# Socio-Economic Assessment for the Apache-Sitgreaves National Forest

Prepared for the Southwest Region
USDA Forest Service

The University of Arizona
School of Natural Resources

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# Socioeconomic Assessment of the Apache-Sitgreaves National Forests

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The cover photo, also featured in *Tapamveni: The Rock Galleries of Petrified Forest and Beyond*, by Pat McCreery and Ekkehart Malotki, represents prehistoric Native American rock art from an area north of Sitgreaves N.F. The exact location is not specified in order to protect the art. The photograph is courtesy of Professor Ekkehart Malotki of Flagstaff, AZ.

This report was developed through the combined efforts of the Socioeconomic Team.
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# Abstract

This report presents findings from a five-county socioeconomic assessment of the area surrounding the Apache-Sitgreaves National Forests. The assessment is based on analysis of secondary data to inform forest staff, stakeholders, and communities of trends in seven topics: 1) demographic patterns and trends, 2) economic characteristics and vitality, 3) access and travel patterns, 4) land use, 5) forest users and uses, 6) designated areas and special places, and 7) community relationships. Findings from the analysis of socioeconomic data are consistent with those from similar studies throughout the region showing significant increases in population and housing, substantial economic shifts from extractive industries toward the service and professional sectors, and a land use policy environment largely affected by an abundance of public land and increasing urbanization. Although the study reveals differences in the demographic, economic, and land use patterns of each county, it also discusses issues of natural and cultural resource protection common to the entire region.

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## Acronyms

| | |
|---|---|
| AADT | Average Annual Daily Traffic |
| ADOC | Arizona Department of Commerce |
| ADOT | Arizona Department of Transportation |
| ADWR | Arizona Department of Water Resources |
| AIRFA | American Indian Religious Freedom Act |
| AMA | Active Management Area |
| ASNF | Apache-Sitgreaves National Forests |
| ATR | Automatic Traffic Recorder |
| AUM | Animal Unit Month |
| AZOT | Arizona Office of Tourism |
| AZSLD | Arizona State Land Department |
| BEA | Bureau of Economic Analysis |
| BLM | Bureau of Land Management |
| CDP | Census Designated Places |
| CE | Categorical Exclusions |
| CIP | Capital Improvement Plan |
| CLIMAS | Climate Assessment for the Southwest |
| CNF | Coronado National Forest |
| DEIS | Draft Environmental Impact Statement |
| EPA | Environmental Protection Agency |
| ESDA | Environmentally Sensitive Development Area |
| FHWA | United States Department of Transportation Federal Highway Administration |
| FMPO | Flagstaff Metropolitan Planning Organization |
| FS | Forest Service |
| FSH | Forest Service Handbook |
| GIS | Geographic Information System |
| IRA | Inventoried Roadless Areas |
| ITS | Intelligent Traffic Systems |
| KNF | Kaibab National Forest |
| LEIMARS | Law Enforcement and Investigations Management Attainment Reporting System |
| MCD | Minor Civil Division |
| MIG | Minnesota IMPLAN Group |
| MOU | Memorandum of Understanding |
| NACOG | Northern Arizona Council of Government |
| NAICS | North American Industry Classification System |
| NFMA | National Forest Management Act |
| NIFC | National Interagency Fire Center |
| NMDOT | New Mexico Department of Transportation |
| NRIS | Natural Resource Information System |
| NSRE | National Survey on Recreation and the Environment |
| NVUM | National Visitor Use Monitoring |
| OHV | Off-Highway Vehicle |
| PFNPO | Petrified Forest National Park Overlay |
| PILT | Payments in Lieu of Taxes |
| PNF | Prescott National Forest |
| PPI | Per Capita Personal Income |
| PRIA | Public Rangelands Improvement Act |

# Acronyms

| | |
|---|---|
| RAP | Roads Analysis Process |
| RARE | Roadless Area Review and Evaluation |
| ROS | Recreation Opportunity Spectrum |
| SOPA | Schedule of Proposed Action |
| TCP | Traditional Cultural Property |
| TDR | Transfer of Development Rights |
| TEIM | Tourism Economic Impact Model |
| TNF | Tonto National Forest |
| USFS | United States Forest Service |
| USFWS | United States Fish and Wildlife Service |
| VMT | Vehicle Miles Traveled |
| WMA | Waste Management of Arizona |

# Executive Summary

The purpose of this assessment is to profile the social and economic environment surrounding the Apache-Sitgreaves National Forests. The collection and analysis of quantitative and qualitative socioeconomic data in this report will serve as a baseline by which the Apache-Sitgreaves National Forests and the wider public can assess management alternatives developed through the process of forest plan revision. It will do so by 1) facilitating a better understanding of the relationship between public lands and surrounding communities, 2) aiding in the identification of specific forest plan elements capable of responding to socioeconomic trends, and 3) assembling a wide array of information need to evaluate trade-offs between various forest management alternatives.

Multi-county areas of assessment provide the framework for compiling social and economic data for this report. The boundaries of the Apache-Sitgreaves National Forests extend into or border five counties in eastern Arizona and western New Mexico. The methods of inquiry for this assessment were described in an initial work plan that was reviewed and approved by the Southwest Regional Office of the USDA Forest Service and by Forest Planners from each of the six national forests in Arizona. The plan identifies socioeconomic indicators, the geographic and temporal scale of analysis, and potential sources of information for each assessment topic. This Executive Summary highlights collected information pertaining to each of these seven topics.

### Demographic Patterns and Trends

#### *Total population*

Data from the 1980 and 2000 censuses show that total population growth was greatest in Coconino County over the twenty-year period. Nonetheless, population growth in all five counties was far less than that for their respective states over the same period. Population growth was minimal in Catron County, NM, and Greenlee County experienced a population decrease of -25.07% between 1980 and 2000. Among individual cities, Flagstaff reported the greatest increase in population over the twenty-year period. The rate of population increase, however, was largest in the communities of Sedona, Page, Whiteriver, and Pinetop-Lakeside.

#### *Population age*

Within the area of assessment, the population of individuals age 65 and over grew at a considerably higher rate between 1990 and 2000 than that of those under age 18. The exception to this trend was seen in Greenlee County which reported net population losses in both categories. The greatest disparities between the growth of the 65-and-over and under-18 populations were reported in Catron and Apache Counties. The cities of Snowflake, Showlow, and Springerville reported the most significant increases in 65-and-over populations among selected cities within the area of assessment.

#### *Racial/ethnic composition*

Navajo and Greenlee Counties reported the most significant increases in population of individuals of multiple race between 1990 and 2000, clearly outpacing increases in the same categories at the state level over the same period. Despite substantial increases in individuals of multiple-race and Hispanic ethnicity, Native Americans were the predominant racial group in Coconino and Navajo Counties, and remained the outright majority in Apache County as of 2000.

### *Housing*

Increases in total housing and housing density were greatest in Coconino and Navajo Counties between 1990 and 2000, mirroring similar growth in overall population. Navajo and Apache Counties reported increases in seasonal housing that far exceeded increases in the same category at the state level over the same period. Similarly, four of the five counties in the area of assessment experienced increases in median home values between 1990 and 2000 that were greater than the average for Arizona.

## Economic Characteristics and Vitality

### *Employment*

Economic growth for the area of assessment was relatively limited between 1990 and 2000. Each of the five counties reported increases in total full and part-time employment that were less than gains at the state level over the same period. As a whole, the area of assessment reported higher rates of unemployment than were average for Arizona, New Mexico, and the United States between 1980 and 2004.

### *Occupational structure*

As of 2000, four of the five counties within the area of assessment maintained occupational structures that closely resembled those of the states of Arizona and New Mexico overall. For these areas, management, professional, and related occupations grouping is the dominant occupational category, followed by sales and office occupations and finally, by service occupations. The exception is Greenlee County, which reported a relatively high percentage of construction, extraction, and maintenance occupations along with production, transportation, and material moving occupations.

### *Income*

Despite significant increases, each of the counties within the area of assessment maintained levels of per capita and median family income that were lower than average for their respective states as of 2000. Apache County saw the greatest increases in per capita and median family income between 1990 and 2000. Similarly, despite substantial declines poverty, four of the five counties reported levels of individual and family poverty which were greater than that of their respective states as of 2000.

### *Natural resource dependent economic activity*

Changes in income from natural resources were particularly dramatic in Coconino County between 1990 and 2000. Data for the county show a precipitous decline in income from wood products and processing and a substantial increase in income from special forest products and processing over the period. Navajo County reported similar, though less dramatic changes in the same categories. Each of the five counties within the area of assessment reported increases in tourism-related employment between 1990 and 2000 that exceeded increases at the state level.

## Access and Travel Patterns

### *Existing federal and state highway conditions*

County and state transportation plans reviewed for this assessment acknowledge that current circulation networks have been developed as needs have arisen and are therefore inadequate for accommodating projected long-term growth. As such, these plans emphasize the need for improved planning through regional approaches linking transportation and land use. According to the Arizona Department of

Transportation, projected demographic changes throughout the state will require "major expansions of roadway capacity and the development of transportation options and alternatives to provide acceptable levels of service on Arizona's roadways and maintain circulation" (ADOT 2004b).

### *Modes of travel and seasonal flows*

Travel by motorized vehicle is by far the most dominant mode of travel throughout the state of Arizona, a trend that is likely to continue given patterns of development in rural areas as well as the expense of developing infrastructure for alternative modes of transportation. Increase in vehicle miles traveled (VMT) was greatest in Coconino County between 1990 and 2000—an expected result of population increases over the same period. Peak traffic flow for the area of assessment occurs between the months of June and August, and traffic is lowest from November to February. With respect to internal modes of travel, the greatest increases were reported for off-highway vehicles (OHVs).

### *Planned improvements*

The Arizona Department of Transportation currently has plans for a number of road improvements in proximity to the Apache-Sitgreaves National Forests over the next five years, most of which involve road widening or resurfacing. Similarly, county governments throughout the area of assessment envision improvements to arterial road networks to accommodate expected population growth. There are currently no plans to expand the existing network of internal roads in the Apache-Sitgreaves National Forests.

### *Barriers to access*

On external road networks, the greatest barrier to access is likely poor road maintenance resulting from constrained county transportation budgets. Internally, the most common barrier to access in the Apache-Sitgreaves National Forests involves OHV use. Amid a significant increase in OHV use, the Apache-Sitgreaves National Forests have joined four other National Forests in Arizona in drafting a policy that would place greater restrictions on the access afforded to this rapidly expanding user group.

## Land Use

### *Land ownership*

As a whole, land ownership within the area of assessment differs from overall ownership patterns for the state of Arizona in that it involves relatively large amounts of Native American and Forest Service land. Navajo and Apache Counties have the greatest percentage of Native American lands whereas Catron and Greenlee Counties have far and away the greatest amount of land controlled by the Forest Service. Catron County reported the greatest percentage of private land and Greenlee County had the greatest percentage of State Trust land as of 2005.

### *Land coverage and land use*

Mixed range land constitutes the predominant land cover in Apache and Navajo Counties whereas shrub and brush rangeland is most common in Catron and Greenlee Counties. Evergreen forest is the predominant land cover in Coconino County. Within the area of assessment, Navajo County reported the highest percentage of residential cover (.31%), while Coconino had the greatest percentage of commercial land cover (.17%) and Greenlee County reported the highest percentage of industrial land cover (.43%).

### *Long range land use plans and local policy environment*

County land use within the area of assessment ranges from traditional uses such as ranching in rural areas to denser concentrations of residential, industrial, and commercial uses in and around urban centers. Preservation of open space is a particularly important land use issue given both the public's desire to maintain the "rural character" of county lands and the need to accommodate rapidly growing populations and municipalities. The provision of adequate, affordable infrastructure and sufficient water supplies is also a growing concern for planners, residents, and land managers throughout the region.

## Forest Users and Uses

### *Extractive uses*

Historically, extractive uses have played a major role in public land management throughout the area of assessment. National studies show, however, that land uses such as livestock grazing, timber cutting, and mining are being slowly succeeded in policy and management by an emphasis on non-extractive uses. These national trends are supported by information which suggests similar declines in livestock grazing and mining on lands managed by the Apache-Sitgreaves National Forests. Forest thinning and treatment projects proposed in the wake of the Rodeo-Chediski fire have contributed to an intense public debate over appropriate fire prevention and management.

### *Non-extractive uses*

Although recreation use has increased steadily since the establishment of the National Forest Service, the increase in recreation over the past few decades has been particularly dramatic. According to National Visitor Use Monitoring data, the Apache-Sitgreaves National Forests received approximately 2 million visits during fiscal year 2001—a majority of which were male, white, and between the ages of 31 and 70. A significant increase in the use of off-highway vehicles (OHVs) has been identified by the Forest Service as a major component of unmanaged recreational use.

### *Special uses*

A number of special user groups were identified for the Apache-Sitgreaves National Forests including Native American tribes, OHV users, wildlife users, and wilderness users. The management and accommodation of these and other special user groups has involved increasing administrative and political implications in recent years.

## Designated Areas and Special Places

### *Natural, recreational and interpretive resources*

The Apache-Sitgreaves National Forests encompass considerable natural, recreational, cultural, and interpretive resources including over 250 boating sites, trailheads, and wilderness areas.

### *Issues surrounding identification of cultural resources*

Due to the cultural, emotional, and spiritual bonds formed between individuals and specific environments, the identification and management of special places can be rather contentious. Making these tasks more difficult is the fact that relationships people form with special places often cut across traditional boundaries dividing liberal and conservative political ideologies, extractive and environmentalist

interests, and urban and rural user groups. Ultimately, incorporation of "special places" into revised Forest Plans is best supported by a commitment to primary research and participatory decision making.

## Community Relationships

### *Community involvement with natural resources*

The communities surrounding the Apache-Sitgreaves National Forests have long been dependent upon natural resources for commodity production, tourism, and aesthetic enjoyment. A review of state and local newspapers reveals a general interest in the use and management of forest resources with particular attention paid to the effects of fire and recreational uses such as hunting and fishing.

### *Communities of interest and historically underserved communities*

The management activities of the Apache-Sitgreaves National Forests must take into account the interests of a growing number of community groups and forest partners. Organizations and individuals influencing forest planning and management represent government agencies, Native American tribes, special advocacy groups, business interests, educational institutions, and the media. Meanwhile, the Forest Service is making a concerted effort to address the needs and desires of historically underserved communities, a fact that is increasingly important to the Apache-Sitgreaves National Forests given the rates of demographic change in the region.

### *Community/forest interaction*

In recent years the Forest Service has placed increasing priority on the social relationships between national forests and surrounding communities. As awareness and commitment to these processes grow, so does the need for forest managers and planners to understand the dynamic linkages between the forest and surrounding communities. Although the concept of community relations is a relatively new component of forest planning, frameworks exist to help planners develop a comprehensive strategy for monitoring and enhancing these relationships.

## Key Resource Management Topics

In addition to the initial seven topics of socioeconomic assessment, forest planners identified several issues of growing importance to the management of natural resources within Arizona's national forests. Although these issues are identified throughout previous chapters, this section provides greater detail on the status of policy debates as well as potential implications for forest planning and management.

Findings suggest that changing demographic patterns and forest user trends will surely affect the alternatives considered in the process of Forest Plan revision. In particular, a significant increase in recreational forest uses and the ongoing concern surrounding susceptibility to catastrophic wildfire and invasive species, the environmental and economic sustainability of livestock grazing on public lands, and the effects of human land use on existing open space will likely continue to have a strong impact on future management activities of the Apache-Sitgreaves National Forests.

Given rates of population growth and urban expansion in Arizona and New Mexico, the Apache-Sitgreaves National Forests stand to be affected by ongoing debates regarding the management of public land and regional water supplies. Reforms proposed by lawmakers and the Arizona State Land Department are likely to have an impact on the forest given the amount of State Trust land within the area of assessment. Likewise, the role of managing regional watersheds places the Apache-Sitgreaves National Forests at the center of contentious debates over water provision, particularly in light of the ongoing regional drought.

Finally, specific issues under the heading of forest access and travel will undoubtedly affect the future management activities of the Apache-Sitgreaves National Forests. Recent reinterpretation of the "Roadless Rule" has been a particularly controversial issue involving extractive business interests, environmental advocacy groups, and the general public at the local and state level. Additionally, the effort on the part of the Forest Service to respond to a dramatic increase in OHV travel promises to raise concerns from various user groups and to affect natural resource management in the Apache-Sitgreaves National Forests over the coming years.

# 1. Introduction

## 1.1 Statement of purpose

The purpose of this assessment is to characterize the social and economic environment of the Apache-Sitgreaves National Forests (ASNF) by showing the relationship and linkages between National Forest System land and communities. The information contained in the assessment is intended to help the Forest Service and the public to do the following:

- Better understand the relationship between public lands and communities,
- Aid in identifying specific elements of the current forest plans that may need to be changed, and
- Assemble information needed to evaluate trade-offs between options for future forest management.

Finally, this assessment is intended to be broadly useful as a basis for well-informed consideration of future alternatives within and beyond the planning process. It does so by clarifying relationships between various socioeconomic characteristics of local communities and the natural resource management activities of the Apache-Sitgreaves National Forests.

## 1.2 Assessment methodology and topics

This assessment of the social and economic environment surrounding the ASNF is based entirely on the analysis of secondary research. Secondary research is defined as data which have already been collected and published for different purposes but which may prove useful in any number of other inquiries or applications. Examples of secondary data include demographic and economic information compiled by the United States Census Bureau as well as information contained in FS documents.

Specific lines of inquiry were identified in the initial Project Work Plan agreed to by the University of Arizona and Region 3 of the USFS in Albuquerque, New Mexico. This document prescribes the methods of assessment of socioeconomic trends for each of Arizona's six national forests. In addition to individual information elements for each assessment topic, this document identifies the desired geographic and temporal scales of analysis as well as potential sources of information.

In accordance with the Work Plan, and following the example of similar socio-economic assessments, this study uses counties as the primary unit of analysis for social and economic data. For each of the national forests in Arizona, the area of assessment consists of all counties adjacent to particular forest boundaries. For the Apache-Sitgreaves National Forests, this includes Apache, Navajo, Greenlee, and Coconino Counties in the eastern and central portions of Arizona and Catron County in western New Mexico.[1] Where appropriate, social and economic trends for the area of assessment are compared to those for the states of Arizona and New Mexico. It should be noted, however, that statewide trends for Arizona are significantly influenced by Maricopa County which was home to nearly sixty percent of the entire state population as of 2000.

In addition to analyzing information at the county and regional levels, this assessment includes data on individual communities of interest to ASNF. The Work Plan defines communities of interest as those that are proximate to forest boundaries, those which share a stake in the management of the forest, and those communities of access and egress. During the collection of demographic and economic data, the decision was made to collect information on selected Census Designated Places (CDPs) as well as the more

[1] A significant discrepancy is noted among various maps of the Apache National Forest. While some suggest that the Apache Forest extends well into Catron County, New Mexico (c.f. http://www.fs.fed.us/recreation/map/xaz_nm_tx.html), available G.I.S. and administrative maps describe the ASNF boundary as ending at the Arizona–New Mexico border. This assessment is based on the latter description.

commonly used Minor Civil Divisions (MCDs). Inclusion of CDPs provides data for settled population concentrations that are identifiable by name but are not legally incorporated under the laws of the state in which they are located (U.S. Census Bureau 2005). Social and economic information on individual communities within Catron County was extremely limited. Where available, information on Reserve, the Catron County seat, is included in the assessment.

The report provides a profile of socioeconomic conditions and trends deemed most relevant to natural resource policies in general and the management of Arizona's national forests in particular. Secondary demographic, economic, and social data have been drawn from readily available sources, including the U.S. Census Bureau, the USFS Natural Resource Information System (NRIS), and the Minnesota IMPLAN Group (MIG). The information contained in this report is well suited to serve as a comparative baseline for each of the counties, presenting descriptive data to assist the ASNF and local communities analyze and monitor trends most likely to influence the management of forest resources throughout the region.

Specific variables used to profile existing socioeconomic conditions and trends within the geographic area of assessment are based on both explicit and implicit assumptions about relationships between various forest management alternatives and affected communities. The individual topics of assessment and specific variables have been identified in conjunction with regional and local FS administrators and are similar to measures used in other social assessment studies (Adams-Russell 2004; Leefers, Potter-Witter, and McDonough 2003). The profiles, generated through collection of secondary data, will serve as valuable tools for estimating the potential impact of policy changes, resource management activities, and development trends for each of the assessment topics.

### 1.3 Report organization

The organization of this assessment is based on the collection and analysis of data pertinent to each of seven individual assessment topics. Following this introductory chapter, collected data on selected socioeconomic indicators are provided for each topic. Additionally, each topic is discussed in its historical context as well as its potential implications for forest planning and management. Chapters 2 and 3 provide information on demographic trends and economic characteristics of counties and selected cities within the area of assessment. Chapter 4 discusses the access and travel patterns within the area of assessment, and Chapter 5 examines land use patterns and policies. Chapter 6 uses available secondary data to discuss trends for current forest users and uses. Chapter 7 identifies designated areas and known special places within the Apache-Sitgreaves NF and discusses their importance to forest management. Chapter 8 assesses relationships between the ASNF and various communities at the local and regional levels. Chapter 9 offers a brief analysis of key management topics identified by forest planners at the inception of this assessment. The final chapter summarizes major trends within each topical area and discusses their combined relevance to Forest Plan revision. A list of works cited is included in this assessment and a separate, fully annotated bibliography will be presented to individual forests alongside the assessments.

# 2. Demographic Patterns and Trends

This section discusses historic and current social conditions affecting local populations and illustrates demographic trends for each of the five counties within the area of assessment for the Apache-Sitgreaves National Forests (ASNF). Data on selected cities within the area of assessment are also included in order to illustrate important factors contributing to demographic change for specific populations. Indicators used to assess demographic patterns and trends include total population, racial/ethnic origin, urban versus rural populations, age structure, educational attainment, and housing density.

A review of secondary social data for area of assessment shows that the region's population has grown at a slower rate than that for the entire state over the last two decades and is expected to continue to do so through 2030. Most of the urban areas within the region can be characterized as small towns with Flagstaff being the only city to report more than 11,000 residents as of 2000. In general, the region's population of individuals under 18-years old has grown at a limited pace when compared to statewide averages. The opposite is true for populations of individuals 65 and over, which, with the exception of Greenlee County, have far exceeded increases in the retirement age population at the state level. On a related note, the region experienced substantial growth in seasonal housing units between 1990 and 2000, particularly in Navajo County. In terms of racial and ethnic diversity, data show that Native Americans comprise a relatively large portion of the regional populations. The decade between 1990 and 2000 also saw increases in multiple race and Hispanic populations for each county in the area of assessment.

## 2.1 Historical context and social characteristics

Human interaction with the lands including and surrounding the Mogollon Rim has been continuous for at least 5,000-6,000 years. The first communities in the region were highly mobile hunting and gathering camps that had only a light effect on the landscape. During the period of time between C.E. 100 and C.E. 900, the resident populace established a more sedentary lifestyle. This transition was typified along the Arizona highlands by cultures such as the Anasazi and the Hohokam. There was an increased use of ceramics, development of more complicated architecture, and the beginnings of horticulture and domesticated livestock. This more sedentary lifestyle led to an associated rise in human population. By the periods encompassing C.E. 900-1200, more long-term human effects were noticeable on the environment, including a depletion of wild game, the institution of standing agricultural fields, and the resultant diversion of water sources (USFS 1999a).

The entrance of Francisco Vasquez de Coronado in 1540 marked the first significant Spanish interest in the Arizona highlands. On a route that led from western Mexico to central Kansas, Coronado's explorations were primarily motivated by a search for silver and gold. He failed to find it in Arizona, and Spanish interest in the area was largely quelled until the discovery of mineral wealth at the turn of the 17$^{th}$ century (Sheridan 1995). Athapaskan (Apache and Navajo) groups played a major role during this time. In fact, the mountainous regions of Arizona were often referred to as the Apacheria. Apaches formed loosely confederated groups based on matrilineal kinship and thrived on a combination of agriculture, hunting, trade, and raiding. Both Navajos and Apaches absorbed skills and traits from neighboring groups, including the Pueblo peoples and the Spaniards. Through most of Spanish and Anglo colonization, Apache raiders were seen as a major threat to settlers. Nonetheless, by the 1700s, Spanish explorers and missionaries routinely made the trip between Tucson and Santa Fe. The area became, by the 1800s, a driving route for livestock, specifically sheep, primarily by Mormon settlers. Due to limited water sources, overgrazing occurred primarily near standing aquifers. However, with the spread of standing agriculture, the pressures of grazing began to spread across the range (USFS 1999a).

In August, 1898, the Black Mesa Forest reserve was established, followed by Roosevelt's proclamation of the National Forest Service in 1907 and, by 1930, the Apache and Sitgreaves National Forests were

among fourteen such protected areas in Arizona. The borders of the parks fluctuated wildly as government decrees shifted land from one protected designation to another. In addition, private ownership contracts impeded the National Forest Service's attempts to consolidate the borders of forest lands. One such conflict between public and private interests began with an 1866 congressional "right-of-way" allowance to the Atlantic-Pacific Railroad and resulted in the return of the land to the forests only after over 100 years of complicated sales and trades which finally brought 68,000 of the approximately 98,000 original acres back into the Apache and Sitgreaves in the 1980s. In 1974, the Apache and Sitgreaves National Forests were administratively merged (Baker et al. 1988).

Today's Apache-Sitgreaves National Forests cover just over two million square acres, stretching from the Western edge of New Mexico through Greenlee and Apache Counties with a band arching up through Navajo County where it runs into the Coconino and Tonto National Forests. Its elevation fluctuates from 3,500 feet at its lowest point to as high as 11,500 feet at the top of Mount Baldy, providing a wide range of climates, ecosystems, wildlife habitats, and recreational opportunities. In addition, the forest continues to provide integral natural resources to Arizona by way of mining, lumber, and other industries.

The demographic history of the area surrounding the ASNF, and the region as a whole, represents one of sustained and rapid growth. In the period since 1930, the Mountain West has doubled its share of the U.S. population, from 3% to 6.5%. This growth increased dramatically in the 1950s and then reduced again in the 1960s. The pattern was repeated for the next forty years, with alternating decades of intense growth followed by decades of slower growth (Otterstrom and Shumway 2003). The three most populous counties surrounding the Apache-Sitgreaves have, in general, grown steadily over the past ninety years; by contrast, Greenlee County has seen precipitous drops over the past thirty years. Apache County has seen heavy growth, especially in the decade between 1970 and 1980, during which the county population nearly doubled from 32,000 residents to 52,000. Coconino County has itself grown at an average of just above 3% per year over the past fifty years, and over the past century, the counties which are home to the Apache-Sitgreaves have grown from 22,600 residents to nearly 300,000 (U.S. Census Bureau 2005, Forstall 1995, Morton 2003). The state of Arizona has grown from 120,000 residents to well over 5 million—along with Washington, only one of two states to show such startling demographic expansion (U.S Census Bureau 2005). Long-term population increases are also supported by seasonal visitors wishing to permanently relocate to environs with increased outdoor opportunities (McHugh and Mings 1996).

The past fifty or sixty years have seen only moderate racial diversification the state of Arizona. While the Hispanic presence has increased from 20.4% to 25.2% of the total population since 1940, African Americans, despite an especially rapid influx in the two decades following WWII and an average population growth rate of 49% per decade, remained static at 3.1% of the population in 2000, only 0.1% above their relative numbers in 1940. The Native American population as a percentage of the total in Arizona, by contrast, has declined significantly over the past five or six decades, falling from 11% in 1940 to 5% in 2000. (U.S. Census Bureau 2005). [2]

[2] The specific numbers for these historical comparisons are found at http://www.census.gov/population/documentation/twps0056/ in the U.S. Census Bureau website (Table 17) and are juxtaposed against the Census 2000 findings.

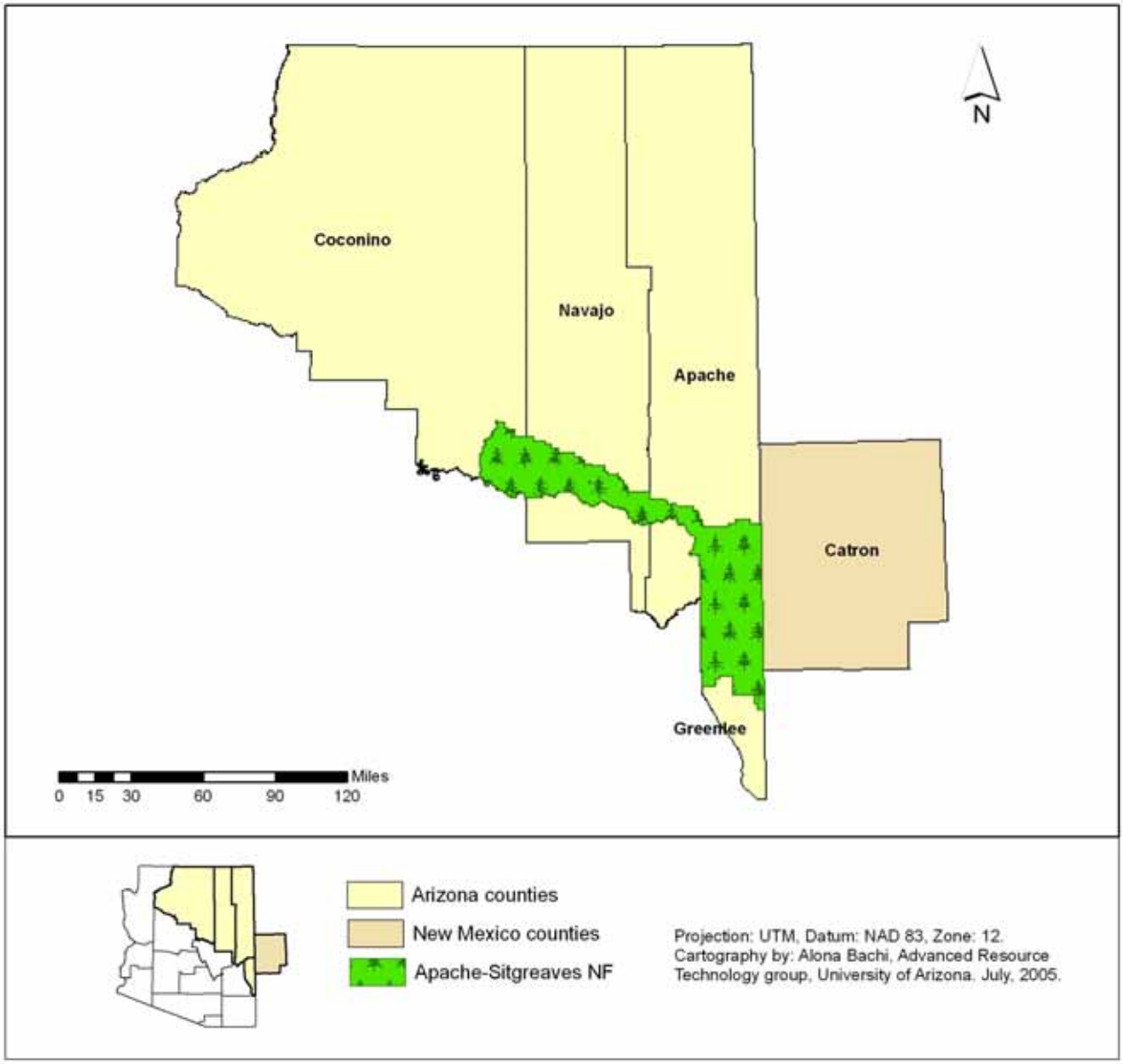



**Figure 1. Map of Forest Boundaries and Counties in Area of Assessment**

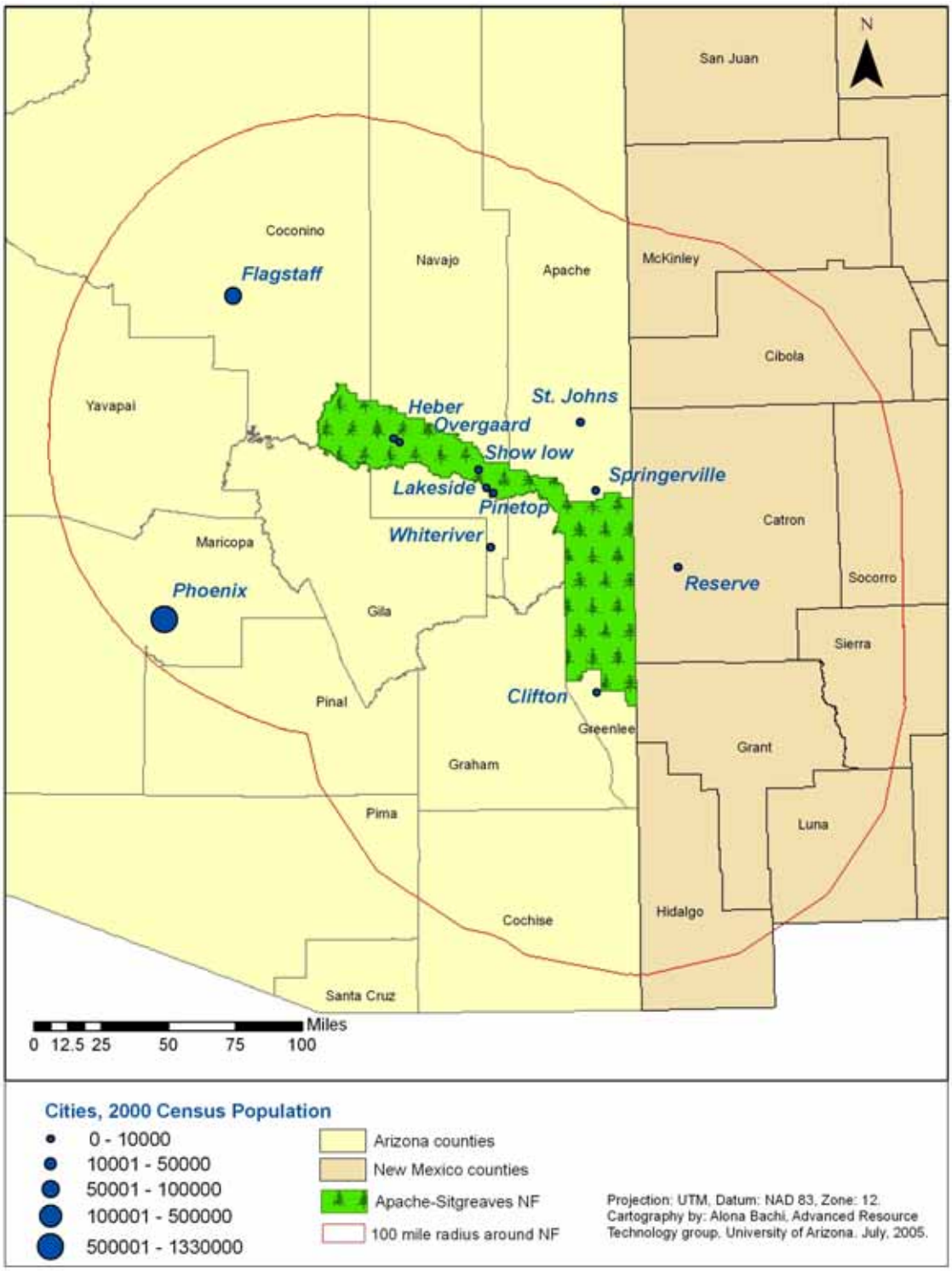



**Figure 2. Proximity of Population – Municipalities within 100-Mile Radius**

## 2.2 Population, age structure, net migration, and tourism

Total land area, total population, population density, and Forest Service acreage is shown for each of the five counties and selected places in Table 1. Data show that Coconino County is the most populous county and has both the largest total area as well as the greatest amount of FS land with well over 3 million acres. Catron County has by far the smallest population per total land area resulting in a population density of one individual for every two square miles. In contrast, Navajo is the most densely populated of the five counties with 9.79 people per square mile. Table 1 shows that Flagstaff is by far the most populous city within the area of assessment with a population of 52,894 as of 2000. All other towns throughout the region support much smaller populations, the least of which was Reserve, NM with a population of 387 in 2000.

