registered herbicides as part of the annual vegetation management program along public roadways that pass through National Forest System lands throughout Arizona. The objectives are to 1) contain, control, or eradicate noxious weeds that are spreading from road rights-of-way to adjacent Forest lands and 2) control vegetation that presents safety hazards to drivers using public roadways. Further information may be found in the *Environmental Assessment for Management of Noxious Weeds and Hazardous Vegetation on Public Roads on National Forest System Lands in Arizona. USDA Forest Service, Southwestern Region. June, 2003.*

  A multi-Forest planning effort is also underway to decide whether and how to control noxious weeds on Forest Service System lands. It is expected that a final EIS will be published in FY 2004.

[1] Very rough information about growth and mortality may be derived by querying the Forest Inventory and Analysis database on the world-wide web at: {HYPERLINK "http://ncrs2.fs.fed.us/4801/fiadb/"}. A report based on the 1995 Interior West Inventory and Analysis inventory of the Kaibab is expected to be available in FY2004, and will be included in next year's Forest Plan Annual Monitoring Report.

- A series of photos taken during the period 1880-1912 was provided to the Forest by Dennis Lund, working for Northern Arizona University's (NAU) Ecological Restoration Institute and the Grand Canyon National Park (GCNP). NAU and GCNP were interested in determining what the Northern Arizona landscape looked like before it was widely settled and affected by changes in management (e.g., fire suppression, grazing, and timber harvest). Mr. Lund has gathered copies of old photographs from a variety of sources, including the National Archives, the Museum of Northern Arizona library, NAU's Cline Library special collections, the Southwestern Regional Office, and private collections. These photos provide a visual representation of the variety of forest conditions that existed during the time of early settlement, and should be a valuable resource to better describe the pre-settlement environment.
- Possible future tools to help the Forest meet Forest Plan goals and objectives for forest thinning on the South Zone are in the analysis phase, as Arizona utility company APS moves forward with their assessment regarding location of biomass plants in northern Arizona. The Stone Forest Biomass Project, nearing completion in Eager as of the end of FY 2003, will help APS develop a template for biomass plants that use similar technology in other parts of the state. These are 3-megawatt plants that consume approximately 96 tons of wood a day. Sites being assessed include Tusayan, Williams, Bellemont, and Flagstaff.

Fire

The Forest Ecosystem Restoration Analysis (ForestERA) Project, located at the Center for Environmental Science and Education at NAU, links field and remotely-sensed data to landscape models in an ArcGIS environment. Forest conditions can be evaluated and alternative restoration strategies analyzed to permit direct comparison of their effects on wildlife, watersheds, vegetation, fire threat, and other factors relevant to fire and forest ecology. The initial study area is the Western Mogollon Plateau, encompassing two million acres in northern Arizona. The study area includes a significant portion of the Williams RD. In FY 2003, Forest ERA developed additional data bases and refined several models.

Land managers may be able to use these tools and products to evaluate restoration or fuels reduction strategies beyond the project or management unit scales. In addition, NAU's Ecological Restoration Institute plans to use the capabilities of ForestERA to assist Northern Arizona stakeholders in developing community-based recommendations for priority areas to be protected from catastrophic wildfire in FY 2004. The ForestERA website is { HYPERLINK "http://forestera.nau.edu/" }.

Monitoring Requirements of other Laws

Clean Water Act, Clean Air Act, Endangered Species Act

The Forest complies with the Clean Water Act through the implementation of Best Management Practices (BMPs) on our projects. We include these in design of allotment management plans, timber sales and roadwork. We also consult with the Arizona Department of Environmental Quality (ADEQ) on large project proposals. BMPs are described in Forest Service Handbook 2509.22, *Soil and Water Conservation Practices Handbook*, which can be accessed at { HYPERLINK "http://fsweb.wo.fs.fed.us/directives/" }.

