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December 2008



Comprehensive Evaluation Report

Apache-Sitgreaves National Forests

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Comprehensive Evaluation Report

Apache-Sitgreaves National Forests
Apache, Coconino, Greenlee and Navajo Counties, Arizona

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Table of Contents

Chapter 1. Introduction	1
What is the Comprehensive Evaluation Report?	1
Area of Analysis.....	2
Apache-Sitgreaves National Forests’ Historical Context.....	3
The Roles and Contributions of the ASNFs.....	4
Chapter 2. Ecological Conditions and Trends.....	6
Physical Resources.....	6
Soils	6
Water	7
Air.....	8
Climate Change	8
Biological Resources	8
Vegetation	8
Aquatic Biota.....	11
Species Diversity	12
Revision Topics.....	15
Maintenance and Improvement of Ecosystem Health – Revision Topic #1.....	15
Chapter 3. Social and Economic Conditions and Trends.....	18
Demographics and the Economy	18
Forest Users and Uses.....	19
Recreation.....	20
Special Uses	21
Timber Harvest.....	22
Livestock Grazing	23
Special Areas.....	24
American Indian Rights and Interests.....	24
Wildland-Urban Interface	25
Community Relationships.....	26
Revision Topics.....	27
Managed Recreation – Revision Topic #2	27
Community-Forest Interaction – Revision Topic #3.....	29
Chapter 4. Summary of Forest Plan Revision Topics.....	31
Maintenance and Improvement of Ecosystem Health	31
Managed Recreation	32
Community-Forest Interaction.....	33
References	35
Appendix	37
A – Public Participation	37
Issues, Concerns, and Opportunities.....	37

Chapter 1. Introduction

The Apache-Sitgreaves National Forests¹ (ASNFs) are managed by the Forest Service, an agency of the U.S. Department of Agriculture. The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

The main challenges of administering more than 2 million acres of National Forest System lands for the citizens of the United States include identifying, managing, and monitoring the health and status of the physical resources (e.g. soil, water, air) that create the environment in which the vegetation and animals live and interact, while balancing the many human uses of the forests (e.g. camping, livestock grazing, firewood gathering, logging, quest for solitude).

The 1987 forest plan (current forest plan) is the principal document that guides forest managers' decision-making. The current forest plan was originally published in August 1987. Since then, the forest plan has been amended 13 times to reflect changes in social, economic, or ecological conditions. The forest plan was written following the guidance in the 1982 forest planning regulations (36 CFR 219).

The major issues and opportunities addressed in the forest plan involved timber and fuelwood, range management, soil and water, land ownership, recreation management, ORV (Off-Road Vehicle) management, wilderness management, fish and wildlife, transportation system, public information, and unauthorized use on the national forests.

The National Forest Management Act of 1976 (U.S.C. 1600 et seq.) requires that forest plans be revised at least every 15 years.

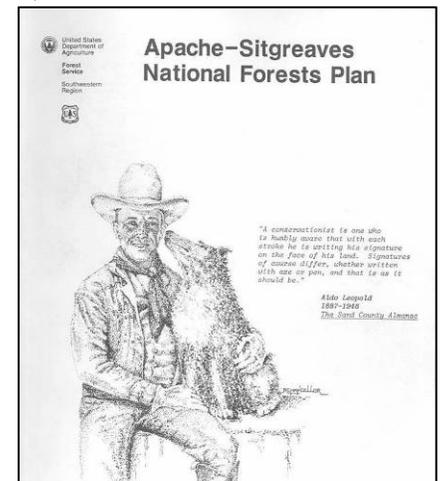


Figure 1. Cover of the 1987 Forest Plan

What is the Comprehensive Evaluation Report?

This report highlights the social, economic, and ecological conditions and trends in and around the ASNFs, as detailed in the Apache-Sitgreaves National Forests' Ecological Sustainability Report (U.S. Forest Service 2008), the Apache-Sitgreaves National Forests' Economic and Social Sustainability Assessment (U.S. Forest Service 2008a), and the Apache-Sitgreaves National Forests' Resource Evaluations (U.S. Forest Service 2008b) for the ASNFs.

This report summarizes those findings and uses them, along with public input (see Appendix A) to identify where the current forest plan does not provide adequate guidance for the present and future.

Even though the needs for change identified in this report are the primary drivers of the development of a revised forest plan, they do not represent a comprehensive list of needed changes. Some areas of the current forest plan are still adequate and timely; that direction will be

¹ In 1974, the Apache National Forest was combined with the Sitgreaves National Forest and became the Apache-Sitgreaves National Forests (ASNFs). The ASNFs are managed as a single administrative unit.

carried forward into the revised forest plan. Many components of the current forest plan, such as the monitoring plan, will be modified or removed, for reasons including:

- They describe a purely administrative or procedural function, such as budgeting, rather than the management of land and resources;
- They duplicate direction that can be found in existing law, regulation, or Forest Service policy;
- They are based on outdated policies, science or information;
- They need to be modified to fit into the new plan format (vision, strategy, and design criteria).

This Comprehensive Evaluation Report is organized as follows:

Chapter 1 provides background information for the reader, describing this document, the analysis area, and the historical context and roles of the forests.

Chapter 2 outlines the ecological conditions and trends of the ASNFs and surrounding areas. It also identifies management concerns that may result from these conditions and trends and the potential revision topics or “need to change” the 1987 forest plan.

Chapter 3 outlines the social and economic conditions and trends of the ASNFs and surrounding areas. It also identifies management concerns that may result from these conditions and the potential revision topics or “need to change” the 1987 forest plan.

Chapter 4 summarizes the potential revision topics for the 1987 forest plan.

Appendix A contains a summary of public input received related to what needs to change in the forest plan.

Area of Analysis

The ASNFs are managed as a single administrative unit and include 2.1 million acres of generally forested lands on and adjacent to the Colorado Plateau in East Central Arizona. The Gila National Forest administers the portion of the Apache National Forest that is located in New Mexico.

Ranger District Offices are located in Alpine, Clifton, Overgaard, Springerville, and Pinetop-Lakeside. The Forest Supervisor’s Office is located in Springerville.

Forest planning occurs on several spatial scales. The primary analysis area for this evaluation is the portion of the ASNFs within Arizona (figure 2). Most management direction is evaluated and applied at this forest scale. Planning for some aspects of forest management is evaluated at different spatial scales as noted in the evaluations.

More detailed descriptions of the area of analysis can be found in Chapters 2 and 3.



Figure 2. The Apache-Sitgreaves National Forests located in the State of Arizona

Apache-Sitgreaves National Forests' Historical Context

The earliest inhabitants of the area comprising the present-day Apache-Sitgreaves National Forests and surrounding lands lived upon the land at least 13,000 years ago. They followed the migrating animal herds, leaving spear points to mark their presence. As early as 2,000 years ago, the Ancestral Puebloans arrived and shared the White Mountains with the Mogollon people already there. By the time the Apache, Navajo, and Yavapai arrived in the 1400s, the Puebloans were gone. After the mid-1500s the Spanish continued a modest forest use, although they used the forests for fuel, structures, and fence posts more than the Native Americans did.

From 1821 to 1848, the Mogollon Rim forests were part of the Republic of Mexico. When the United States acquired the territory from Mexico, those lands became a part of the “public domain” if they were not owned by private individuals, including earlier Spanish and Mexican land grants. The land was opened under various laws to settlement, purchase, and use. Only after the American Civil War and the completion of the railroads did a great change in public land use begin in Arizona. Domestic enterprises like cutting timber, mining, and raising cattle became corporate enterprises with national and international markets.

The territory of Arizona was established in the early 1860s. It urged the sale of all of the territorial timberlands at public auction. In 1879 and in 1880 Congress authorized the citizens of Arizona to “fell and remove timber from the public domain for mining and domestic purposes.” Timber production in Arizona and New Mexico, estimated at 8 million board feet in 1879, rose to 22 million in 1889, and 67 million in 1900. Cattle grazed on the open ranges in ever greater numbers, increasing from a small number of herds in 1860 to 172,000 head in 1880 to 1.5 million by 1890. In 1891, Congress authorized the President to designate particular areas of forested public domain as “reserves,” to be set aside for future use. The reserves were, by law, completely closed to public use; there was no management or supervision of the land. Congress restricted the President’s authority in 1897 with the passage of the Organic Act authorizing him to establish reserves only to preserve timber, protect watersheds, and provide lumber for local use.

On August 17, 1898 Black Mesa Reserve (North and South) was established. By 1900, once lush grasslands could no longer support large numbers of livestock. It was becoming clear to Southwesterners that the renewable and nonrenewable resources of the Southwest were being depleted. The Secretary of Agriculture announced in 1905 the transfer of the Forest Reserves to the Department of Agriculture, as authorized by Congress. Some 21 million acres of public lands, almost one-eighth of the land area of Arizona and New Mexico, were now to be administered by a regional subdivision of the Forest Service. The Forest Service was charged to maintain the permanence of national forest resources, while providing for their use. In 1907, Black Mesa Reserve was made a national forest with its headquarters in Show Low, Arizona. In 1908, Theodore Roosevelt established the Sitgreaves National Forest from parts of the Black Mesa North Reserve and Tonto National Forest. The Apache National Forest was established the same year from portions of the Black Mesa South Reserve and other neighboring forest reserves.

Arizona’s population increased dramatically following World War II, but little changed in the rural communities within and surrounding the Apache and Sitgreaves National Forests. Logging, grazing, and mining were important economic factors in the local communities and the forests provided employment where few other jobs were available. In 1974, the Apache National Forest was combined with the Sitgreaves National Forest and became the Apache-Sitgreaves National Forests.

The Roles and Contributions of the ASNFs

The 2.1 million acre Apache-Sitgreaves National Forests are located in the White Mountains of east-central Arizona and along the Mogollon Rim. This abrupt escarpment is the southern boundary of the Colorado Plateau and splits Arizona into the low elevation deserts and the high elevation mountains and plateaus.

Within its boundaries, the forests are marked by mountains, hills, cinder cones, plains, plateaus, deep canyons, and escarpments. Elevations vary from about 3,500 feet in the Clifton area to 11,400 feet on Mount Baldy², second highest peak in the state. The forests claim the third highest mountain, Escudilla.

The diverse vegetation ranges from semi-desert grasslands to high elevation spruce-fir forests. The ASNFs contain a portion of the largest ponderosa pine forest in the world as well as the most extensive montane and subalpine grasslands in Arizona. Riparian vegetation types are unique habitats in east-central Arizona and the majority of these are found on the ASNFs.

The ASNFs are a unique and important component of the arid Southwest, containing over 30 lakes and reservoirs and more than 1,000 miles of rivers and perennial streams, more than any other Southwestern National Forest. The forests contain the headwaters of several major Arizona rivers including the Little Colorado, Black, Blue, and San Francisco.