Population change for each of the five counties and selected places is presented in Table 2. With the exceptions of Greenlee and Catron Counties, both of which saw declines in their relatively small populations between 1980 and 1990, each county has experienced net population growth. Still, data show that the rate of growth for each county over the past two decades has remained well below the rate of growth for the state of Arizona as a whole. While Coconino County experienced significant growth between 1980 and 1990, the rate of growth slowed considerably over the next decade. The population of the city of Page mirrored this pattern, expanding by 191% between 1980 and 1990 before slowing dramatically over the next decade. Demonstrating an opposite trend, population growth within Navajo County between 1990 and 2000 far exceeded that of the previous decade. Table 2 also shows that the population of Greenlee County has stabilized following sharp declines in the local labor market as a result of the scaling back of mining activities in the mid 1980s. The influence of changing local economies is also seen in the sharply declining populations of mining towns like Clifton and Morenci which were at least partially offset by gains in Whiteriver and Pinetop-Lakeside during the same period. While the rate of population growth within Greenlee County appears to have stabilized, it remains the lowest of the four Arizona counties and far below that of the state as a whole.

## Table 1. Total Area, Total Population, Population Density, and Forest Service Acreage by County and Place

| County/Place | Total Area Sq. Miles | 2000 population | Pop. Density per sq. mile | USFS Acres |
|---|---|---|---|---|
| **Apache County** | 11,218.4 | 69,423 | 6.2 | 492,814 |
| Eagar | 11.3 | 4,033 | 356.9 | n/a |
| St. Johns | 6.6 | 3,269 | 495.3 | n/a |
| Springerville | 11.5 | 1,972 | 171.5 | n/a |
| **Coconino County** | 18,661.2 | 116,320 | 6.2 | 3,275,320 |
| Flagstaff | 63.6 | 52,894 | 831.7 | n/a |
| Sedona | 18.6 | 10,192 | 548.0 | n/a |
| Page | 16.6 | 6,809 | 410.2 | n/a |
| Williams | 43.5 | 2,842 | 65.3 | n/a |
| Fredonia | 7.4 | 1,036 | 140.0 | n/a |
| **Greenlee County** | 4,641.1 | 8,547 | 1.8 | 751,060 |
| Clifton | 14.9 | 2,596 | 174.2 | n/a |
| Morenci | 0.8 | 1,879 | 2,348.8 | n/a |
| **Navajo County** | 9,959.5 | 97,470 | 9.8 | 488,158 |
| Show Low | 27.9 | 7,695 | 275.8 | n/a |
| Whiteriver | 17.8 | 5,220 | 293.3 | n/a |
| Snowflake | 30.8 | 4,460 | 144.8 | n/a |
| Pinetop-Lakeside | 11.3 | 3,582 | 317.0 | n/a |
| Heber-Overgaard | 7.0 | 2,722 | 388.9 | n/a |
| **Catron County, NM** | 6,927.8 | 3,543 | 0.51 | 2,222,895 |
| Reserve | .56 | 387 | 696.24 | n/a |

Source: NRIS - Human Dimensions

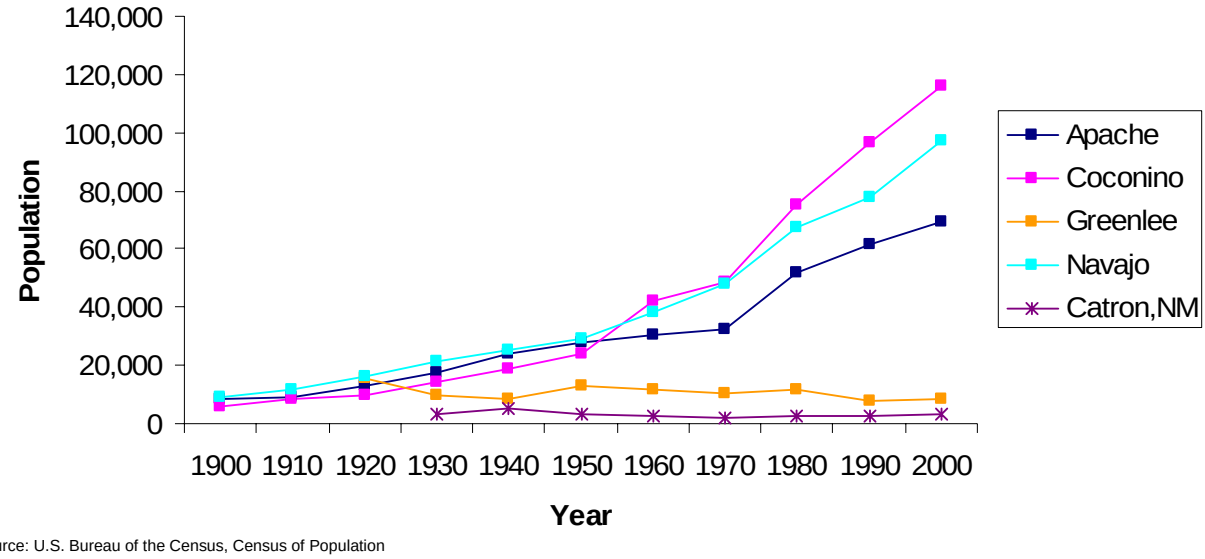
http://www.epodunk.com/cgi-bin/genInfo.php?locIndex=17798

**Table 2. Decennial County, Place, and State Populations, 1980-2000 and % Change**

| County/Place/State | Total Population 1980 | 1990 | 2000 | 1980-1990 % Change | 1990-2000 % Change |
|---|---|---|---|---|---|
| **Apache County** | 52,108 | 61,591 | 69,423 | 18.20% | 12.72% |
| Eagar | 2,791 | 4,025 | 4,033 | 44.21% | 0.20% |
| St. Johns | 3,368 | 3,294 | 3,269 | -2.20% | -0.76% |
| Springerville | 1,452 | 1,802 | 1,972 | 24.10% | 9.43% |
| **Coconino County** | 75,008 | 96,591 | 116,320 | 28.77% | 20.43% |
| Flagstaff | 34,743 | 45,857 | 52,894 | 31.99% | 15.35% |
| Sedona | 4,907 | 7,645 | 10,192 | 55.80% | 33.32% |
| Page | 2,266 | 6,598 | 6,809 | 191.17% | 3.20% |
| Williams | 5,368 | 2,461 | 2,842 | -54.15% | 15.48% |
| Fredonia | 1,040 | 1,197 | 1,036 | 15.10% | -13.45% |
| **Greenlee County** | 11,406 | 8,008 | 8,547 | -29.79% | 6.73% |
| Clifton | 4,245 | 2,771 | 2,596 | -34.72% | -6.32% |
| Morenci | 2,736 | 1,868 | 1,879 | -31.73% | 0.59% |
| **Navajo County** | 67,629 | 77,658 | 97,470 | 14.83% | 25.51% |
| Show Low | 4,298 | 5,019 | 7,695 | 16.78% | 53.32% |
| Whiteriver | 2,256 | 3,738 | 5,220 | 65.69% | 39.65% |
| Snowflake | 3,510 | 3,679 | 4,460 | 4.81% | 21.23% |
| Pinetop-Lakeside | 1,527 | 2,422 | 3,582 | 58.61% | 47.89% |
| Heber-Overgaard | n/a | n/a | 2,722 | n/a | n/a |
| **Catron County** | 2,720 | 2,563 | 3,543 | -5.77% | 38.24% |
| **Arizona** | 2,718,215 | 3,665,228 | 5,130,632 | 34.84% | 39.98% |
| **New Mexico** | 1,302,894 | 1,515,096 | 1,819,046 | 16.29% | 20.06% |

Source: NRIS - Human Dimensions

http://www.epodunk.com/cgi-bin/genInfo.php?locIndex=17798




Source: U.S. Bureau of the Census, Census of Population

**Figure 3. Five-County Assessment Area Population Change, 1900-2000**

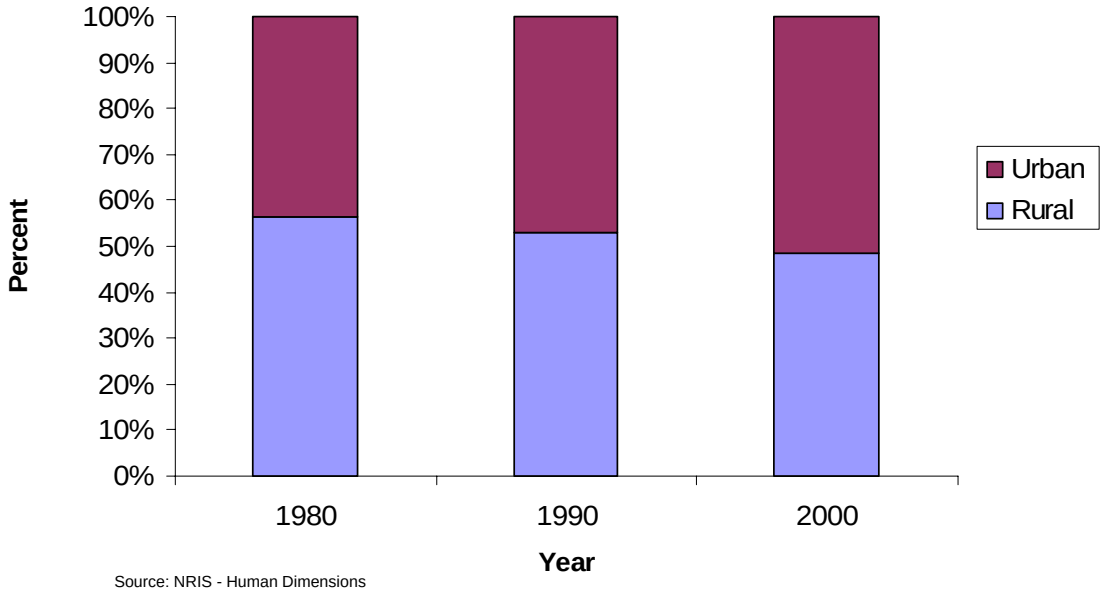
Table 3 demonstrates interesting trends in the overall urban/rural structure of the populations for each of the five counties in the area of assessment. As of 1980, populations within Apache and Navajo Counties could be characterized as predominantly rural whereas those of Coconino and Greenlee Counties were largely urban. Between 1980 and 2000, the assessment area witnessed interesting trends in the urban/rural composition of county populations. The urban population of Greenlee County was significantly affected by the aforementioned changes in the local labor market. Similarly, Apache and Coconino Counties saw significant increases in rural population concurrent with an increase in seasonal housing. During the same time period, Greenlee and Navajo Counties reported relatively strong growth in urban populations. Further evidence of these divergent patterns is offered by Apache County's net decrease in urban population and Greenlee County's comparable loss of rural residents between 1990 and 2000. Given its extremely low population density, the census bureau categorizes the population of Catron County as entirely rural.

The age structure of populations for each of the five counties and selected places is presented in Table 4. Data show a clear difference in population trends for individuals under 18 and those 65 and over for each of the counties and places of the counties with the exception of Greenlee County, which witnessed declines in both age groups between 1990 and 2000. Perhaps the most dramatic distinction can be seen in Apache County, where the under-18 population declined and the 65-and-over population grew significantly in Eager, St. Johns, and Springerville. The contrast between growth rates in these age groups was also significant in Catron County. In fact, all five counties saw relatively minor increases in the number of individuals under 18 when compared to that of the Arizona over the same period. Growth rates for the under-18 population were also considerably lower than overall population growth within these same counties between 1990 and 2000. Conversely, the 65-and-over population for each of the five counties grew at a higher rate than was average for its respective states and considerably higher than county populations as a whole. Catron County experienced the highest rate of increase in the 65-and-over population at 70.59%. In sheer number, however, Navajo County experienced a more significant increase in individuals 65 and over with a gain of 54.86% between 1990 and 2000. Among cities, Show Low and Snowflake saw the largest increases in the 65-and-over population with growth rates of 85% and 87% respectively. Again, the exception to this overall trend is Greenlee County, which experienced a five percent decrease in the number of individuals 65 and over between 1990 and 2000.

**Table 3. Urban and Rural County Populations 1980-2000 and % Change**

| County | | 1980* Population | 1980* % of Total | 1980* % Change | 1990 Population | 1990 % of Total | 1990 % Change | 2000 Population | 2000 % of Total | 2000 % Change |
|---|---|---|---|---|---|---|---|---|---|---|
| **Apache** | Urban | 12,405 | 23.81% | n/a | 19,941 | 32.38% | 60.75% | 16,606 | 23.92% | -16.72% |
| | Rural | 39,703 | 76.19% | n/a | 41,650 | 67.62% | 4.90% | 52,817 | 76.08% | 26.81% |
| **Coconino** | Urban | 46,473 | 61.96% | n/a | 63,988 | 66.25% | 37.69% | 74,462 | 64.01% | 16.37% |
| | Rural | 28,535 | 38.04% | n/a | 32,603 | 28.03% | 14.26% | 41,858 | 35.99% | 28.39% |
| **Greenlee** | Urban | 6,981 | 61.20% | n/a | 2,759 | 34.45% | -60.48% | 4,324 | 50.59% | 56.72% |
| | Rural | 4,425 | 38.80% | n/a | 5,249 | 65.55% | 18.62% | 4,223 | 49.41% | -19.55% |
| **Navajo** | Urban | 24,857 | 36.75% | n/a | 28,784 | 37.07% | 15.80% | 40,937 | 42.00% | 42.22% |
| | Rural | 42,772 | 63.25% | n/a | 48,874 | 62.93% | 14.27% | 56,533 | 58.00% | 15.67% |
| **Catron, NM** | Urban | 0 | 0% | n/a | 0 | 0% | 0% | 0 | 0% | 0% |
| | Rural | 2,720 | 100% | 0% | 2,563 | 100% | 0% | 3,543 | 100% | 0% |

NB: % Total is the percentage of total population. % Change is the percentage of change from prior census year
*Does not account for farming populations
Source: NRIS - Human Dimensions




Source: NRIS - Human Dimensions

**Figure 4. Five-County Assessment Area Urban/Rural Composition, 1980-2000**

**Table 4. Age Structure of County, Place, and State Populations (under 18 and 65+), 1990-2000 and % Change**

| | Under 18 | | | 65 And Over | | |
|---|---|---|---|---|---|---|
| **County/Place/State** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** |
| **Apache County** | 25,974 | 26,731 | 2.91% | 3,939 | 5,741 | 45.75% |
| Eagar | 1,709 | 1,461 | -14.51% | 255 | 373 | 46.27% |
| St. Johns | 1,504 | 1,160 | -22.87% | 212 | 341 | 60.85% |
| Springerville | 612 | 576 | -5.88% | 172 | 288 | 67.44% |
| **Coconino County** | 29,624 | 33,425 | 12.83% | 5,585 | 8,143 | 45.80% |
| Flagstaff | 11,321 | 12,834 | 13.36% | 1,988 | 2,826 | 42.15% |
| Sedona | 1,098 | 1,401 | 27.60% | 2,456 | 2,605 | 6.07% |
| Page | 2,559 | 2,178 | -14.89% | 351 | 432 | 23.08% |
| Williams | 743 | 847 | 14.00% | 323 | 316 | -2.17% |
| Fredonia | 470 | 335 | -28.72% | 72 | 115 | 59.72% |
| **Greenlee County** | 2,735 | 2,712 | -0.84% | 894 | 849 | -5.03% |
| Clifton | 885 | 839 | -5.20% | 358 | 283 | -20.95% |
| Morenci | 804 | 669 | -16.79% | 14 | 12 | -14.29% |
| **Navajo County** | 29,858 | 34,527 | 15.64% | 6,301 | 9,758 | 54.86% |
| Show Low | 1,682 | 2,248 | 33.65% | 622 | 1,151 | 85.05% |
| Whiteriver | 1,779 | 2,317 | 30.24% | 108 | 166 | 53.70% |
| Snowflake | 1,712 | 1,691 | -1.23% | 254 | 475 | 87.01% |
| Pinetop-Lakeside | 659 | 912 | 38.39% | 361 | 531 | 47.09% |
| Heber-Overgaard | n/a | 589 | n/a | n/a | 610 | n/a |
| **Catron County** | 688 | 747 | 8.58% | 391 | 667 | 70.59% |
| **Arizona** | 978,783 | 1,366,947 | 39.66% | 477,200 | 667,839 | 39.95% |
| **New Mexico** | 446,439 | 508,574 | 13.92% | 162,518 | 212,225 | 30.59% |

Source: NRIS - Human Dimensions
tp://www.epodunk.com/cgi-bin/genInfo.php?locIndex=17798

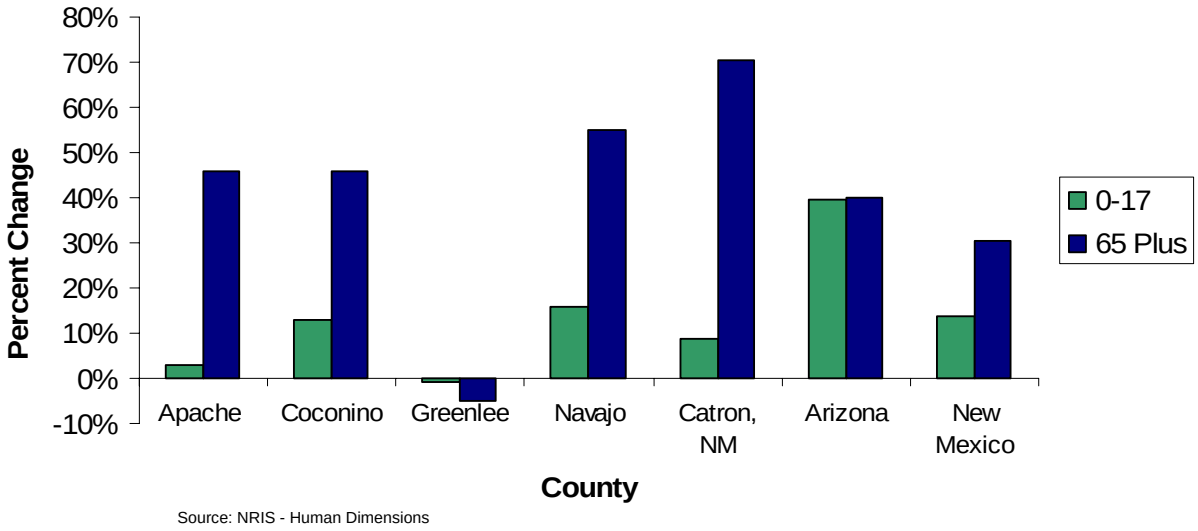



**Figure 5. Percent Change under-18 and 65+ Populations by County, 1990-2000**

Table 5 presents data on net migration for each county through the years 1990 and 2000 as well as the percent change. The data represent numbers of individuals who reported living in a different location five years previously. As such, the 1990 data provide information on location of residence in 1985 and 2000 data indicate location of residence in 1995. Once again, net migration data show that population growth within the area of assessment has been relatively slow with limited in-migration of individuals previously living outside the county. The exceptions to this trend were Apache and Navajo Counties, both of which reported relatively strong growth in individuals migrating to the area from other states as well as from different counties within Arizona. The greatest numbers of individuals moving in from out-of-state came from the West and the Midwest. Coconino County, however, reported a significant increase in the number of migrants from the Northwest over the period. Finally, both Apache and Navajo Counties reported significant increases in the number of individuals migrating from "elsewhere" (different countries) over the period.

Figure 6 displays the seven distinct tourism regions designated by the Arizona Office of Tourism (AZOT). AZOT has traditionally gathered and reported visitation statistics within these regions rather than by counties. The area of assessment of Apache-Sitgreaves National Forests is located primarily within the region referred to as the "High Country" Region. The 2003 Profile for the High Country Region reported 722,800 domestic overnight leisure visitors, representing a 9.5% increase over the 660,000 domestic overnight leisure visitors a decade earlier in 1993. This made the High Country the sixth most visited region in the state ahead of only the Northeast Country in the number of domestic overnight visitors. Approximately 80% of these visitors came to the area for leisure while the remaining 20% were visiting on business (AZOT 2004a).

In 2002, nearly 70% of domestic visitors to the High Country came from within Arizona, while Utah, California, New Mexico, and Texas contributed the largest number of tourists from outside the state. 57% of in-state visitors in 2003 were residents of the Phoenix metropolitan area, and roughly 13% were from Tucson and Sierra Vista. According to AZOT data, the High Country is a predominantly outdoor-based activity destination with 42% of visitors engaging in nature activities including camping (11%), visiting national and state parks (19%), visiting water sources (2%), and participating in eco-travel activities (10%). The flow of visitors is greatest between the months of July and September with 38% of total visitation taking place in the summer (AZOT 2004a).

Statistics for overseas visitors are not made available for individual tourism regions; however, AZOT reports that the state of Arizona experienced a 15.3% decline in overseas visitors in 2003 (dropping to 544,000 from 636,000 in 2002) while the U.S. saw a decline of 4%. The primary countries of origin for overseas visitors to Arizona were the U.K. (18.4%), Germany (16.4%), Mexico (11.0%), Japan (9.1%), and France (8.5%) (AZOT 2004a).

**Table 5. Net Migration by County, 1990-2000 and % Change**

| | Apache | | | Coconino | | | Greenlee | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Total** | 54,033 | 63,202 | 16.97% | 88,003 | 107,775 | 22.47% | 7,369 | 7,855 | 6.60% |
| Same House | 37,232 | 44,593 | 19.77% | 36,558 | 49,841 | 36.33% | 4,197 | 4,487 | 6.91% |
| Different House | 16,801 | 18,609 | 10.76% | 51,445 | 57,934 | 12.61% | 3,172 | 3,368 | 6.18% |
| In United States | 16,711 | 18,140 | 8.55% | 50,117 | 56,247 | 12.23% | 3,155 | 3,301 | 4.63% |
| Same County | 9,672 | 9,074 | -6.18% | 21,006 | 24,801 | 18.07% | 1,577 | 1,643 | 4.19% |
| Different County | 7,039 | 9,066 | 28.80% | 29,111 | 31,446 | 8.02% | 1,578 | 1,658 | 5.07% |
| Same State | 3,379 | 4,372 | 29.39% | 13,634 | 14,870 | 9.07% | 864 | 857 | -0.81% |
| Different State | 3,660 | 4,694 | 28.25% | 15,477 | 16,576 | 7.10% | 714 | 802 | 12.32% |
| Northwest | 132 | 152 | 15.15% | 927 | 1,658 | 78.86% | 11 | 8 | -27.27% |
| Midwest | 267 | 504 | 88.76% | 2,373 | 3,055 | 28.74% | 84 | 46 | -45.24% |
| South | 455 | 335 | -26.37% | 2,755 | 2,856 | 3.67% | 187 | 157 | -16.04% |
| West | 2,806 | 3,703 | 31.97% | 9,422 | 9,007 | -4.40% | 432 | 590 | 36.57% |
| In Puerto Rico | 0 | 8 | n/a | 0 | 7 | n/a | 0 | 0 | n/a |
| Elsewhere | 79 | 461 | 483.54% | 1,307 | 1,680 | 28.54% | 17 | 67 | 294.12% |

| | Navajo | | | Catron, NM | | |
|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Total** | 69,158 | 89,175 | 28.94% | 2,403 | 3,394 | 41.24% |
| Same House | 39,984 | 54,025 | 35.12% | 1,237 | 1,960 | 58.45% |
| Different House | 29,174 | 35,150 | 20.48% | 1,166 | 1434 | 22.98% |
| In United States | 28,969 | 34,115 | 17.76% | 778 | 1,430 | 83.80% |
| Same County | 17,337 | 17,860 | 3.02% | 388 | 307 | -20.88% |
| Different County | 11,632 | 16,255 | 39.74% | 778 | 1,123 | 44.34% |
| Same State | 6,815 | 10,580 | 55.25% | 258 | 344 | 33.33% |
| Different State | 4,817 | 5,675 | 17.81% | 520 | 779 | 49.81% |
| Northwest | 182 | 170 | -6.59% | 73 | 17 | -76.71% |
| Midwest | 544 | 642 | 18.01% | 29 | 48 | 65.52% |
| South | 1,102 | 1,022 | -7.26% | 13 | 85 | 553.85% |
| West | 2,989 | 3,841 | 28.50% | 405 | 629 | 55.31% |
| In Puerto Rico | 4 | 0 | -100.00% | 0 | 0 | n/a |
| Elsewhere | 194 | 1,035 | 433.51% | 0 | 4 | n/a |

## Table 5 (cont.). Net Migration by County, 1990-2000 and % Change

| | Arizona | | | New Mexico | | |
|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Total** | 3,374,806 | 4,752,724 | 40.83% | 1,390,048 | 1,689,911 | 21.57% |
| Same House | 1,454,319 | 2,103,907 | 44.67% | 719,628 | 919,717 | 27.80% |
| Different House | 1,920,487 | 2,648,817 | 37.92% | 670,420 | 770,194 | 14.88% |
| In United States | 1,840,216 | 2,465,345 | 33.97% | 645,519 | 731,488 | 13.32% |
| Same County | 1,026,332 | 1,456,345 | 41.90% | 345,469 | 400,128 | 15.82% |
| Different County | 813,884 | 1,009,490 | 24.03% | 300,050 | 331,360 | 10.43% |
| Same State | 164,063 | 213,070 | 29.87% | 107,289 | 126,093 | 17.53% |
| Different State | 649,821 | 796,420 | 22.56% | 192,761 | 205,267 | 6.49% |
| Northwest | 63,950 | 84,288 | 31.80% | 14,311 | 15,329 | 7.11% |
| Midwest | 179,202 | 190,720 | 6.43% | 28,270 | 29,457 | 4.20% |
| South | 118,041 | 140,608 | 19.12% | 73,548 | 72,497 | -1.43% |
| West | 288,628 | 380,804 | 31.94% | 76,632 | 87,984 | 14.81% |
| In Puerto Rico | 665 | 1,745 | 162.41% | 110 | 398 | 261.82% |
| Elsewhere | 78,618 | 181,237 | 130.53% | 24,466 | 38,308 | 56.58% |

* Totals do not include persons under the age of 5

Source:1990- US Census of Population- Social and Economic Characteristics

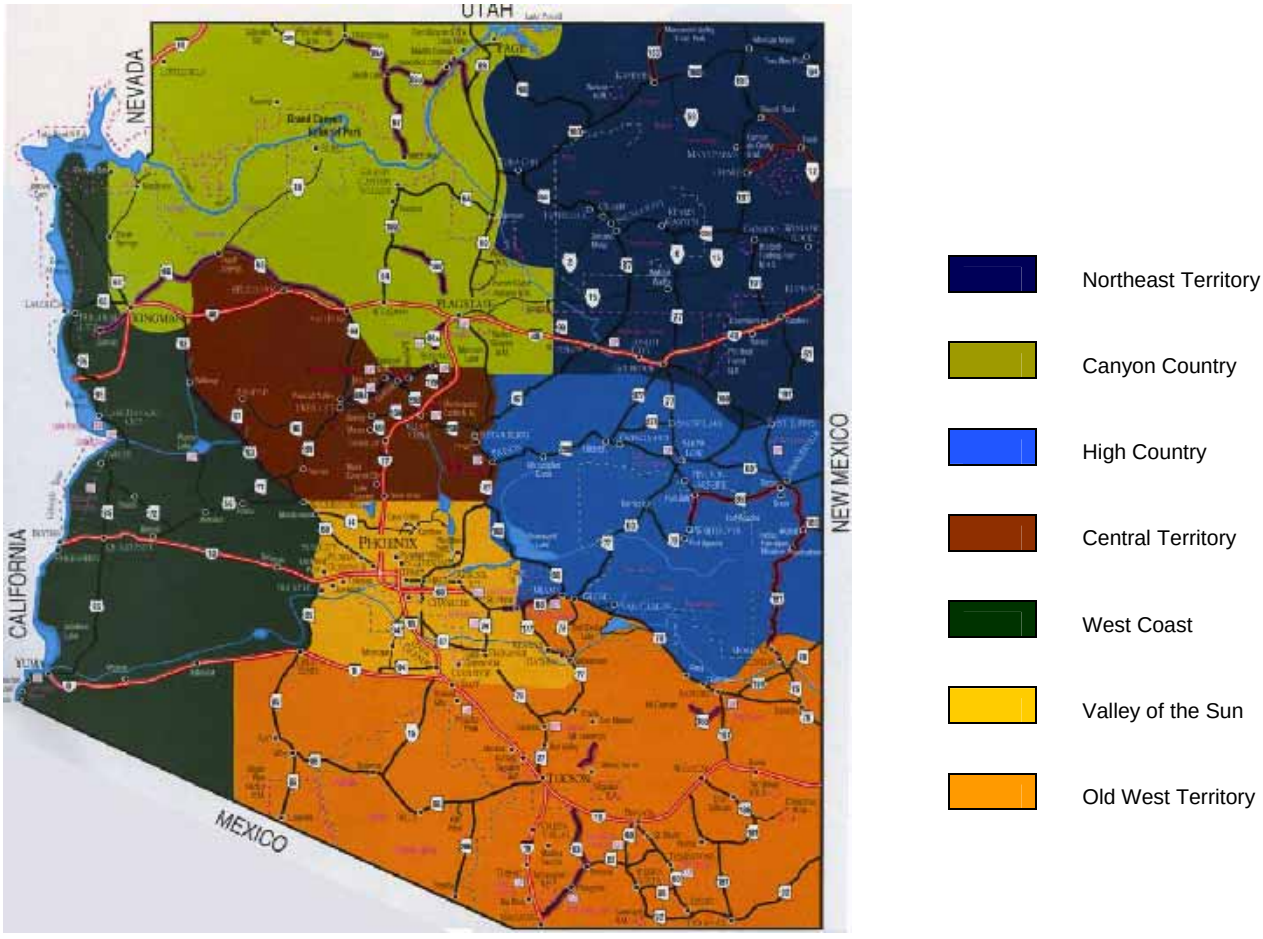



**Figure 6. Map of Arizona Tourism Regions**

## 2.3 Racial/ethnic composition and educational attainment

Tables 6 and 7 present collected data on the racial and ethnic composition of the population in the five counties as well as the states of Arizona and New Mexico. Table 6 presents reported numbers and percentage change in individuals of specific racial and ethnic categories between 1990 and 2000. Table 7 represents these racial and ethnic categories according to their proportional representation in the overall county and state populations. As a point of clarification, race and ethnicity are defined as separate concepts by the federal government. People of a specific race may be of any ethnic origin, and people of a specific ethnic origin may be of any race. Race in this section covers the following five groups: White, Black or African American, American Indian and Alaska Native, Asian and Pacific Islander, and Multiple Races. The population of Hispanic origin is defined for federal statistical purposes as another group and may be of any race (Hobbs and Stoops 2002; Leefers, Potter-Witter, and McDonough 2004).