The National Forests in Arizona fund a position with ADEQ to coordinate our prescribed burning programs and ensure compliance with the Clean Air Act. This position and the relationship built between agencies have been quite successful in maintaining good will with ADEQ and the public while accomplishing needed work.

The Endangered Species Act is complied with through project designs that meet recovery plan requirements and maintain the viability of all TE&S species. We consult with the USF&WS on all projects that potentially affect threatened or endangered species. Biological Assessment and

Evaluations must be completed prior to approval of NEPA decision documents and are maintained in the Supervisor's Office. Also, as per the Mexican Spotted Owl Recovery Plan, all projects affecting key habitat components for that species are required to have pre- and post-project implementation monitoring ("micro-habitat monitoring") to verify that treatments are meeting their stated objectives.

Links to Other Planning/Analysis Efforts

A number of other jurisdictions within, adjacent to, or encompassing portions of the Kaibab NF have recently developed, or are currently developing, management plans which may have some bearing on the upcoming revision of the Kaibab NF Forest Plan, and will certainly need to be reviewed and evaluated for consistency with the Kaibab NF plan during revision. Plans in development include USDI Bureau of Land Management Resource Area Plans for the Arizona Strip District, a portion of which is adjacent to the North Kaibab RD; these plans are expected to be completed in FY 2004. Plans developed during FY 2003 include the City of Williams General Plan, a final draft of which was produced in August, 2003; the Yavapai County General Plan, approved April 7, 2003; and the Coconino County Comprehensive Plan, adopted September 23, 2003.

In addition, a multi-institutional analysis effort coordinated by the U. S. Geological Survey is currently underway. The Southwest Regional Gap Analysis Project (SWReGAP) is a mapping and assessment of biodiversity for a five-state region consisting of the Four Corners states and Nevada. The primary objective of the project is to use a coordinated mapping approach to create detailed maps of land cover, habitat for native terrestrial vertebrates, land stewardship, and management status. This information is analyzed to identify species' habitats and cover types that are underrepresented on lands managed for long term conservation. Knowledge of these "gaps" can aid proactive conservation planning. Federal lands encompass 52% of the five-state analysis area. Information from the gap analysis, as available, may also be used in Forest Plan revision efforts.

The SWReGAP website is {HYPERLINK "http://leopold.nmsu.edu/fwscoop/swregap/"}.

Research Needs Update

Many needs are previously discussed by project above and in previous monitoring reports.

Emerging Issues and Trends

On this Forest, emerging issues are fairly typical of most Southwestern Forests, with some exceptions. It has become quite clear that the Management Indicator Species (MIS) selected for the original Forest Plan are not good indicators of management on the Forest. Many MIS species (especially game species and migratory birds) are subject to numerous actions beyond either the boundaries of the Forest, the Forest's management authority, or both. Other MIS species' have ranges peripheral to the Forest (e.g. Lincoln's sparrow) or are more affected by the vagaries of weather than management activities (e.g. cinnamon teal). The Forest is assessing the possibility of amending the Plan to select new MIS. Riparian issues, including T&E species associated with them, are not becoming as critical as elsewhere in the Region due to the limited amount of riparian habitat that exists on the Forest.

We are experiencing changes in who uses the Forest and how they (and we) view it. Up until now, increases in recreational use have been within the bounds forecast in the 1988 Plan but the type of use is changing. Mountain bike use and off-road vehicle use have increased significantly. Impacts of unmanaged vehicle use include soil damage and erosion, the spread of noxious weeds, and disturbance to wildlife. A proposal to restrict off-road motorized vehicle use on all National Forests in Arizona except the Coronado NF was developed and partially analyzed in FY 2003. An Environmental Impact Statement should be finalized in FY 2004 following additional analysis.