Figure 3. Woods Canyon Lake

The diverse ecosystems of the forests provide homes to a wide array of wildlife, fish, and plants. Some can only be found in this area. Unique species include the Apache trout, Springerville pocket mouse, White Mountains ground squirrel, and the Mogollon paintbrush. The forests are one of two in the Nation to provide a home for the recovery of the Mexican gray wolf.

Visitors, the majority from the state's metropolitan areas, come to the forests seeking a respite from the desert heat and the noise and confinement of urban living. Many visitors are drawn to the ASNFs' water-based activities. Others enjoy the diverse scenery from vast rolling grasslands to rugged desert terrain to lush alpine forests.

Forest visitors enjoy the developed recreation sites of the ASNFs, including three scenic byways and the popular Rim Lakes, Big Lake, and East Fork recreation areas. The forests also provide an abundance of dispersed activities. Three wilderness areas and the Nation's only primitive area provide



Figure 4. Switchbacks along the Coronado Trail National Scenic Byway

² The summit of Mount Baldy is within the Fort Apache Indian Reservation just outside of the forests' boundary.

opportunities for solitude and backcountry experiences. Over a thousand miles of trails provide ample hiking, horseback, and off-highway vehicle access to natural highlights of the forests' landscape. Big game hunting and fishing in some of the best cold and warm water fisheries of the Southwest are popular activities. The forests are a primary destination in winter for snow play including snowmobiling, ice fishing, cross country skiing, and sledding.

Loggers, ranchers, and tribal members were a significant part of the forests' history and their traditional uses remain an important part of the cultural landscape of the forests.

Additional features that make the ASNFs unique on a regional and national scale:

- Visitors use the forests as an overnight place to stay more than any other forest in the National Forest System.
- Aldo Leopold, known as the father of wildlife conservation, served as a timber cruiser on the Apache National Forest from 1909-1911.
- The State of Arizona has designated nine ASNFs' streams as being outstanding state resources and classified them as unique waters.
- Over twenty of the forests' rivers are eligible for inclusion in the National Wild and Scenic Rivers Systems.
- The Blue River contains six native threatened & endangered species. At 50 miles, the river is one of the longest stretches in the State with native species.
- Almost all of the Arizona big game species including antelope, black bear, bighorn sheep, elk, javelina, turkey, mountain lion, mule deer, and white-tailed deer can be found on the forests.
- The ASNFs, along with the Tonto National Forest, are home to the last remaining sheep driveway in Arizona, a portion of the old Heber-Reno driveway.
- Over 140 campsites located in ASNFs' developed campgrounds are available to users free of charge.

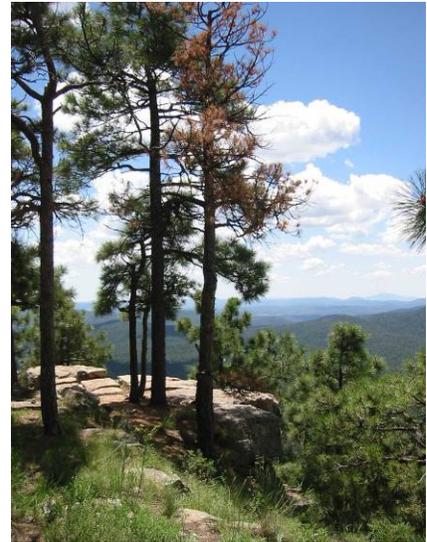


Figure 5. View from the Mogollon Rim

Chapter 2. Ecological Conditions and Trends

This chapter summarizes the key findings from the Apache-Sitgreaves National Forests Ecological Sustainability Report (U.S. Forest Service 2008) and the Apache-Sitgreaves National Forests Resource Evaluations (U.S. Forest Service 2008b). It describes the ecological conditions and trends within and around the ASNFs and how the forests contribute to regional and local sustainability. Resulting management concerns and the need to change the current forest plan are summarized at the close of this chapter.

This evaluation considers ecological information at various scales including: within the boundaries of the ASNFs; the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section and its subsections³; and the watersheds that overlap the forests.

Physical Resources

The soil, water, and air of the ASNFs provide the foundation for the plants and animals that live there.

Soils

Approximately one-third are considered to be in unsatisfactory or impaired condition. Recent drought has contributed to reduced vegetative growth and ineffective ground cover.

- Approximately one-third, primarily those associated with grasslands and woodlands, are considered to be in unsatisfactory or impaired condition resulting in ecosystem degradation and habitat conversion (including loss of grasslands).
- Over 80 percent of the soils in wetland/cienega, spruce-fir with wet mixed conifer, ponderosa pine, montane/subalpine, and mixed conifer with frequent fire are in satisfactory condition. However, over 70 percent of soils associated with certain vegetation types (piñon-juniper woodlands, Great Basin grasslands, and the riparian forests) are impaired or are in unsatisfactory condition.
- Unsatisfactory soil conditions signify an unnatural level of erosion is occurring which, in turn, can impact lakes and streams and the species dependent on them as well as the vegetation that grows on them. Some soils in unsatisfactory condition in the grassland and woodland vegetation types may be irreversibly disturbed and may not be able to return to their historic productivity.
- The forests have experienced several years of drought (since about 1997) resulting in reduced upland vegetative growth and ineffective vegetative ground cover putting the soil at risk of accelerated erosion and increasing sediment delivery to streams during storm events.

³ Ecoregion sections and subsections are units in the National Hierarchy of Ecological Units ranging in size from 13 million acres (section) down to 10,000 acres (subsection) that describe areas of similar environmental and biological features. The ASNFs fall completely within the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section.

Water

The ASNFs are a unique and key component of the arid Southwest containing the largest number of perennial streams of all forests in Arizona. Overall water quality is considered to be good to excellent. However, there are some streams and lakes on the ASNFs that currently fall short of meeting state and federal water quality standards. There is also a concern that groundwater pumping may be exceeding the inflow of water into two of the three groundwater basins under the ASNFs.

- The ASNFs contain the most perennial streams of all forests in Arizona, over 1,000 miles. Many of the headwater streams of the Salt (Black River), Gila (Blue and San Francisco Rivers), and the Little Colorado River basins are found on the ASNFs, making it one of the richest sites for riparian communities and fisheries in the state.
- Overall, the ASNFs' water quality is considered to be good to excellent. However, there are several streams and water bodies that currently do not meet state and national water quality standards and are classified as impaired. Non-point sources of pollution, such as sediment generated from roads in close proximity to drainages and residual effects of past, and in some cases, current livestock and/or wild ungulate grazing, are responsible for much of the ASNFs' remaining water quality impairment. Trends in water quality are considered to be upward or improving.
- The forests yield approximately 385,000 acre feet of water per year: this is the amount leaving the forests to become surface water or groundwater recharge. For comparison purposes, this is less than 20 percent of the water Phoenix uses in one year. It is estimated that current surface water use on the forests is slightly higher today than in 1980 because new campgrounds and day-use areas have opened due to a sharp increase in recreational use.
- The highest precipitation in the State occurs on forest lands and contributes substantial recharge to groundwater levels. Three major groundwater basins originate on the forests: Little Colorado River, Morenci, and Black River basins. Large industry (power generation, paper manufacturing, and mining) as well as municipal water supplies are the major users of groundwater in the Little Colorado and Morenci Basins, while livestock and domestic water are the major users (although minimal amounts) within the Black River basin. The Morenci and Little Colorado River groundwater basins have documented pumping that exceeds the amount of water estimated to flow into these basins.

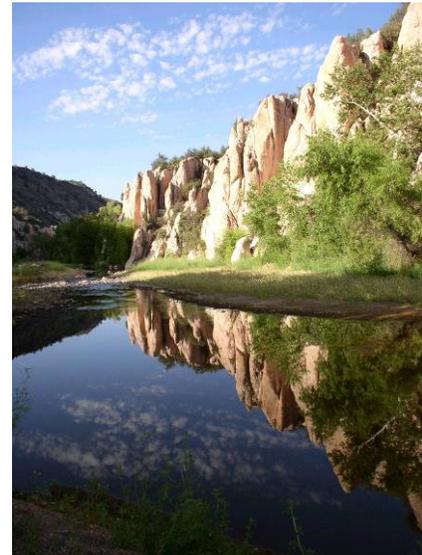


Figure 6. Along the Blue River

Air

Air quality on the ASNFs is considered to be good, although visibility impairment has been documented.

- Forestwide air quality is considered to be good. Forest management actions, such as prescribed burning and dust from unsurfaced roads, contribute to air pollution, but are of limited duration and/or intensity. The presence of smoke can prompt concerns from local citizens and visitors.
- One Class I airshed occurs within the ASNFs associated with the 6,842 acre Mount Baldy Wilderness Area. Class I airsheds are one of three classes provided for in the Clean Air Act and are the “cleanest” of the classes receiving special visibility protection. Airsheds on the forests are within regulatory requirements for air pollution. Visibility impairment has been documented in all Class I areas in Arizona, generally due to regional haze. If recently adopted state and federal regulations related to air quality are met, visibility is expected to steadily improve over the next several decades.
- There are no airsheds over the ASNFs that are outside of regulatory requirements.

Climate Change

Climate change may intensify the risk of ecosystem change for terrestrial and aquatic systems, affecting ecosystem structure, function, and productivity.

- Climate scientists agree that human activities have led to elevated atmospheric concentrations of carbon dioxide (CO₂) and other greenhouse gases that cause global warming, and observed concentrations are projected to increase. Climate change may intensify the risk of ecosystem change for terrestrial and aquatic systems, affecting ecosystem structure, function, and productivity.
- The potential ecological implication of climate change trends in the Southwest include: increasing temperatures; more extreme disturbance events, including wildfires, intense rain and floods, wind events, and drought; reduced precipitation; and shifts in the timing of snowmelt. The consequences of climate change are unknown but may affect forest resources such as water, vegetation, and animals.

Biological Resources

The biological resources include the plants and animals that live on the ASNFs. There are 13 major vegetation types or groupings. There are over 500 known wildlife and fish species and roughly 2,500 plant species (both native and non-native) associated with the ASNFs.

Vegetation

All thirteen of the vegetation types found on the ASNFs vary to some degree from historic conditions. Natural disturbance processes, such as fire and insects, are not functioning properly.

- Thirteen vegetation types occur on the ASNFs in forests, woodlands, grasslands, chaparral, and riparian areas. All of these vegetation types vary, sometimes substantially,

in structure, composition, function, and natural disturbance processes from what they were historically (figure 7).