Reported census data demonstrate a strong correlation between individuals who identify themselves as being of multiple racial background as well as Hispanic origin. Notably, the decade between 1990 and 2000 saw significant increases in individuals of multiple race four of the five counties, mirroring the overall trend for the states of Arizona and New Mexico (Table 6). Similarly, the growth in Hispanic populations exceeded the overall population growth rates for within these same counties. The exception to this trend was Catron County, which reported a minimal increase in multiple race population and a slight decline in the Hispanic population between 1990 and 2000. Navajo County experienced the most significant increases in both multiple race and Hispanic populations with growth rates of 154.54% and 44.63% respectively. In spite of marked increases in both multiple race and Hispanic populations for each county, Table 7 shows that Native American populations constitute a relatively large portion of county populations, particularly when compared to the state as a whole. Despite a slight decrease in proportional representation, Native Americans remain a clear ethnic majority in Apache County. Although Native Americans are no longer the majority ethnic population of Navajo County, they remain the largest group at over 47% of the population. The clear exception to the overall ethnic diversity of the region is Greenlee County, which more closely resembles the overall ethnic composition of the state of Arizona.

Educational attainment for the population 25-years of age and older is shown for each of the five counties in Table 8. The data show that both Coconino and Greenlee Counties exceed the overall state percentage of high school graduates while Apache and Navajo Counties fall well short of the statewide average. While the percentage of individuals with a Bachelor's degree or higher is greater for Coconino County than the state as a whole, Apache, Navajo, and Greenlee Counties all fall below the statewide percentage in this category. Table 8 shows that Apache County is most restricted in educational attainment with 18.78% of the 25-and-over population achieving less than a $9^{th}$-grade education.

## Table 6. Racial/Ethnic Composition of County and State Populations, 1990-2000 and % Change

| Ethnicity | Apache County | | | Coconino County | | | Greenlee County | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| American Indian or Alaska Native | 47,798 | 53,375 | 11.67% | 28,270 | 33,161 | 17.30% | 154 | 142 | -7.79% |
| Asian or Pacific Islander | 17 | 132 | 676.47% | 724 | 1,018 | 40.61% | 45 | 16 | -64.44% |
| African American or Black | 112 | 173 | 54.46% | 1,255 | 1,215 | -3.19% | 27 | 44 | 62.96% |
| Multiple Races | 1,148 | 2,207 | 92.25% | 4,086 | 7,545 | 84.65% | 860 | 2,006 | 133.26% |
| White | 12,516 | 13,536 | 8.15% | 62,256 | 73,381 | 17.87% | 6,922 | 6,339 | -8.42% |
| Hispanic | 2,407 | 3,119 | 29.58% | 9,768 | 12,727 | 30.29% | 3,425 | 3,681 | 7.47% |

| | Navajo County | | | Catron County, NM | | | Arizona | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| American Indian or Alaska Native | 40,528 | 46,532 | 14.81% | 54 | 102 | 88.89% | 204,589 | 255,879 | 25.07% |
| Asian or Pacific Islander | 208 | 331 | 59.13% | 0 | 12 | n/a | 54,127 | 98,969 | 82.85% |
| African American or Black | 812 | 857 | 5.54% | 0 | 5 | n/a | 110,062 | 158,873 | 44.35% |
| Multiple Races | 1,949 | 4,961 | 154.54% | 37 | 57 | 54.05% | 328,768 | 743,300 | 126.09% |
| White | 34,161 | 44,752 | 31.00% | 2,521 | 2,699 | 7.06% | 2,967,682 | 3,873,611 | 30.53% |
| Hispanic | 5,539 | 8,011 | 44.63% | 728 | 688 | -5.49% | 680,628 | 1,295,617 | 90.36% |

| | New Mexico | | |
|---|---|---|---|
| | 1990 | 2000 | % Change |
| American Indian or Alaska Native | 134,035 | 173,483 | 29.43% |
| Asian or Pacific Islander | 14,372 | 20,758 | 44.43% |
| African American or Black | 29,818 | 34,343 | 15.18% |
| Multiple Races | 188,282 | 376,209 | 99.81% |
| White | 1,148,562 | 1,214,253 | 5.72% |
| Hispanic | 576,709 | 765,386 | 32.72% |

Source: NRIS - Human Dimensions

## Table 7. Racial/Ethnic Composition of County and State Populations by Percentage, 1990-2000 and Change

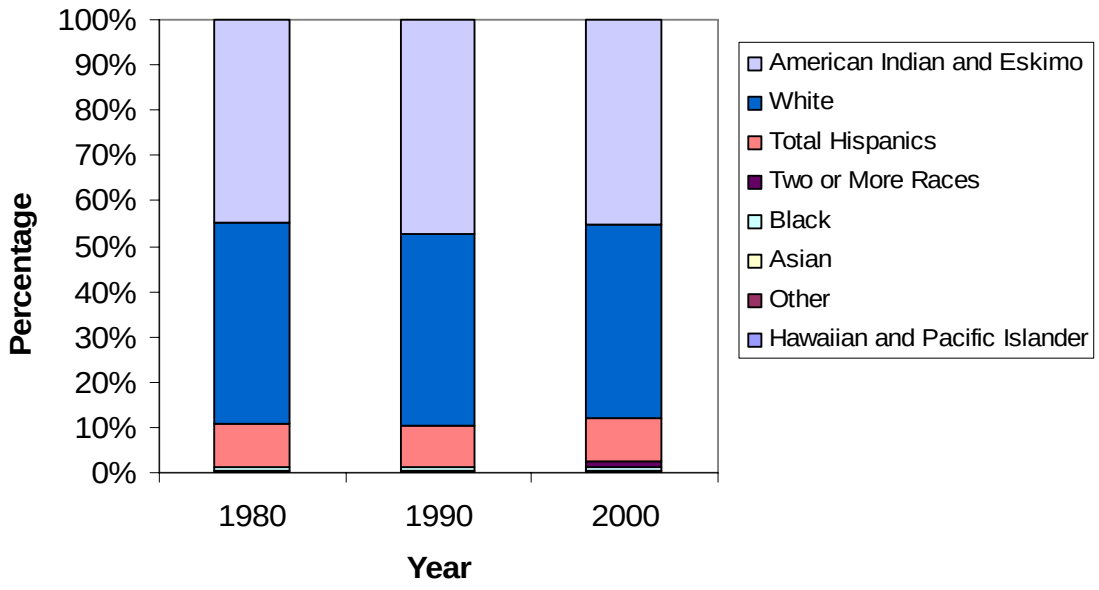
| | Apache County | | | Coconino County | | | Greenlee County | | |
|---|---|---|---|---|---|---|---|---|---|
| **Ethnicity** | **1990** | **2000** | **Change** | **1990** | **2000** | **Change** | **1990** | **2000** | **Change** |
| American Indian or Alaska Native | 77.61% | 76.88% | -0.72% | 29.27% | 28.51% | -0.76% | 1.92% | 1.66% | -0.26% |
| Asian or Pacific Islander | 2.76% | 0.19% | -2.57% | 0.75% | 0.88% | 0.13% | 0.56% | 0.19% | -0.37% |
| African American or Black | 0.18% | 0.25% | 0.07% | 1.30% | 1.04% | -0.25% | 0.34% | 0.51% | 0.18% |
| Multiple Races | 1.86% | 3.18% | 1.32% | 4.23% | 6.49% | 2.26% | 10.74% | 23.47% | 12.73% |
| White | 20.32% | 19.50% | -0.82% | 64.45% | 63.09% | -1.37% | 86.44% | 74.17% | -12.27% |
| Percent Non-white | 79.68% | 80.50% | 0.82% | 35.55% | 36.91% | 1.37% | 13.56% | 25.83% | 12.27% |
| Hispanic | 3.91% | 4.49% | 0.58% | 10.11% | 10.94% | 0.83% | 42.77% | 43.07% | 0.30% |

| | Navajo County | | | Catron County, NM | | | Arizona | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1990** | **2000** | **Change** | **1990** | **2000** | **Change** | **1990** | **2000** | **Change** |
| American Indian or Alaska Native | 52.19% | 47.74% | -4.45% | 2.11% | 2.88% | 0.77% | 5.58% | 4.99% | -0.59% |
| Asian or Pacific Islander | 0.27% | 0.34% | 0.07% | 0.00% | 0.34% | 0.34% | 1.48% | 1.93% | 0.45% |
| African American or Black | 1.05% | 0.88% | -0.17% | 0.00% | 0.14% | 0.14% | 3.00% | 3.10% | 0.09% |
| Multiple Races | 2.51% | 5.09% | 2.58% | 1.44% | 1.61% | 0.17% | 8.97% | 14.49% | 5.52% |
| White | 43.99% | 45.91% | 1.92% | 96.45% | 95.37% | -1.08% | 80.97% | 75.50% | -5.47% |
| Percent Non-white | 56.01% | 54.05% | -1.96% | 3.55% | 4.63% | 1.08% | 19.03% | 24.50% | 5.47% |
| Hispanic | 7.13% | 8.22% | 1.09% | 28.40% | 19.42% | -8.99% | 18.57% | 25.25% | 6.68% |

| | New Mexico | | |
|---|---|---|---|
| | **1990** | **2000** | **Change** |
| American Indian or Alaska Native | 8.85% | 9.54% | 0.69% |
| Asian or Pacific Islander | 0.95% | 1.14% | 0.19% |
| African American or Black | 1.97% | 1.89% | -0.08% |
| Multiple Races | 12.43% | 20.68% | 8.25% |
| White | 75.81% | 66.75% | -9.06% |
| Percent Non-white | 24.19% | 33.25% | 9.06% |
| Hispanic | 38.06% | 42.08% | 4.02% |

Source: NRIS - Human Dimensions

Note: 1990 and 2000 data expressed as a % of total population. Change simply illustrates the trends in proportional representation of various racial/ethnic groups in the overall population.




Source: NRIS - Human Dimensions

**Figure 7. Five-county Assessment Area Racial/Ethnic Composition, 1980-2000**

**Table 8. Educational Attainment for County and State Populations 25-Yrs. Old and Over**

| | Apache County | | Coconino County | | Greenlee County | | Navajo County | |
|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Population 25 years and over | 36,217 | 100.00% | 65,976 | 100.00% | 5,207 | 100.00% | 54,215 | 100.00% |
| Less than 9th grade | 6,801 | 18.78% | 4,596 | 6.97% | 330 | 6.34% | 6,514 | 12.02% |
| 9th to 12th grade, no diploma | 6,365 | 17.57% | 6,108 | 9.26% | 582 | 11.18% | 9,113 | 16.81% |
| High school graduate (includes equivalency) | 9,008 | 24.87% | 14,279 | 21.64% | 1,828 | 35.11% | 15,036 | 27.73% |
| Some college, no degree | 7,543 | 20.83% | 17,344 | 26.29% | 1,450 | 27.85% | 13,673 | 25.22% |
| Associate degree | 2,390 | 6.60% | 3,891 | 5.90% | 382 | 7.34% | 3,218 | 5.94% |
| Bachelor's degree | 2,641 | 7.29% | 12,316 | 18.67% | 372 | 7.14% | 4,020 | 7.41% |
| Graduate or professional degree | 1,469 | 4.06% | 7,442 | 11.28% | 263 | 5.05% | 2,641 | 4.87% |
| Percent high school graduate or higher | n/a | 63.60% | n/a | 83.80% | n/a | 82.50% | n/a | 71.20% |
| Percent bachelor's degree or higher | n/a | 11.30% | n/a | 29.90% | n/a | 12.20% | n/a | 12.30% |

| | Catron County, NM | | Arizona | | New Mexico | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Total Population Over 25 | 2,651 | 100.00% | 3,256,184 | 100.00% | 1,134,801 | 100% |
| Less than 9th grade | 195 | 7.36% | 254,696 | 7.82% | 104,985 | 9.25% |
| 9th to 12th grade, no diploma | 380 | 14.33% | 364,851 | 11.20% | 134,996 | 11.90% |
| High school graduate (includes equivalency) | 770 | 29.05% | 791,904 | 24.32% | 301,746 | 26.59% |
| Some college, no degree | 649 | 24.48% | 859,165 | 26.39% | 259,924 | 22.90% |
| Associate degree | 175 | 6.60% | 219,356 | 6.74% | 67,001 | 5.90% |
| Bachelor's degree | 334 | 12.60% | 493,419 | 15.15% | 154,372 | 13.60% |
| Graduate or professional degree | 154 | 5.81% | 272,793 | 8.38% | 111,777 | 9.85% |
| Percent high school graduate or higher | n/a | 78.40% | n/a | 81.00% | n/a | 0.789 |
| Percent bachelor's degree or higher | n/a | 18.40% | n/a | 23.50% | n/a | 0.235 |

Source: U.S. Census Bureau, Census 2000 Summary File http://www.census.gov/census2000/states/az.html

## 2.4 Housing characteristics and population projections

Housing characteristics for the five counties and selected places are presented in Table 9. Total housing units in 2000 range from a high of 53,443 in Coconino County to a low of 2,548 in Catron County. Housing density and median home value within Greenlee and Apache Counties are significantly lower than neighboring counties and the state as a whole. Table 9 also shows significant increases in seasonal housing units for both Apache and Navajo Counties between 1990 and 2000. Growth in seasonal housing units within the area of assessment was most dramatic in Snowflake and Pinetop-Lakeside, both of which saw increases of over 1,000%. Finally, the median home value and the rate at which it increased were both significantly higher for Coconino County than for the state of Arizona as a whole. Within the area of assessment, median home values increased most significantly in the cities of Flagstaff, Sedona, and Pinetop-Lakeside.

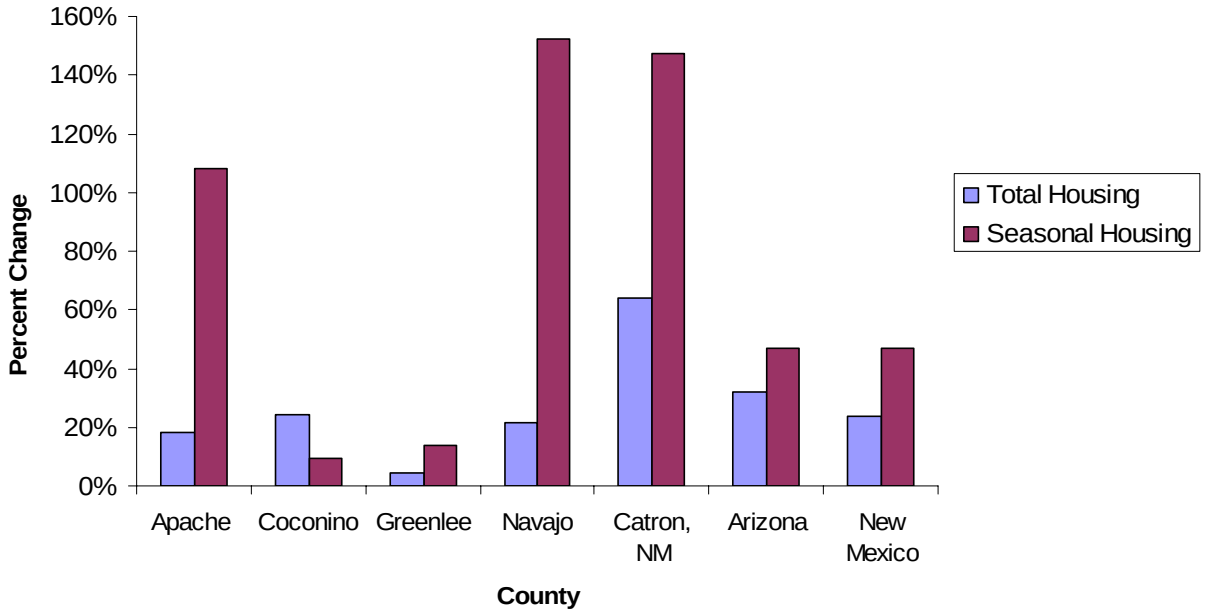
Table 10 suggests that population growth at the county and state level is expected to continue although at somewhat lower rates than were experienced over the last two decades. The population growth for each county is expected to be significantly less than statewide rates of growth with the possible exception of Coconino County and its projected increase of 26.66% between 2000 and 2010. Although the population of Navajo County is expected to experience an upward trend between 2010 and 2020, growth rates will likely remain well below the state average.

## Table 9. County, Place, and State Housing Characteristics, 1990-2000 and % Change

| County/Place/ State | Total Housing Units | | | Seasonal Housing Units | | | Housing Density per Sq. Mile | | | Median Home Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Apache County** | 26,731 | 31,621 | 18.29% | 3,134 | 6,530 | 108.36% | 2.39 | 2.82 | 18.30% | $16,600 | $41,700 | 151.20% |
| Eagar | 1,504 | 1,696 | 12.77% | 83 | 157 | 89.16% | 147 | 150 | 2.04% | $68,100 | $89,400 | 31.28% |
| St. Johns | 1,237 | 1,388 | 12.21% | 72 | 51 | -29.17% | 187 | 210 | 12.30% | $57,000 | $69,000 | 21.05% |
| Springerville | 840 | 902 | 7.38% | 32 | 37 | 15.63% | 73 | 78 | 6.85% | $57,200 | $80,200 | 40.21% |
| **Coconino County** | 42,914 | 53,443 | 24.54% | 8,361 | 9,155 | 9.50% | 2.30 | 2.87 | 24.55% | $82,600 | $142,500 | 72.52% |
| Flagstaff | 16,313 | 21,430 | 31.37% | 925 | 977 | 5.62% | 258 | 337 | 30.62% | $90,300 | $161,000 | 78.29% |
| Sedona | 4,658 | 5,709 | 22.56% | 430 | 446 | 3.72% | 237 | 307 | 29.54% | $159,600 | $253,700 | 58.96% |
| Page | 2,307 | 2,606 | 12.96% | 33 | 76 | 130.30% | 139 | 157 | 12.95% | $91,700 | $138,600 | 51.15% |
| Williams | 1,118 | 1,224 | 9.48% | 40 | 52 | 30.00% | 39 | 28 | -28.21% | $64,800 | $100,300 | 54.78% |
| Fredonia | 464 | 428 | -7.76% | 7 | 18 | 157.14% | 91 | 58 | -36.26% | $54,300 | $77,900 | 43.46% |
| **Greenlee County** | 3,582 | 3,744 | 4.52% | 109 | 124 | 13.76% | 1.94 | 2.03 | 4.53% | $40,700 | $62,700 | 54.05% |
| Clifton | 1,246 | 1,114 | -10.59% | 14 | 12 | -14.29% | 84 | 75 | -10.71% | $31,700 | $49,900 | 57.41% |
| Morenci | 762 | 731 | -4.07% | 12 | 13 | 8.33% | 942 | 902 | -4.25% | $67,500 | n/a | n/a |
| **Navajo County** | 38,967 | 47,413 | 21.67% | 5,160 | 13,007 | 152.07% | 3.91 | 4.76 | 21.68% | $51,500 | $77,000 | 49.51% |
| Show Low | 3,116 | 4,388 | 40.82% | 984 | 1,190 | 20.93% | 113 | 158 | 39.82% | $67,700 | $106,100 | 56.72% |
| Whiteriver | 1,064 | 1,335 | 25.47% | 0 | 3 | n/a | 97 | 75 | -22.68% | $30,800 | $35,400 | 14.94% |
| Snowflake | 1,158 | 1,515 | 30.83% | 9 | 104 | 1,055.56% | 39 | 49 | 25.64% | $64,700 | $92,500 | 42.97% |
| Pinetop-Lakeside | 2,307 | 2,756 | 19.46% | 86 | 1,153 | 1,240.70% | 207 | 245 | 18.36% | $74,700 | $121,100 | 62.12% |
| Heber-Overgaard | n/a | 3,185 | n/a | n/a | 1,878 | n/a | n/a | 458 | n/a | n/a | $110,500 | n/a |
| **Catron County** | 1,552 | 2,548 | 64.18% | 258 | 638 | 147.29% | .22 | .37 | 68.18% | $41,000 | $82,000 | 100% |
| Reserve | n/a | 263 | n/a | n/a | n/a | n/a | n/a | 469 | n/a | n/a | $67,700 | n/a |
| **Arizona** | 1,659,430 | 2,189,189 | 31.92% | 96,687 | 141,965 | 46.83% | 15.00 | 19.0 | 26.67% | $79,700 | $121,300 | 52.20% |
| **New Mexico** | 632,058 | 780,579 | 23.50% | 21,778 | 31,990 | 46.89% | 5.00 | 6.0 | 20.00% | $69,800 | $108,100 | 54.87% |

Source: NRIS - Human Dimensions

p://www.epodunk.com/cgi-bin/genInfo.php?locIndex=17798




Source: NRIS - Human Dimensions

**Figure 8. Percent Change in Total and Seasonal Housing Units by County, 1990-2000**

**Table 10. County and State Population Projections, 2010-2030 and % Change**

| County/State | Total Pop. 2000 | Projected 2010 | % Change | Projected 2020 | % Change | Projected 2030 | % Change |
|---|---|---|---|---|---|---|---|
| Apache County | 69,423 | 76,645 | 10.40% | 85,766 | 11.90% | 94,707 | 10.42% |
| Coconino County | 116,320 | 147,352 | 26.68% | 169,343 | 14.92% | 189,868 | 12.12% |
| Greenlee County | 8,547 | 9,605 | 12.38% | 10,271 | 6.93% | 10,984 | 6.94% |
| Navajo County | 97,470 | 99,979 | 2.57% | 111,946 | 11.97% | 123,460 | 10.29% |
| Catron County, NM | 3,543 | 4,063 | 14.68% | 4,459 | 9.75% | 4,752 | 6.57% |
| Arizona | 5,130,632 | 6,145,108 | 19.77% | 7,363,604 | 19.83% | 8,621,114 | 17.08% |
| New Mexico | 1,819,046 | 2,112,986 | 16.16% | 2,383,116 | 12.78% | 2,626,553 | 10.22% |

Source: Arizona Department of Commerce - Arizona County Population Projections: 1997-2050

http://www.azcommerce.com/prop/eir/population.asp

University of New Mexico – Bureau of Business and Economic Research

http://www.unm.edu/~bber/demo/table1.htm

### 2.5 Key issues for forest planning and management

Over the past two decades, continued population growth in predominantly rural areas has brought about significant changes in the dynamic relationships between human communities and publicly administered lands throughout Arizona. These changes have occurred amid ongoing resource policy debates concerning fire suppression, forest restoration, water allocation, road construction, and other economically and environmentally pressing issues.

Although population growth in the communities surrounding the ASNF has been somewhat slower than in other parts of the state, significant changes in the human populations surrounding the forest are likely to affect not only the quantity of goods and services demanded from public lands but also significantly

influence the character, or quality, of those goods and services. Research shows that areas with an abundance of natural-resource based amenities (forested mountains, rivers, lakes, access to hiking and camping, presence of clean air and water) are increasingly attractive to retirement-age populations as well as others seeking to take advantage of the quality of life offered by small, rural communities. In particular, migrants are increasingly attracted to smaller communities with relatively affordable housing, low crime rates, and cultural traditions associated with small, rural towns throughout the Mountain West (Booth 2002, McCool and Kruger 2003, Bodio 1997). These demographic shifts are borne out by collected data for ASNF which show substantial increases in both the retirement-age population and the number of seasonal housing units throughout the areas characterized by small, rural towns.

Although the potential for population growth can enhance the economic vitality of rural areas through greater employment opportunities and an expanding tax base, it can also challenge the capacity of rural communities and public land managers to provide for the wide array of services. This is particularly true in areas where potential conflicts in value systems between established community interests and recently arrived immigrants can create friction over natural resource management. For example, the growth in populations seeking natural amenities from forest lands may pit them against traditional commodity interests. Likewise, the dramatic growth in multiple race and Hispanic populations (sometimes referred to as “hidden populations”) may force different demands for public services and may interact with natural resources in fundamentally different ways than have been the historic norm for the resident population (McCool and Kruger 2003).

Together, these shifts in the demographic makeup of communities surrounding the ASNF carry important implications for the development of good relations between management agencies and their local publics. For example, how might agencies contribute to the maintenance of viable resource economies given increasing demands for amenities? Similarly, how does expansion of the wildland-urban interface influence issues such as forest access, water quality, habitat fragmentation, or fire management? Finally, demographic change within forest communities may not influence only the management of natural resources, but also the social and political acceptability of processes used to develop management plans. Land management objectives of new property owners may lead to demands for change in how adjacent federally administered land is managed. In addition, immigrant populations may lack a thorough understanding of underlying community values while at the same time acting on a thorough understanding of planning regulations and methods of influencing political processes (McCool and Kruger 2003, Booth 2002, Wilkinson 1992).

# 3. Economic Characteristics and Vitality

In this section, historic and current economic conditions within the five counties surrounding the Apache-Sitgreaves National Forests (ASNF) are examined. A primary purpose of this analysis is to determine trends in the economic dependency of communities on certain industries and forest resources. Data on selected cities within the area of assessment are also included in order to illustrate trends that may signal linkages between forest management alternatives and economic change affecting specific populations. Indicators used to assess economic characteristics and vitality include major employers within the region, employment by industry, per capita and household income, portion of income derived from natural resources, and federal-lands related payments based on forest resource use.

Data show that the area of assessment for the ASNF has experienced limited economic growth over the past two decades. In general, growth in wage and salary employment was particularly low when compared to state averages despite significant gains in the finance, real estate, and retail trade sectors. In terms of occupational structure, the region closely resembled the situation for the state overall with management, professional, and related occupations maintaining primary importance over sales and office as well as service occupations. Both Apache and Navajo Counties reported relatively low per capita and family incomes as well as high rates of poverty, placing them among the most economically challenged regions in the state. Four of the five counties within the area of assessment reported substantial losses in income from wood products and processing between 1990 and 2000. These losses were partially offset by dramatic increases in income from special forest products and processing in Coconino and Navajo Counties over the same period. Each of the counties reported gains in tourism employment between 1990 and 2000, exceeding increases at the state level over the same period. In terms of federal-lands related revenue, Coconino County is the clear exception in the region given its abundance of PILT entitlement acreage and relatively large amount of forest receipts or "twenty-five percent monies."

## 3.1 Historical context and regional economic conditions

The economy of the region surrounding ASNF has undergone dramatic changes over the past century. Originally a territory isolated on the borders of a cohering nation, Arizona, and the West in general, is quickly becoming more metropolitan, and economic realities have shifted to reflect this change. For the first half of the century, Arizona's economy was dominated by the mining, agricultural, and ranching industries. Following World War II and a dramatic increase in population which continues to the present, Arizona shifted away from a dependence on these earlier industries and diversified into a mix of urban and rural industries that cover nearly every sector. Industrial diversity in Arizona showed some increases after 1971, but reached a peak in the mid-80s and has now fallen well below other states to between .45-.5 on the Industrial Diversity Index[1] (Sheridan 1995, Canamex 2001, ADOC 2002a).

Per capita personal income (PPI) in Arizona has, in a general sense, followed the national trends although it has often fluctuated more dramatically. Labor force growth has been in the process of slowing since the 1970s when it reached a peak of 2.7% per annum. It afterwards slowed to 1.7% in the 1980s and to 1.2% in the 1990s. The relation and impact of education on economic standing has also heightened, with the salary ratio of college-educated workers to high-school educated workers increasing dramatically since 1975, up to above 1.85:1 from 1.55 to 1. Poverty rates have shifted only slightly in the past three or four decades, remaining between 14-16% in Arizona (U.S. Census Bureau 2005, ADOC 2002a).

Over the past thirty to thirty-five years, the primary locus of economical advancement has shifted. Mining, which represented 3% of the Arizona's per capita income in the late 1960s, had dropped to a

[1] Where 1.0 represents a state of industrial diversity equal to the U.S. as a whole. While no longer limited to agricultural and mining interests, Arizona is still restricted in its industrial array. By contrast, states like Texas and Illinois have IDIs near 0.8, which suggests a much broader industrial foundation.

mere fraction of a percent by 2002. Agriculture, too, remained beneath 1%. While the construction, manufacturing, and trade/utilities areas of the Arizona economy have either remained static or dropped slightly in the second half of the past century, the service industry has skyrocketed, topping 20% by 2002, up from 13% in 1969 (Morton 2003). This trend is partially due to the fact that Arizona has become an increasingly urbanized state, with 88.2% of the population living in urban areas according to the 2000 census. Recent PPI also reflects this disparity, with the 2002 metro figure being $27,285 as compared to the non-metro amount of $18,992—a differential of 30.4%, up from 23.3% in 1970.

The counties surrounding the Apache-Sitgreaves National Forests are, collectively, the most economically challenged compared to those surrounding the other forests in the state. The 2002 PPI of the four Arizona counties abutting the forest land is $19,333[2], representing a 26.5% differential from the state average at that time, a 2% drop from its relative numbers 1969. Compared to the national averages, the PPI of the counties containing the Apache-Sitgreaves represents only 62.8% of the national total, down nearly 6% over the past thirty years (BEA 2002). The average rate of income growth in the area of assessment over the past three decades is just under 8%, slightly below the 8.5% rate of growth for New Mexico and well below the 10.1% Arizona average (BEA 2002). This suggests that although Arizona's growth continues to be strong, it nonetheless remains behind the country as a whole in individual economic status. These figures are likely influenced by the aforementioned shift in economic industries within these states (i.e. away from mining) and the nearby presence of several Native American reservations whose economic situations regularly lie below state and national averages.

### 3.2 Income and employment within key industries

Table 11 presents employment by industry at both the state and county levels for the years 1990 and 2000. Economic data confirm earlier findings which suggested relatively limited growth in the region when compared to state averages. For instance, growth in total full- and part-time employment for each of the five counties in the area of assessment was below that of their respective states as a whole. Employment growth for Navajo and Apache Counties was particularly limited (26.62% and 38.66% respectively) when compared to the increase of 47.62% over ten years at the state level. Economic data for the region also differed from those of the state regarding changes in types of employment between 1990 and 2000. While increases in wage and salary employment were below the state average for all but Greenlee County, Apache and Coconino Counties witnessed substantial increases in employment of proprietors, particularly non-farm proprietors.

With the exception of Greenlee County, the region experienced relatively low increases in private employment over the ten-year period. There were, however, significant increases within certain industries for individual counties. Between 1990 and 2000, Coconino, Apache, and Navajo Counties each demonstrated substantial employment increases in the financial/real estate sector as well as in retail trade. Similarly, both Coconino and Greenlee Counties also saw a considerable increase of employment in the construction industry over the same period.

Table 12 displays the percentage of employment in each industry at the state and county levels as well as the percentage change between 1990 and 2000. As stated earlier, wage and salary employment is relatively limited in the region when compared to state levels and actually declined as a portion of overall employment for all but Greenlee County. With the exception of Navajo County, all counties saw further deterioration of previously limited farm employment, mirroring a similar trend for the state as a whole. As stated earlier, individual counties experienced relatively strong employment growth within specific sectors between 1990 and 2000. Table 12 affirms that the share of employment in the financial services/real estate industry grew considerably in Apache, Coconino, and Navajo Counties while the

[2] N.B.: Discrepancies between these figures and the PPIs listed in Table 16 stem from the latter having been adjusted for deflation in order to calculate % change. The salaries listed in this section represent current PPIs in non-adjusted dollars.

percentage of construction employment outpaced growth in other sectors for Greenlee County. The relatively limited percentage of private employment for both Apache and Navajo Counties is likely offset by considerable employment in the government through the Navajo and Apache Nations.