The risk and fact of catastrophic fires have been abundantly realized. The public is increasingly supportive of preventative action, although there are also those adamantly opposed to management to significantly mitigate risk. Implementation of the National Fire Plan continues. It promotes aggressive fuel treatments that will minimize uncharacteristically intense fires. The Kaibab is planning and implementing urban interface treatments to help meet the Region's priorities for treatment. These projects will provide opportunities for monitoring to determine if they create the desired result.

Over the past few years, the Forest has shifted more of its work emphasis to the range program due to several factors including compliance with the 1995 Recissions Act schedule, the on-going drought, and public interest in grazing effects.

Antelope populations and their habitat have attracted more attention from both the Kaibab and Coconino National Forests with the decline of the population statewide. While the antelope population on the Kaibab NF appears to be stable according to Arizona Game & Fish Department data, restoration of corridors, if not entire grassland/savannah areas, has become a planning issue on several landscapes and is actively being discussed at a multi-district scale across the two Forests. Much work to restore grasslands has occurred on the South Zone over the past few years.

Noxious weeds are not a severe problem on the Forest yet, but there is a concern that if we do not begin progress towards containment and eradication they will eventually become a severe problem. Severe infestations of noxious weeds that have developed elsewhere in the West have significantly reduced native vegetation, negatively impacted wildlife habitat, impacted ecosystem health, and affected aesthetics. An integrated noxious weeds treatment EIS began a few years ago in collaboration with the Coconino and Prescott National Forests. A decision is expected in 2004.

Current and Potential Monitoring Partnerships

Most of our monitoring partnerships are with Northern Arizona University (Bridger-Knoll fire monitoring, Pumpkin fire monitoring, studies involving several species of mammals), and the Rocky Mountain and the Pacific Southwest Research Stations (goshawk demography, habitat use, and prey species habitat; fire & fire surrogate study; effects of prescribed fire on birds; effects of chipping on bark beetles). Other important partners include the Arizona Game & Fish Department and Arizona State University.

The Merriam-Powell Center for Environmental Research at Northern Arizona University (NAU) has created a NAU Environmental Research Database (NERD) to track all projects associated with a master research permit issued by the Coconino NF. Goals of the database are to 1) provide researchers with information on past or present research activities in the area, 2) provide land managers with a system for tracking research, 3) share technological information among researchers and USFS personnel, and 4) encourage researchers to register their studies as part of the Master permit process. Discussions are ongoing at this time regarding the Kaibab NF entering into a similar relationship with NAU.

The Rocky Mountain Research Station (RMRS) developed a Strategic Framework in FY 2003, in collaboration with land managers, other researchers, and partners. The Strategic Framework will help the RMRS accomplish the goals of the national USDA Forest Service Strategic Plan. As such, six focus areas have been identified: 1) changing ecosystems, 2) conflicting values, 3) wildland fire, 4) healthy environments, 5) wildlife and fish habitat, and 6) communicating with stakeholders. The next step will be development of an implementation plan to translate the Strategic Framework into action; development of the implementation plan will give the Forest an additional opportunity to focus RMRS research on our priority management needs. For additional information on this topic, see the RMRS website { HYPERLINK "http://www.fs.fed.us/rm" }.

Opportunities for partnerships exist for monitoring populations of rare or endangered species, including the Paradine plains cactus and noxious weeds through groups such as the Arboretum at Flagstaff, the Native Plant Society, Weed Warriors, and the Arizona Department of Transportation. Others who might be interested in helping monitor economic, social and biological conditions include Grand Canyon Trust, permit holders and local residents. These partnership opportunities warrant further pursuit.

Barriers to Effective Monitoring and Evaluation

The Forest Service has released draft forest planning regulations that would require extensive, well-designed and reviewed monitoring of various sustainability indicators. Adoption would likely result in greater emphasis and expenditure on monitoring and evaluation.

The biggest barrier to effective monitoring and evaluation continues to be limited funding. However, as should be evident from the activities described in this document, there continues to be a wide range of monitoring activities accomplished annually on the Kaibab National Forest.

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