- Some of the factors that have contributed to these variations include: forest management practices, such as timber harvest or fire suppression; human caused fire; non-native invasive plant and animal species introductions; unauthorized livestock grazing; excessive wild ungulate grazing; and roads. These factors continue to pose threats to the sustainability of the forests' ecosystem.
- Ponderosa pine and mixed conifer with frequent fire forests, the first and third largest vegetation types on the ASNFs (30 and 14 percent, respectively), are the most departed from their historic conditions (figure 7). Historically, these forests were open and park-like with a variety of ages and sizes of trees and were maintained by frequent surface wildfires. Today, these forest types are mostly dense groups of mid-aged smaller diameter trees that are prone to stand-replacing crown fires.
- Spruce-fir with wet mixed conifer forest has less old trees than historically and more young- to middle-aged trees. These forests have been heavily impacted by insects and disease resulting in standing dead trees. These dead trees contribute to the hazard of wildfire. Stand-replacing wildfire is the natural fire regime for this vegetation type.
- The quaking aspen component of several vegetation types is declining because of insects, disease, browsing by wildlife and livestock, absence of natural fire, and unnaturally dense stands of conifers that shade out and inhibit aspen growth. Healthy aspen stands have scenic values and provide wildlife habitat, forage for wildlife and livestock, and natural fire breaks.

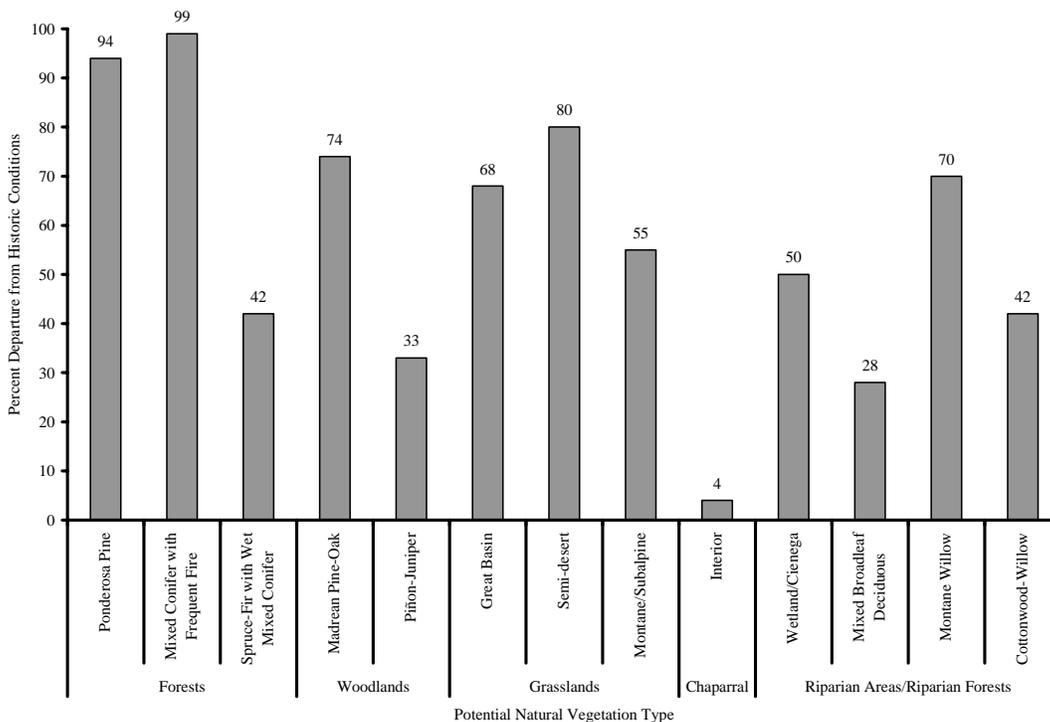


Figure 7. Percent divergence from historic condition of the thirteen vegetation types found on the ASNFs

- The woodland vegetation types cover approximately 40 percent of the ASNFs. The madrean pine-oak woodland has more young- and middle-aged trees in a dense concentration than occurred historically, while the piñon-juniper woodland has more medium to large trees. There has been a decrease in ground cover in both woodlands contributing to unsatisfactory soil conditions and increases in erosion and sedimentation.
- The three grassland types have had dramatic vegetation changes from historic conditions, including the encroachment of trees and shrubs, loss of perennial grass cover, and spread of non-native species. Over 65 percent of Great Basin, 80 percent of Semi-desert, and 10 percent of the montane/subalpine grasslands have been invaded by woody species. Some grassland areas are now considered non-restorable because site characteristics have changed (e.g. loss of topsoil). Amongst national forests in Arizona and New Mexico, the ASNFs have experienced a larger proportion of its grasslands converted to shrublands.
- The interior chaparral vegetation community differs very little from historic conditions in terms of structure and composition. However, non-native invasive species and the presence of roads indicate there are some departures from historic conditions.
- Riparian areas and riparian forests are unique habitats in east-central Arizona and important because of the rarity of water in the region. Although they comprise less than 2 percent of the forests, over 50 percent of this habitat within the larger analysis area⁴ occurs on the ASNFs. Therefore, ASNFs' management is very influential and makes a major contribution to the ecological sustainability riparian areas and forests.
- Riparian areas tend to be a focal point for use by humans, wildlife, and livestock. Riparian areas are more resilient than once believed. Once stresses are relieved, many headwater riparian systems can regain their equilibrium within a few years. Larger systems, such as the Blue River, may take much longer.
- In addition to riparian, other vegetation types (spruce-fir with mixed conifer, and mixed conifer with frequent fire) are a relatively small percentage of the forests but contribute a relatively large percentage to the larger analysis area.
- The ASNFs also have an important contribution to the sustainability of ponderosa pine, mixed conifer with frequent fire, and spruce-fir with wet mixed conifer because of the degree of departure from historic conditions and proportion to the larger analysis area.
- Fire is a natural component and plays a role in sustaining many Southwestern ecosystems, yet 10 of the 13 vegetation communities are out of sync with historic natural fire cycles. Dramatic changes in fire size, frequency, intensity, severity or landscape pattern are a result, as evidenced by the 2002 Rodeo-Chediski Fire, the largest wildfire in Arizona's history.



Figure 8. Mixed conifer and aspen in Williams Valley

⁴ The 13.5 million acre ecoregion section, White Mountains-San Francisco Peaks-Mogollon Rim, includes the Apache-Sitgreaves National Forests and other lands.

- At one time or another, insects or disease have extensively damaged the forest and woodland vegetation types. Damage in the spruce-fir forests is high and up to 38 percent of the piñon-juniper has been impacted by the Ips bark beetle. Although the occurrence of insects and disease is a natural process, their impacts can have a greater effect when combined with other stressors such as drought.
- Greater numbers of non-native invasive weeds are found on the ASNFs each year; currently there are over 20,000 acres infected. These infestations can grow and spread at rapid rates and place native plants at risk by aggressively replacing them. There are many negative ecological impacts associated with non-native invasive weeds including changes in species composition, natural fire regime, and habitat for native wildlife species.

Aquatic Biota

- The forests provide over 2,500 miles of riparian habitat; only 28 percent is considered to be in good condition; 63 percent have a soil, water, or vegetation attribute that makes them susceptible to degradation; and 9 percent are not functional because they do not provide the appropriate vegetation, stream channel, or large woody debris to dissipate energy during high flows, reduce erosion, or improve water quality.
- Riparian areas tend to be a focal point for use by humans, wildlife, and livestock. Riparian areas are more resilient than once believed. Once stresses are relieved, many headwater riparian systems can regain their equilibrium within a few years. Larger systems, such as the Blue River, may take much longer.
- The ASNFs historically provided habitat for 14 native fish species from high elevation coldwater trout streams to lower elevation warmwater streams with primarily cyprinid (minnow family) species. As noted in table 1 below, seven of the native species are protected under the Endangered Species Act.
- Historical impacts (e.g. roads, grazing, timber harvest) that occurred 20 to 100+ years ago resulted in significant impacts to aquatic communities and their watersheds. Approximately seventy percent of inventoried streams show reduced fish habitat quality. Some fish populations have shown decreases of 50 to 75 percent over the last 10 years. These declines can be attributed to altered habitat characteristics, such as excessive sedimentation or stream channel downcutting (downward erosion).
- Only the Upper and Middle Black River watershed currently contain the same native fish species that occurred historically. All other watersheds have lost some species of native fish. Thirty-seven percent of watersheds are considered to be highly or severely departed from historic conditions. Upper Silver Creek, Cottonwood Creek, Black Canyon, Lower Chevelon Canyon, and Centerfire Creek-San Francisco River watersheds no longer have any occurrences of native fish.
- There are 25 non-native fish that have contributed to major impacts and alterations of fish species across the ASNFs. Non-native invasive animals, such as crayfish and bullfrogs, prey on, out-compete, and degrade habitats that many aquatic native species depend on.
- Characteristics and species most at risk are related to riparian/aquatic ecosystems. As mentioned earlier, a large percentage of riparian areas are not functioning properly. The sustainability of all the native fish, amphibians such as Chiricahua leopard frog, reptiles like the narrowheaded gartersnake, and birds such as southwestern willow flycatcher are

at high risk over the long term. Some specific ecological characteristics such as lowered water quality and quantity, stream bank instability, as well as non-native predators and competitors threaten ecological and species diversity.

- Threats associated with some species include accidental and incidental poisoning, genetic swamping⁵ of some species by non-native fish, and continued dewatering from over pumping and diversions.

Species Diversity

A wide variety of wildlife and fish species occur on the ASNFs. Eleven of these species are listed as threatened or endangered under the Endangered Species Act. Fish populations have continued to decline in the last twenty years. Non-native invasive animals, such as crayfish and bullfrogs, are a growing threat to native species.

- It must be recognized from the outset that since Euro-American settlement, massive changes to species diversity have occurred throughout the Southwest as well as in the planning area. Many top predators and other highly interactive species were extirpated or became extinct due to habitat modification, over harvesting, and deliberate eradication efforts. It has now been shown that such actions have profound effects on other species not considered when the targeted species were driven out of an area. Restoration of the full compliment of species present prior to settlement is not considered possible or desirable due to both ecological and social implications.
- The great variety of habitat conditions found on the ASNFs provide for a wide diversity of plant and animal species. Preliminary estimates account for 511 species including 14 native fish, 13 amphibian, 36 reptile, 324 bird, and 105 mammal species. In addition, there are roughly 2,500 plant species and several thousand invertebrate species. There are several animals and plants that are found only in the White Mountains (e.g. Springerville pocket mouse, White Mountain ground squirrel, Mogollon paintbrush).
- At the time the 1987 forest plan was published, there were three species identified as threatened or endangered on the ASNFs (Apache trout, American peregrine falcon, and bald eagle); however three additional fish species listed as threatened or endangered were later located on the forests. Since that time, two species, the American peregrine falcon and the bald eagle, have been removed from the federal list, while seven have been added. At present, there are eleven federally threatened or endangered animal species on the ASNFs (table 1).
- As noted in the table 1 below, some species are no longer found on the ASNFs. Three additional species, the Chiricahua leopard frog, the Little Colorado spinedace, and the loach minnow are currently in danger of being extirpated (removed completely) from the forests.