## Table 1. Employment by Industry, County, and State, 1990-2000 and % Change

| | Apache | | | Coconino | | | Greenlee | | | Catron, NM | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Employment by place of work** | | | | | | | | | | | | |
| Total full-time and part-time employment | 17,876 | 24,786 | 38.66% | 48,977 | 70,286 | 43.51% | 3,607 | 5,216 | 44.61% | 1,246 | 1,456 | 16.85% |
| **By type** | | | | | | | | | | | | |
| Wage and salary employment | 15,476 | 20,114 | 29.97% | 41,079 | 55,639 | 35.44% | 3,096 | 4,645 | 50.03% | 709 | 689 | -2.82% |
| Proprietors employment | 2,400 | 4,672 | 94.67% | 7,898 | 14,647 | 85.45% | 511 | 571 | 11.74% | 537 | 767 | 42.83% |
| Farm proprietors employment | 351 | 327 | -6.84% | 276 | 204 | -26.09% | 136 | 134 | -1.47% | 226 | 221 | -2.21% |
| Non-farm proprietors employment | 2,049 | 4,345 | 112.05% | 7,622 | 14,443 | 89.49% | 375 | 437 | 16.53% | 311 | 546 | 75.56% |
| **By industry** | | | | | | | | | | | | |
| Farm employment | 358 | 345 | -3.63% | 313 | 254 | -18.85% | 154 | 168 | 9.09% | 282 | 274 | -2.84% |
| Non-farm employment | 17,518 | 24,441 | 39.52% | 48,664 | 70,032 | 43.91% | 3,453 | 5,048 | 46.19% | 964 | 1,182 | 22.61% |
| Private employment | 8,441 | 11,986 | 42.00% | 36,864 | 54,305 | 47.31% | 2,886 | 4,480 | 55.23% | 607 | 825 | 35.91% |
| Ag. services, forestry, fishing and other | 125 | (D) | N/A | (D) | 510 | N/A | 33 | (D) | N/A | (D) | (D) | N/A |
| Mining | 66 | (D) | N/A | (D) | 159 | N/A | (D) | (D) | N/A | (D) | (L) | N/A |
| Construction | (D) | 1,183 | N/A | 2,363 | 4,014 | 69.87% | 170 | 869 | 411.18% | 64 | (D) | N/A |
| Manufacturing | (D) | 167 | N/A | 3,562 | 2,985 | -16.20% | (D) | 24 | N/A | 106 | 58 | -45.28% |
| Transportation and public utilities | 728 | 650 | -10.71% | 1,979 | 1,957 | -1.11% | 49 | 88 | 79.59% | 46 | 69 | 50.00% |
| Wholesale trade | 111 | (D) | N/A | 801 | 1,378 | 72.03% | 52 | 93 | 78.85% | (L) | (L) | N/A |
| Retail trade | 1,897 | 2,616 | 37.90% | 10,862 | 15,266 | 40.55% | 369 | 328 | -11.11% | 110 | 160 | 45.45% |
| Finance, insurance, and real estate | 616 | 1,379 | 123.86% | 2,052 | 4,674 | 127.78% | 42 | (D) | N/A | (D) | (D) | N/A |
| Services | (D) | 5,432 | N/A | 14,837 | 23,362 | 57.46% | 420 | 494 | 17.62% | 188 | 287 | 52.66% |
| Government and government enterprises | 9,077 | 12,455 | 37.21% | 11,800 | 15,727 | 33.28% | 567 | 568 | 0.18% | 357 | 357 | 0.00% |
| Federal, civilian | 2,068 | 2,861 | 38.35% | 3,054 | 3,322 | 8.78% | 32 | 44 | 37.50% | 151 | 129 | -14.57% |
| Military | 231 | 158 | -31.60% | 378 | 283 | -25.13% | 30 | 20 | -33.33% | 13 | 12 | -7.69% |
| State and local | 6,778 | 9,436 | 39.22% | 8,368 | 12,122 | 44.86% | 505 | 504 | -0.20% | 193 | 216 | 11.92% |
| State government | 321 | 528 | 64.49% | 3,560 | (D) | N/A | 51 | 38 | -25.49% | 66 | 63 | -4.55% |
| Local government | 6,457 | 8,908 | 37.96% | 4,808 | (D) | N/A | 454 | 466 | 2.64% | 127 | 153 | 20.47% |

## Table 11 (cont.). Employment by Industry, County, and State, 1990-2000 and % Change

| | Navajo | | | Arizona | | | New Mexico | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Employment by place of work** | | | | | | | | | |
| Total full-time and part-time employment | 26,878 | 34,033 | 26.62% | 1,909,879 | 2,819,302 | 47.62% | 767,139 | 972,954 | 26.83% |
| **By type** | | | | | | | | | |
| Wage and salary employment | 22,377 | 27,429 | 22.58% | 1,607,628 | 2,355,299 | 46.51% | 635,725 | 789,690 | 24.22% |
| Proprietors employment | 4,501 | 6,604 | 46.72% | 302,251 | 464,003 | 53.52% | 131,414 | 183,264 | 39.46% |
| Farm proprietors employment | 404 | 357 | -11.63% | 8,027 | 7,572 | -5.67% | 13,600 | 14,985 | 10.18% |
| Non-farm proprietors employment | 4,097 | 6,247 | 52.48% | 294,224 | 456,431 | 55.13% | 117,814 | 168,279 | 42.83% |
| **By industry** | | | | | | | | | |
| Farm employment | 423 | 555 | 31.21% | 19,297 | 19,842 | 2.82% | 19,766 | 21,760 | 10.09% |
| Non-farm employment | 26,455 | 33,478 | 26.55% | 1,890,582 | 2,799,460 | 48.07% | 747,373 | 951,194 | 27.27% |
| Private employment | 18,794 | 22,737 | 20.98% | 1,583,146 | 2,410,566 | 52.26% | 568,085 | 748,804 | 31.81% |
| Ag. services, forestry, fishing and other | 175 | 252 | 44.00% | 27,817 | 46,873 | 68.50% | 8,414 | 13,548 | 61.02% |
| Mining | 1,220 | (D) | N/A | 15,475 | 12,607 | -18.53% | 20,489 | 19,323 | -5.69% |
| Construction | 1,295 | (D) | N/A | 108,918 | 200,373 | 83.97% | 40,606 | 59,895 | 47.50% |
| Manufacturing | 2,029 | (D) | N/A | 194,529 | 225,767 | 16.06% | 47,732 | 48,788 | 2.21% |
| Transportation and public utilities | 1,859 | 1,877 | 0.97% | 84,360 | 124,954 | 48.12% | 34,130 | 43,350 | 27.01% |
| Wholesale trade | 467 | 596 | 27.62% | 82,812 | 122,582 | 48.02% | 27,896 | 33,751 | 20.99% |
| Retail trade | 5,014 | 6,625 | 32.13% | 344,297 | 484,207 | 40.64% | 134,482 | 172,516 | 28.28% |
| Finance, insurance, and real estate | 953 | 2,090 | 119.31% | 170,005 | 281,675 | 65.69% | 46,955 | 62,905 | 33.97% |
| Services | 5,782 | 6,965 | 20.46% | 544,933 | 911,528 | 67.27% | 207,381 | 294,728 | 42.12% |
| Government and government enterprises | 7,661 | 10,741 | 40.20% | 307,436 | 388,894 | 26.50% | 179,288 | 202,390 | 12.89% |
| Federal, civilian | 1,627 | 1,577 | -3.07% | 45,843 | 48,135 | 5.00% | 31,621 | 30,205 | -4.48% |
| Military | 354 | 224 | -36.72% | 38,197 | 33,258 | -12.93% | 22,552 | 17,167 | -23.88% |
| State and local | 5,680 | 8,940 | 57.39% | 223,396 | 307,501 | 37.65% | 125,115 | 155,018 | 23.90% |
| State government | 362 | (D) | N/A | 61,595 | 81,026 | 31.55% | 55,722 | 64,654 | 16.03% |
| Local government | 5,318 | (D) | N/A | 161,801 | 226,475 | 39.97% | 69,393 | 90,364 | 30.22% |

Source: Bureau of Economic Analysis website http://www.bea.doc.gov/bea/regional/reis/action.cfm

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

(L) Less than 10 jobs, but the estimates for this item are included in the totals.

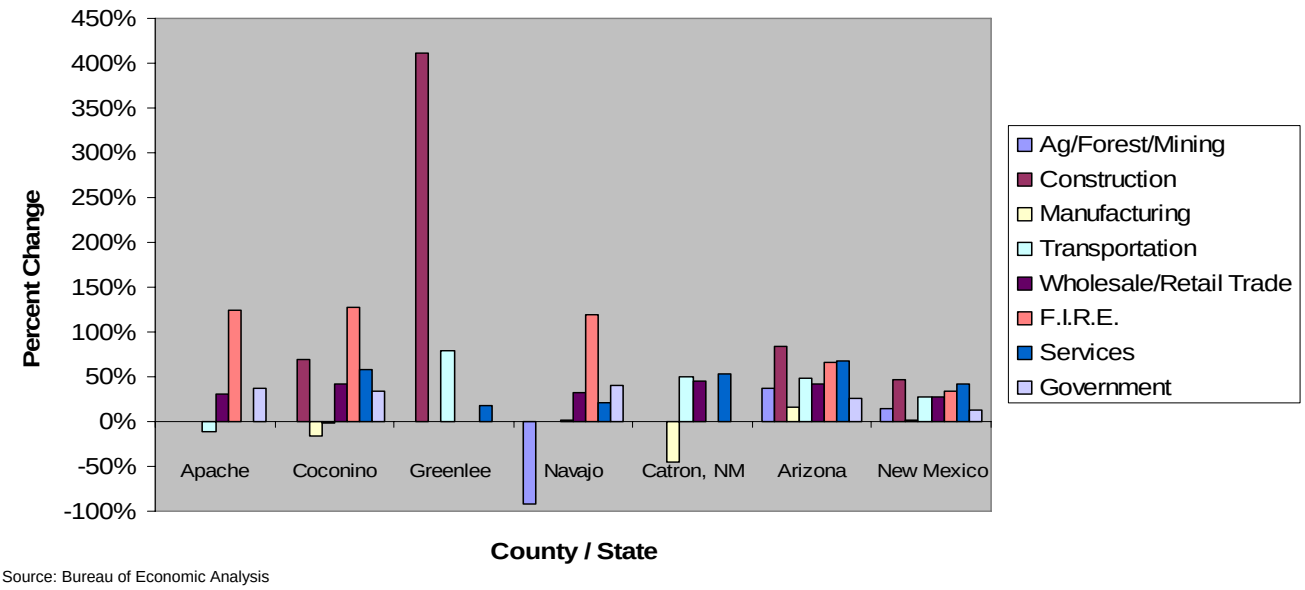
## Table 2. Employment by Industry Percentages, County, and State, 1990-2000 and % Change

| | Apache | | | Coconino | | | Greenlee | | | Catron, NM | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Employment by place of work** | | | | | | | | | | | | |
| Total full-time and part-time employment | 100.00% | 100.00% | 0.00% | 100.00% | 100.00% | 0.00% | 100.00% | 100.00% | 0.00% | 100.00% | 100.00% | 0.00% |
| **By type** | | | | | | | | | | | | |
| Wage and salary employment | 86.57% | 81.15% | -6.26% | 83.87% | 79.16% | -5.62% | 85.83% | 89.05% | 3.75% | 56.90% | 47.32% | -16.84% |
| Proprietors employment | 13.43% | 18.85% | 40.40% | 16.13% | 20.84% | 29.23% | 14.17% | 10.95% | -22.73% | 43.10% | 52.68% | 22.23% |
| Farm proprietors employment | 1.96% | 1.32% | -32.81% | 0.56% | 0.29% | -48.50% | 3.77% | 2.57% | -31.86% | 18.14% | 15.18% | -16.32% |
| Non-farm proprietors employment | 11.46% | 17.53% | 52.94% | 15.56% | 20.55% | 32.04% | 10.40% | 8.38% | -19.41% | 24.96% | 37.50% | 50.24% |
| **By industry** | | | | | | | | | | | | |
| Farm employment | 2.00% | 1.39% | -30.50% | 0.64% | 0.36% | -43.45% | 4.27% | 3.22% | -24.56% | 22.63% | 18.82% | -16.85% |
| Non-farm employment | 98.00% | 98.61% | 0.62% | 99.36% | 99.64% | 0.28% | 95.73% | 96.78% | 1.10% | 77.37% | 81.18% | 4.93% |
| Private employment | 47.22% | 48.36% | 2.41% | 75.27% | 77.26% | 2.65% | 80.01% | 85.89% | 7.35% | 48.72% | 56.66% | 16.31% |
| Ag. services, forestry, fishing and other | 0.70% | (D) | N/A | (D) | 0.73% | N/A | 0.91% | (D) | N/A | (D) | (D) | N/A |
| Mining | 0.37% | (D) | N/A | (D) | 0.23% | N/A | (D) | (D) | N/A | (D) | (L) | N/A |
| Construction | (D) | 4.77% | N/A | 4.82% | 5.71% | 18.37% | 4.71% | 16.66% | 253.49% | 5.14% | (D) | N/A |
| Manufacturing | (D) | 0.67% | N/A | 7.27% | 4.25% | -41.61% | (D) | 0.46% | N/A | 8.51% | 3.98% | -53.17% |
| Transportation and public utilities | 4.07% | 2.62% | -35.61% | 4.04% | 2.78% | -31.09% | 1.36% | 1.69% | 24.19% | 3.69% | 4.74% | 28.37% |
| Wholesale trade | 0.62% | (D) | N/A | 1.64% | 1.96% | 19.88% | 1.44% | 1.78% | 23.68% | (L) | (L) | N/A |
| Retail trade | 10.61% | 10.55% | -0.54% | 22.18% | 21.72% | -2.06% | 10.23% | 6.29% | -38.53% | 8.83% | 10.99% | 24.48% |
| Finance, insurance, and real estate | 3.45% | 5.56% | 61.45% | 4.19% | 6.65% | 58.72% | 1.16% | (D) | N/A | (D) | (D) | N/A |
| Services | (D) | 21.92% | N/A | 30.29% | 33.24% | 9.72% | 11.64% | 9.47% | -18.66% | 15.09% | 19.71% | 30.64% |
| Government and government enterprises | 50.78% | 50.25% | -1.04% | 24.09% | 22.38% | -7.13% | 15.72% | 10.89% | -30.73% | 28.65% | 24.52% | -14.42% |
| Federal, civilian | 11.57% | 11.54% | -0.22% | 6.24% | 4.73% | -24.20% | 0.89% | 0.84% | -4.92% | 12.12% | 8.86% | -26.89% |
| Military | 1.29% | 0.64% | -50.67% | 0.77% | 0.40% | -47.83% | 0.83% | 0.38% | -53.90% | 1.04% | 0.82% | -21.01% |
| State and local | 37.92% | 38.07% | 0.40% | 17.09% | 17.25% | 0.94% | 14.00% | 9.66% | -30.98% | 15.49% | 14.84% | -4.22% |
| State government | 1.80% | 2.13% | 18.63% | 7.27% | (D) | N/A | 1.41% | 0.73% | -48.47% | 5.30% | 4.33% | -18.31% |
| Local government | 36.12% | 35.94% | -0.50% | 9.82% | (D) | N/A | 12.59% | 8.93% | -29.02% | 10.19% | 10.51% | 3.10% |

## Table 12 (cont.). Employment by Industry Percentages, County, and State, 1990-2000 and % Change

| | Navajo | | | Arizona | | | New Mexico | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | % Change | 1990 | 2000 | % Change | 1990 | 2000 | % Change |
| **Employment by place of work** | | | | | | | | | |
| Total full-time and part-time employment | 100.00% | 100.00% | 0.00% | 100.00% | 100.00% | 0.00% | 100.00% | 100.00% | 0.00% |
| **By type** | | | | | | | | | |
| Wage and salary employment | 83.25% | 80.60% | -3.19% | 84.17% | 83.54% | -0.75% | 82.87% | 81.16% | -2.06% |
| Proprietors employment | 16.75% | 19.40% | 15.88% | 15.83% | 16.46% | 4.00% | 17.13% | 18.84% | 9.96% |
| Farm proprietors employment | 1.50% | 1.05% | -30.21% | 0.42% | 0.27% | -36.10% | 1.77% | 1.54% | -13.12% |
| Non-farm proprietors employment | 15.24% | 18.36% | 20.42% | 15.41% | 16.19% | 5.09% | 15.36% | 17.30% | 12.62% |
| **By industry** | | | | | | | | | |
| Farm employment | 1.57% | 1.63% | 3.62% | 1.01% | 0.70% | -30.34% | 2.58% | 2.24% | -13.20% |
| Non-farm employment | 98.43% | 98.37% | -0.06% | 98.99% | 99.30% | 0.31% | 97.42% | 97.76% | 0.35% |
| Private employment | 69.92% | 66.81% | -4.45% | 82.89% | 85.50% | 3.15% | 74.05% | 76.96% | 3.93% |
| Ag. services, forestry, fishing and other | 0.65% | 0.74% | 13.73% | 1.46% | 1.66% | 14.15% | 1.10% | 1.39% | 26.96% |
| Mining | 4.54% | (D) | n/a | 0.81% | 0.45% | -44.81% | 2.67% | 1.99% | -25.64% |
| Construction | 4.82% | (D) | n/a | 5.70% | 7.11% | 24.62% | 5.29% | 6.16% | 16.30% |
| Manufacturing | 7.55% | (D) | n/a | 10.19% | 8.01% | -21.38% | 6.22% | 5.01% | -19.41% |
| Transportation and public utilities | 6.92% | 5.52% | -20.26% | 4.42% | 4.43% | 0.34% | 4.45% | 4.46% | 0.15% |
| Wholesale trade | 1.74% | 1.75% | 0.79% | 4.34% | 4.35% | 0.28% | 3.64% | 3.47% | -4.60% |
| Retail trade | 18.65% | 19.47% | 4.35% | 18.03% | 17.17% | -4.73% | 17.53% | 17.73% | 1.15% |
| Finance, insurance, and real estate | 3.55% | 6.14% | 73.20% | 8.90% | 9.99% | 12.24% | 6.12% | 6.47% | 5.63% |
| Services | 21.51% | 20.47% | -4.87% | 28.53% | 32.33% | 13.32% | 27.03% | 30.29% | 12.06% |
| Government and government enterprises | 28.50% | 31.56% | 10.73% | 16.10% | 13.79% | -14.31% | 23.37% | 20.80% | -10.99% |
| Federal, civilian | 6.05% | 4.63% | -23.45% | 2.40% | 1.71% | -28.87% | 4.12% | 3.10% | -24.68% |
| Military | 1.32% | 0.66% | -50.03% | 2.00% | 1.18% | -41.02% | 2.94% | 1.76% | -39.98% |
| State and local | 21.13% | 26.27% | 24.30% | 11.70% | 10.91% | -6.75% | 16.31% | 15.93% | -2.31% |
| State government | 1.35% | (D) | n/a | 3.23% | 2.87% | -10.89% | 7.26% | 6.65% | -8.51% |
| Local government | 19.79% | (D) | n/a | 8.47% | 8.03% | -5.18% | 9.05% | 9.29% | 2.67% |

Source: Bureau of Economic Analysis website http://www.bea.doc.gov/bea/regional/reis/action.cfm




Source: Bureau of Economic Analysis

**Figure 1. Percent Change in Industry by County and State, 1990-2000**

Table 13 presents a list of major employers throughout the region which has been adapted from the Arizona Department of Commerce Community Profiles. Dominant occupations, as determined by number of employees and the percentage of total employment, are shown for each county in Table 14. Data show that four of the five counties within the area of assessment maintain occupational structures very similar to that for the states of Arizona and New Mexico as a whole. "Management, professional, and related occupations" is the dominant occupational category for the state of Arizona, followed by sales and office occupations and finally by service occupations. The same ranking occurs in Apache, Coconino, and Navajo Counties. The clear exception to this trend is Greenlee County where construction, extraction, and maintenance occupations were foremost as of 2004, followed by management, professional, and related occupations, then by production, transportation, and material moving occupations.

Table 15 presents annual unemployment rates for the counties, the states of Arizona and New Mexico, the United States, and selected cities within the area of assessment. During the period covered, average unemployment ranged from a high of 14.9% in Apache County to a low of 7.2% in Coconino County. Navajo County also experienced an average unemployment (12.6%) that was much higher than the state average of 5.2% over the same period. This may be due, at least in part, to the extremely high average unemployment rate in Whiteriver (22.0%), the second most populous town in Navajo County. Among individual cities within the area of assessment, Sedona enjoyed the lowest average unemployment rate, which was 2.3% during the period.

Table 16 provides per capita and median family incomes as well as rates of individual and family poverty. Data demonstrate increases in per capita and median family income that were greater in each county than increases at the state level during the same period. Despite these increases, however, per capita and median family income remained significantly lower than the state average in each of the counties as of 2000. A similar trend is evident in individual and family poverty between 1990 and 2000. Each of the counties saw declines in individual and family poverty that were greater than the reductions in poverty at the state level over the ten-year period. Still, the percentage of individual and family poverty was higher than the state average in each of the counties within the area of assessment. Apache County appears to be the most economically challenged of the four Arizona counties with an income below and a poverty level well above that of neighboring counties and the state of Arizona. As of 2000, individual and family poverty was particularly high in Whiteriver on the Apache Indian Reservation in Navajo County.

Household income distribution for each county is presented in Table 17. Here again, the economic status of Apache County is shown to be considerably limited with over 27% of households earning less than $15,000 per year. Median household income was greatest in Greenlee County at $39,384 in 2000. By comparison, Coconino County is the more affluent of the five counties with 8.5% of households earning $100,000 or more as of 2000.

**Table 3. Major Employers by County, 2004**

| Apache County |
|---|
| Fort Defiance Hospital, Ft. Defiance |
| Indian Health Services, Chinle/Ft. Defiance |
| Navajo Communications Co., Window Rock |
| Navajo Nation, Window Rock |
| Navajo Tribal Utility Authority, Navajo Nation |
| P&M Coal Co., Window Rock |
| Packard-Hughes Interconnect, Ft. Defiance |
| Sage Memorial Hospital, Ganado |
| Salt River Project Coronado Generating Station |
| Tucson Electric Power, Springerville |
| White Mountain Community Hospital, Springerville |

| Greenlee County |
|---|
| Clifton Elementary |
| Clifton High School |
| Copperoom Restaurant & Lounge, Morenci |
| Duncan Public Schools, Duncan |
| Fairbanks School, Morenci |
| Greenlee County, Clifton |
| Kempton Chevrolet, Buick, Geo, Clifton |
| Morenci Healthcare Center |
| Morenci High School |
| Morenci Public Schools |
| Morenci Water and Electric Co. |
| Phelps Dodge, Morenci |
| Town of Clifton |

| Catron County, NM |
|---|
| Catron County Commission on Aging |
| Reserve Independent Schools<br>Quemado Independent Schools |
| State of New Mexico Highway Department |
| United States Forest Service |

| Coconino County |
|---|
| ARA Leisure Services, Page |
| City of Flagstaff |
| Coconino Community College, Flagstaff |
| Coconino County, Flagstaff |
| Flagstaff Unified School District, Flagstaff |
| Flagstaff Medical Center, Flagstaff |
| Grand Canyon Railway, Williams |
| Kaibab National Forest, Williams |
| National Park Service , Page |
| Navajo Generating Station, Page |
| Navajo Government Executive Branch, Navajo Nation |
| Navajo Tribal Utility Authority, Navajo Nation |
| Northern Arizona University, Flagstaff |
| Pittsburg & Midway Coal Mining Co., Navajo Nation |
| Nestle Purina Petcare, Flagstaff |
| Samaritan Family Health Center, Grand Canyon |
| Tooh-Dineh Industries, Leupp |
| Tuba City Indian Medical Center |
| Tuba City Unified School District #15 |
| Walgreens Distribution |
| Wal-Mart, Flagstaff and Page |
| Window Rock Unified School District |
| SCA Tissue, Flagstaff |
| W.L. Gore and Associates, Inc., Flagstaff |

| Navajo County |
|---|
| Abitibi Consolidated Inc., Snowflake |
| APS, Joseph City |
| Burlington Northern Santa Fe |
| Railway, Winslow |
| Holiday Inn, Kayenta |
| Kayenta Boarding B.I.A. School, Kayenta |
| Keams Canyon Indian Hospital, Keams Canyon |
| Navajo Government Executive Branch, Navajo Nation |
| Navajo Tribal Utility Authority, Keams Canyon |
| Navapache Hospital, Show Low |
| Northland Pioneer College, Holbrook |
| Peabody Coal Co., Kayenta |
| PFFJ, Inc., Snowflake |
| Piñon Unified School District #4 |
| Suntastic Hothouse Inc., Snowflake |
| Grower Western |
| Western Moulding Company Inc., Snowflake |

Source: Arizona Department of Commerce - Community Profiles

http://www.azcommerce.com/Communities/community_profiles.asp

## Table 4. Dominant Occupations of State and County Populations, 2000

| County/State | Number | Percent |
|---|---|---|
| **Apache County** | | |
| Management, professional, and related occupations | 5,467 | 33.2% |
| Sales and office occupations | 3,582 | 21.7% |
| Service occupations | 2,944 | 17.9% |
| Construction, extraction, and maintenance occupations | 2,680 | 16.3% |
| Production, transportation, and material moving occupations | 1,686 | 10.2% |
| **Coconino County** | | |
| Management, professional, and related occupations | 19,309 | 38.4% |
| Sales and office occupations | 14,240 | 25.7% |
| Service occupations | 10,610 | 19.1% |
| Construction, extraction, and maintenance occupations | 5,548 | 10.0% |
| Production, transportation, and material moving occupations | 5,529 | 10.0% |
| **Greenlee County** | | |
| Construction, extraction, and maintenance occupations | 1,037 | 30.0% |
| Management, professional, and related occupations | 797 | 23.0% |
| Production, transportation, and material moving occupations | 636 | 18.4% |
| Sales and office occupations | 546 | 15.8% |
| Service occupations | 403 | 11.6% |
| **Navajo County** | | |
| Management, professional, and related occupations | 8,042 | 27.2% |
| Sales and office occupations | 7,136 | 24.1% |
| Service occupations | 5,254 | 17.8% |
| Construction, extraction, and maintenance occupations | 4,731 | 16.0% |
| Production, transportation, and material moving occupations | 4,042 | 13.7% |
| **Catron County** | | |
| Management, professional, and related occupations | 394 | 31.8% |
| Sales and office occupations | 280 | 22.6% |
| Service occupations | 201 | 16.2% |
| Construction, extraction, and maintenance occupations | 197 | 15.9% |
| Production, transportation, and material moving occupations | 132 | 10.6% |
| **Arizona** | | |
| Management, professional, and related occupations | 730,001 | 32.70% |
| Sales and office occupations | 636,970 | 28.50% |
| Service occupations | 362,547 | 16.20% |
| Construction, extraction, and maintenance occupations | 245,578 | 11.00% |
| Production, transportation, and material moving occupations | 244,015 | 10.90% |
| **New Mexico** | | |
| Management, professional, and related occupations | 259,510 | 34.0% |
| Sales and office occupations | 197,580 | 25.9% |
| Service occupations | 129,349 | 17.0% |
| Construction, extraction, and maintenance occupations | 87,172 | 11.4% |
| Production, transportation, and material moving occupations | 81,911 | 10.7% |

Source: U.S. Census Bureau, American Fact Finder
http://factfinder.census.gov

## Table 5. Average Annual Unemployment Rates by County, State, Place, and U.S., 1980-2004

| Area | 1980* | 1990* | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Apache County** | 12.6% | 13.5% | 18.4% | 16.4% | 19.7% | 17.4% | 15.5% | 14.0% | 13.0% | 11.9% | 13.1% | 14.1% | 13.5% | 14.9% |
| Eagar | 13.0% | 4.2% | 5.9% | 5.2% | 6.3% | 5.5% | 4.8% | 4.3% | 4.0% | 3.6% | 4.0% | 4.3% | 4.2% | 5.5% |
| St. Johns | 5.9% | 4.3% | 6.1% | 5.4% | 6.6% | 5.7% | 5.0% | 4.5% | 4.1% | 3.8% | 4.1% | 4.5% | 4.3% | 4.9% |
| Springerville | n/a | 7.1% | 9.9% | 8.8% | 10.8% | 9.3% | 8.3% | 7.4% | 6.8% | 6.2% | 6.9% | 7.5% | 7.1% | 7.9% |
| **Coconino County** | 7.7% | 7.8% | 9.2% | 7.8% | 8.7% | 8.4% | 7.3% | 6.7% | 5.8% | 5.4% | 5.9% | 6.4% | 6.1% | 7.2% |
| Flagstaff | 7.0% | 6.1% | 7.3% | 6.1% | 6.9% | 6.6% | 5.8% | 5.3% | 4.6% | 4.3% | 4.6% | 5.1% | 4.8% | 5.7% |
| Sedona | 5.3% | 2.1% | 2.5% | 2.1% | 2.4% | 2.3% | 2.0% | 1.8% | 1.6% | 1.5% | 1.6% | 1.8% | 1.6% | 2.3% |
| Page | 4.8% | 6.1% | 7.3% | 6.1% | 6.9% | 6.6% | 5.8% | 5.3% | 4.6% | 4.2% | 4.6% | 5.0% | 4.8% | 5.4% |
| Williams | n/a | 3.7% | 4.4% | 3.6% | 4.1% | 4.0% | 3.4% | 3.2% | 2.7% | 2.5% | 2.7% | 3.0% | 2.9% | 3.3% |
| Fredonia | n/a | 7.2% | 8.6% | 7.2% | 8.1% | 7.8% | 6.8% | 6.3% | 5.3% | 5.0% | 5.4% | 5.9% | 5.7% | 6.5% |
| **Greenlee County** | 5.4% | 8.7% | 9.5% | 6.7% | 7.9% | 7.2% | 8.1% | 8.7% | 5.5% | 8.9% | 9.1% | 7.5% | 5.2% | 7.6% |
| Clifton | 4.0% | 6.6% | 7.2% | 5.1% | 6.0% | 5.5 | 6.1% | 6.6% | 4.1% | 6.8% | 6.9% | 5.7% | 3.9% | 5.6% |
| Morenci | 5.3% | n/a | 8.9% | 6.3% | 7.3% | 6.7% | 7.5% | 8.1% | 5.1% | 8.3% | 8.5% | 6.9% | 4.9% | 6.8% |
| **Navajo County** | 10.0% | 11.2% | 15.3% | 15.0% | 15.9% | 15.3% | 13.6% | 13.1% | 11.6% | 10.6% | 10.7% | 10.8% | 10.7% | 12.6% |
| Show Low | 4.7% | 4.0% | 5.6% | 5.5% | 5.8% | 5.6% | 4.9% | 4.7% | 4.1% | 3.7% | 3.8% | 3.8% | 3.8% | 4.5% |
| Whiteriver | n/a | 20.1% | 26.5% | 26.1% | 27.4% | 26.5% | 24.0% | 23.2% | 20.9% | 19.1% | 19.3% | 19.5% | 19.4% | 22.0% |
| Snowflake | 10.9% | 4.6% | 6.4% | 6.3% | 6.7% | 6.4% | 5.6% | 5.4% | 4.7% | 4.3% | 4.3% | 4.4% | 4.4% | 5.7% |
| Pinetop-Lakeside | n/a | 3.1% | 4.5% | 4.4% | 4.7% | 4.4% | 3.9% | 3.8% | 3.3% | 2.9% | 3.0% | 3.0% | 3.0% | 3.5% |
| Heber-Overgaard | n/a | 7.7% | 10.7% | 10.6% | 11.2% | 10.7% | 9.5% | 9.1% | 8.0% | 7.2% | 7.3% | 7.5% | 7.4% | 8.6% |
| **Catron County, NM** | - | 15.4% | 13.6% | 12.1% | 14.3% | 11.9% | 12.0% | 9.7% | 6.7% | 6.9% | 5.9% | 8.1% | 8.2% | 10.4 |
| **Arizona** | 6.7% | 5.5% | 6.4% | 5.1% | 5.5% | 4.6% | 4.1% | 4.4% | 4.0% | 4.7% | 6.2% | 5.6% | 4.9% | 5.2% |
| **New Mexico** | 7.5% | 6.5% | 6.3% | 6.3% | 8.1% | 6.2% | 6.2% | 5.6% | 5.0% | 4.8% | 5.4% | 6.4% | 5.5% | 6.1% |
| **United States** | 7.1% | 5.6% | 6.1% | 5.6% | 5.4% | 4.9% | 4.5% | 4.2% | 4.0% | 4.7% | 5.8% | 6.0% | 5.5% | 5.3% |