⁵ Genetic swamping is undesirable gene flow into wild populations. This may result from the mating of domestic, feral, non-native, or invasive species with a wild indigenous species.

Table 1. Status of Threatened (T) and Endangered (E) species on the ASNFs.

Species	Federal Status ¹	Status on the ASNFs
Mexican gray wolf	ENE	1998: Arizona re-introduction population designated as experimental and non-essential
Southwestern willow flycatcher	E	Birds found in two locations; critical habitat located on the ASNFs
Mexican spotted owl	T	144 delineated territories; critical habitat located on the ASNFs
Chiricahua leopard frog	T	Species located on the ASNFs, but declining range wide
Gila chub	E	Species and critical habitat located on the ASNFs
Little Colorado spinedace	T	Species and critical habitat located on the ASNFs - under review for uplisting to endangered
Spikedace	T	Critical habitat located on the ASNFs - species not recently found
Apache trout	T	Species located on the ASNFs
Gila trout	T	Species and habitat located on the ASNFs
Loach minnow	T	Species and critical habitat located on the ASNFs
Razorback sucker	E	Has not been located on the ASNFs since late 1980's.

¹Federal Status: ENE² = Experimental, non essential; E = Endangered; and T = Threatened

²An experimental, non-essential population is a reintroduced population whose loss would not be likely to appreciably reduce the likelihood of the survival of the species in the wild.

- Invasive animal species are also a serious and growing threat to native species. Non-native invasive animals, such as crayfish and bullfrogs, prey on, out-compete, and degrade habitats that many native species depend on. There are 25 non-native fish that have contributed to major impacts and alterations of fish species across the ASNFs.
- A comprehensive list of species that have habitat or population concerns has been evaluated. This list is composed of:
 - Threatened and Endangered (T&E) - species listed under the Endangered Species Act.
 - Species-of-Concern (SOC) - those species that may require management action to prevent listing under the Endangered Species Act.
 - Species-of-Interest (SOI) – those species that may require management action to achieve ecological or other multiple use management objectives.

**Figure 9. Chiricahua leopard frog**

- Using this comprehensive list of species as a starting point, evaluation was conducted looking at several factors:
 - whether there are known occurrences or suitable habitat for the species on the forests;
 - whether the species is secure within the planning area;
 - how management of the forests may affect the species, including occasional and accidental species;
 - whether there is enough information known about the species in order to formulate management direction;
 - consideration of species' habitat requirements, abundance, and threats.
- The majority of species depend on one or more of the vegetation types presented in figure 7 for their habitat. As mentioned earlier, all vegetation types vary, somewhat significantly, from historic conditions. Altered habitat conditions elevate the risks to species diversity throughout the planning area. Identified threats to the vegetation types also threaten the species associated with these types.
- Some species depend on specific ecological characteristics such as cliffs, caves, rocky slopes, tree cavities, specific soils, or valley bottoms. Threats to these features threaten the species dependent on them.
- Some species have additional threats not related to the vegetation or special features with which they are associated.
- Collection has the potential to affect over 25 species on the ASNFs, especially plants. Whether it is large trees for fireplace mantels and furniture, rare plants, or butterfly specimens, over-collecting can directly affect species, and can affect other species that are dependent on those collected. While it is unclear to what extent collecting on the ASNFs currently takes place, it may have catastrophic impacts in limited situations and on small populations of rare plants.
- Illegal hunting (poaching) or killing, although usually minor, can also affect species such as the recently reintroduced Mexican gray wolf. In addition, legal hunting of “varmints”, particularly prairie dogs, may be leading towards listing of this species. Prairie dogs are important because they provide habitat features (burrows and bare soil) and are prey for other species such as ferruginous hawks and western borrowing owls.
- It was determined that a total of forty⁶ species may need additional plan components because they are at risk from activities not addressed through ecosystem diversity.

⁶ Species that may need further consideration in the planning process include 3 T&E, 23 SOC, 14 SOI.

Revision Topics

The following section identifies the key revision topic that encompasses ecological issues: Maintenance and Improvement of Ecosystem Health. For this revision topic, management concerns (extracted from conditions and trends set forth in this chapter and public comments noted in Appendix A) and the resulting need to change the current forest plan are listed.

Maintenance and Improvement of Ecosystem Health – Revision Topic #1

Management Concerns

One-third of the forests' soils are in impaired or unsatisfactory condition and are susceptible to accelerated erosion and loss of soil productivity. Risks associated with these conditions include increased sedimentation in lakes and rivers and decreased plant and tree growth. These can, in turn, place species that depend on these habitats at risk, as well as impact humans that depend on the water or vegetation for recreation or their livelihood. One of the main goals of the current forest plan is to maintain or enhance soil productivity. This direction is still valid and needs to be retained in the revised forest plan.



Figure 10. Reintroduction of Little Colorado spinedace into West Chevelon Creek

Of the thirteen vegetation types found on the ASNFs, all vary to some degree from historic conditions. Of particular concern is the loss of native grasslands, the condition of riparian areas, the composition and amount and distribution of structural classes in all vegetation types (especially ponderosa pine and mixed conifer with frequent fire), and the decline in aspen. These changes in vegetative condition can lead to impacts on habitat quality, availability of forest products, and scenic values. These areas may need high levels of treatments (e.g. hand or mechanical thinning, prescribed or wildland fire) to restore ecological process and function.

Riparian areas play a unique and important role in the arid Southwest. Over 70 percent of the riparian areas on the ASNFs are not functioning properly and need management attention. One of the main emphasis areas of the current forest plan directs managers to improve riparian areas and reduce or eliminate adverse impacts. The current forest plan recognizes the need to focus on improving riparian areas and this emphasis should be carried into the revised forest plan.

Approximately 85 percent of ASNFs' vegetation communities are out of sync with historic natural fire cycles. Years of fire suppression have impacted the ability of fire to play its natural role in maintaining ecosystem health.

There are higher levels of woody vegetation (fuel loads) in the forests than existed historically. When combined with the effects of drought and insect and disease infestations, the forests and surrounding lands are at an increased risk from uncharacteristic wildfires.

There are streams and lakes on the forests that do not meet state and national water quality standards for their designated uses. The major identified, non-point source pollutant

associated with activities is sediment. There is a need to improve upland watershed conditions, restore proper functioning condition to riparian areas, and reduce pollutants associated with streams and lakes. The current forest plan emphasizes improvement of riparian resources and includes direction to prevent water quality deterioration; this direction needs to be carried into the revised forest plan.

Increased demand for water has elevated concerns regarding water availability and contamination. There is a need to improve streamflow conditions by improving and maintaining healthy upland watershed conditions in all vegetation types. The current forest plan directs forest managers to acquire or maintain instream flow and water rights to protect aquatic ecosystems, fish, and wildlife, as they are critical for forests' management and protection. There is a continued need to provide this direction in the revised forest plan.

Continued or increased pumping may negatively affect base flow of streams that are directly connected to major aquifers and thus affect the plants and animals that depend on that instream flow. Groundwater pumping from the Coconino (Little Colorado River) and Morenci aquifers may negatively affect forest wells used for stock watering and domestic use. There is a need to retain groundwater levels to maintain fish habitat, riparian health, and water yield. This may be outside of the forests' ability to control.

Forest managers will be challenged by the uncertainties of climate change. Climate change has the potential to alter forest ecosystems in the Southwest due to higher temperatures and less precipitation, and may cause additional strains on water resources and uncharacteristic wildfires.

The increasing occurrence of both plant and animal non-native invasive species has the potential to substantially alter ecological systems and processes. The most vulnerable species are those tied to aquatic systems, including riparian habitats. The 25 non-native fish species, along with bullfrogs and crayfish, impact the native fish, amphibian, macroinvertebrate, and plant species in those systems. It is anticipated that the forests will lose native fish species if conditions continue to decline.

There are threatened and endangered species that need special attention to improve habitat and promote recovery. The urgency lies with aquatic-associated species since there has been a nearly categorical decline across aquatic species over the last 10-20 years. Recovery efforts for threatened and endangered species are emphasized in the current forest plan and should continue in the revised forest plan.

There are plant and animal species that may need further consideration in the planning process, including invasive species. Though the majority of these species should be provided for if there are improved ecological conditions in the vegetation communities, there are species that are dependent on changes in specific ecological characteristics or non-habitat related conditions. There are additional species that are threatened by such activities as collecting or illegal hunting. Overall, characteristics and species most at risk are related to riparian/aquatic ecosystems.

Need to Change the Current Forest Plan

Ecosystem Diversity

All Vegetation Types - The current forest plan does not clearly describe desired conditions for the vegetative communities of the ASNFs. Since all of the vegetation types vary from historic conditions, the revised forest plan needs to clearly describe the desired composition, structure, and cover needed to improve conditions, maintain appropriate fire regimes, and contribute to species diversity. There is a need to recognize the social, economic, and ecological constraints that may limit or prolong restoration.

By describing the desired conditions for the vegetative communities of the ASNFs the revised forest plan will describe the ecological conditions needed to provide a framework for sustainability of plant and animal diversity on the forests.

Fire – Because the majority of the forests vegetation types are out of sync with natural fire regimes, current forest management has emphasized the restoration of fire-adapted ecosystems. The current forest plan does not fully recognize the importance of increasing fire frequency and decreasing fire severity. As part of restoring fire-adapted ecosystems, the forest plan needs to include plan components that provide opportunities to reintroduce fire as a necessary ecological process and restore and maintain appropriate fire regimes.

Species Diversity

Species with Specific Needs or Concerns – There are plant and animal species both aquatic and terrestrial that may need further consideration in the planning process. Though the majority of these species should be provided for if there are improved ecological conditions in the vegetation communities, there are species that are dependent on changes in specific ecological characteristics (e.g. logs, tree cavities) or non-habitat related conditions (e.g. collection, poisoning) or affected by threats (e.g. invasive species, shooting). The revised forest plan may need additional components to address these species' needs or concerns.

Emerging Issues

Non-native Invasive Species and Climate Change - When the current forest plan was written, issues such as non-native invasive species threats and climate change were not on the horizon. The revised forest plan needs to focus on preventing the introduction of new non-native plant and animal invasive species; conducting early treatment of new infestations; and controlling established infestations. The revised forest plan also needs to address the emerging issue of climate change by incorporating adaptive management strategies and describing ecological conditions that are resilient to change.

Chapter 3. Social and Economic Conditions and Trends

This chapter summarizes the key findings from the Economic and Social Sustainability Assessment (U.S. Forest Service 2008a) and the Resource Evaluations (U.S. Forest Service 2008b). It describes the social and economic conditions and trends within and around the ASNFs and how the forests contribute to sustainability. Resulting management concerns and the need to change the current forest plan are summarized at the close of this chapter.

This evaluation considers social and economic information from Apache, Navajo, Coconino, and Greenlee Counties in Arizona and Catron and Grant Counties in New Mexico.

Demographics and the Economy

The ASNFs are located within Apache, Navajo, Coconino, and Greenlee Counties in Arizona and border Catron and Grant Counties in New Mexico (figure 11).

Demographic information for the area surrounding the ASNFs describes an area of predominantly rural character accompanied by limited growth.

- The area is considered to have low population density, with population growth well below the state average. Within that minimal growth, the retirement age population is growing faster than the under-18 population.
- Employment growth in the area is slow and unemployment rates are higher than the state average. Per capita income is far below national averages, with over 25 percent of the population living below the poverty level.
- Area populations have moderate racial and ethnic diversification. The Hispanic presence has increased from 20 percent to 25 percent of the total population since 1940, while African American population increased only 0.1 percent. The Native American population has grown from approximately 44,000 to 275,000 over the past 6 decades. However, as a percentage of Arizona's population, it has declined from 11 percent in 1940 to 5 percent in 2000.
- Populations have moderate levels of education. Both Coconino and Greenlee Counties exceed the overall state percentage of high school graduates, while Apache and Navajo Counties fall well short.

Growth has occurred in the numbers of seasonal homes and retirees.

- There has been a notable increase in seasonal housing units for both Apache and Navajo Counties between 1990 and 2000, most dramatically in Snowflake and Pinetop-Lakeside, both of which saw increases of over 1,000 percent.



Figure 11. Counties containing and bordering the Apache-Sitgreaves National Forests

- There has been an influx of retirement-age residents and seasonal homeowners. These individuals tend to bring in income not tied to local employment.

The economy of the State of Arizona and the area surrounding the ASNFs has undergone a substantial change, shifting towards a more service-based economy.

- In general, the communities dependent on the ASNFs have shifted from a commodity-based economy dependent on logging and grazing, to a service-based economy dependent on service, recreation, and construction. However, there continue to be local social and economic dependencies on commodity activities (e.g. paper production, utility plants, and mining).
- Communities were historically based on common social, spiritual, and economic values, but have evolved to ones characterized by different economic associations with natural resources and more diversity in social institutions and values.

The ASNFs contribute to the local economy, with the greatest benefits coming from recreation, hunting, fishing, and wildlife viewing opportunities.

- Federal, State, county, city, and tribal governments are major employers in the assessment area. The government sector provided the largest portion of regional employment (29 percent), followed by the services (27 percent) and retail trade (19 percent) sectors. The manufacturing sector represented 3 percent of the employment, farming and ranching 1 percent; agricultural services, forestry and fishing 0.5 percent; and mining 0.1 percent.
- ASNFs' management activities during 2005 contributed approximately 7 percent of the jobs and 5 percent of the labor income to surrounding areas. The majority of these jobs were in the government sector and in the accommodations and food services sector. The White Mountain Stewardship Project (see page 23) contract accounts for 5 percent of this labor income percentage.
- Economic activity associated with the ASNFs generated over \$83 million in labor income directly and indirectly to the local economy. The combined recreation and wildlife economic contribution areas, including recreation, hunting, fishing, and wildlife viewing-based visits to the ASNFs, are 68 percent of this total, or over \$56 million.
- The five counties that contain ASNFs' land have received a portion of the revenues generated on National Forest System lands (the "25 Percent Fund"). These payments returned 25 percent of all revenues generated from forest activities and were paid based on the acreage of National Forest System lands within each county. These funds were used for the maintenance of public schools and roads. In the past, timber sale proceeds constituted the majority of the 25 Percent Fund payments, but these have declined substantially since the late 1980s.

Forest Users and Uses

People use the ASNFs for a wide variety of purposes. Some uses include livestock ranching, timber cutting, mineral extraction, road rights-of-ways, power line corridors, communication sites, recreation, research, and Tribal activities. Below are some key findings related to use of the ASNFs.

Recreation

A variety of recreation opportunities and visitor experiences are provided by the ASNFs.

- The ASNFs offer a wide array of developed recreation opportunities, including single family and group campgrounds, picnic areas, boating and fishing sites, trailheads, two visitor centers, and scenic overlooks. Over 35 percent of forest visitors use developed campgrounds.
- The primary recreation activities are “relaxing and escaping the heat,” fishing, hiking, OHV use, viewing natural features and wildlife, camping, driving for pleasure, picnicking and large group gatherings, and hunting. Over 19 percent of forest visitors camped outside of developed campgrounds.
- Visitors use the forests as an overnight place to stay more than any other forest in the National Forest System.
- The ASNFs are known for their backcountry opportunities, including 3 designated wildernesses, the 180,000 acre Blue Range Primitive Area, and roadless areas encompassing over 300,000 acres.
- Visitors are drawn to the water on the ASNFs, a unique feature in the arid Southwest. The ASNFs have over 30 lakes and reservoirs and more than 1,000 miles of rivers and perennial streams, more than can be found in any other southwestern national forest.



Figure 12. The rugged Blue Range Primitive Area

The large majority of visitors are from the fast-growing metropolitan areas of Arizona. They come to the forests seeking relief from higher temperatures and looking for a variety of recreation opportunities.

- Although the counties within and surrounding the ASNFs are experiencing some population growth, the Phoenix metropolitan area, where the majority of forest visitors live, is one of the Nation’s fastest growing areas.
- The ASNFs receive approximately 2 million visitors per year. Approximately 70 percent of the forests’ visitors are from the Phoenix and Tucson metropolitan areas. Access to public lands is considered a major contributor to the quality of life by many Arizonans.
- Planned highway improvements will provide easier access to the ASNFs from the State’s major population centers, increasing visitor numbers as well as recreation demands. The population is also aging; the 65 and over population in the surrounding counties grew at a higher rate than the state average.

Recreational motorized vehicle use continues to increase. The ASNFs have an extensive road network with over 6,000 miles of road.

- Dispersed camping with motor homes, trailers, truck campers, “toy haulers,” and tent trailers is now a common and popular activity. These camps are often accompanied by various OHVs for motorized travel out of the base camp.

- Motorized use on primitive roads, even when officially closed, is common. Establishment of unauthorized user-created trails is becoming a major concern. Hunting seasons and holidays generally have an extraordinary volume of motor vehicle traffic.
- The number of OHVs in Arizona has risen dramatically. Almost 500,000 Arizona households have one or more OHVs and 29 percent of Arizonans operate OHVs for recreation. OHV sales show a steady increase in vehicles sold each year, escalating the anticipated use of these vehicles on the forests.
- Approximately 11 percent of 2001 forest visitors used OHVs, but only 4 percent identified OHV use as their primary recreational activity.
- The ASNFs have an extensive road network with over 6,000 miles of road. Forest managers face major challenges in maintaining this transportation system to ensure user safety and resource protection.
- Motorized vehicle use is not allowed or is seasonally restricted on approximately 18 percent of the ASNFs. The remainder of the forests is open to motorized vehicle use, including cross-country travel.
- The forests are in the process of implementing the 2005 Travel Management Rule, which when fully implemented, will restrict motorized vehicle use to designated routes and areas and will prohibit cross-country motorized travel. This will help provide sustainable motorized recreation opportunities on the ASNFs while protecting the natural resources of the forests.



Figure 13. User-created routes on the Lakeside Ranger District near Show Low, AZ

Special Uses

As communities grow the demand for special use authorizations continues to grow.

- Occupancy and use of national forest lands for public and private purposes through the issuance of special use authorizations and easements, where the use is consistent with natural resource management goals, continues to be allowed.
- The demand for non-recreation uses continues to grow, in particular for public transportation agency needs and access to private land. State agencies, counties, local cities and towns, public utilities, and other service providers regularly request new authorizations or amendments to existing authorizations. Increased requests have been received for private road access across



Figure 14. Hannagan Meadow Lodge is authorized under a special use permit

National Forest System land as residential development has occurred on adjacent private lands.

- The forests can expect requests for new or larger energy transport corridors for oil, gas, and hydrogen pipelines and electricity transmission related to the Energy Policy Act of 2005 and individual utility company activities. This act directs the Secretary of Agriculture to designate energy corridors in several western states including Arizona.
- Existing recreation residences are located on the Clifton and Springerville Ranger Districts; no permits for additional lots will be issued.
- The ASNFs issue an average of 125 recreational special use permits per year. These permits include outfitter/guide, recreational event, and non-commercial group use. Typical outfitter/guide permits are for hunting or fishing guides, although the number of ecotourism guides is growing.

Timber Harvest

Since 1987, timber harvest has decreased on the ASNFs. There has been a shift in emphasis from commercial timber production towards the need to reduce fuel loads, with a focus on removing small-diameter trees.

- Nationally, timber harvest on national forests declined from 9.9 billion board feet to 1.1 billion board feet between 1986 and 2003. Associated with this decline is the reduction in capacity to process timber by 37 percent. Similar trends can be observed on the ASNFs (figure 15). This downturn was related, in part, to increasing litigation, listing of the Mexican spotted owl, and loss of timber companies. Recent increases in production are the result of White Mountain Stewardship Project (WMSP) contract, Rodeo-Chediski fire salvage, other mechanical treatments, and improving markets.

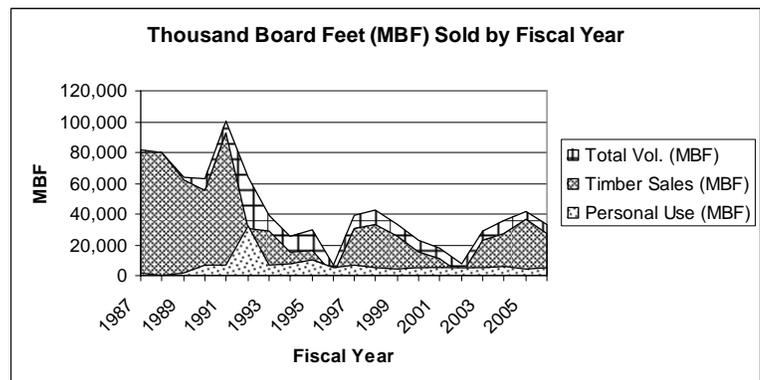


Figure 15. Volume of wood products sold from fiscal year 1987 through 2006 on the ASNFs

- Firewood gathering is an important component of the local social and economic fabric; the personal use volumes depicted in figure 15 primarily represent personal use firewood sales.
- The decline of timber sales and the disappearance of most local wood product industries over the last several years have resulted in the ASNFs having to pay for most treatments to manage and care for trees. Decline of local processing capacity was evidenced by the closing of several sawmills and the paper mill near Snowflake, Arizona, converting to using 100 percent recycled paper material in the late 1990s. However, recent trends show an improving marketplace. As of May 2008, seven businesses were utilizing small diameter logs and fiber harvested from the forests.