Source: Arizona Department of Commerce, Arizona Workforce Informer

http://www.workforce.az.gov/cgi/dataanalysis/?PAGEID=94&SUBID=142

U.S. Bureau Of Labor Statistics

http://www.bls.gov/cps/prev_yrs.htm

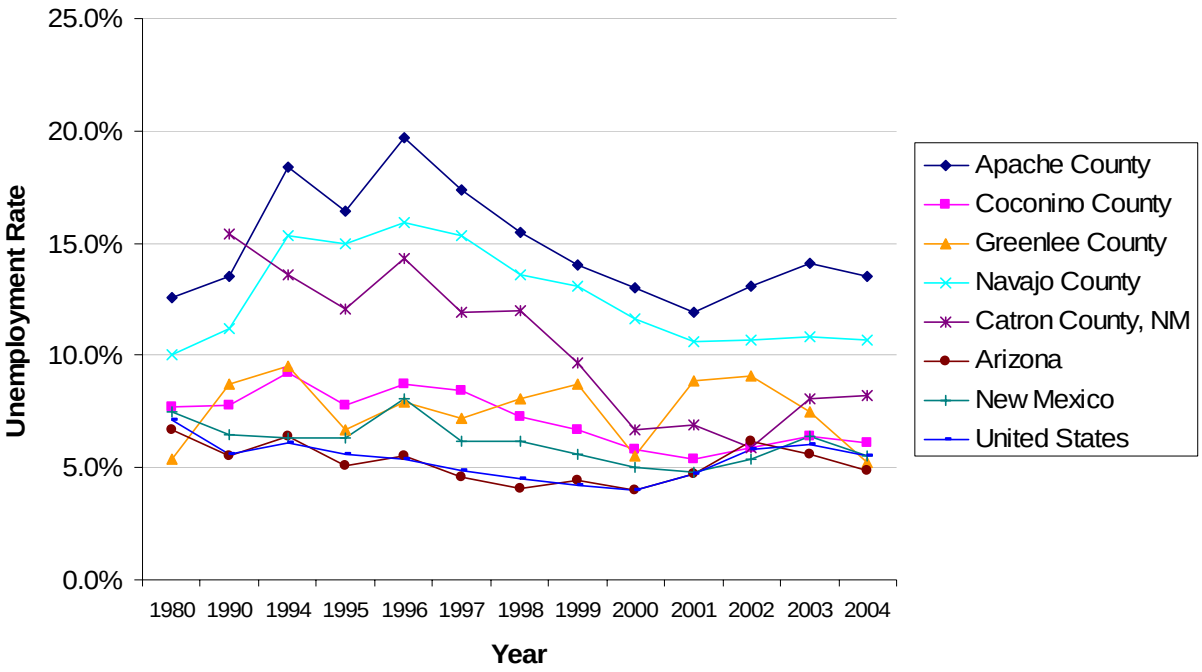
* 1980 and 1990 unemployment data unavailable for towns with a population of less than 2,500 individuals

## Table 6. Per Capita and Family Income by County and State, 1990-2000 and % Change

| | Per Capita Income | | | Median Family Income | | | % Individuals in Poverty | | | % Families in Poverty | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **County/Place** | **1990** | **2000*** | **% Change** | **1990** | **2000*** | **% Change** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** |
| **Apache County** | $5,399 | $6,818 | 26.28% | $16,346 | $19,966 | 22.15% | 47.1% | 37.8% | -19.75% | 41.5% | 33.5% | -19.28% |
| Eagar | $9,725 | $11,095 | 14.09% | $33,421 | $31,297 | -6.35% | 14.2% | 7.4% | -47.89% | 12.4% | 7.8% | -37.10% |
| St. Johns | $10,720 | $10,115 | -5.65% | $36,917 | $28,436 | -22.97% | 11.2% | 15.3% | 36.61% | 9.0% | 12.5% | 38.89% |
| Springerville | $9,528 | $10,493 | 10.13% | $26,141 | $27,565 | 5.45% | 15.4% | 21.0% | 36.36% | 12.5% | 14.7% | 17.60% |
| **Coconino County** | $10,580 | $13,004 | 22.91% | $30,648 | $34,805 | 13.56% | 23.1% | 18.2% | -21.21% | 16.9% | 13.1% | -22.49% |
| Flagstaff | $11,517 | $14,140 | 22.78% | $34,952 | $36,743 | 5.12% | 17.2% | 17.4% | 1.16% | 10.4% | 10.6% | 1.92% |
| Sedona | $19,893 | $23,786 | 19.57% | $35,559 | $39,954 | 12.36% | 8.9% | 9.7% | 8.99% | 6.3% | 4.7% | -25.40% |
| Page | $12,352 | $14,181 | 14.81% | $42,068 | $41,216 | -2.02% | 9.2% | 13.9% | 51.09% | 8.5% | 12.8% | 50.59% |
| Williams | $10,121 | $10,098 | -0.23% | $26,524 | $23,454 | -11.57% | 11.7% | 15.0% | 28.21% | 8.0% | 12.3% | 53.75% |
| Fredonia | $8,185 | $12,309 | 50.38% | $27,065 | $29,638 | 9.51% | 13.5% | 12.8% | -5.19% | 11.1% | 9.9% | -10.81% |
| **Greenlee County** | $9,794 | $11,998 | 22.50% | $29,945 | $33,022 | 10.28% | 12.6% | 9.9% | -21.43% | 10.8% | 8.0% | -25.93% |
| Clifton | $9,810 | $11,618 | 18.43% | $28,504 | $31,730 | 11.32% | 13.3% | 11.5% | -13.53% | 9.9% | 8.1% | -18.18% |
| Morenci | $10,208 | $14,184 | 38.95% | $35,226 | $41,414 | 17.57% | 6.2% | 3.0% | -51.61% | 5.9% | 2.7% | -54.24% |
| **Navajo County** | $7,586 | $8,808 | 16.11% | $21,336 | $24,590 | 15.25% | 34.7% | 29.5% | -14.99% | 30.3% | 23.4% | -22.77% |
| Show Low | $10,358 | $11,788 | 13.80% | $29,375 | $27,615 | -5.99% | 18.5% | 15.0% | -18.92% | 14.2% | 11.7% | -17.61% |
| Whiteriver | $3,896 | $4,339 | 11.37% | $10,139 | $13,486 | 33.01% | 55.6% | 51.6% | -7.19% | 58.4% | 46.9% | -19.69% |
| Snowflake | $7,810 | $10,160 | 30.09% | $29,200 | $32,246 | 10.43% | 18.6% | 15.0% | -19.35% | 16.3% | 10.4% | -36.20% |
| Pinetop-Lakeside | $12,582 | $14,068 | 11.81% | $30,778 | $32,014 | 4.02% | 10.0% | 10.1% | 1.00% | 7.9% | 6.6% | -16.46% |
| Heber-Overgaard | n/a | $15,596 | n/a | n/a | $35,380 | n/a | n/a | 16.4% | n/a | n/a | 11.7% | n/a |
| **Catron County** | $8,537 | $10,585 | 23.99% | $22,278 | $23,325 | 4.70% | 25.6% | 24.5% | -4.30% | 19.5% | 17.4% | -10.77% |
| **Arizona** | $13,461 | $15,383 | 14.28% | $32,178 | $35,450 | 10.17% | 15.7% | 14.0% | -10.83% | 11.4% | 10.0% | -12.28% |
| **New Mexico** | $11,246 | $13,096 | 16.45% | $27,623 | $29,913 | 8.29% | 21.0% | 18.0% | -16.67% | 17.0% | 15.0% | -11.76% |

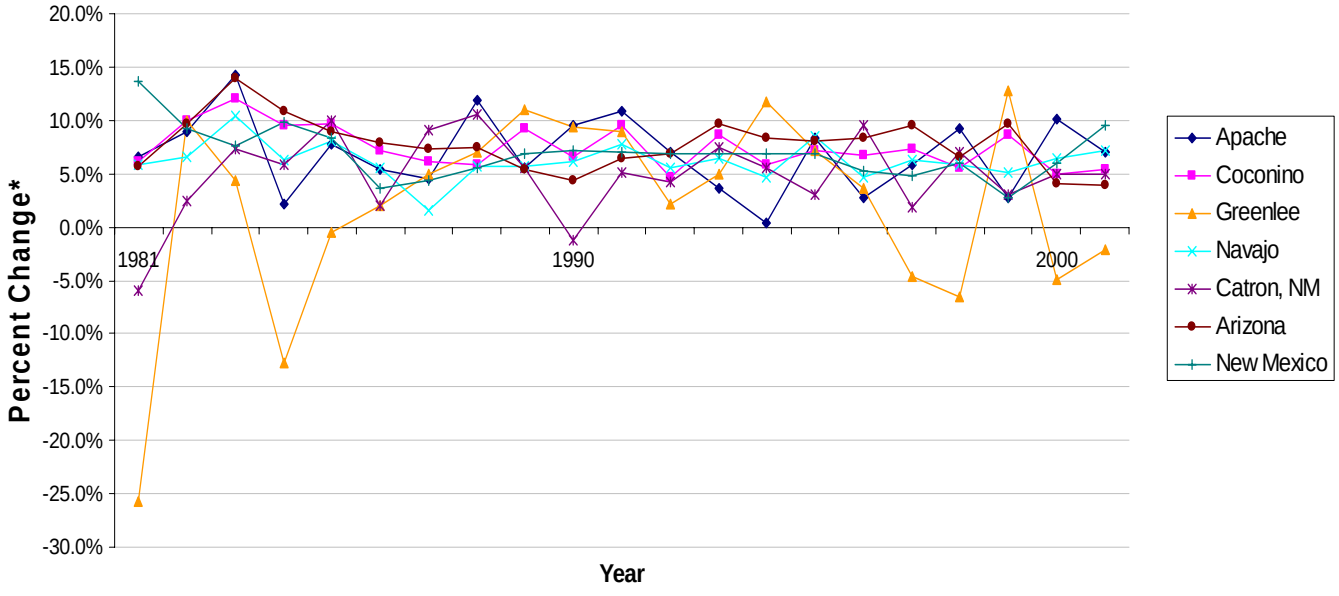
Source: NRIS - Human Dimensions

*2000 Income data adjusted to reflect 1990 constant dollars by applying deflation factor calculated by Consumer Price Index



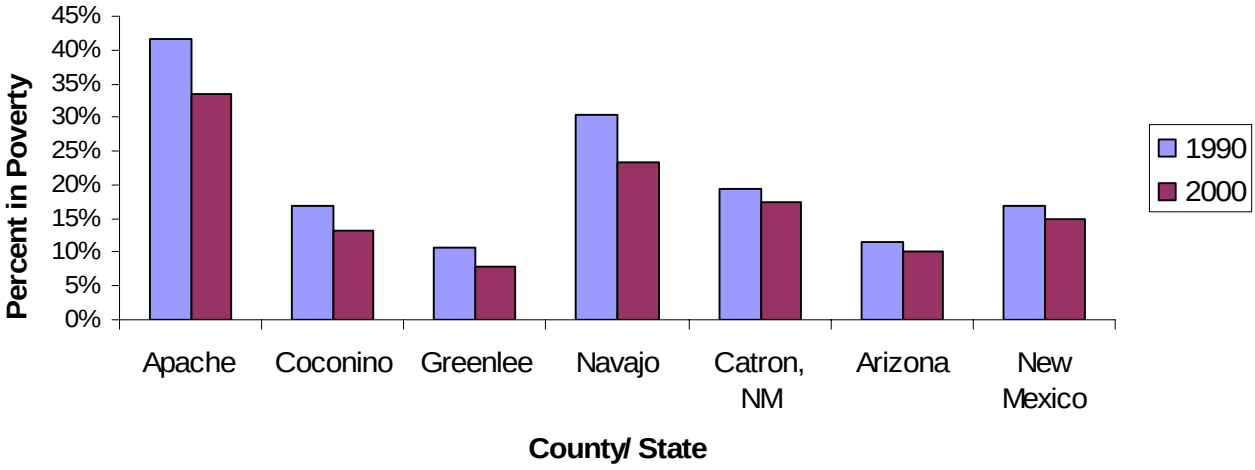

Sources: Arizona Department of Commerce, Arizona Workforce Informer
U.S. Bureau of Labor Statistics

**Figure 2. Unemployment Rates by County and State, 1980-2004**




Source: Bureau of Economic Analysis
*** Annual percent change in per capita personal income based on mid-year Census Bureau estimates of county population**

**Figure 3. Annual Percent Change in Per Capita Income by County, 1980-2000**




Source: NRIS – Human Dimensions

**Figure 4. Percent of Families in Poverty by County, 1990-2000**

**Table 7. Household Income Distribution by County, 2000**

| | Apache County | | Coconino County | | Greenlee County | | Navajo County | | Catron County | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Less than $10,000 | 5,401 | 27.1% | 4,285 | 10.6% | 291 | 9.3% | 5,589 | 18.6% | 333 | 21.0% |
| $10,000 to $14,999 | 2,053 | 10.3% | 2,838 | 7.0% | 204 | 6.5% | 2,684 | 8.9% | 159 | 10.0% |
| $15,000 to $24,999 | 2,979 | 14.9& | 5,670 | 14.0% | 406 | 13.0% | 5,040 | 16.8% | 325 | 20.5% |
| $25,000 to $34,999 | 2,791 | 14.0% | 5,542 | 13.7% | 416 | 13.3% | 4,264 | 14.2% | 237 | 14.9% |
| $35,000 to $49,999 | 2,781 | 14.0% | 7,018 | 17.4% | 795 | 25.4% | 4,848 | 16.1% | 225 | 14.2% |
| $50,000 to $74,999 | 2,488 | 12.5% | 7,661 | 19% | 680 | 21.7% | 4,425 | 14.7% | 201 | 12.7% |
| $75,000 to $99,999 | 839 | 4.2% | 3,950 | 9.8% | 249 | 8.0% | 1,900 | 6.3% | 65 | 4.1% |
| $100,000 to $149,999 | 487 | 2.4% | 2,349 | 5.8% | 61 | 1.9% | 951 | 3.2% | 37 | 2.3% |
| $150,000 to $199,999 | 47 | 0.2% | 555 | 1.4% | 22 | 0.7% | 198 | 0.7% | 3 | 0.2% |
| $200,000 or more | 66 | 0.3% | 518 | 1.3% | 7 | 0.2% | 156 | 0.5% | 2 | 0.1% |
| Median household income ($) | $23,344 | (x) | $38,256 | (x) | $39,384 | (x) | $28,569 | (x) | $23,892 | (X) |

Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000
http://www.census.gov/census2000/states/az.html

### 3.3 Forest and natural resource dependent economic activities

Data on natural-resource dependent economic activities are comprised of available information on income from wood products and processing, income from special forest products and processing, and tourism employment. Analysis is based on IMPLAN data provided by the USFS Planning Analysis Group and Inventory and Monitoring Institute in Fort Collins, Colorado. IMPLAN is a form of input-output analysis developed specifically for the unique needs of the Forest Service. Input-output analysis (I-O) is used to quantify linkages among the structural parts of an economy. Given a particular economic impact, for example a public lands management decision, I-O analysis generally calculates the overall effects

resulting from a direct impact on the economy. This mathematical model accounts for a variety of employment, income, and output effects including both direct effects (i.e. wages) and indirect effects (i.e. the stimulation of local economy to supply inputs and processing). Some I-O analyses also model induced effects, the additional economic effects of household spending of increased wages within the community. The secondary (indirect and induced) effects are often described as "ripple-like" effects of spending throughout other sectors of a local economy (Loomis 2002). IMPLAN data are tabulated for 525 distinct industries according to the North American Industry Classification System (NAICS). A list of industries used to calculate income from wood and special forest products and processing as well as tourism employment is included in Appendix A. It should also be noted that analysis of IMPLAN data in this assessment is based solely on the direct economic impacts of selected industries and does not include indirect or induced economic impacts. Appendix B addresses some of the indirect economic effects of forest-related industries.

Total labor income from Forest Resources for the years 1990 and 2000 is shown in Table 18. Total labor income is commonly defined as the sum of employee compensation and proprietor's income. Data show significant losses in total labor income from wood products and processing for each of the counties between 1990 and 2000 with the exception of Greenlee County which reported no income from this category in either year. Apache and Greenlee Counties reported similar losses in total labor income from special forest products and processing, while Navajo County reported a substantial increase (328%) in the same category. The increase in total labor income from special forest products and processing was greatest for Coconino County between 1990 and 2000 (2,346%), due primarily to a considerable increase in income from the agriculture, forestry, and fishery services industry.

Table 19 suggests that the most substantial gains in tourism employment between 1990 and 2000 took place in Coconino County. Although the rate of increase was larger within other counties, the gain in actual number of individuals employed in tourism related sectors was significantly less. Notably, each of the five counties reported rates of increase in tourism employment exceeding that of their respective states between 1990 and 2000.

**Table 8. Total Labor Income from Forest Resources by County and State, 1990-2000 and % Change**

| County | Income from Wood Processing and Products | | | Income From Special Forest Products and Processing | | |
|---|---|---|---|---|---|---|
| | 1990 | 2000 | %Change | 1990 | 2000 | %Change |
| **Apache** | $8,680,090.55 | $1,160,175.56 | -86.63% | $840,850.11 | $520,546.91 | -38.09% |
| **Coconino** | $30,558,827.28 | $4,973,588.91 | -83.72% | $78,834.20 | $1,928,131.94 | 2,345.81% |
| **Greenlee** | $0.00 | $0.00 | n/a | $406,979.70 | $98,564.00 | -75.78% |
| **Navajo** | $49,567,159.03 | $34,270,346.61 | -30.86% | $1,294,655.82 | $5,535,208.71 | 327.54% |
| **Catron, NM** | $307,427.69 | $192,946.78 | -37.24% | $129,989.50 | $148,253.04 | 14.05% |
| **Assessment Area Total** | **$88,806,076.86** | **$40,404,111.08** | **-54.50%** | **$2,621,319.82** | **$8,082,451.55** | **208.34%** |
| **Arizona** | $263,558,989.17 | $369,474,538.71 | 40.19% | $175,994,086.50 | $137,825,248.28 | -21.69% |
| **New Mexico** | $74,750,035.16 | $71,318,854.00 | -4.59% | $32,359,688.72 | $39,734,899.98 | 22.79% |

*2000 Income data adjusted to reflect 1990 constant dollars by applying deflation factor calculated by Consumer Price Index

Source: 1990 and 2000 IMPLAN data

**Table 9. Tourism Employment by County and State, 1990-2000 and % Change**

| | Apache County | | | Coconino County | | | Catron County ,NM | | |
|---|---|---|---|---|---|---|---|---|---|
| **Industry Sector** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** |
| Retail | 144 | 201 | 39.71% | 562 | 896 | 59.47% | 6 | 12 | 111.76% |
| Restaurant/Bar | 76 | 157 | 105.48% | 1,054 | 1,451 | 37.69% | 9 | 12 | 31.79% |
| Lodging | 278 | 587 | 111.02% | 3,812 | 4,831 | 26.73% | 26 | 56 | 118.89% |
| Amusement | 2 | 1 | -3.33% | 60 | 121 | 101.21% | 0 | 2 | n/a |
| **Total** | **500** | **947** | **89.29%** | **5,488** | **7,299** | **33.00%** | **40** | **82** | **102.24%** |

| | Greenlee County | | | Navajo County | | | Arizona | | |
|---|---|---|---|---|---|---|---|---|---|
| **Industry Sector** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** |
| Retail | 21 | 28 | 34.29% | 310 | 408 | 31.71% | 21,655 | 30,376 | 40.28% |
| Restaurant/Bar | 17 | 22 | 29.86% | 373 | 559 | 49.94% | 26,393 | 38,395 | 45.47% |
| Lodging | 63 | 94 | 50.30% | 469 | 623 | 32.69% | 47,848 | 56,848 | 18.81% |
| Amusement | 0 | 10 | 7,940.00% | 12 | 20 | 69.64% | 1,442 | 3,462 | 140.05% |
| **Total** | **101** | **155** | **53.50%** | **1,163** | **1,609** | **38.33%** | **97,338** | **129,081** | **32.61%** |

| | New Mexico | | |
|---|---|---|---|
| **Industry Sector** | **1990** | **2000** | **% Change** |
| Retail | 8,217 | 10,748 | 30.81% |
| Restaurant/Bar | 10,734 | 14,290 | 33.13% |
| Lodging | 14,056 | 17,021 | 21.09% |
| Amusement | 490 | 1,421 | 189.73% |
| **Total** | **33,497** | **43,480** | **29.80%** |

Source: 1990 and 2000 IMPLAN data

### 3.4 Government earnings from federal-lands related payments

Federal lands support the fiscal management of local governments through Payments in Lieu of Taxes (PILT) and what are commonly referred to as "Payments to States" or "Secure Schools and Roads" funding. PILT funds derive from a 1976 law (Public Law 94-565) that provides money to local governments based on the amount of federal lands within their jurisdiction. These payments are affected by federal funding limitations, prior year "Payments to States," and formulas derived from county populations. Based on annual congressional appropriation decisions, PILT payments may not always be fully funded. Counties may also receive monies based on a 1908 law that allocates to them ten percent of the gross revenues generated from timber harvest, grazing, mining, and all other uses from the federal lands within their jurisdictions.

The Weeks Law of 1911 increased the amount of forest receipt payments from ten to twenty-five percent. These "twenty-five percent monies" were mandated for use in schools and on roads. With recent diminishing commercial uses of federal lands, the President, in 2000, signed the Secure Rural Schools and Community Self Determination Act (PL 106-393). The purpose of the Act was to address the diminishing amounts of the twenty-five percent monies. This new law provides counties with the option of continuing to receive the twenty-five percent amount or to elect to receive a fixed amount based on the average of the three highest years between 1986 and 1999. In rural counties, these funds can be an important source of funding to maintain roads and provide support for schools. The law was originally

scheduled to sunset in 2006, but a bill to reauthorize the Act and extend it through FY 2013 was, at the time of this report, being considered by Congress (S. 267, H.R. 517).

PILT entitlement acreage is presented for each county in Table 20. Coconino County holds, by far, the greatest entitlement acreage with over 4.7 million acres, 3.2 million of which are FS lands. Catron County also reports a significant amount of entitlement acreage. Greenlee County also holds a significant amount of FS lands entitled to PILT with over 750,000 acres. Actual PILT payments for each county are presented in Table 21. Coconino County has consistently been among the largest recipients of PILT payments, which is not surprising given its abundance of entitlement acreage. In 2003 and 2004, however, Apache County received the greatest PILT payments with $910,399 and $896,233 respectively. Catron County reported the lowest average PILT payment between 2000 and 2004.

Annual forest receipts for the period spanning 1986-1999 are presented for each county in Table 22. Here again, Coconino County is shown to be the clear exception within the area of assessment with average annual receipts of over $2.4 million during the period. By contrast, Apache County reported the fewest forest receipts with an annual average of $273,300.

**Table 10. Payment in Lieu of Taxes (PILT) Entitlement Acreage by County and Agency, FY 2004**

| County | BLM | FS | BOR | NPS | COE | ARMY | FISH | URC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| Apache County | 95,774 | 492,814 | 0 | 63,885 | 0 | 0 | 0 | 0 | 652,473 |
| Coconino County | 605,440 | 3,269,240 | 24,083 | 826,877 | 0 | 0 | 0 | 0 | 4,725,640 |
| Greenlee County | 156,233 | 751,142 | 0 | 0 | 0 | 0 | 0 | 0 | 907,375 |
| Navajo County | 92,981 | 487,997 | 4,819 | 18,904 | 0 | 0 | 0 | 0 | 604,701 |
| Catron County, NM | 598,884 | 2,150,385 | 0 | 533 | 0 | 0 | 0 | 0 | 2,749,802 |
| **TOTAL** | 1,549,312 | 7,151,578 | 28,902 | 910,199 | 0 | 0 | 0 | 0 | 9,639,991 |

Source: U.S. Department of the Interior, Bureau of Land Management

http://www.blm.gov/pilt

**Table 11. County PILT Payments, 2000-2004**

| County | 2000 | 2001 | 2002 | 2003 | 2004 | Average |
|---|---|---|---|---|---|---|
| Apache County | $523,885 | $745,100 | $795,723 | $926,386 | $910,399 | $780,299 |
| Coconino County | $820,879 | $1,260,220 | $1,329,731 | $858,124 | $896,233 | $1,033,037 |
| Greenlee County | $345,990 | $473,543 | $530,056 | $341,525 | $353,908 | $409,004 |
| Navajo County | $435,569 | $641,880 | $694,151 | $794,619 | $826,810 | $678,606 |
| Catron County | $149,812 | $267,638 | $280,882 | $320,469 | $329,469 | $269,654 |
| **TOTAL** | $2,276,135 | $3,388,381 | $3,630,543 | $3,241,123 | $3,316,819 | $3,170,600 |

Source: U.S. Department of the Interior, Bureau of Land Management
http://www.blm.gov/pilt/search.html

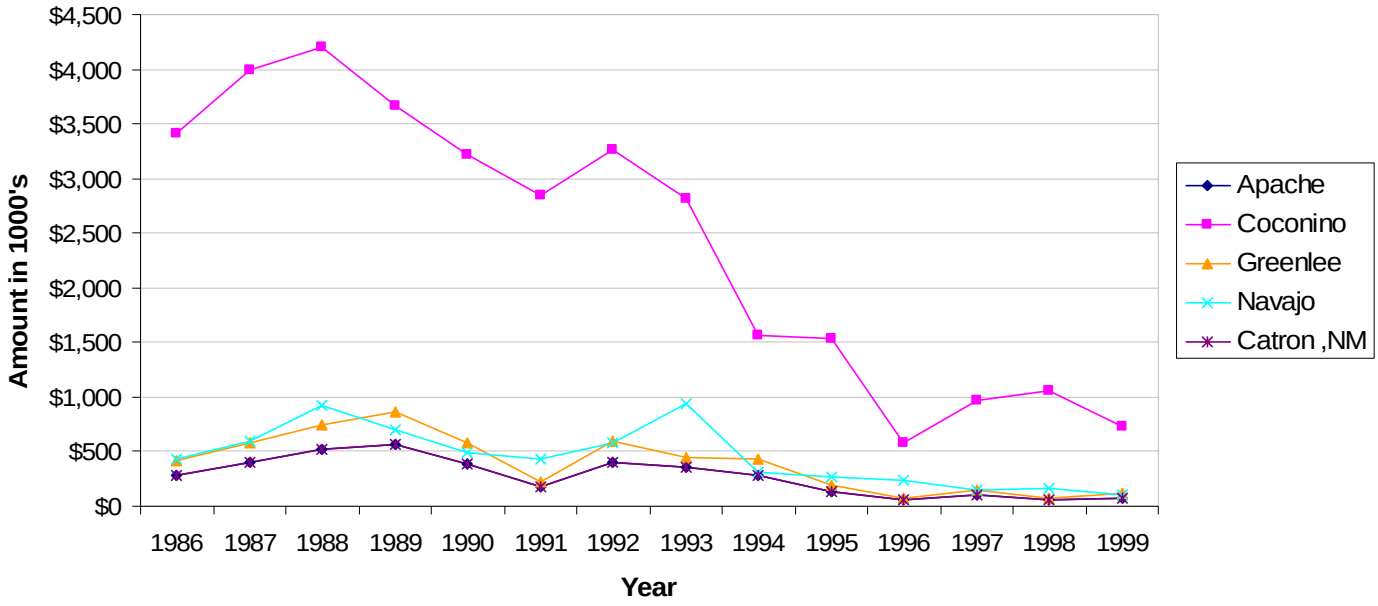
**Table 12. Forest Receipts by County, 1986-1999 (Amounts in 1,000s)**

| County | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|---|---|---|
| Apache County | $284.1 | $397.2 | $523.2 | $569.5 | $387.1 | $174.2 | $406.8 | $355.1 | $285.5 |
| Coconino County | $3,418.8 | $3,991.3 | $4,208.3 | $3,671.3 | $3,218.2 | $2,839.2 | $3,256.8 | $2,817.3 | $1,566.2 |
| Greenlee County | $415.6 | $581.0 | $743.8 | $858.1 | $580.2 | $227.9 | $597.5 | $453.5 | $432.2 |
| Navajo County | $426.3 | $594.2 | $919.2 | $693.1 | $487.9 | $428.0 | $578.2 | $937.1 | $305.5 |
| Catron County, NM | $459.6 | $613.0 | $859.2 | $942.0 | $616.9 | $323.7 | $736.0 | $535.4 | $499.3 |

| County | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | Average |
|---|---|---|---|---|---|---|---|
| Apache County | $285.5 | $137.1 | $62.0 | $100.3 | $63.1 | $81.4 | $273.3 |
| Coconino County | $1,566.2 | $1,534.2 | $584.4 | $969.9 | $1,058.5 | $735.3 | $2,419.3 |
| Greenlee County | $432.2 | $189.0 | $67.1 | $144.2 | $79.9 | $119.8 | $392.1 |
| Navajo County | $305.5 | $265.1 | $238.4 | $156.0 | $165.8 | $108.0 | $450.2 |
| Catron County, NM | $499.3 | $266.6 | $119.5 | $195.3 | $140.5 | $163.7 | $462.2 |

Source: NRIS - Human Dimensions

Amounts in $1,000's




Source: NRIS – Human Dimensions

**Figure 5. Forest Receipts by County, 1986-1999**

### 3.5 Key issues for forest planning and management

In the early stages of Arizona's development, extractive industries such as mining, ranching, farming, and timber harvesting were the mainstays of local economies. For decades, these sectors provided the foundation for employment upon which the state's predominantly rural economy was based (Case and Alward 1997, Rasker 2000). In recent decades, however, Arizona has joined neighboring western states in experiencing a significant decline in extractive industries along with the employment and income traditionally provided by these sectors (Baden and Snow 1997, Booth 2002).

While these changes have undoubtedly had a negative impact on many local economies, the relative expansion of information- and service-based industries has led to a more diverse, and some say more sustainable, state economy (Baden and Snow 1997, Booth 2002). The economic data gathered for the area of assessment for Apache-Sitgreaves National Forests illustrate this trend showing substantial growth in the F.I.R.E. (finance, insurance and real estate) sector as well as in the retail trade industry. When matched with a simultaneous decline in extractive and productive industries, these changes have made the composition of the area's rural economy similar to those of urban areas and the state of Arizona as a whole (Booth 2002, Case and Alward 1997).

Again, these changes are emblematic of those seen in recent decades throughout the Mountain West and signal important demographic and economic trends that are likely to shape the region's future development. Despite relatively slow population and economic growth for the area surrounding the ASNF, data show expansion of certain populations and industries that are increasingly important to the local economy. In particular, the increase in retirement-aged population and increase in seasonal housing units, when combined with increases in the service/professional, retail trade, and construction industries, mirror a common trend in rural western economies.

These trends support the notion that growth in rural western communities is increasingly supported by individuals and households with the wherewithal to support increasingly non-extractive economies. Although the data show that per capita and median household income in the region grew somewhat faster than the state average between 1990 and 2000, overall income levels remain below the state average for most counties in the area of assessment. This trend takes on increasing relevance when combined with observed demographic trends showing an influx of retirement-age residents and seasonal homeowners. Several researchers have noted that while labor income is growing in the rural Mountain West, it is growing more slowly than transfer (social security, pensions, retirement) and dividend income. In other words, growth of rural communities is being fueled, at least in part, by income that is not tied to local employment (Booth 2002, Rasker 2000).

The relative expansion of the service and professional industries is also facilitated by advances in the transportation and information technologies that increasingly allow urban populations to relocate to high-amenity rural communities while maintaining employment and income characteristics typical of more urban settings (Booth 2002, Rasker 2000).

Together, these trends signal a convergence of rural and urban economies and carry important implications for natural resource management. Many of the rural communities hardest hit by the transition away from extractive industries belong to traditional constituencies associated with the FS, the BLM, and other federal and state agencies. In many cases, these agencies are caught between the necessity of responding to market forces and powerful interests determined to protect established industries from such changes (Baden and Snow and Snow 1997). Finally, data for the area surrounding the ASNF demonstrate the reciprocal cause and effect relationship between economic and demographic trends. Although the economic growth of rural communities may be fueled by households with relatively "footloose" income, potentially negative consequences include an increased demand for construction, schools, health care, and other services as well as undesirable side affects such as pollution, urban sprawl, and congestion (Rasker 2000, Case and Alward 1997).

# 4. Access and Travel Patterns

This section addresses historic and current factors affecting access patterns and transportation infrastructure within the five counties surrounding the Apache-Sitgreaves National Forests (ASNF). The information gathered is intended to outline current and future trends in forest access as well as potential barriers to access which may be encountered by various user groups. Primary sources of data on access and travel patterns for the state's national forests include the Arizona Department of Transportation and the Arizona Department of Commerce as well as the circulation elements of individual county comprehensive plans. Indicators used to assess access and travel patterns include existing road networks and planned improvements, trends in vehicle miles traveled (VMT) on major roadways, seasonal traffic flows, and county transportation planning priorities. Additional input on internal access issues has been sought directly from forest planning staff.

Various sources of information for the area surrounding ASNF cite the difficulty of transportation planning in the region given its vast geographic scale, population growth, pace of development, and constrained transportation funding. In an effort to respond effectively to such challenges, local and regional planning authorities stress the importance of linking transportation planning with preferred land uses. Data suggest that the area surrounding Apache-Sitgreaves NF has a relatively large network of State Highways and Indian Routes compared to Arizona's other national forests. Overall increases in VMT were greatest in Coconino County between 1990 and 2000, mirroring the region's relatively strong population growth. Research shows that there are few significant improvements currently scheduled for the region's transportation network and that seasonal traffic flows coincide with weather conditions which influence accessibility for visitors from outside the region.

### 4.1 Historical context and current access issues

Transportation infrastructure throughout the state of Arizona was initially developed to serve the needs of a predominantly rural population while supporting expansion of the state's largely agricultural economy. County and city comprehensive plans reviewed for this assessment specifically mention economic influences such as logging, ranching, tourism, and recreation as having played a role in developing the region's circulation system (Coconino County 2003, ADOT 2004a).