- Current forest plan direction related to the Mexican spotted owl and the northern goshawk is often in conflict with management objectives to thin forested areas near wildland-urban interface areas and has resulted in five site-specific amendments to the forest plan.
- In 1987, timber sale revenue funded forest improvements such as road reconstruction and maintenance or was returned to the Federal Treasury. In about 2000, direction shifted to emphasize fuels management projects within the wildland-urban interface (WUI) treating primarily small-diameter trees. These projects return little revenue to the ASNFs. However, the intent of these projects is to reduce the fire hazard on forest lands adjacent to private property.
- In August 2004, the first large, 10-year stewardship contract in the Nation for the White Mountains Stewardship Project (WMSP) was awarded. The contract is for treatment of approximately 5,000 to 25,000 acres per year over the 10-year contract term. As of February 2008, task orders for the treatment of over 33,000 acres have been issued, over 23,000 acres of thinning completed, and more than 600,000 green tons of biomass removed from the forests. Development of this project began with the goal to restore forest health, reduce the risk of wildfire to communities, and encourage new wood product industries. These objectives are not identified in the current forest plan.

Livestock Grazing

Since 1987 livestock grazing receipts have decreased. Grazing on the ASNFs helps to maintain the social customs and traditions of ranching, provides economic contributions to local ranching operations, and affects the ecological condition of the forests.

- Grazing revenues have declined over the past 21 years due to several factors, including balancing permitted livestock numbers with allotment capacity, extended drought and subsequent reduced stocking levels, and the large Rodeo-Chediski Fire of 2002.
- National Environmental Policy Act (NEPA) decisions completed for grazing allotments highlight that additional or changed management is needed to improve watershed and soil conditions, improve range forage production, improve wildlife habitat, and enhance visual quality.
- The ASNFs manage 128 grazing allotments. Livestock grazing contributes to the livelihood of the permittees and to the economy of the local communities and counties. Livestock grazing on the forests generates approximately 0.3 percent of the labor income and roughly 2 percent of employment within the six

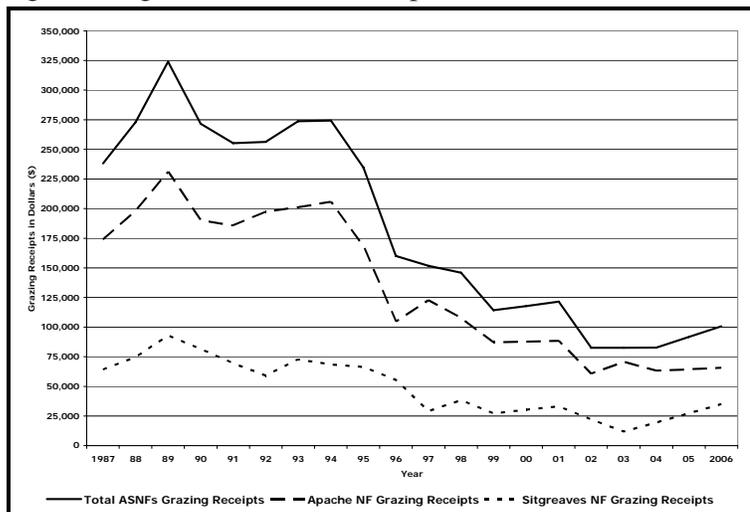


Figure 16. ASNFs annual grazing receipts from public land ranching on the ASNFs from 1987 to 2006

counties (Apache, Coconino, Greenlee, and Navajo Counties in Arizona and Catron and Grant Counties in New Mexico) surrounding the ASNFs.

- Grazing activities on the ASNFs contribute to the quality of life in rural communities through ranching and the associated sense of place, social customs, culture, and traditions.

Special Areas

The ASNFs have many designated areas that attract visitors to the area who contribute to the local economies.

- Three wilderness areas: Mount Baldy Wilderness, Bear Wallow Wilderness, and Escudilla Wilderness.
- The Nation's sole remaining primitive area: Blue Range Primitive Area.
- 17 Inventoried Roadless Areas, totaling over 300,000 acres.
- Of the 1,000 perennial stream miles on the ASNFs, over 25 percent have been found eligible for inclusion in the National Wild and Scenic Rivers System as wild, scenic, or recreational rivers.
- Four national recreation trails, all designated in 1979: Blue Ridge, General George Crook, Eagle, and Escudilla.
- Three scenic byways: 120-mile Coronado Trail National Scenic Byway, 123-mile White Mountain Scenic Road, and 3 miles of the 67-mile From the Desert to Tall Pines Scenic Road.
- One research natural area: Phelps Cabin, which was set aside to provide researchers an opportunity to gather information about the montane/subalpine grassland ecosystem. There are four proposed research natural areas.
- One designated botanical area: the Phelps Botanical Area.
- The Heber Wild Horse Territory, approximately 20,000 acres.



Figure 17. Hikers in Escudilla Wilderness

American Indian Rights and Interests

The Forest Service and federally recognized Native American tribes have a special and unique government-to-government relationship of one sovereign nation to another, based on the U.S. Constitution, treaties, statutes, and court decisions. The ASNFs share over 150 miles of border with the Fort Apache (White Mountain Apache Tribe) and the San Carlos Indian Reservations.

- The ASNFs consult with ten tribes on a regular basis: Fort McDowell Yavapai Nation, Hopi Tribe, Navajo Nation, Ramah Navajo Chapter, San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation of Camp Verde Indian Reservation, Yavapai-Prescott Tribe of the Yavapai Reservation, and Pueblo of Zuni.
- The ASNFs encompass the aboriginal territory of many Native American tribes. Such lands are thought to contain many traditional cultural properties of concern and significance to tribal neighbors.
- Native American tribal members' use of ASNFs' lands includes gathering of various forest products, such as boughs, basket materials, and teepee poles for ceremonial purposes, through forest permit.

Wildland-Urban Interface

The forests are literally the backyard for many residents of Arizona's White Mountains. Many communities adjoin the ASNFs, while others are completely surrounded by the forests. The area where human development and the forests meet is commonly referred to as the wildland-urban interface (WUI).

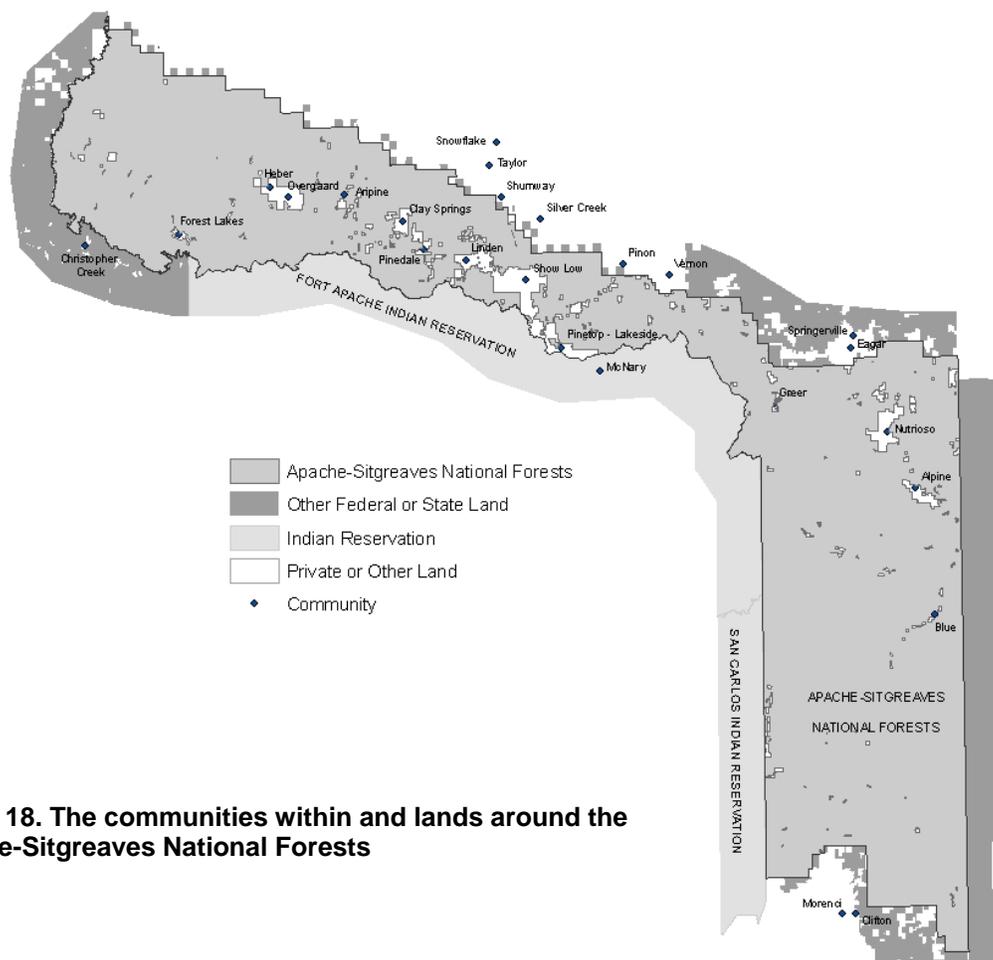


Figure 18. The communities within and lands around the Apache-Sitgreaves National Forests

Residents within the wildland-urban interface (WUI) are increasing and their expectations of using the ASNFs are growing as well. Forested areas, including those within the WUI, are at increased risk from wildfire because of uncharacteristically high fuel levels.

- It was estimated in 2004 that there were approximately 25,000 full-time residents and about 80,000 seasonal residents (primarily summer) within the wildland-urban interface (WUI) of the following communities: Forest Lakes, Heber/Overgaard, Aripine, Clay Springs, Pinedale, Linden, Show Low, Wagon Wheel, Pinetop-Lakeside, Hondah, McNary, Vernon, Hideaways area, Greer, South Fork, Eagar, Springerville, Nutrioso, and Alpine.
- Because subdivision and development of land adjoining or surrounded by the ASNFs is increasing, demands for utility corridors, roads, and special use permits to service these developments are expected to increase.
- Demographic changes, including increasing populations of retirement-age and part-time residents, have resulted in larger WUI areas and increased demands for access, water, recreation, and consideration of persons with disabilities.
- Because fuel loads on the ASNFs are at uncharacteristically high levels, forested areas are at increased risk from wildfires. Although the current forest plan does not recognize this threat, forest leadership has placed an emphasis on restoration of fire-adapted ecosystems and community protection. The White Mountain Stewardship Project (WMSP), implemented in 2004, emphasizes large-scale forest restoration activities that result in healthier forests, enhanced rural economic development, and the utilization of previously unmarketable small diameter trees. Some WMSP benefits include hazard fuel reduction and local economy contributions in the form of new jobs.
- The expansion of many communities is limited because they are surrounded by the forests. There are strong public feelings, both for and against future land exchanges that would make National Forest System lands available for community growth.