Today, many regions of the state, including the area surrounding the ASNF, are struggling to provide much needed improvements to transportation networks in order to accommodate growing populations and changing local economies. Circulation planning throughout the area of assessment is particularly challenging given the vast geographic scale of the area, its limited population, and the presence of large ranching tracts, extensive forest lands, large parcels of publicly owned property, and large Native American reservations. Each of the comprehensive plans further admits that current transportation networks have been developed as needs arose and, thus, inadequate for handling projected long-term growth (Coconino County 2003, Apache County 2003, Navajo County 2004).

Despite a diverse array of transportation planning issues at the county and municipal level, planning agencies throughout the state express a common concern for the linkages between transportation and land use planning. In its current long range plan, ADOT includes an appendix which analyzes broad transportation trends and issues as well as potentially significant implications for future transportation planning. In summary, ADOT identifies five large-scale issues that are most likely to influence transportation planning in the coming years: 1) Population growth and demographic change, 2) Economic growth and change, 3) Security concerns, 4) Energy supply and efficiency, and 5) Technological change and opportunities (ADOT 2004b). While the latter three issues are discussed in largely hypothetical terms and are at best indirectly linked to forest management, the first two identified issues are immediately relevant and directly pertain to other factors presented in this assessment.

Stressing the importance of demographic change for the future of transportation planning in the state, ADOT notes that Arizona's population is projected to double over the next forty years, growing from 5 to 10 million residents. In the agency's estimation, such changes will require "major expansions of roadway capacity and the development of transportation options and alternatives to provide acceptable levels of service on Arizona's roadways and maintain circulation" (ADOT 2004b). Specific concerns regarding the impact of population growth on state transportation planning include the cost of infrastructure surrounding sprawling metropolitan areas, traffic congestion and greater commuting distances within developed areas, and access to the state highway system for areas outside of major metropolitan centers.

In order to adequately prepare for future transportation needs, ADOT calls for greater coordination between state, regional, and local agencies in transportation and land use planning statewide. Strategies for doing so include the provision of education and technical assistance to local partners, enforcement of legal land use requirements, and the exercise of direct land use controls through state agencies such as the Arizona State Land Department. Through such efforts, ADOT hopes to play an important role in shaping the location of future development to ensure the maintenance of existing infrastructure while meeting the transportation needs of millions of new residents (ADOT 2004b).

Citing Arizona's transition from an agricultural- and extraction-based economy toward one where sales and services are increasingly important, ADOT addresses the consequent changes to transportation needs throughout the state. As a case in point, small parcel shipments and an increase in commuting that result from the growing information and service-based industries lead to different travel patterns and different types of vehicles on the road. ADOT suggests that increases in highway and freight rail capacity, development of intelligent traffic systems (ITS), expansion of intermodal facilities, and other related investments could help sustain Arizona's current industries and provide opportunities for new industries (ADOT 2004b).

### 4.2 Predominant transportation modes and seasonal flow patterns

A map of the roadway network within the area of assessment is presented in Figure 14. Interstates, U.S. and State highways, and Indian Routes within the area of assessment are presented in Table 23. The information shows that the area has a considerably dense network of rural roads and an abundance of State highways and more Indian Routes. Additionally, most of the major roadways follow a north-south orientation, the exceptions being Interstate 40 and State Highway 260, both of which are oriented east to west.

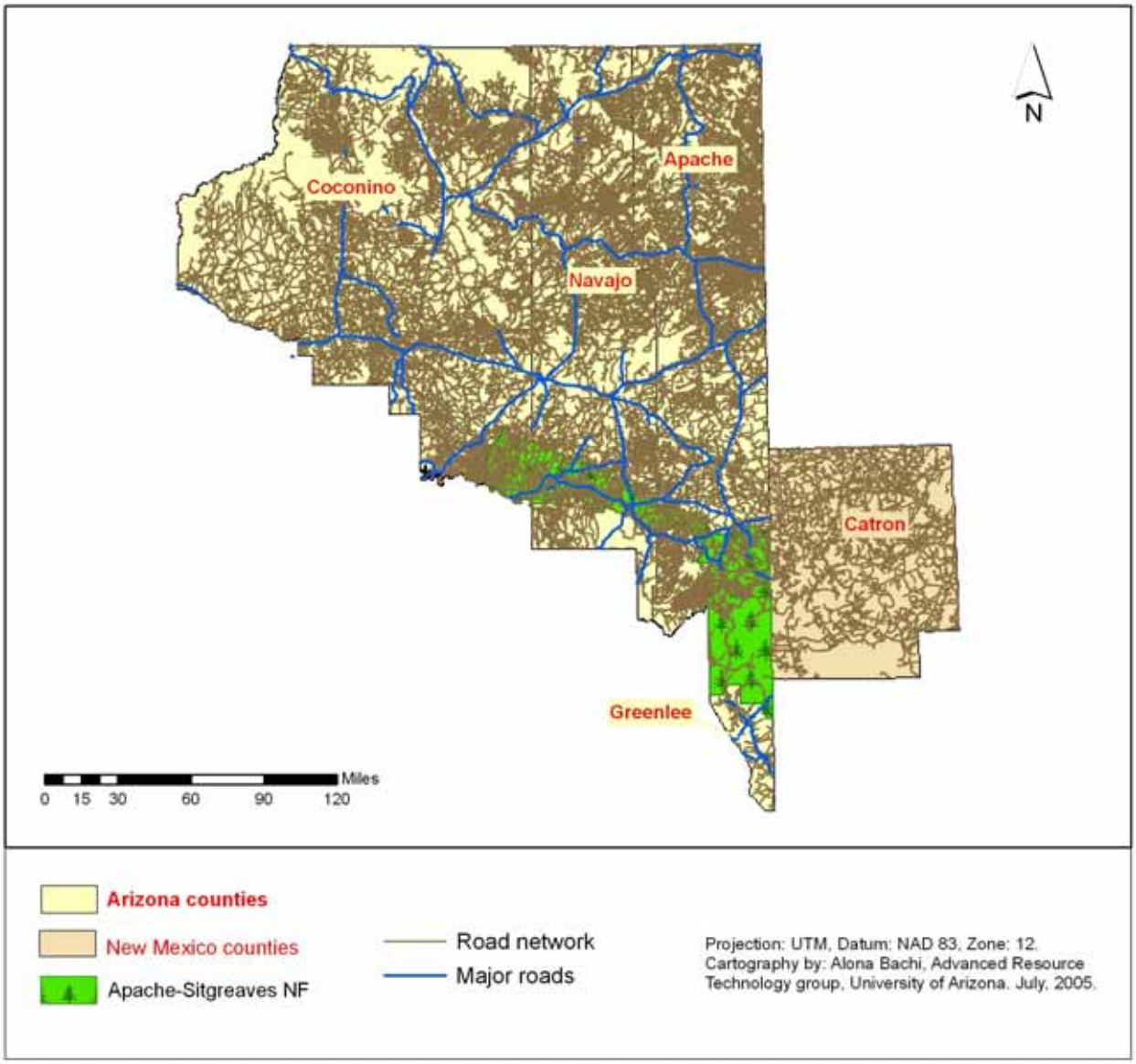



**Figure 6. Road Network within the Area of Assessment**

**Table 13. U.S., State, and Indian Routes by County**

| | Interstates / U.S. Highways | State Highways | Indian Routes |
|---|---|---|---|
| **Apache County** | | | |
| | Interstate 40 | State Highway 61 | Indian Route 7 |
| | U.S. 60 | State Highway 180A | Indian Route 12 |
| | U.S. 160 | State Highway 260 | Indian Route 54 |
| | U.S. 180 | State Highway 261 | Indian Route 59 |
| | U.S. 191 | State Highway 262 | Indian Route 63 |
| | | State Highway 264 | |
| | | State Highway 273 | |
| **Coconino County** | | | |
| | Interstate 40 | State Highway 64 | Indian Route 2 |
| | Interstate 17 | State Highway 66 | Indian Route 15 |
| | U.S. 89 | State Highway 67 | Indian Route 18 |
| | U.S. 160 | State Highway 87 | |
| | U.S. 180 | State Highway 89 | |
| | | State Highway 89A | |
| | | State Highway 98 | |
| | | State Highway 99 | |
| | | State Highway 260 | |
| | | State Highway 264 | |
| **Greenlee County** | | | |
| | U.S. 70 | State Highway 75 | |
| | U.S. 191 | State Highway 78 | |
| **Navajo County** | | | |
| | Interstate 40 | State Highway 73 | Indian Route 63 |
| | U.S. 60 | State Highway 77 | Indian Route 15 |
| | U.S. 160 | State Highway 87 | |
| | U.S. 163 | State Highway 99 | |
| | | State Highway 260 | |
| | | State Highway 264 | |
| | | State Highway 277 | |
| | | State Highway 377 | |
| | | State Highway 564 | |
| **Catron County** | | | |
| | U.S. 180 | State Highway 12 | |

Source: Arizona Department of Commerce: County Profiles

The vast majority of circulation corridors throughout the area of assessment provide infrastructure for a single transportation mode—travel by motorized vehicle. Currently, over ninety percent of daily person trips in the Flagstaff area utilize private motor vehicles whereas less than ten percent of mobility in the winter is accomplished via public transit, walking, and bicycling. Given the expense of developing

infrastructure for alternative modes of transportation and patterns of development throughout rural areas of the state, the predominance of motorized vehicles is likely to continue for the foreseeable future. Nonetheless, counties and cities throughout the region express a desire to reduce dependency on automobiles by supporting alternative modes—transit, walking, bicycling—thereby reducing the demand for expanded roadways (Coconino County 2003, Navajo County 2004, Apache County 2003, FMPO 2001).

The Arizona highway system consists of over 58,000 miles of roadway, of which two percent are interstates, three percent are U.S. routes, and nearly six percent are state routes. Although only 12% of the total highway network is a part of state facilities, over 57% of the daily VMT occurs on these roads. The Interstate System carries 28% of all daily VMT (ADOT 2004c). Much of the Arizona state highway system passes through lands owned by federal agencies and federally recognized tribes. Federal agencies and federally recognized tribes own 70% of the land in Arizona. Federal lands agencies, including the USFS, the BLM, and others, own 42% of the land in Arizona with over 2,000 miles of state highway passing through these lands. Arizona's twenty-one federally recognized tribal nations own 28% of Arizona land. An additional 1,200 miles of state highway passes through these lands with over one-half of these road-miles in the Navajo Nation (ADOT 2004c).

Table 24 presents data on daily VMT for the years 1990 and 2000 as well as the percentage change. ADOT reported a dramatic increase in travel on non-state roads within Apache County over the ten-year period. In light of the relatively modest increase in traffic for all roads within the county, the increase in travel on non-state roads likely points to significant increases in travel on county, private, and tribal road networks. Navajo County also experienced a substantial increase in travel on non-state roads over the same period. The largest increase in travel on all roads was reported in Coconino County (42.09%) while Greenlee County actually reported a decrease (17.14%) for the same category. These distinct trends in travel are likely explained in part by diverging population growth trends in the two counties. Directly comparable data for Catron County and the state of New Mexico were unavailable at the time of this assessment. Available information suggests, however, that Catron County experienced significant declines in VMT between 1990 and 2000. Although total VMT grew much more quickly in Arizona between 1990 and 2000, increases in travel on interstates and rural arterial routes for the State of New Mexico were nearly identical that for Arizona (NMDOT 2005).

**Table 14. Daily Vehicle-Miles of Travel (VMT) by County, 1990-2000 and % Change**

| | Total VMT all roads (000s) | | | Total VMT state system (000s) | | | Total VMT non state (000s) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Area** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** | **1990** | **2000** | **% Change** |
| **Apache County** | 2,145 | 2,651 | 23.59% | 1,904 | 2,005 | 5.30% | 241 | 646 | 168.05% |
| **Catron County** | 353 | 184 | -47.79 | n/a | n/a | n/a | n/a | n/a | n/a |
| **Coconino County** | 4,783 | 6,796 | 42.09% | 3,646 | 5,211 | 42.92% | 1,137 | 1,585 | 39.40% |
| **Greenlee County** | 315 | 261 | -17.14% | 170 | 179 | 5.29% | 145 | 82 | -43.45% |
| **Navajo County** | 3,044 | 3,975 | 30.58% | 2,348 | 2,884 | 22.83% | 696 | 1,091 | 56.75% |
| **Arizona** | 97,139 | 134,345 | 38.30% | 40,252 | 66,671 | 65.63% | 56,887 | 67,674 | 18.96% |
| **New Mexico** | 49,016 | 54,319 | 10.82% | n/a | n/a | n/a | n/a | n/a | n/a |

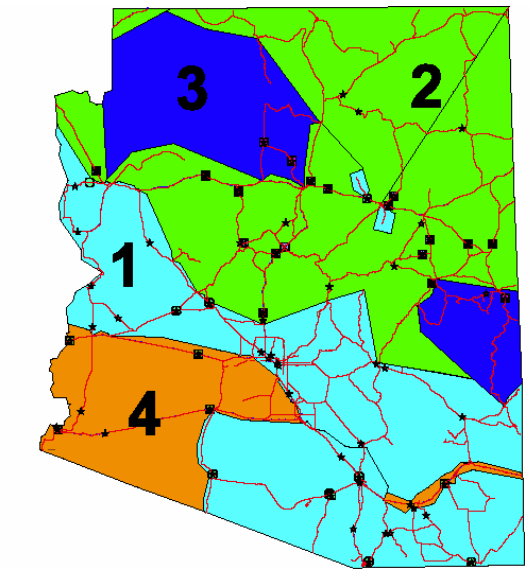
Source: Arizona Department of Transportation, Transportation Planning Division

HPMS Data for the Calendar years 1990 and 2000

New Mexico Department of Transportation, Transportation Planning Division – New Mexico Traffic Survey

## Seasonal Flow Patterns

The Data Section of ADOT's Transportation Planning Division has delineated four distinct "cluster areas" of traffic patterns throughout the state of Arizona (Figure 15). The clusters represent areas that are similar in terms of their variation with respect to Average Annual Daily Traffic (AADT) for the given area. Cluster areas are arranged hierarchically such that Area 1 demonstrates the least amount of monthly variation from the AADT whereas Area 4 experiences the greatest variation. Figure 15 shows the four cluster areas within the state of Arizona as well as the various Automatic Traffic Recorder (ATR) positions.




Source: Arizona Department of Transportation, Transportation Planning Division, Data Section

**Figure 7. Traffic Pattern Cluster Areas**

Table 25 provides daily and monthly factors for each of the four cluster areas collected during 2003. The factors below are presented as an inverse ratio of AADT to collected traffic counts. A factor of *greater than one* shows that traffic was *less* than average for the specific time period; *less than one* shows traffic as being *greater* than the AADT during the period.

Points of access to Apache-Sitgreaves NF extend into the portions of the state designated as Area 2 and Area 3 by ADOT's Transportation Planning Department. Data in Table 25 show that peak traffic flow for both areas occurs during the months of June, July, and August while traffic is lowest from November to February. This would confirm the logical notion that traffic in the region fluctuates primarily according to weather conditions and patterns of visitors from outside the region.

## Table 15. Daily and Monthly Traffic Variation by Cluster Area, 2003

| | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area 1** | 1.011 | 0.940 | 0.930 | 0.959 | 0.999 | 1.033 | 1.050 | 1.049 | 1.075 | 0.983 | 0.998 | 1.022 |
| **Sunday** | 1.109 | 1.076 | 1.067 | 1.109 | 1.104 | 1.066 | 1.043 | 1.111 | 1.086 | 1.062 | 1.116 | 1.095 |
| **Monday** | 1.029 | 1.016 | 1.045 | 1.021 | 1.011 | 1.019 | 1.032 | 1.039 | 1.034 | 1.024 | 1.012 | 0.981 |
| **Tuesday** | 1.041 | 1.040 | 1.049 | 1.056 | 1.044 | 1.044 | 1.054 | 1.040 | 1.047 | 1.068 | 1.046 | 0.978 |
| **Wednesday** | 1.074 | 1.058 | 1.031 | 1.049 | 1.062 | 1.050 | 1.033 | 1.027 | 1.047 | 1.056 | 0.952 | 1.003 |
| **Thursday** | 0.981 | 1.009 | 0.995 | 0.962 | 0.984 | 0.998 | 0.947 | 0.988 | 0.991 | 0.983 | 1.033 | 1.100 |
| **Friday** | 0.879 | 0.883 | 0.893 | 0.884 | 0.873 | 0.878 | 0.911 | 0.863 | 0.865 | 0.872 | 0.901 | 0.915 |
| **Saturday** | 0.958 | 1.000 | 0.996 | 1.055 | 1.046 | 1.038 | 1.058 | 1.040 | 1.047 | 1.069 | 1.047 | 1.012 |
| | | | | | | | | | | | | |
| **Area 2** | 1.176 | 1.133 | 1.053 | 1.038 | 0.978 | 0.925 | 0.902 | 0.926 | 0.979 | 0.965 | 1.016 | 1.068 |
| **Sunday** | 1.008 | 0.972 | 1.029 | 1.039 | 1.065 | 1.001 | 1.005 | 1.055 | 1.058 | 1.021 | 1.043 | 1.061 |
| **Monday** | 1.066 | 0.996 | 1.086 | 1.039 | 1.027 | 1.059 | 1.052 | 1.061 | 1.024 | 1.064 | 1.073 | 1.009 |
| **Tuesday** | 1.163 | 1.123 | 1.12 | 1.083 | 1.084 | 1.114 | 1.099 | 1.083 | 1.087 | 1.102 | 1.052 | 1.008 |
| **Wednesday** | 1.098 | 1.138 | 1.067 | 1.05 | 1.067 | 1.088 | 1.063 | 1.051 | 1.062 | 1.062 | 0.962 | 1.01 |
| **Thursday** | 1.026 | 1.064 | 0.991 | 0.977 | 0.997 | 1.003 | 0.964 | 1.012 | 0.997 | 0.998 | 1.05 | 1.076 |
| **Friday** | 0.861 | 0.876 | 0.86 | 0.869 | 0.865 | 0.864 | 0.925 | 0.866 | 0.866 | 0.883 | 0.915 | 0.935 |
| **Saturday** | 0.914 | 0.971 | 0.981 | 1.047 | 0.998 | 1.012 | 0.991 | 0.974 | 1.015 | 0.996 | 0.993 | 0.983 |
| | | | | | | | | | | | | |
| **Area 3** | 1.566 | 1.534 | 1.175 | 1.034 | 0.921 | 0.783 | 0.737 | 0.801 | 0.911 | 0.906 | 1.186 | 1.525 |
| **Sunday** | 1.05 | 0.966 | 1.164 | 1.079 | 0.944 | 1.048 | 1.019 | 0.931 | 1.02 | 0.943 | 1.091 | 1.051 |
| **Monday** | 1.099 | 0.907 | 1.073 | 1.049 | 1.026 | 1.046 | 1.04 | 1.089 | 1.008 | 1.067 | 1.058 | 1.037 |
| **Tuesday** | 1.119 | 1.071 | 1.005 | 1.088 | 1.065 | 1.04 | 1.052 | 1.118 | 1.105 | 1.1 | 1.047 | 1.007 |
| **Wednesday** | 1.158 | 1.159 | 0.929 | 1.052 | 1.087 | 1.056 | 1.04 | 1.105 | 1.091 | 1.112 | 1.069 | 1.049 |
| **Thursday** | 1.069 | 1.19 | 0.962 | 0.937 | 1.069 | 0.999 | 1.055 | 1.081 | 1.041 | 1.057 | 1.084 | 1.093 |
| **Friday** | 0.889 | 1.006 | 0.93 | 0.908 | 0.964 | 0.952 | 0.999 | 0.941 | 0.925 | 0.961 | 0.856 | 1.029 |
| **Saturday** | 0.823 | 0.897 | 0.992 | 0.939 | 0.897 | 0.892 | 0.839 | 0.844 | 0.876 | 0.845 | 0.889 | 0.851 |
| | | | | | | | | | | | | |
| **Area 4** | 0.952 | 0.932 | 0.922 | 1.067 | 1.086 | 1.05 | 0.961 | 1.07 | 1.19 | 1.087 | 0.945 | 0.859 |
| **Sunday** | 0.962 | 1.026 | 0.971 | 0.948 | 1.032 | 0.964 | 0.886 | 0.985 | 0.985 | 0.938 | 0.927 | 0.981 |
| **Monday** | 1.111 | 1.021 | 1.091 | 1.054 | 0.982 | 1.058 | 1.077 | 1.079 | 0.961 | 1.043 | 1.129 | 1.052 |
| **Tuesday** | 1.131 | 1.074 | 1.079 | 1.115 | 1.114 | 1.108 | 1.133 | 1.108 | 1.083 | 1.104 | 1.108 | 1.017 |
| **Wednesday** | 1.095 | 1.049 | 1.057 | 1.082 | 1.096 | 1.075 | 1.083 | 1.063 | 1.089 | 1.077 | 0.942 | 1.041 |
| **Thursday** | 0.991 | 0.98 | 0.997 | 0.968 | 0.996 | 1.002 | 0.931 | 1.013 | 1.028 | 1.014 | 1.034 | 1.186 |
| **Friday** | 0.878 | 0.874 | 0.86 | 0.848 | 0.824 | 0.867 | 0.927 | 0.847 | 0.87 | 0.866 | 0.937 | 0.915 |
| **Saturday** | 0.905 | 1.027 | 1.01 | 1.059 | 1.032 | 0.983 | 1.046 | 0.966 | 1.05 | 1.027 | 0.993 | 0.889 |

N.B.: Factors listed represent a ratio of recorded traffic counts to the AADT

Source: Arizona Department of Transportation, Transportation Planning Division, Data Section

### 4.3 Regional transportation plans and roadway improvements

Each of the counties within the area of assessment shares common issues regarding transportation infrastructure. Nonetheless, various constraints and opportunities are discussed for individual areas in available ADOT documents as well as county and city comprehensive and transportation plans. This section examines both barriers to access and planned improvements for the state and county transportation networks surrounding the ASNF.

Planned improvements to the state highway system surrounding the ASNF are presented in Table 26. Although the data may not account for all ADOT projects within the area of assessment, they present a useful guide to the timing, nature, and extent of highway projects that are likely to influence travel to and from the forest.

**Table 16. ADOT Current 5-Year Transportation Facilities Construction Program, Apache-Sitgreaves NF**

| Year | Route | Milepost | County | Funding Source | Location | Length (miles) | Type Of Work | Costs ($1000s) |
|---|---|---|---|---|---|---|---|---|
| 2005 | 60 | 343 | Navajo | National Highway System | MP 343 to Rocky Arroyo | 5.3 | Resurface | $1,600 |
| 2005 | 60 | 348.3 | Navajo | National Highway System | Rocky Arroyo-JCT SR 61 | 3.95 | Resurface | $1,191 |
| 2005 | 180 | 416.3 | Apache | Surface Transportation Program | Nutrioso-Alpine | 10.1 | Resurface | $3,928 |
| 2006 | 191 | 181 | Greenlee | STATE | Coronado Trail | 0 | District Force Account. | $200 |
| 2005 | 191 | 181 | Greenlee | STATE | Coronado Trail | 0 | District Force Account. | $200 |
| 2005 | 191 | 181 | Greenlee | STATE | Coronado Trail | 0 | District Force Account. | $250 |
| 2005 | 191 | 225 | Greenlee | Surface Transportation Program | KP Cienega-Butter Cienaga | 14 | Resurface | $963 |
| 2005 | 260 | 269.2 | Gila | National Highway System | Colcord-Woods Canyon | n/a | Resurface | $5,852 |
| 2006 | 260 | 314 | Navajo | National Highway System | Heber-Show Low , MP 314-315 EB & 315.8-316.8 WB | 18 | Construct Passing Lanes | $1,462 |

Source : Arizona Department of Transportation
http://tpd.azdot.gov/pps/searchprogram.asp

In an effort to facilitate coordination among the various planning authorities throughout the state, ADOT has charged various regional planning bodies with responsibility for distributing federal transportation planning and construction funds to local agencies in their respective areas. Within the area of assessment for the ASNF, the Northern Arizona Council of Government (NACOG) and the Flagstaff Municipal Planning Organization (FMPO) share transportation planning responsibilities within their respective areas. Policy decisions regarding circulation infrastructure development and improvement within the regional planning area are influenced by both city and county provisions (Coconino County 2003, Apache County 2003, Navajo County 2003). A brief description of access issues and planned improvements as

discussed in regional, county, and city comprehensive plans is included below. It must be kept in mind, however, that the timing and implementation of these projects are subject to considerable funding constraints and an uncertain pace of future development.

### *Apache County*

The circulation element of the *Apache County Comprehensive Plan* describes an established network of roads that carries vehicular traffic east-west and north-south but explains that large portions of the county are not easily accessible and are, at best, served by privately owned and maintained roads, none of which are under the jurisdiction of the county government. The county plans to increase routes for north-south and east-west traffic in the coming years. The primary purpose of new roads will be to improve access between the southern portion of the county and the communities along Interstate 40; provide alternative connections between Interstate 40, the Phoenix metropolitan region, and along the Mogollon Rim; and improve access to the Petrified Forest National Park (Apache County 2003).

### *Coconino County*

Similar to other comprehensive plans, the circulation element of the *Coconino County Comprehensive Plan* claims that limited funding requires a continuing emphasis on maintaining existing systems rather than pursuing new roadway construction and other improvements. As with other elements in the comprehensive plan, the circulation framework for the county is grounded within an overall conservation framework. The plan explicitly states that circulation throughout the county will be planned in order to limit fragmentation or damage to habitat, disruption of wildlife movement, and introduction of pollutants or invasive species as a result of road construction.

Two major highways serve crucial circulation roles for Coconino County—Interstate 17, which heads south to Phoenix, and Interstate 40, the only east-west roadway extending across the county. U.S. highways in Coconino County primarily serve north-south traffic. Coconino County is responsible for maintaining the roads it owns as well as those managed through cooperative agreements with ADOT, the Forest Service and the Navajo Nation. The most pressing access issues occur on private, unpaved roads throughout the county. The county encourages the formation of improvement districts in order to ensure maintenance of private roads in previously developed areas. The Public Works Department is responsible for all roadway improvements. Projects are evaluated according to safety and efficiency and are prioritized in the county's Capital Improvement Plan (CIP). The most recent available CIP describes no major roadway improvements affecting forest access in Coconino County (Coconino County 2002).

### *Navajo County*

Similar to Apache County, the *Navajo County Comprehensive Plan* claims that accessibility to and from many rural areas is limited to a patchwork of privately owned and maintained roads. Navajo County also seeks to improve connectivity to Interstate 40 as well as from eastern portions of the state to the Phoenix metropolitan area. Regarding specific infrastructure projects, the comprehensive plan states that "the road network east of State Route 77 could eventually develop due to continued housing growth in the area known as Cedar Hills, both northward and also southward east of White Mountain Lake to U.S. 60. The network around Chevelon Canyon, north of Heber and the Forest Service lands, continues to experience in-fill and the existing roads could blossom there as well. Existing forest roads could expand usage between the Mogollon Rim to the northern edge of the FS boundary. The area south and southeast of Woodruff might see added growth along current roads or new roads that development might cause (Navajo County 2004).

### *Fort Apache Indian Reservation (White Mountain Apache Tribe)*

There are approximately 1,000 miles of roadways on the Ft. Apache Indian Reservation. There are also about 128 miles of state highways, including State Route 73 located in the northern part of the reservation and passing through the communities of Fort Apache and White Mountain. US 60/SR 77 runs from the Salt River Canyon and the border with the San Carlos Indian Reservation to the intersection with SR 260, just north of the reservation border. SR 260 is an east-west route in the northeast corner of the reservation that goes through Hon Dah and McNary. The BIA Agency Roads Engineer works closely with the tribe on transportation. The BIA has staff on the reservation and is responsible for the roads' programming and maintenance. The BIA has a consulting contract to develop the long-range transportation plan for the tribe. As of 2004, ongoing and proposed road projects included the reconstruction of BIA 690, the construction of dirt and gravel roads in residential areas of McNary, the stabilization and resurfacing of an eight-mile stretch of BIA 69, and a cooperative project with ADOT to improve the intersection of SR 73 and SR 260 (FHWA 2004).

### *Other Regional Transportation Planning Authorities*

Although the scope of this assessment does not allow for an exhaustive review of municipal transportation plans, a number of other planning authorities may provide information useful in analyzing transportation issues throughout the region. Navajo County is the coordinating body for the White Mountain Regional Transportation Plan, a collaborative project aimed at directing transportation planning in portions of Apache, Gila, and Navajo Counties. Copies of the plan can be requested through the Navajo County Public Works Department.

The San Carlos Apache Tribe does not receive the same Federal Highway Administration (FHWA) transportation planning support as the White Mountain Apache Tribe; however, information on transportation issues on the San Carlos Apache Reservation can be requested through the Inter Tribal Council of Arizona's Transportation Working Group.

Finally, the Flagstaff Municipal Planning Organization (FMPO) addresses transportation issues in the City of Flagstaff and the surrounding area in the Flagstaff Area Regional Land Use and Transportation Plan. Copies of the document are available on-line at http://www.flagstaff.az.gov/documents%5CCommunity%20Development%5CRegional%20Plan/Web%20plan.pdf

## 4.4 Internal modes, barriers, and access issues

Regarding internal access to Apache-Sitgreaves NF, the rapidly expanding use of off-highway vehicles (OHVs) has become an increasingly important issue for forest management. In an effort to ensure adequate user access while mitigating the various negative affects of growing OHV use, the Apache-Sitgreaves National Forests have joined with the Coconino, Kaibab, Prescott, and Tonto National Forests in developing a draft environmental impact statement (DEIS) aimed at regulating cross-country OHV travel in each of the five forests. Under the five-forest plan, the need for restrictions on travel within the forests is evidenced by 1) increased erosion and other damage to roads and trails as a result of OHV use; 2) impairment of visual quality within the forest; 3) the potential for user conflict and issues of user safety; 4) negative affects on the habitat of threatened, endangered, or sensitive species; 5) disruption of or reduction of wildlife reproduction; and 6) damage to riparian areas (USFS 2003c; Schendel, pers. comm.).

Under revision at the time of this assessment, the five-forest DEIS raises several important issues involving barriers to access and modes of travel within each of the forests. Primary issues include the ability to effectively and efficiently enforce proposed travel restrictions as well as the ability of diverse

user groups to access recreational sites and resources such as fuelwood and big game. This effort to regulate cross-country OHV travel is further complicated by the need to adequately assess existing roads and trails and the logistics of implementing OHV restrictions given a planning process addressing ten to fifteen specific sites. How such decisions will affect existing permits and leases and whether the "one-size-fits-all" plan can adequately address OHV issues for a five-forest area are issues still under consideration (Schendel, pers. comm.).

In addition to cross-country OHV travel, the Apache-Sitgreaves National Forests face several challenges in maintaining efficient and equitable forest access. Access to the forest will undoubtedly be affected by planned improvements of Arizona State Route 260 near Payson, the Mogollon Rim, and Eager as well as the realignment and widening of FH43 from Sunrise to Crescent Lake. Internally, the forest continues to experience shortfalls in road funding, creating difficulties in maintaining and signing roads to the objective maintenance level (Schendel, pers. comm.).

While the Apache-Sitgreaves National Forests do enforce seasonal road closures during periods of high fire danger and severe winter weather, valid permit holders are generally allowed access for the purpose of managing their permit operations (grazing, minerals, etc.). In terms of observed trends in the modes of travel employed by forest users, gains have been strongest in recreational OHV use. The demand for mountain bike access has also apparently increased in recent years while snowmobile and equestrian uses have each experienced a recent decline (Schendel, pers. comm.).

### 4.5 Key issues for forest planning and management

The FS has long been aware of the considerable impact internal roads have on forest management. Increasingly, however, the short- and long-term effects of such roads have become highly controversial given the wider public's concern for roadless areas and the perceived detrimental affects on wilderness due to resource extraction. Previous research on the impact of roads in forested environments tended to focus on broadly defined positive and negative impacts of road networks. Positive impacts are generally considered to include improved access to forest areas for the purpose of timber harvesting and the collection of special forest products, livestock grazing, mining, fire control, research and monitoring, access to private inholdings, and the cultural value of the roads themselves. Potentially negative impacts of forest roads include adverse effects on hydrology and geomorphic features; habitat fragmentation; predation; roadkill; invasion by exotic species; degraded water quality and chemical contamination; degraded aquatic habitat; use conflicts; destructive human actions such as fire ignition, trash dumping, illegal hunting; lost solitude; loss of soil productivity; and a decline in biodiversity (Gucinski et al. 2001).

Although much of the existing research on forest roads focuses on their physical and ecological impact, the indirect economic consequences of forest roads (or the lack thereof) are also considerable for forest managers and surrounding communities. For instance, the extent and quality of forest roads are known to have a substantial impact on the economic costs and benefits associated with various user groups such as timber harvesters, energy and mining interests, fuels managers, and recreational users (Gucinski et al. 2001, Duffus 1992). Likewise, land managers in Arizona are increasingly aware of the potential economic and environmental impacts of OHV use, an issue discussed in more detail later in this assessment.