Community Relationships

Since communities and private landowners are in such close proximity to the forests, many are directly affected by forest management decisions. These entities, in turn, affect forest management.

- In the past, local communities have not played a large role in the national forest land management planning process. Because local governing bodies cannot mandate or direct the actions of federal government agencies, there has been little consideration of national forest management issues in their policies.
- The events surrounding the 2002 Rodeo-Chediski Fire, the largest in Arizona history, served as a catalyst for increased public concern and interaction with the Forest Service. Following the fire, communities developed community wildfire protection plans, which identify and prioritize treatment areas to reduce the wildfire hazard to communities. In 2004, the ASNFs awarded the White Mountain Stewardship Contract to treat forest lands identified in the community wildfire protection plans. A citizen-based monitoring board provides input to the ASNFs regarding contract activities.

- Collaborative efforts have resulted in the formation of many more partnerships such as the Natural Resources Working Group, the Arizona Sustainable Forest Partnership, Eastern Arizona Counties Resource Advisory Committee, and the Little Colorado River Weed Management Area. These partnerships have contributed to the decision making process and desired outcomes on the forests.
- The ASNFs work closely with the county governments in Greenlee, Apache, Coconino, and Navajo Counties, with state and local governments, and with other Federal agencies.



Figure 19. Building wildfire community protection plans

Revision Topics

The following section identifies the two key revision topics that encompass social and economic issues: Managed Recreation and Community-Forest Interaction. For each revision topic, management concerns (extracted from conditions and trends set forth in this chapter and public comments noted in Appendix A) and the resulting need to change the current forest plan are listed.

Managed Recreation – Revision Topic #2

Management Concerns

As use of the forests grows and the general population becomes more diverse, demand increases for a greater range of experiences on the ASNFs. The forests may not be prepared for the needs of the increasingly socially and ethnically diverse forest users, as well as the increasing 65-and-over populations.

Potential conflicts in value systems and expectations between long-time residents and people who have recently moved into the area can create friction over natural resource management. Managers will be challenged to provide a balance of opportunities and uses to the public as well as reduce conflicts with other users and forest resources.

The Recreation Facility Analysis⁷ examined the need to eliminate the \$2.6 million backlog of deferred recreation facility maintenance⁸. Managers are challenged to maintain these facilities while providing for human health safety and protection of natural resources. Increased demand may not be met due to limited recreation opportunities (facilities, developed campground, trails, and dispersed camping opportunities).

Increased population growth has the potential to put higher demands on forest resources, especially access, water, and recreation. More pressure may be put on the riparian and

⁷ Recreation Facility Analysis is a process used to develop a 5-year proposed "Program of Work" to better manage and improve the quality of recreation sites. The ASNFs completed the Recreation Facility Analysis in late 2007.

⁸ Deferred maintenance is the postponing of repairs or maintenance due to lack of resources, which results in a decline of the condition or value.

wilderness areas to provide recreation opportunities. Watersheds and riparian areas could experience resource damage and wilderness values such as solitude or primitive and unconfined recreation may be affected. Unmanaged recreation could cause resource damage and user conflicts.

OHV use has increased dramatically and unmanaged OHV use can cause resource damage, user conflicts, and safety concerns.

Need to Change the Current Forest Plan

Recreation Opportunities

Spectrum of Opportunities - As forest use grows and the general population becomes more diverse, demand increases for a greater range of experiences on the ASNFs. The current forest plan provides for a wide variety of developed and dispersed recreation opportunities. The Recreation Opportunity Spectrum (ROS)⁹ classification system was used to delineate types of recreation settings. These delineations are outdated and need to be updated based on current and projected recreation needs, natural resource impacts, and public input.

Suitability of Areas – Off-highway use has increased dramatically and unmanaged OHV use can cause resource damage. The current forest plan allows OHV use across the forests, including cross-country, except where posted closed. This direction is in conflict with the 2005 Travel Management Rule which eliminates cross-country motor vehicle travel except in designated areas. The revised forest plan needs to describe where motorized vehicle use is generally suitable or generally unsuitable.

Special Areas - The ASNFs have many designated places that attract visitors to the area. There is a need to recognize/delineate existing special areas that were not previously mentioned in the forest plan (i.e. Heber Wild Horse Territory, highly developed recreation areas (Big Lake, Rim Lakes, etc), scenic byways).

As required by the planning regulations (36 CFR 219.7) all National Forest System lands possessing wilderness characteristics must be considered for recommendation as potential wilderness areas. If there are recommendations, they will need to be incorporated into the revised forest plan.

The current forest plan provides management direction for only a small portion of rivers that are currently eligible for designation into the National Wild and Scenic Rivers System. The forest plan needs to be updated to reflect these eligible rivers.

⁹ A method of delineating types of recreation settings. There are six ROS settings. These settings are: Primitive – Essentially unmodified natural environments; Semi-Primitive Non-Motorized – Few or subtle modifications by people, high probability of isolation, no motorized activity; Semi-Primitive Motorized – Predominately natural or natural appearing environments where motorized use occurs; Roded Natural – Predominately natural appearing environments with moderate evidence of the sights and sounds of man; Rural – Modified natural environment with facilities for special activities; Urban – substantially urbanized environment.

Recreation Program Emphasis

Developed Recreation – As demand for recreation opportunities continues to grow, there will be pressure placed onto the forests to build new developed facilities (e.g. campgrounds, picnic shelters, toilets) to meet demand. The current forest plan calls for the development of new recreation facilities to meet increasing demand. This direction is in conflict with the recently completed Recreation Facility Analysis. The forest plan needs to emphasize the care and maintenance of existing infrastructure prior to building new facilities.

Wildland-Urban Interface – As population increases in the wildland urban interface, associated demands for access to the forests and recreation-related services (e.g. parking lots, trails) increases. The forest plan needs to provide direction on how to manage these increasing and new demands.

Community-Forest Interaction – Revision Topic #3

Management Concerns

Due to the shift from a commodity-based economy to a service-based economy, natural resource-related jobs may continue to decline. This decline in skilled labor may pose a challenge to accomplishing needed forest land treatments.

Although there has been a shift from commodity-based economies to service-based economies, there are still local dependencies associated with timber, grazing, and forest restoration activities. Therefore, fluctuation in management activities could affect the labor income and jobs for these industries.

Although revenues from livestock grazing have declined, ranching contributes to the social customs, culture, and traditions of the Southwest. Managers may be pressured to find ways to make livestock grazing on federal lands more profitable in order to retain the presence of ranching and the perceived rural sense of place associated with it.

Due to a decrease in ASNFs' budgets and organizational capacity, the forests may not be able to meet public and industry demands for goods and services (e.g. recreation, firewood, timber, special use permits).

Increases in population and housing development may lead to more wildland-urban interface areas, loss of open space, and the associated use of the forests and demands for services. Managers are faced with concerns over available water supply and the preservation of open space (natural areas) around communities.

Increasing development in the wildland-urban interface is putting more human improvements at risk because of the potential for uncharacteristic wildfire.

Since many communities are completely surrounded by the forests and limited in the ability to expand, managers may receive pressure to exchange land to provide for community growth.

The forests received public input identifying the need for existing and future energy corridors because of the expected demand for additional electric transmission lines to serve the growing populations of Arizona and the Southwest.

Need to Change the Current Forest Plan

Contributions to Local Communities

Goods and Services - Due to the shift from a commodity-based economy to a service-based economy, natural resource-related jobs may continue to decline. The communities surrounding the ASNFs are not directly relying on forest goods and services for their economic sustainability. However, the ASNFs contribute to sustaining the lifestyles and traditions of local communities through commodity use and production (e.g. grazing, logging). The current forest plan provides for these activities and uses. The revised forest plan needs to address providing a sustainable supply of forest and rangeland resources that is consistent with achieving desired conditions and that supports local communities.

Land Ownership Adjustment - Since many communities are completely surrounded by the forests and limited in the ability to expand, managers may receive pressure to exchange land to provide for community growth. The current forest plan provides guidelines for land ownership adjustment, including land exchange and acquisition. In the revised forest plan, there is a need to address community expansion desires, preservation of open space, and water during land ownership adjustments.

Wildland-Urban Interface

Wildfire - Increasing development in the wildland-urban interface, coupled with current vegetation conditions, is putting more human improvements at risk because of the potential for uncharacteristic wildfire. Current national, regional, and forest strategic direction guides the Forest Service to reduce the risk to communities and natural resources from wildfire. The White Mountain Stewardship Project is an example implementing this strategic direction. This direction is not identified in the current forest plan and needs to be added.

Urban Interface Demands - Increases in population and housing development may lead to more wildland-urban interface areas and the associated use of the forests and demands for services. The current forest plan does not recognize the increasing populations and structural development along the forests' boundaries. The revised forest plan needs to provide guidance for addressing urban interface demands (e.g. roads, pipelines, access, water supply).

Energy Resource Needs

It is anticipated there will be increased demand for additional electric transmission lines to serve the growing populations of Arizona and the Southwest. The current forest plan identifies existing energy (utility) corridors and allows for the establishment of new corridors. The revised forest plan needs to better define the criteria for establishing new corridors.

Chapter 4. Summary of Forest Plan Revision Topics

This chapter presents a summary of the need to change the current forest plan. Detailed information can be found in Chapters 2 and 3.

This need to change can be grouped into three primary revision topics: Maintenance and Improvement of Ecosystem Health, Managed Recreation, and Community-Forest Interaction.

Maintenance and Improvement of Ecosystem Health

When the current forest plan was approved in 1987, ecosystem management was a relatively new concept and not an emphasis at that time. Little, if any, guidance existed to understand how ecosystems work and how human activities affect them over time. The direction in the 1987 forest plan is insufficient for today's concerns about ecosystem and species diversity and the role of natural disturbance processes (e.g. fire).



Some of the concerns related to maintaining and improving ecosystem health, include:

- Vegetation conditions are divergent from historic conditions.
- Forest conditions indicate a substantial departure from the natural fire regime.
- Riparian areas, soils, and water on portions of the forests are in poor condition.
- There are plant and animal species which may need further consideration in the planning process.
- There are emerging issues not addressed by the current forest plan (e.g. non-native invasive plants and animals, climate change).

There is a need for the revised forest plan to . . .

- adequately describe desired conditions for vegetative communities regarding:
 - composition, structure, and function;
 - resilient, functioning ecosystems;
 - fire regimes;
 - plant and animal diversity.
- provide direction regarding invasive species.
- address the emerging issue of climate change by incorporating adaptive management strategies and describing ecological conditions that are resilient to change.
- continue current forest plan emphasis related to improving riparian areas, soil, and water.

Managed Recreation

The ASNFs offer a wide array of recreation opportunities and receive approximately 2 million visitors a year. The Chief of the Forest Service identified unmanaged recreation, in particular the large increase in demand for motorized recreation opportunities, as one of the four threats to the Nation's forests and grasslands.