This assessment, however, is primarily concerned with the socioeconomic status and trends among communities outside of the forest, many of which are likely to directly affect future forest management alternatives. The quantity and quality of road networks to and from the ASNF are no exception. A recent report to the United States Congress noted that while the condition of our national interstate highway system has improved considerably over the last fifty years, traffic congestion has also increased. Daily VMT—the principle measure of traffic density—increased 31% on the national highway system between 1990 and 2000. By comparison, the state of Arizona reported a 38% increase in VMT over the same period. Within the area of assessment for the ASNF, only Coconino County exceeded the state increase

with a reported gain of 42.09% in VMT between 1990 and 2000. The same study also found that while "the density of traffic on urban interstate highways is higher than on rural interstates, traffic on rural interstate highways is increasing at a faster rate than on any other class of road." Additionally, the Federal Highway Administration (FHWA) expects to see significant increases in both passenger and freight traffic on the interstate highway system between 2001 and 2010 (17% and 28% respectively) (Siggerud 2002). Given population projections for counties within the area of assessment, the ASNF is likely to be affected by increased traffic flow, congestion, and longer commute times.

Finally, current and projected trends in vehicular traffic are particularly relevant in that they are instrumental in determining local and regional land use patterns. Each of the county comprehensive plans reviewed for this assessment makes specific mention of the link between transportation networks and land use. Some acknowledge that regional approaches to transportation development and financing likely offer the best chances of accommodating expected growth without compromising residents' quality of life. Indeed, research has shown that adequate highway systems and access to regional urban centers have a direct impact on population density, reflecting the importance of transportation on the location decisions for individual residents. Furthermore, studies have shown that transportation infrastructure is directly related to economic stability in that economic diversity, and therefore, the stability of local and regional economies is dependent on an efficient highway system (Booth 2002, Case and Alward 1997).

# 5. Land Use

In this section, land ownership and use within the four counties surrounding the Apache-Sitgreaves National Forests (ASNF) are examined. Land ownership and use are both variables which can significantly influence the interaction of forests and surrounding communities. Regional patterns of major land uses vary from county to county, reflecting differences in soil, climate, topography, ownership, development patterns, and other cultural, social and economic trends. Individual counties must manage a range of land use issues including, but not limited to, water quality and availability, logging and mining activity, agricultural and recreational lands, access to state and federal land, transition of rangelands, open space preservation, and residential sprawl (Northern Economics 2002).

Collected land use and ownership data reveal that the area of assessment for the ASNF contains a relatively high percentage of Native American and Forest Service (FS) land, both of which stand to have a considerable impact on future forest planning. Additional factors, such as available water supply and the preservation of open space, contribute to a land use policy environment that is increasingly focused on the economic and environmental sustainability of urban development. The proximity of private parcels to forest lands has also contributed to a number of significant land exchanges involving the ASNF over the last several years.

### 5.1 Historical context and land use patterns

Since the federal government first began designating public-trust land in the late nineteenth century, the amount of national forest land in Arizona has remained remarkably steady. The concept of shared land has had a long history in the Southwest, mirroring Native American and Mexican-American sensibilities (Baker et al. 1988). This, in part, may explain the relative stability of the use of these lands since their inception. The amount of land under public domain stood at 75% in Arizona in 1891, and by 1977, that number remained at over 70%. Today, the National Forest System itself accounts for about 15% of the land in Arizona. This small segment of the state's land represents a substantial portion of Arizona's natural resources, including 40% of the watersheds and nearly 60% of the timber. For this reason, maintaining the integrity of the forest boundaries by acquisition of land to form contiguous borders has historically been an essential objective of the USFS. Recently, trends have reflected the increasing importance of national forests as a resource for recreational use. The primary purpose of national forest land is for "multiple use" although certain elements of its subsidiary functions, like maintaining wilderness and species habitats, can limit this practice (Baker et al. 1988). The specific land use history of the Apache-Sitgreaves National Forests is discussed in more detail in section 2.1.

The majority of forest land is grassland with about 20% being forested (Alig et al. 2003). In the latter areas, logging remains an integral and controversial element of national forest land use despite the fact that private owners contribute 90% of the timber harvest in the U.S. and control 60-70% of the timberland (Haynes 2003a, Alig and Butler 2004). Five years ago, Arizona national forests produced 13 million cubic feet of saw-timber, but over the past two decades, the amount of land devoted to timber uses has declined, and these lower levels are expected to remain stable for at least the next fifty years (Mills and Zhou 2003, Alig and Butler 2004, Johnson 2000).

Although the total amount of land covered has remained consistent, the specific lands contained within the national forests have occasionally been juggled about. As early as 1909, the Apache National Forest acquired land from the White Mountain Apache Indian Reservation although that land was eventually returned. Since then, the forests have added or released land regularly in an attempt to consolidate the outer boundaries of the national forests (Baker et al. 1988). At present, the amount of land represented by the USFS in the communities surrounding the Apache-Sitgreaves NF varies from as low as 10% in Apache County to as much as 45% of the total land of the Pinetop-Lakeside area of Navajo County. These lands are frequently devoted to open space and are unavailable to private development, being

dedicated instead to public recreational uses such as view sheds, trail connections, and other public services. Nevertheless, trading or purchasing of the land is viable (Pinetop-Lakeside 2004). While land deals like the fifteen-acre Smith Place purchase and the exchanges at Show Low, Dry Lakes, and Camp Tatiyee remain on the list of proposed interactions, other purchases/exchanges have met with resistance (ASNF 2005a). An attempt to purchase Woodland Park in the town of Pinetop-Lakeside, a 580-acre plot which the USFS leased to the town, was scuttled by a congressional edict in 1998 despite the Clinton administration's desire to keep it available to private interest (Pinetop-Lakeside 2004, S. 2413, H.R. 4371). Recently, a private citizen by the name of Herb Owens wished to acquire just over 300 acres of Apache-Sitgreaves land near Greer, a request which, although considered, was eventually dismissed by the Greer Coalition under the fear of impending development (Pitzl 2004).

Naturally, the private citizens who live on the outskirts of the forest represent a formidable influence on the forests themselves. Originally, grazers and lumbermen expanded their own privately held lands into those earmarked for the national forests although this was eventually suppressed. Nonetheless, the communities that build and grow on the edges of these public lands frequently apply for trades involving these lands to allow towns to grow—applications which may either be accepted or rejected by the USFS depending upon how such trades threaten to impact the specific forests.

### 5.2 Land ownership and land use

There are over 31 million acres of land in the five-county area of assessment for ASNF. Within this expanse, there are distinct patterns of land ownership and use, each of which carries important implications for current and future forest management. Figures 16 and 17 provide information on land ownership for the entire area of assessment while Table 27 provides more detailed land ownership data on a county-by-county basis. Figure 16 displays a relatively large amount of Forest Service land in close proximity to private land as well as considerable Native American holdings within the area of assessment. Data in Figure 17 suggest that, as a whole, the area of assessment for the ASNF differs from overall ownership patterns for the state of Arizona. Most importantly, the area contains a relatively large percentage of Native American land compared to the state (43% versus 27% respectively). The five-county area also contains a considerable percentage of land managed by the Forest Service (23%). Meanwhile, the assessment area currently maintains percentages of private and State Trust land that are below those reported for the state of Arizona as a whole. Each of these factors exercise a great deal of influence on regional development patterns as is discussed later in this section (AZSLD 2004).

The more detailed data provided in Table 27 indicate important differences in ownership among the five individual counties within the area of assessment. Navajo, Apache and Coconino Counties are particularly notable for their substantial amounts of Native American land (66.0%, 65.38%, and 38.13% respectively). Alternatively, Greenlee and Catron County are distinguished by large percentages of Forest Service land (63.55% and 50.23% respectively). Meanwhile, four of the five counties in the area of assessment contain percentages of State Trust land that are below that for the state of Arizona as a whole. The lone exception is Greenlee County with 14.68% of total land area managed by the Arizona State Land Department. The percentage of private land ranges from a high of 24.25% in Catron County to a low of 8.14% in Greenlee County.

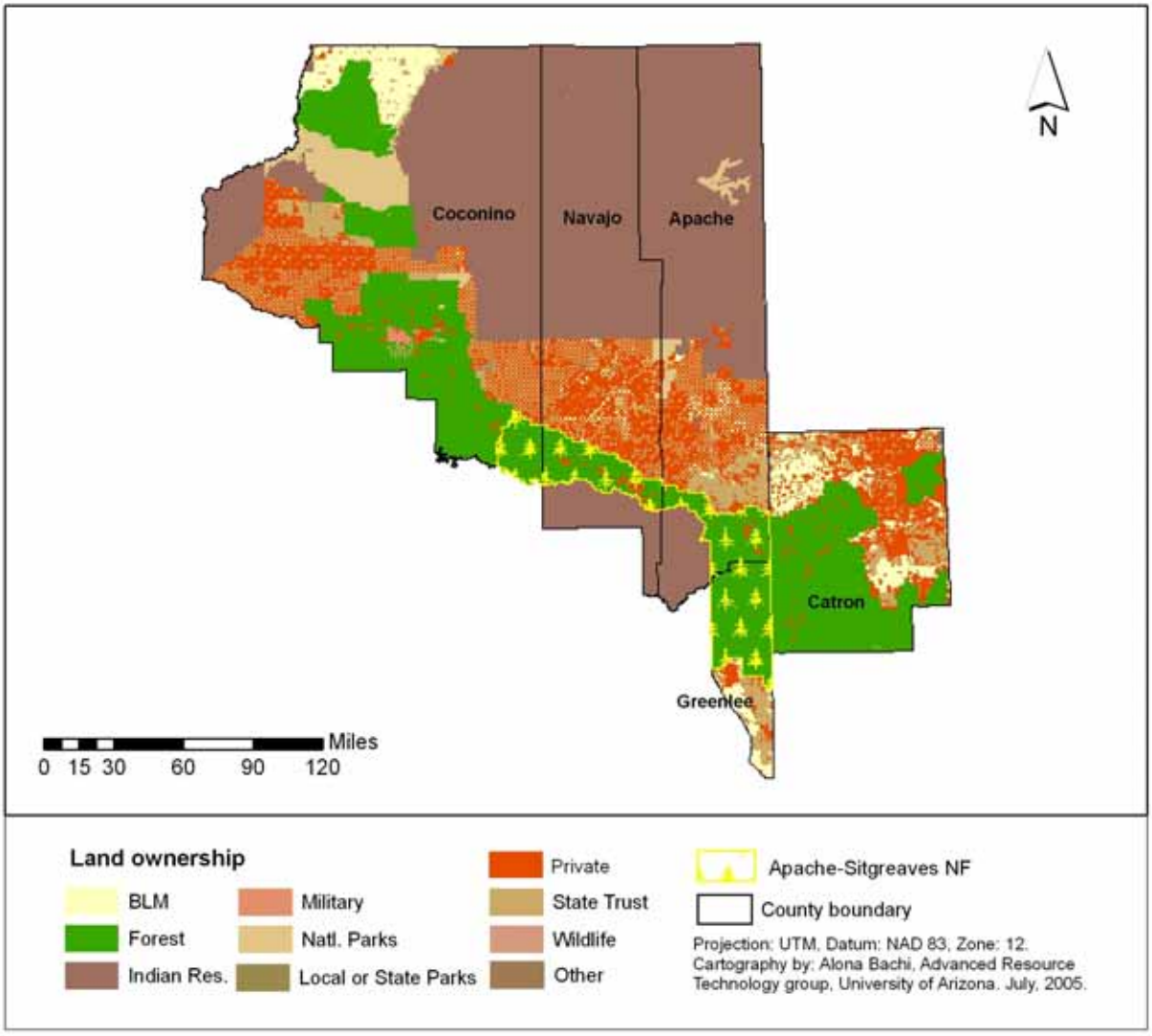
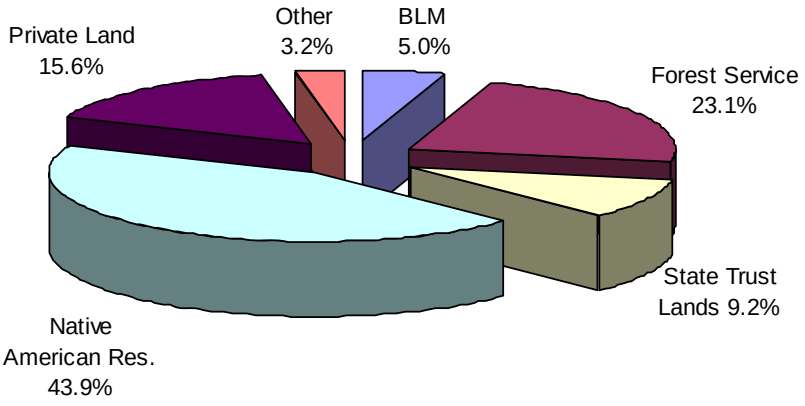



**Figure 8. Land Ownership within Area of Assessment**




Source: Arizona State Land Department

**Figure 9. Percent Ownership by Major Land Owners in Five-County Area of Assessment**

## Table 17. Land Ownership by County, 2005

| Land Ownership | Acres | Percent |
|---|---|---|
| **Apache County** | | |
| Apache-Sitgreaves NF | 491,363.65 | 6.85% |
| Bureau of Land Mgmt. | 109,972.01 | 1.53% |
| Canyon De Chelly NM | 92,308.90 | 1.29% |
| County Land | 1,317.99 | 0.02% |
| Game and Fish | 6,377.76 | 0.09% |
| Hubble Post NHS | 160.01 | 0.00% |
| Indian Allotments | 29,317.21 | 0.41% |
| Navajo Indian Res. | 4,187,029.04 | 58.33% |
| Navajo Reservation | 73,330.99 | 1.02% |
| Petrified Forest NP | 71,618.83 | 1.00% |
| Private Land | 940,773.51 | 13.11% |
| State Trust Land | 668,900.61 | 9.32% |
| White Mountain Apache Indian Res. | 500,480.73 | 6.97% |
| Zuni Indian Res. | 5,231.20 | 0.07% |
| TOTAL | 7,178,182.44 | 100.00% |
| **Coconino County** | | |
| Apache-Sitgreaves NF | 288,821.10 | 2.42% |
| Bureau of Land Mgmt. | 605,491.35 | 5.08% |
| Coconino NF | 1,399,784.27 | 11.73% |
| Game and Fish | 10,073.02 | 0.08% |
| Glen Canyon NRA | 40,657.72 | 0.34% |
| Grand Canyon NP | 681,829.36 | 5.72% |
| Havasupai Indian Res. | 171,918.92 | 1.44% |
| Hopi Indian Res. | 493,566.28 | 4.14% |
| Hualapai Indian Res. | 579,476.99 | 4.86% |
| Indian Allotments | 4,625.05 | 0.04% |
| Kaibab Indian Res. | 13,170.00 | 0.11% |
| Kaibab NF | 1,510,895.79 | 12.66% |
| Marble Canyon NM | 14,600.29 | 0.12% |
| Navajo Army Depot | 25,752.93 | 0.22% |
| Navajo Indian Res. | 3,166,147.29 | 26.54% |
| Navajo NM | 39.18 | 0.00% |
| Navajo-Hopi Joint Use | 123,966.85 | 1.04% |
| Prescott NF | 43,592.26 | 0.37% |
| Private Land | 1,587,305.56 | 13.31% |
| State Trust Land | 1,125,427.03 | 9.43% |
| Sunset Crater NM | 3,035.99 | 0.03% |
| Walnut Canyon NM | 3,049.74 | 0.03% |
| Wupatki NM | 36,478.85 | 0.31% |
| TOTAL | 11,929,705.82 | 100.00% |

| Land Ownership | Acres | Percent |
|---|---|---|
| **Greenlee County** | | |
| Apache-Sitgreaves NF | 746,981.54 | 63.55% |
| Bureau of Land Mgmt. | 160,090.68 | 13.62% |
| Private Land | 95,715.64 | 8.14% |
| State Trust Land | 172,590.22 | 14.68% |
| TOTAL | 1,175,378.08 | 100.00% |
| **Navajo County** | | |
| Apache-Sitgreaves NF | 488,315.54 | 7.67% |
| Bureau of Land Mgmt. | 92,960.86 | 1.46% |
| County Land | 668.23 | 0.01% |
| Game and Fish | 1,897.45 | 0.03% |
| Hopi Indian Res. | 1,061,734.31 | 16.68% |
| Indian Allotments | 44,624.93 | 0.70% |
| Navajo Indian Res. | 1,723,965.18 | 27.08% |
| Navajo NM | 312.08 | 0.00% |
| Navajo-Hopi Joint Use | 761,145.21 | 11.95% |
| Petrified Forest NP | 22,367.89 | 0.35% |
| Private Land | 1,141,423.36 | 17.93% |
| State Trust Land | 372,146.88 | 5.84% |
| White Mountain Apache Indian Res. | 655,552.30 | 10.30% |
| TOTAL | 6,367,114.22 | 100.00% |
| **Catron County** | | |
| Bureau of Land Management | 581,435 | 13.17% |
| USDA Forest Service | 2,217,036 | 50.23% |
| State land | 533,037 | 12.08% |
| Private land | 1,070,477 | 24.25% |
| Indian reservations | 11,302 | 0.26% |
| Other federal land | 533 | 0.0% |
| TOTAL | 4,413,820 | 100.00% |

Source: Arizona Land Resource Information System

Catron county, New Mexico – Assessor's Office

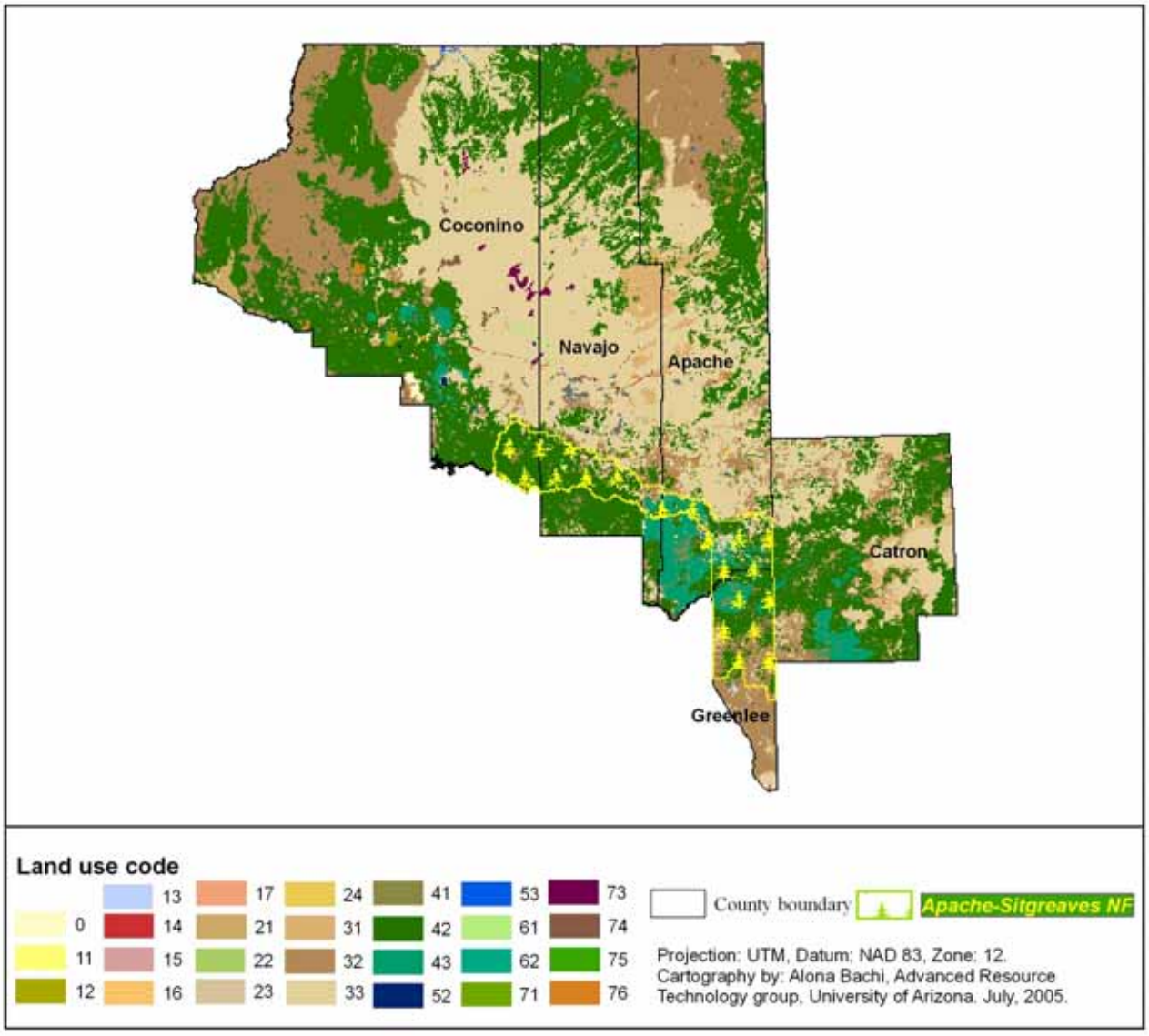



**Figure 10. Land Cover within the Area of Assessment**

Figure 18 depicts land cover within the entire area of assessment while Table 28 provides detailed data on land cover within each of the three counties. As a point of clarification, cells with no data for a given category indicate that the land cover type does not exist within the county whereas a figure of 0.00% indicates that the cover type constitutes less than one-tenth of one percent of the county's total land area. Navajo County reported the greatest amount of residential cover at .31% compared to .16% for the assessment area as a whole. Greenlee County reported the greatest amount of industrial land cover while Coconino had the greatest amount of land dedicated to commercial and services uses. Mixed rangeland was the predominant land cover in both Apache and Navajo Counties (35.47% and 43.82% respectively) while shrub and brush rangeland was the most common land cover in Catron and Greenlee Counties (86.55%and 48.02% respectively). Evergreen forest land cover was most common in Coconino County (43.19%).

**Table 18. Land Cover by County and Assessment Area, 1990**

| Land Use Code | Coverage Type | Apache County | | Coconino County | | Greenlee County | |
|---|---|---|---|---|---|---|---|
| | | Acres | Percentage | Acres | Percentage | Acres | Percentage |
| 0 | Unknown / Background | 3,702.40 | 0.05% | 26,569.37 | 0.22% | 1,745.31 | 0.15% |
| 11 | Residential | 8,694.69 | 0.12% | 13,388.27 | 0.11% | 1,765.97 | 0.15% |
| 12 | Commercial and services | 1,905.90 | 0.03% | 20,442.36 | 0.17% | 241.25 | 0.02% |
| 13 | Industrial | 1,959.08 | 0.03% | 2,572.22 | 0.02% | 5,106.75 | 0.43% |
| 14 | Transportation, communication, utilities | 4,511.21 | 0.06% | 14,941.95 | 0.13% | 386.57 | 0.03% |
| 16 | Mixed urban or built-up land | 1,527.52 | 0.02% | 4,099.80 | 0.03% | 221.40 | 0.02% |
| 17 | Other urban or built-up land | 2,241.29 | 0.03% | 1,442.16 | 0.01% | 167.97 | 0.01% |
| 21 | Cropland and pasture | 41,033.62 | 0.57% | 130,212.76 | 1.09% | 12,316.83 | 1.05% |
| 23 | Confined feeding operations | 0.00 | 0.00% | 79.30 | 0.00% | 0.00 | 0.00% |
| 24 | Other agricultural land | 1,075.31 | 0.01% | 335.15 | 0.00% | 253.73 | 0.02% |
| 31 | Herbaceous rangeland | 298,704.25 | 4.16% | 9,558.57 | 0.08% | 788.89 | 0.07% |
| 32 | Shrub and brush rangeland | 1,649,300.85 | 22.98% | 2,384,941.46 | 19.99% | 564,434.46 | 48.02% |
| 33 | Mixed rangeland | 2,545,767.22 | 35.47% | 3,831,908.43 | 32.12% | 92,313.23 | 7.85% |
| 41 | Deciduous forest land | 43,746.86 | 0.61% | 739.79 | 0.01% | 14,721.56 | 1.25% |
| 42 | Evergreen forest land | 2,021,835.28 | 28.17% | 5,152,146.85 | 43.19% | 352,522.87 | 29.99% |
| 43 | Mixed forest land | 483,687.48 | 6.74% | 147,202.14 | 1.23% | 116,715.88 | 9.93% |
| 51 | Streams and canals | 0.00 | 0.00% | 1,252.25 | 0.01% | 0.00 | 0.00% |
| 52 | Lakes | 938.56 | 0.01% | 11,379.67 | 0.10% | 0.00 | 0.00% |
| 53 | Reservoirs | 8,614.59 | 0.12% | 17,867.90 | 0.15% | 93.22 | 0.01% |
| 61 | Forested wetland | 1,279.75 | 0.02% | 17,097.44 | 0.14% | 151.89 | 0.01% |
| 62 | Non-forested wetland | 5,829.87 | 0.08% | 602.26 | 0.01% | 332.12 | 0.03% |
| 71 | Dry Salt Flats | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% |
| 73 | Sandy areas not beaches | 3,448.52 | 0.05% | 55,940.82 | 0.47% | 1,839.03 | 0.16% |
| 74 | Bare exposed rock | 12,811.89 | 0.18% | 56,323.72 | 0.47% | 4,534.28 | 0.39% |
| 75 | Strip mines, quarries, gravel pits | 1,811.78 | 0.03% | 6,093.54 | 0.05% | 4,650.35 | 0.40% |
| 76 | Transitional areas | 32,689.78 | 0.46% | 21,834.28 | 0.18% | 74.53 | 0.01% |
| 77 | Mixed Barren Land | 1,064.73 | 0.01% | 364.05 | 0.00% | 0.00 | 0.00% |
| 85 | Mixed tundra | 0.00 | 0.00% | 369.30 | 0.00% | 0.00 | 0.00% |
| | **Total** | **7,178,182.44** | **100.00%** | **11,929,705.82** | **100.00%** | **1,175,378.08** | **100.00%** |

**Table 28. (cont.). Land Cover by County and Assessment Area, 1990**

| Land Use Code | Coverage Type | Navajo County | | Catron County, NM | | Assessment Area | |
|---|---|---|---|---|---|---|---|
| | | Acres | Percentage | Acres | Percentage | Acres | Percentage |
| 0 | Unknown / Background | 4,283.51 | 0.07% | 240.17 | 0.01% | 36,300.59 | 0.14% |
| 11 | Residential | 19,641.98 | 0.31% | 26.16 | 0.00% | 43,490.91 | 0.16% |
| 12 | Commercial and services | 3,243.61 | 0.05% | 1.15 | 0.00% | 25,833.13 | 0.10% |
| 13 | Industrial | 2,049.94 | 0.03% | 18.59 | 0.00% | 11,687.99 | 0.04% |
| 14 | Transportation, communication, utilities | 5,244.58 | 0.08% | 0.00 | 0.00% | 25,084.31 | 0.09% |
| 16 | Mixed urban or built-up land | 1,242.92 | 0.02% | 2.20 | 0.00% | 7,091.64 | 0.03% |
| 17 | Other urban or built-up land | 1,238.79 | 0.02% | 1.01 | 0.00% | 5,090.22 | 0.02% |
| 21 | Cropland and pasture | 36,760.28 | 0.58% | 0.00 | 0.00% | 220,323.49 | 0.83% |
| 23 | Confined feeding operations | 468.21 | 0.01% | 0.00 | 0.00% | 547.51 | 0.00% |
| 24 | Other agricultural land | 868.95 | 0.01% | 2.67 | 0.00% | 2,533.14 | 0.01% |
| 31 | Herbaceous rangeland | 302,988.93 | 4.76% | 7,548.28 | 0.17% | 612,040.64 | 2.30% |
| 32 | Shrub and brush rangeland | 480,614.63 | 7.55% | 3,820,299.04 | 86.55% | 5,079,291.41 | 19.06% |
| 33 | Mixed rangeland | 2,789,890.05 | 43.82% | 301,699.83 | 6.84% | 9,259,878.93 | 34.75% |
| 41 | Deciduous forest land | 603.97 | 0.01% | 0.00 | 0.00% | 59,812.18 | 0.22% |
| 42 | Evergreen forest land | 2,537,290.59 | 39.85% | 283,699.59 | 6.43% | 10,063,795.59 | 37.76% |
| 43 | Mixed forest land | 96,572.28 | 1.52% | 0.00 | 0.00% | 844,177.78 | 3.17% |
| 51 | Streams and canals | 0.00 | 0.00% | 0.00 | 0.00% | 1,252.25 | 0.00% |
| 52 | Lakes | 2,123.13 | 0.03% | 3.37 | 0.00% | 14,441.36 | 0.05% |
| 53 | Reservoirs | 1,977.53 | 0.03% | 11.78 | 0.00% | 28,553.24 | 0.11% |
| 61 | Forested wetland | 11,826.33 | 0.19% | 35.13 | 0.00% | 30,355.41 | 0.11% |
| 62 | Non-forested wetland | 2,629.59 | 0.04% | 82.08 | 0.00% | 9,393.84 | 0.04% |
| 71 | Dry Salt Flats | 0.00 | 0.00% | 15.83 | 0.00% | 0.00 | 0.00% |
| 73 | Sandy areas not beaches | 23,561.61 | 0.37% | 85.12 | 0.00% | 84,789.98 | 0.32% |
| 74 | Bare exposed rock | 1,069.49 | 0.02% | 43.93 | 0.00% | 74,739.37 | 0.28% |
| 75 | Strip mines, quarries, gravel pits | 10,131.20 | 0.16% | 4.08 | 0.00% | 22,686.87 | 0.09% |
| 76 | Transitional areas | 11,157.31 | 0.18% | 0.00 | 0.00% | 65,755.91 | 0.25% |
| 77 | Mixed Barren Land | 19,634.80 | 0.31% | 0.00 | 0.00% | 21,063.59 | 0.08% |
| 85 | Mixed tundra | 0.00 | 0.00% | 0.00 | 0.00% | 369.30 | 0.00% |
| | **Total** | **6,367,114.22** | **100.00%** | **4,413,820.00** | **100.00%** | **26,650,380.56** | **100.00%** |

Source: U.S. Geological Survey, 1990
Land use/ land cover digital data collected by USGS and converted to ARC/INFO by the EPA. Each quadrangle of land use data has a different representative date; however, dates ranging from mid-1970s to early 1980s are common.

Metadata can be found at http://www.epa.gov/ngispgm3/spdata/EPAGIRAS/meta/general-metadata.text

## 5.3 County land use plans and local policy environment

For the purpose of this assessment, county comprehensive plans have been used as a primary source of information on the history of land use within the region, the patterns of development, desired conditions, and current county land use policies. It must be noted, however, that county governments hold no legal authority over independent jurisdictions such as federal and state lands, incorporated cities and towns, or Native American tribal reservations[3]. Additionally, the comprehensive plans reviewed for this assessment vary widely with respect to the date of their adoption, the nature of land use data provided, and the overall

[3] Although some counties have challenged this; see Catron County below.

format of the documents. While some offer a broad, descriptive analysis of land use patterns and desired conditions, others present more detailed, prescriptive policies and guidelines for county land use. As such, information from the various comprehensive plans is discussed in terms of its potential for influencing land use patterns adjacent to the national forests. Despite efforts to obtain it, the Comprehensive Plan for Greenlee County was unavailable at the time of this assessment.

### *Apache County Comprehensive Master Plan*

Apache County was established by the Tenth Territorial Legislative Assembly on February 24, 1879. The city of St. Johns has been the county seat since 1882. The county is situated in the northeastern corner of the state of Arizona. It measures approximately 220 miles north to south and fifty miles east to west, making it the third largest county in Arizona with a total land area of 11,216 square miles. The entire county lies above 4,000 feet in elevation, the highest point being Mt. Baldy at 11,357 feet. At higher elevations in Apache County, coniferous forests are common while most of the remainder of the county is characterized by piñon and juniper woodlands as well as mixed shrub and grasslands (Apache County 2003).

Native American tribes own over sixty-five percent of the total land area of Apache County, which is home to nearly one quarter of Arizona's total Native American population. As a result, Apache County reports a relatively limited amount of private land, much of which is held in a "checkerboard" pattern interspersed with state, federal, and reservation holdings. St. Johns, Eager, and Springerville are the only incorporated communities in Apache County. Unincorporated areas outside of reservation boundaries include the communities of Hawley Lake, McNary, Nutrioso, Northwoods, Greer, Correjo Crossing, Green Spot, Richville, El Tule, Concho, Salado, Woodridge, Ranch, Hunt, Witch Wells, Pinta, Navajo, Chambers, Sanders, and Lunton. The Apache County comprehensive plan states that the local economy, particularly in the southern portions of the county, is predominantly land based given traditional uses such as agriculture, forestry, and outdoor recreation. Furthermore, it predicts that the county will continue be primarily rural in nature, characterized by small, dispersed communities (Apache County 2003).