Some of the concerns related to unmanaged recreation include:

- Recreational use of the forests, including off-highway vehicle use, continues to increase. OHV use can cause resource damage, user conflicts, and safety concerns.
- Demographics of recreationists are changing. An aging population and increased ethnic diversity contribute to the changes in demand for recreation opportunities on the ASNFs. The forests may not be prepared to meet the needs of the increasingly socially and ethnically diverse forest users.
- There are special areas that were not addressed in the current forest plan (e.g. scenic byways and developed recreation areas).
- There may be National Forest System lands that could be recommended to Congress for designation into the National Wilderness Preservation System.
- There are rivers that are eligible for the National Wild and Scenic Rivers System that are not identified in the current forest plan.



There is a need for the revised forest plan to . . .

- update the spectrum of recreation opportunities and the suitability of areas for motorized vehicle use that reflect changing demographics and recreational demands.
- incorporate direction for existing special areas that were not included in the current forest plan.
- identify rivers that are eligible for the National Wild and Scenic Rivers System.
- evaluate lands for wilderness potential and, if appropriate, recommend designation by Congress.

Community-Forest Interaction

The Apache-Sitgreaves National Forests are literally the backyard for many residents of the White Mountains region of Arizona. Many communities adjoin the forests, while others are completely surrounded by the forests. Because of this close proximity, many communities and private landowners are directly affected by forest management decisions. These entities, in turn, affect forest management.

There has been a major increase in development, including seasonal homes on land adjoining or surrounded by the ASNFs. Demands related to this growth include access to the forests, utility corridors, roads, special use permits, and recreational opportunities. With more and more people residing in proximity to the forests, managers are challenged to provide the goods, services, and access that people demand.



Some of the concerns related to community-forest interaction include:

- Communities are at risk from uncharacteristic wildfire.
- There are increasing demands for goods, services, and forest access from growing populations and urban developments that border the forests.
- Many communities are surrounded by the forests and can be affected by adjustment to ASNFs' land ownership.
- Commodity use and production (e.g. grazing, logging) have shown declines from the past. However, these forest uses contribute to sustaining the lifestyles and traditions of local communities.
- Energy resource demands continue to grow, including the need for additional energy (utility) corridors for transmission lines.

There is a need for the revised forest plan to . . .

- reduce the risk to communities and natural resources from wildfire and provide guidance for addressing urban interface demands (access, trailheads, special use permits).
- address community expansion needs, preservation of open space, and water during land ownership adjustments.
- address a sustainable supply of forest and rangeland resources that is consistent with achieving desired conditions and that supports local communities.
- update the criteria for establishing new energy (utility) corridors.

References

U.S. Forest Service. 2008. Apache-Sitgreaves National Forests Ecological Sustainability Report. Springerville, Arizona.

U.S. Forest Service. 2008a. Apache-Sitgreaves National Forests Economic and Social Sustainability Assessment. Springerville, Arizona.

U.S. Forest Service. 2008b. Apache-Sitgreaves National Forests Resource Evaluations. Springerville, Arizona.

Appendix

A – Public Participation

A region wide effort began in 2005 to gather information about values, attitudes, and beliefs toward National Forest System lands. Focus groups sessions were conducted across the Apache-Sitgreaves National Forests (ASNFs) and resulted in two reports addressing public and Tribal beliefs and values, as well as community-agency-priorities and relationships.¹⁰

Beginning in 2006 the ASNFs conducted two sets of public meetings in locations across the forests; a total of 21 meetings which over 475 people attended. The forests also conducted several meetings to obtain forest employee, government agency, and Tribal input. The objective of these meetings was to obtain input regarding ASNFs' management, specifically what needs to change. Over 2,000 comments have been received from the public meetings, internal Forest Service meetings, comment forms, e-mails, letters, and phone calls.



Figure 20. Forest plan revision meeting held in January 2007 in Clifton, Arizona

A preliminary version of this document in newsletter format was distributed to the plan revision mailing list, issued in a news release, and posted on the forests' web site in July 2007. A request for review and comments accompanied this information.

Feedback gathered through these collaborative efforts has been used to help identify the revision topics outlined in the main body of the Comprehensive Evaluation Report.

Issues, Concerns, and Opportunities

The key issues, concerns, and opportunities that were raised during the public involvement efforts are summarized below. This information along with the science-based findings of the Apache-Sitgreaves National Forests Ecological Sustainability Report (U.S. Forest Service 2008), the Apache-Sitgreaves National Forests Apache-Sitgreaves National Forests Economic and Social Sustainability Assessment (U.S. Forest Service 2008a), and the Resource Evaluations (U.S. Forest Service 2008b) provide the basis for the need to revise the current forest plan.

Forest Health and Threats

Public input centered on the poor health of the forests stemming from past management practices (suppression of wildfires, lack of management action, etc.) and natural occurrences (climate and

¹⁰ John. C. Russel, Ph.D. and Peggy A. Adams-Russell. 2006. Values, Attitudes and Beliefs Toward National Forest System Lands: The Apache-Sitgreaves National Forests. Placerville, CA.

John. C. Russel, Ph.D. and Peggy A. Adams-Russell. 2006. Values, Attitudes and Beliefs Toward National Forest System Lands: Tribal Peoples. Placerville, CA.

drought, wildfire, insect and disease, etc.). Some symptoms of poor forest health include increases in density of trees, species mortality, loss of grasslands, and non-native invasive weed occurrence.

There was particular concern regarding the buildup of forest fuels and the threat of fire to life and property, including electric transmission lines.

Suggested remedies included: increased thinning of forest vegetation, providing a variety of vegetative compositions/structures, more stewardship projects, encourage demand for small diameter wood, utilizing prescribed and natural fire, creating new transmission corridors, and increasing protection and treatments around communities.

Motorized Vehicle Use and Access

With the concurrent implementation of the Travel Management Rule, there has been considerable input regarding use of motor vehicles on the forests and access to the national forests.

There were divergent views regarding the amount of roads (need more vs. need less) and the use of off-highway vehicles (OHVs) (ban OHVs vs. provide more opportunities). Positive and negative effects were identified: tourism and related economic benefits, access for persons with disabilities, access for emergency/fire vehicles, recreation opportunities, erosion, air and water quality, noise, etc.

Outdoor Recreation

The public expressed concerns about the growing numbers of visitors coming to the ASNFs and the forests' ability to provide adequate recreational opportunities. There were comments suggesting that there be no more recreational developments versus others that stated the need for more. Additional needs for certain types of dispersed recreation opportunities were identified (scenic, undisturbed/undeveloped areas, shooting areas, watchable wildlife, and scenic byways). There were a variety of comments related to trails, including non-motorized and motorized.

Wildlife and Fisheries

Input included the need to protect threatened and endangered species and improve fisheries. Opinions varied regarding how the Forest Service should manage for species including: wildlife habitat closure areas, old growth, and conflicts that arise when implementing the Endangered Species Act and multiple-use management.

Contributions to Local Communities

Community members identified a need for more social and economic opportunities related to the national forests, including: access to forest products, small timber sales, sustainable woody biomass, more stewardship projects, tourism, transportation system, and other traditional activities (logging, grazing).

There was a range of opinions regarding land exchanges—some wanted no more land exchanges while others wanted more. Comments identified the increased demand for infrastructure (roads, utilities, etc.) and special use permits related to increasing wildland-urban interface.

Special Areas

Special areas include roadless areas, wilderness, the Blue Range Primitive Area, wild and scenic rivers, and research natural areas. Opinions varied from needing less of these areas to needing more.

Uses of the National Forests

There was a variety of opinions regarding the various uses that should be allowed on national forests, from eliminating these uses to increasing them. Specific activities mentioned included grazing, logging, motorized vehicle use, mining, and recreational activities. Comments also highlighted the beneficial and harmful effects of these activities.

There was a request that the forests consider the need for existing and future energy corridors because of the expected demand for additional electric transmission lines.

American Indian Rights and Interests

The forests continue to consult with our tribal neighbors and will continue to incorporate their input into the revision process.

Heritage Resources

There were comments that emphasized protecting the cultural, historic, and prehistoric resources found on the forests.

Riparian and Water

There were divergent comments regarding riparian management, some requesting more emphasis on riparian management, while others stated that areas have been overprotected.

Other concerns included restoration of surface waters, water availability, water quality, and water rights.

Rangeland Management

There were comments that supported the activity of grazing while others wanted it managed differently or eliminated. Both beneficial and harmful effects of grazing were mentioned. Some comments indicated the need to recognize the importance of the ranching lifestyle. There was concern regarding some terminology regarding grazing that is used in the current forest plan. There were several comments regarding the specific wording of standards and guidelines in the current forest plan.

Non-Revision Issues, Concerns, and Opportunities

The following issues, concerns, and opportunities were identified but are not topics that should be addressed in the forest plan. They fall into one of the following categories: procedural or administrative (something we can already do); direction already stated in law, regulation or policy; beyond agency authority; or site-specific decisions.

Forest Communication and Management

Some members of the public expressed concern that laws, mandates, lawsuits, and appeals were affecting the forests' ability to manage. There were also recommendations that the forests consult and coordinate with local, State, and Federal agencies and organizations, and tribes.

There was a range of opinions regarding Forest Service management approaches, including decisions, management styles, priorities, and FS personnel actions. There was concern that past public involvement had not been effective and that the Forest Service needs to utilize public input.

Law Enforcement and Conservation Education

There was a range of opinion regarding the amount of law enforcement presence that was needed. There were concerns regarding the amount of garbage and litter being left on the forests. Several comments outlined methods to supplement law enforcement (AZGFD, citizen enforcement, charge fees to user groups) and increase compliance (increase education, review citations and fines, hotline for reporting violations).

The public emphasized the need to have more outreach and education regarding FS history and mission, natural processes, Leave No Trace, and wildlife.

Transportation System

Many comments and concerns were received about specific roads being open or closed, ineffectiveness of road closure devices, and impacts from implementation of the Travel Management Rule (dispersed camping, game retrieval, firewood).

Fire Management

Comments identified concerns with smoke impacts on the public and the need to close the forest sooner during high fire danger. A range of opinions surrounded whether Forest Service personnel should protect private structures during wildfire suppression.

Outdoor Recreation

There were several comments advocating the need for designated shooting areas on the forests. There were concerns regarding administration of special uses and maintenance of recreation facilities and trails. Comments included the need to provide more information regarding recreation opportunities. There was a range of opinions regarding fee campgrounds, as well as concessionaire-operated sites.

Rangeland Management

Several allotment management issues were identified including stocking rate, maintenance of range improvements (stock tanks, fences, etc.), allotment closures, and vehicle access. Various opinions were expressed regarding management of horses and the Heber Wild Horse Territory Management Plan.

Planning Process

There were concerns regarding the assessments, research, and procedures that would be used in the revision process. Comments stressed the need for effective monitoring and evaluation.