The comprehensive plan proposes the expanded use of performance, or development standards, as well as the introduction of community master plans in order to effectively guide future development throughout the county. Performance standards may include elements such as noise limits, setback requirements, visual buffers involving walls and/or landscape materials, access requirements for highways and parking areas, and sign standards. Community master plans require developers to determine potential land uses, number of dwelling units, types and intensities of commercial and industrial development, parcel sizes, preservation of natural features, and provision of critical infrastructure (water, sewer, roads, etc.). Through the use of community master plans, the *Apache County Comprehensive Master Plan* intends to direct future growth in the county in a manner that capitalizes on existing social and physical infrastructure.

The comprehensive plan states that infill development will likely accommodate the majority of future growth in Apache County. Furthermore, it explains that most of this development will occur on private lands and that it is unlikely that development of state or federal lands will be necessary to accommodate growth in the near term. In the long term, however, Apache County and the Arizona State Land Department may consider development of checkerboard state land due to their proximity to transportation corridors (Apache County 2003).

The land use element of the Apache County Comprehensive Master Plan establishes seven character areas and one overlay zone that correspond to existing and potential zoning districts. The purpose of the character areas is to protect the existing community character while maximizing balanced economic development. The character areas differ in density and land use intensity depending on the surrounding land cover characteristics, access to transportation corridors, and traditional uses such as ranching and agriculture. A brief description of the various character areas follows:

- Rural Ranch

The Rural Ranch character area is intended to preserve the open character of land traditionally used for ranching in the county. A substantial amount of land designated as Rural Ranch has been divided into thirty-six- or forty-acre parcels. Development within this character area should not include lots of smaller than nine acres unless they comply with county subdivision regulations and are accompanied by an approved community master plan. Community master plans in this character area should be based on a minimum of thirty-six acres and should limit residential density to one dwelling unit per acre.

- Range Land

The purpose of this character area is to support cattle ranching, farming, and other traditional agricultural uses in Apache County. The Range Land character area is designated for large private tracts or other property that is, and will continue to be, used for ranching purposes. Development in this character area should not include parcels smaller than 160 acres. Residential density should not exceed one dwelling unit per five acres.

- Community Village

The Community Village character area is intended to provide large areas for higher density residential development with a mix of related commercial, industrial, and institutional uses such as community college campuses, hospitals, and medical clinics. All development within this character area should include paved access extending from highway corridors and intersections. There are no maximum or minimum residential density guidelines in the Community Village character area.

- Rural Edge

The Rural Edge character area provides for lower density residential development adjacent to Community Village character areas. It is designated for properties adjacent to existing or planned areas of higher density as well as for areas within two miles of highways or other significant roads. Minimum lot size in this character area is nine acres, and maximum residential density is four dwelling units per acre.

- Highway Service

The purpose of this character area is to provide small, transportation-oriented commercial development nodes proximate to the interstate highway system and other highway-oriented development. Intended land uses will provide services to the local traveling public, long-haul freight drivers, and vacationers.

- Recreation

The Recreation character area provides for limited growth in support of vacation and recreation-oriented uses on properties adjacent to or surrounded by national forest land. National forest land transferred to private ownership in the future will be designated within this character area. Appropriate uses include guest lodges, resorts, hotels, bed and breakfasts, restaurants, second homes, and other tourist-oriented commercial and residential uses. Development within this area has minimum foliage requirements (eight native trees per acre), must maintain natural meadows, and must be “fire-wise.” Residential densities greater than one dwelling unit per ten acres and all commercial uses require paved access from the

highway. Logging, mining and mineral extraction are allowed subject to the approval of the Board of Supervisors.

- Environmentally Sensitive Development Area (ESDA)

The ESDA character area provides for limited growth of appropriate land uses on environmentally sensitive lands. Such areas include properties adjacent to the Petrified Forest National Park, Lyman Lake State Park, and other publicly owned and specially designated areas set aside for their scenic, historic, and/or recreational value. Preferred uses in the ESDA character area include the same uses outlined above for the Recreation character area.

- Petrified Forest National Park Overlay (PFNPO)

The purpose of the PFNPO is to determine the area into which the Petrified Forest National Park may expand and assess what effects future development within the overlay area might have on the Park. The National Park and the Painted Desert cover an area of approximately 94,189 acres, a portion of which extends into Navajo County. The PFNPO is not a character area, but rather, is to be used in conjunction with the character areas. The overlay area allows all uses permitted within the character area with which it is combined. If the overlay specifically prohibits something allowed in the underlying, or combined, character area, the overlay takes precedence and controls the land. Within the PFNPO, the minimum parcel size for development is forty acres unless the minimum parcel size of the underlying character area is larger, in which case the larger minimum parcel size applies.

### *Catron County Comprehensive Land Use and Policy Plan*

The *Catron County Comprehensive Land Use and Policy Plan* was published by the National Federal Lands Conference. In the early 1990s this organization earned a reputation as a leading advocate of the "County Movement," which asserts supremacy of county policies and regulations over those typically applied to state and federal lands. Adopted in September 1992, the plan served as impetus for a nationwide debate involving the legal status of state and federal land regulations versus personal property rights guaranteed in the Constitution. First and foremost, the plan claims that its primary purpose is to protect the custom, culture, and livelihoods of county residents in the face of onerous state and federal regulations. The plan states that county citizens are particularly vulnerable to "aggressive" state and federal land use policies given the fact that over seventy percent of Catron County is under the jurisdiction of government land agencies, primarily the Bureau of Land Management and the United States Forest Service. In fact, the preface to the plan explicitly states that "[f]ederal and state agents threaten the life, liberty, and happiness of the people of Catron County" (Catron County 1992).

In response to a perceived abuse of federal authority on county lands, the plan explains that "all natural resource decisions affecting Catron County shall be guided by the principles of protecting private property rights, protecting local custom and culture, maintaining traditional economic structures through self-determination, and opening new economic opportunities through reliance on free markets" (Catron County 1992). Specifically, the plan identifies restrictions and regulations applied by federal and state governments as the single most important issue affecting private lands and resources in the county. The plan describes federal and state land use restrictions as arbitrary barriers that have been "illegally imposed" without county government input (Catron County 1992). This sentiment is reflected in over sixty pages of County Ordinances which cite the Public Rangelands Improvement Act (PRIA) 43 U.S.C. §§1901, the Civil Rights Act, 42 U.S.C. §1983, and other precedents as the legal basis for requiring close coordination on the development of federal and state land use policies that are responsive to the public interest (Catron County 1992).

Chapter 2 of the Catron County plan describe both the custom and culture of the county as being inextricably linked to traditional land use practices such as livestock grazing, timber harvesting, mining, and hunting. It also explains that arid conditions unsuitable to farming, as well as land use practices adopted from Spanish and Mexican predecessors, contributed to a local economy dependent on citizen use of unclaimed public lands. A primary basis for the plan is the stated notion that federal regulations aimed at protecting the environment and endangered species have had a particularly detrimental effect on the economy and social stability of Catron County. For example, the plan points out that centralization of the county's traditionally small-scale timber industry contributed to increased logging of old growth forests during the 1970's and 1980's. It goes on to claim that the Forest Service subsequently implemented drastic harvest reductions with the stated purpose of protecting threatened habitat of the Mexican spotted owl. From this standpoint, the plan claims that "these impacts have not only affected private businesses, but also the ability of the Catron County government to provide basic community services" (Catron County 1992).

Chapter 3 describes the implementation of the Land Use and Policy Plan. The organizational structure presented in the plan places the citizens of Catron County in a position of authority over the county commission as well as state and federal agencies involved in land use decisions. Most importantly, the Land Planning Committee oversees and coordinates the efforts of seven subordinate committees including the Livestock, Timber, Farming, Mining, Recreation/business, and Wildlife Committees, joined by the Water Advisory Board.

The *Catron County Comprehensive Land Use and Policy Plan* does not specifically address issues such as preferred locations and densities for residential, commercial, and industrial land uses, nor does it provide guidelines or standards pertaining to community infrastructure or services.

### *Coconino County Comprehensive Plan*

The *Coconino County Comprehensive Plan* estimates that nearly 60% of the county's population—an estimated 75,000 people—lives within the Flagstaff Regional Planning Area. All other residents of the county, approximately 40,000 individuals, live in unincorporated areas (Coconino County 2003). Coconino County is the largest county in Arizona and the second largest in the United States, but it remains one of the most sparsely populated. Native American reservations (Navajo, Hopi, Kaibab-Paiute, Havasupai, and Hualapai) cover 38.1% of the land area. Federal and state agencies manage a combined 49% of the county's lands—the Forest Service (28.3%), the BLM (5%), the AZSLD (9.4%), and the Park Service (6.8%). Only 13% of the land in Coconino County is under private ownership (Coconino County 2003).

The *Coconino County Comprehensive Plan*, adopted in September 2003, is based in large part on a conservation framework that seeks to accommodate growth in existing communities while retaining their historic, natural, and cultural character (Coconino County 2003). The plan also claims that "conservation-based planning provides an equitable way to consider the varied interests of residents, developers, and conservationists in a cooperative manner" (Coconino County 2003). In order to facilitate implementation of the framework, the plan incorporates specific conservation guidelines into each of its elements.

The plan describes a rapidly decreasing private land base, limited water sources, and public concern over the impact of high-density development on the area's rural character as the primary planning challenges faced by the county. The majority of private land in the county is owned by ranchers and others with large holdings. Platted subdivisions are almost completely built out and development of inholdings is constrained by political pressure as a result of preference for open space. Although some growth has been facilitated through lot splits, the county's authority for reviewing such development does not extend to issues of drainage, utilities, and other infrastructure, often resulting in uncoordinated wildcat development in unincorporated areas (Coconino County 2003).

Water for residential use is either unavailable or difficult to obtain in unincorporated areas of Coconino County. The plan claims that groundwater depth typically exceeds 1,000 feet prompting residents to

depend on shared wells, small public water supply systems, or the hauling of water from municipal standpipes. While the county does have the authority to require developers to reveal sources of water for planned subdivisions, it does not have the legal authority to evaluate the impact of proposed wells on neighboring water sources or the environment. The plan also alludes to the planning challenges posed by the reverence for the "rural" character of the county held by many residents in unincorporated areas. It explicitly states that the ultimate success of the conservation framework will depend on planners' success in redefining "rural character" from that of two- to five-acre lots with no protected open space to land use patterns that incorporate smaller individual lots and large areas of conserved open space (Coconino County 2003).

Land use patterns in Coconino County have historically been influenced by land ownership, topography, tourist attractions, Native American reservations, and railroad infrastructure. In the foreseeable future, demographic trends, employment growth, and availability of water are likely to play increasingly important roles in determining patterns of development. In an effort to respond to these and other factors, the *Coconino County Comprehensive Plan* promotes mixed-use, infill development as the surest way of supporting a stable county economy while preserving healthy landscapes. The plan specifically mentions the acquisition of conservation easements and the use of Transfers of Development Rights (TDRs) as effective methods of preserving county open space. The plan cites the transfer of 40,000 acres of Cataract Ranch from Babbitt Ranches to The Nature Conservancy and Coconino County as a successful example of conservation easements (Coconino County 2003).

The plan also cites the importance of ranchlands in ensuring sustainable management of county land use, estimating that nine ranch owners with private land holdings each exceeding 10,000 acres collectively own 1.13 million acres—71% of the county's private land (Coconino County 2003). One means of doing so is by allowing ranchers to petition the Board of Supervisors for the formation of "rural planning areas" which provide incentives for large, private landholders to set aside portions of ranchland for purposes of conservation. The use of rural planning areas was specifically provided for under the state of Arizona's Growing Smarter legislation (Coconino County 2003).

- Residential land use

Residential areas in unincorporated Coconino County fall into various categories with most areas surrounding the cities of Flagstaff and Williams characterized as, and zoned for, agricultural-residential land uses. Exceptions include the Parks and Mormon Lake areas, several platted subdivisions, and rural ranchlands. The *Coconino County Comprehensive Plan* distinguishes between three residential development patterns: rural communities; remote subdivisions; and rural, large-parcel agricultural-residential lands. Rural communities, which may include some small-scale commercial development, include areas such as Doney Park, Parks, Pinewood, Kachina Village, Mountainaire, and Mormon Lake. Rural subdivisions in the area include Forest Lakes, Clear Creek Pines, Starlight Pines, Mogollon Ranch, Blue Ridge Estates, and Tamarron Pines. Many of the residential units in these areas are developed on lots ranging from two-and-a-half to ten acres and serve as second homes, a trend county planners expect will continue (Coconino County 2003).

The pace of residential development and the scarcity of available land have made the affordability of housing a growing issue in Coconino County. The *Coconino County Comprehensive Plan* asserts that median home prices in the county doubled between 1987 and 2000. Given a median household income of $38,256 in 2000, over one-half of residents in the Flagstaff area could not afford a median-priced home. In unincorporated areas of the county, higher development costs and land prices are due in part to large lot zoning and the fact that more accessible lands with existing infrastructure have already been developed. Attempts by the county to address the issue of housing affordability have included the amendment of the county subdivision ordinance to simplify the subdivision process, the encouragement of higher densities, the clustering of subdivisions, and the selection of locations for manufactured homes.

A related trend in residential housing involves the proliferation of seasonal homes in Coconino County. Census data reveal that in 2000, 17% of all homes in Coconino County were used for seasonal occupancy. At issue is the fact that the costs to the county of providing second-home communities with services, such as police protection, solid waste disposal, road maintenance, and snow removal, typically exceed tax revenues from seasonal populations (Coconino County 2003).

Residential development in unincorporated Coconino County is also complicated by the common use of lot splits. State law allows owners to divide land into parcels of thirty-six acres or more with no county oversight. Similarly, subsequent owners can split property up to five ways without subdivision review until the resulting parcels reach the minimum zoned size. The *Coconino County Comprehensive Plan* claims that, as of 2002, these types of developments contained approximately 3,200 forty-acre lots that covered 200 square miles (8%) of private land in the county.

Current land regulations also permit ranchers to sell their land for development as forty-acre "ranchettes," an increasingly attractive option for agricultural interests, particularly in light of the ongoing drought and diminishing grazing rights on state and federal land. The checkerboard pattern of development that results from this practice has the potential to affect state and federal lands by increasing pressure for consolidation of available sections. While residents and developers benefit from these practices in terms of lower density, lower initial land costs, and shorter times for approval, the county seeks greater control over lot splits and the purchase of "ranchettes" in order to mitigate some of the negative consequences. These include conflict over easements, substandard roads, inadequate drainage, and fragmentation of wildlife habitat (Coconino County 2003).

- Commercial and industrial land use

Commercial uses in unincorporated Coconino County are typically located on or near state highways and are characterized as neighborhood commercial or tourist/highway commercial uses. Common commercial land uses in the county include general retail and office facilities, grocery stores, gas stations, restaurants, post offices, and feed stores. Tourist/highway commercial uses typically include hotels, motels, campgrounds, RV parks, gift shops, and recreational facilities. Both county and municipal planners have attempted to maintain the rural character of low-density residential areas by encouraging the location of commercial development near major intersections and existing communities. The county has taken the further steps of amending the zoning ordinance to prohibit establishments of over 70,000 $ft^2$ in rural areas as well as adopting design guidelines from commercial and industrial uses through the Area Plan process in the communities of Tusayan, Doney Park, Oak Creek Canyon, Kachina Village, and Mountainaire (Coconino County 2003).

Due to the fact that most industrial facilities require municipal water, fire protection, and other services, relatively few are located outside of cities and towns in unincorporated areas of the county. As of 2002, the primary areas of heavy industrial zoning and development were located near Winona (seventy-two acres) and on Leupp Road (242 acres) in the Doney Park area. An additional 140 acres are industrially zoned in Bellemont and considerable additional development is possible at both Bellemont and Flagstaff Ranch Road. The *Coconino County Comprehensive Plan* states a preference for future industrial uses in the area that do not require large amounts of water such as warehouse, distributing, and light manufacturing (Coconino County 2003).

### *Navajo County Comprehensive Plan*

Navajo County was established on March 21, 1895 by the Territorial Assembly. Carved from what had previously been Apache County, the land within Navajo County had largely been developed due in part to the established railroad and North America's third largest ranch, the Aztec Land and Cattle Company. Founded in 1871, Holbrook was chosen as the county seat (Navajo County 2004).

Navajo County is effectively divided into two distinct regions by the Mogollon Rim. The northern part of the county is characterized by arid and desert-like plains and valleys, interspersed with isolated mesas, buttes and plateaus. Sagebrush, short grasses, and scattered piñon and juniper trees are the primary vegetation types. The Little Colorado River is a predominant geographic feature flowing west-northwest from the Apache County border on the east to the Navajo Indian Reservation and Coconino County boundaries on the north and west. The southern portion of the county is a more mountainous, heavily wooded area with several lakes and streams. Elevation ranges from 4,800 feet near Winslow to over 7,500 feet near the Mogollon Rim (Navajo County 2004).

Collectively, the Navajo, Hopi, and White Mountain Apache tribes own over sixty-six percent of the total land area of Navajo County. Similar to neighboring Apache County, Navajo County reports a relatively limited amount of private land, much of which is held in a "checkerboard" pattern interspersed with state, federal, and reservation holdings. The towns of Winslow, Snowflake, Taylor, Show Low, and Pinetop/Lakeside are currently the only incorporated communities within Navajo County. Unincorporated communities outside of reservation boundaries include Heber, Overgaard, Clay Springs, Shumway, Linden, Cedar Hills, White Mountain Lake, Joseph City, Pinedale, Sun Valley/Adamana, and Woodruff (Navajo County 2004).

Tourism, manufacturing, coal mining, timber production, and ranching are the primary industries within Navajo County. Arizona Public Service's Cholla Power Plant, the Burlington Northern Santa Fe Railway Company, and the Abitibi Consolidated Paper Mill are also significant employers for county residents (Navajo County 2004).

In most respects, the land use element of *the Navajo County Comprehensive Plan* is identical to that of Apache County. Like Apache County, Navajo County proposes the expanded use of development standards in order to guide future growth and limit the negative impacts of distinct land uses in adjacent parcels. Additionally, the comprehensive plan advocates the use of "Special Development Zones," which are analogous to the community master plans described in the *Apache County Comprehensive Master Plan*. Special Development Zones require developers to determine potential land uses, numbers of dwelling units, types and intensities of commercial and industrial development, parcel sizes, methods of preservation of natural features, and provisions of critical infrastructure (water, sewer, roads, etc.). Like Apache County, the comprehensive plan for Navajo County explains that infill development is expected to accommodate the majority of future growth in the county. In Navajo County, future development is likely to occur within a limited private land base, though certain state lands may need to be acquired to accommodate growth over the long term (Navajo County 2004).

The land use element of the *Navajo County Comprehensive Plan* establishes each of the same character areas that that were described above for the *Apache County Comprehensive Master Plan*. As stated earlier, the purpose of the character areas is to protect the existing community character while maximizing balanced economic development. The character areas differ in density and land use intensity depending on the surrounding land cover characteristics, access to transportation corridors, and traditional uses such as ranching and agriculture (Navajo County 2004).

Finally, the Navajo County Comprehensive Plan makes specific mention of the land use implications surrounding the Rodeo-Chediski Fire. Between June 18 and July 7, 2002, the fire burned 467,099 acres, establishing it as the largest fire in Arizona history. It affected 167,215 acres on the Sitgreaves National Forest, 10,667 acres on the Tonto National Forest, and 289,217 aces on the White Mountain Apache Reservation. In light of destroyed homes, charred forest cover, and lost tourism potential, the fire has prompted Navajo County to renew its focus on long-term forest health as critical to future growth and development (Navajo County 2004).

Specifically, the comprehensive plan points to existing population centers, paved roads, and previously treated forest areas as central to managing similar fires in the future. The plan recommends strategically locating forest treatment programs in areas where multiple canyons converge or where canyons allow

fires from below the Mogollon Rim to reach, and gain strength at higher elevations. It also recommends that the Mogollon Rim Road and State Route 260 be paved in order to provide broader firebreak areas. The comprehensive plan also recommends that existing population centers be allowed to actively treat and thin a defensible area one mile outside each populated area or to the White Mountain Apache Tribal boundary. The plan advocates a forest-wide management plan and professional treatment program that would eliminate excess fuels while providing forest-related jobs for the local economy, thus protecting the area's recreation and tourism industries (Navajo County 2004).

### 5.4 Changes in land ownership affecting the Apache-Sitgreaves National Forests

- Sierra Blanca Land Exchange (2005)

The current Schedule of Proposed Action (SOPA) for the ASNF includes this proposed acquisition of private land adjacent to National Forest System holdings in the Alpine Ranger District in Apache County. Partners and acreage involved in the exchange are not specified in the SOPA (ASNF 2005a).

- Black River Land Exchange (2005)

This exchange proposes the transfer of two federal parcels located south of SR 260 and west of SR 373, north of Greer, for several private parcels located on the Black River and the Blue River in the Springerville and Alpine Ranger Districts. On August 27, 2004, the Director of Lands and Minerals for the Southwestern Region made a decision on the Black River Land Exchange to proceed in order to consolidate isolated federal parcels and acquire significant wildlife habitat. The decision was appealed to the Forest Service Washington Office. The Appeal Deciding Officer for the Chief of the Forest Service reversed the decision and directed that additional environmental analysis be conducted. The Forest Service is in the process of completing the required additional analysis before issuing a new decision (ASNF 2005a, USFS 2005r).

- Camp Tatiyee Land Exchange (2005)

The current SOPA for the ASNF (April 1 – June 30, 2005) describes this land exchange as an opportunity both to consolidate isolated parcels within forest boundaries and to provide land for children's camps currently operating under a special use permit. The proposed action involves the exchange of private parcels in the ASNF, CNF, PNF, and TNF for federal lands currently held within the Pinetop-Lakeside town limits. A final decision on the Camp Tatiyee land exchange is expected in October 2005 with implementation taking place in January 2006 (ASNF 2005a).

- Tonto Apache Land Exchange (2005)

This proposal involves the exchange of a 278-acre parcel of land adjacent to the Tonto Apache Reservation for four privately held parcels within the Lakeside, Verde, Payson, Tonto Basin, and Red Rock Ranger Districts. Implementation of the land exchange was expected in May 2005 (ASNF 2005a).

- Cote Land Exchange (2005)

According to the most recent ASNF Schedule of Proposed Action, this land exchange involves parcels in all districts of CNF and portions of the ASNF. The SOPA explains that the land acquisition involves parcels in Cochise, Graham, Pima, and Santa Cruz Counties. As of May 15, 2004, the Sonoita Valley Planning Partnership raised concerns that the exchange would sever the last remaining corridor between

FS lands and the Las Cienagas National Conservation Area. The current SOPA for the CNF (April 1 – June 30, 2005) describes the Cote Land Exchange as being "on hold" (ASNF 2005a, SVPP 2004).

- Gray Wolf Land Exchange (2005)

The current Statement of Proposed Action (SOPA) for the ASNF states that this exchange is intended to provide land for the expansion of the Gray Wolf sanitary landfill site, approximately ten miles east of Dewey, Arizona in Yavapai County. As proposed by Waste Management of Arizona (WMA), the exchange calls for the acquisition of approximately 255 acres of national forest land on the Prescott National Forest (PNF) in Yavapai County, Arizona. In exchange, the PNF, ASNF, KNF, and the CNF would receive title to seven parcels of private land totaling approximately 872 acres. A final decision on the Gray Wolf land exchange was expected in February 2005 with implementation taking place in July 2005 (ASNF 2005a, PNF 2004).

- Dry Lakes Land Exchange (2005)

This proposal calls for the exchange of 179 acres of federal land in the Lakeside Ranger District of the ASNF for 586 acres of private inholdings currently owned by the BC2 LLC/Genesis Real Estate and Development, Inc. in the Springerville and Lakeside Ranger Districts. BC2 LLC acquired the five private parcels with the specific purpose of offering them in exchange for the federal parcels in the Morgan Flat area. Acquisition of the private parcels would benefit forest management by consolidating forest boundaries thereby reducing administrative costs and the likelihood of encroachment on national forest land. It would also help to retain the open space value of undeveloped land, provide additional federally managed habitat for wildlife and plant species, and prevent future land uses incompatible with surrounding forest property. By acquiring the federal parcels, BC2 LLC would increase its acreage of real estate holdings available for residential development in the Morgan Flat area. As part of the proposal, BC2 LLC has committed to donating land for the construction of a new fire station adjacent to Porter Mountain Estates. Similarly, the Forest Service would issue two public road easements to Navajo County to ensure access to the new fire station and continued access to national forest lands (ASNF 2005b).

### *Ellison Creek Land Exchange (2004)*

This proposal called for the exchange of a 142-acre federal recreation residence parcel on the Payson Ranger District for 521 non-federal acres located throughout the Alpine, Verde, Williams, Payson, Red Rock, and Pleasant Valley Ranger Districts. Implementation of the proposed land exchange was expected in September 2004 (TNF 2005).

## 5.5 Key issues for forest planning and management

> *"A critical element in understanding the regional significance of national forest lands and resources in the Southwest is understanding the development and relationships of public and private land ownership and control."*
>
> *- Timeless Heritage: A History of the Forest Service in the Southwest*

Few, if any, of the topics included in this assessment have as direct an impact on forest management as land use planning. Although land ownership and use remained remarkably stable in the century following the founding of the Arizona Territory in 1863, recent shifts in the state's population and economic base

have brought about dramatic trends in land use that are likely to influence forest management for decades to come.

Arizona has long maintained a relatively large percentage of lands under federal jurisdiction. In 1891, land held under the public domain accounted for approximately 75% of Arizona's total land base. By 1977, the proportion of federally controlled land had decreased but was still substantial at 71%. By comparison, federally controlled land accounted for 34% of New Mexico's land base in the same year. Alternatively, only 16% of land in Arizona was under private ownership in 1977 while private land constituted 45% of all land in New Mexico in the same year (Baker et al. 1988). When combined with demographic and economic trends discussed previously in this assessment, these ownership characteristics have placed increasing pressure on what has likely become one of Arizona's most valuable natural resources: land.

The current policy debate regarding transition of public and private lands in Arizona is rooted in a historic context that reflects significant economic change. Traditionally, sectors such as mining, ranching, and logging have been mainstays of the state's predominantly rural economy. In addition to owning substantial portions of Arizona's limited private land base, these interests have exerted considerable influence over the management and use of adjoining public lands. For example, private owners of scattered parcels on which springs and wells are located have typically enjoyed a certain amount of control over activities on surrounding dry areas. Likewise, large private land owners, such as railroads and mining companies, have also sought to influence access to the state's vast public lands. Although many of the industries associated with Arizona's early history have declined in recent decades, controversy between public and private land interests has steadily increased under the pressure for continued urban development. According to the *Land and Water Law Review*, "The proper allocation of rights to private landowners and federal land conservation interests has become one of the most contentious and emotional issues in public land law" (Stuebner 1998).

The area surrounding the ASNF exemplifies many of the trends and controversial issues involving the economic stability and effective management of public lands. Within the area of assessment, an abundance of publicly managed land has led to a vigorous debate between government land agencies and private property owners. Collected data show that nearly 84% of land within the assessment area is controlled by Native American tribes, the Forest Service, the BLM, the AZSLD, and other public agencies. This pattern of ownership continues to put increasing pressure on existing private property, particularly in light of population and housing growth in recent decades.

At issue is how, and whether, private owners and public land managers can come to an agreement on how to best manage the competing priorities of resource conservation and economic development. As seen in the county comprehensive plans reviewed for this assessment, planners are struggling to cope with growing demands for housing and recreation while ensuring preservation of a shrinking natural resource base that contributes to Arizona's highly valued "rural character."

Much of the current controversy involving land management is encapsulated in the debate over open space. Research shows that the rate of conversion of private parcels from farming, ranching, and forestry to more urban land uses has outpaced population growth over the last several decades (USFS 2005f). This trend has led to increasingly pointed exchanges between ranchers, farmers, seasonal residents, conservation interests, and home builders over the immediate and long-term value of open space. Meanwhile, all sides of the debate over the management of public lands have become aware of the increasingly important role of Arizona's State Trust lands in conserving natural resources and sustaining urban growth. As such, proposed reforms of the current State Trust land system are likely to be highly relevant to future management plans of the ASNF in light of the amount of State Trust lands within the area of assessment.

Finally, all of the national forests in Arizona are likely to find themselves at the center of growing debate over the management of the state's water resources. This is due to the fact that the forests share primary

responsibility for the management of watersheds critical to environmental sustainability as well as residential and industrial growth. Studies have shown that approximately forty percent of surface and subsurface water in Arizona originates on lands administered by the Forest Service (USFS 1983). The role of the ASNF in protecting the integrity of area watersheds is likely to become increasingly important given the rates of projected growth in Coconino, Apache, and Navajo Counties.

In order to facilitate resolution of current and future land use issues, the ASNF should continue working in partnership with affected communities and landowners adjacent to forest boundaries and promote the efforts of county and city land use planners in the institution of sustainable regional approaches to urban development and resource conservation. In particular, the FS can use its technical and organizational strengths to help stakeholders make informed decisions about land ownership and use that will undoubtedly affect their future environmental and economic well-being (USFS 2005f).

# 6. Forest Users and Uses

The purpose of this section is to describe how different parts of the Apache-Sitgreaves National Forests are used and by whom. This includes use for both extractive and non-extractive purposes as well as special uses and user groups. The following subsections include historical context and user groups, extractive users and uses, and non-extractive users and uses (including recreation; recreation planning; special users and uses, such as Native Americans, wildlife, wilderness; and illegal uses).

A review of available data on users and uses within the ASNF is consistent with larger surveys of trends at the regional and national levels. These trends show a decline in extractive uses of national forests concurrent with an increase in recreational use, particularly in visitors to wilderness areas and users of off-highway vehicles (OHVs). These and other socioeconomic factors discussed in this section present significant challenges for multiple-use management of the ASNF.

### 6.1 Historical context and user groups

Federal agencies often struggle to balance the needs and wishes of different users on public lands. Not long after the establishment of the first national forest reserves in 1891, Congress passed the Organic Act to help direct the management of those forests. The forest reserves, later to become the national forests, were to be used in a way that protected or improved the forest itself (including protection from fire), secured waterflows for use in other areas, and provided a reliable supply of timber. Public lands deemed to be more valuable for mineral extraction or agricultural uses were not to be included in the national forests, and individuals were allowed free use for certain extractive purposes. Essentially, all types of use were permitted, provided that the use was not destructive to the forest. At the time, this was considered to include grazing, recreation, the construction of homes and resorts, and use for rights-of-way. The essential aim of the policy was to use the forests wisely to support local, regional, and national development and growth (USFS 1993).

A practical doctrine of managing for multiple uses eventually developed out of the conflict and cooperation among competing users and user groups. This doctrine was formally expressed in the 1960 Multiple-Use Sustained-Yield Act (USFS 1993). Managers were directed to give equal consideration to all resource users, and national forest lands were to be used in the ways that best met the needs of the American people. They were specifically not to be managed with the singular goal of maximizing output or economic profit (Fedkiw 1998). Similarly, the National Forest Management Act of 1976, “reinforces the mission laid out in other governing statues—that the agency will both provide goods and services, such as timber and recreation, and protect forest resources, such as clean air and water, aesthetics, and fish and wildlife habitat” (GAO 1999a). However, multiple-use laws generally provide little or no guidance as to how forests should balance conflicting or competing uses (GAO 1999a).

Fedkiw (1998) describes managing for multiple uses as, “the fitting of multiple uses into ecosystems according to their capability to support the uses compatibly with existing uses...in ways that would sustain the uses, outputs, services, and benefits, and forest resources and ecosystems for future generations.” From this perspective, forest users and uses are seen as the primary drivers of management. These ideas will be crucial in this section, which aims to describe how the Apache-Sitgreaves National Forests are used, who uses them, and how trends in forest users and uses compare to historical and national trends.

Uses and users of the national forests can be defined roughly as being either extractive or non-extractive. Extractive uses include livestock ranching, timber cutting, and mining. While not strictly extractive, the use of public lands for infrastructure (such as power lines and communication sites) is also included in this group. Recreation is the most common non-extractive use although the national forests are also commonly used for research and tribal activities. Hunting, fishing, and gathering, though arguably extractive, are included here because they are considered in recreation data. Notably, forest use can also be legal or illegal.

## 6.2 Extractive users and uses

Nationally, livestock grazing, timber cutting, and mining are the most common extractive uses on national forest land. Although extractive uses have historically played a major role in public-lands management, most recent evidence seems to suggest that they are being slowly succeeded in policy and management by an emphasis on non-extractive uses (Davis 2001). Also, environmental citizen groups and recreation users are increasingly challenging extractive uses.

In fiscal year 2002, 7,750 operators were permitted to graze livestock on a total of about 95 million acres of available Forest Service-administered land (Vincent 2004). [4] As Davis (2001) notes, the number of permits issued for livestock grazing on public lands has decreased slightly over recent years. In 2004, the Apache-Sitgreaves National Forests issued seventy-nine grazing permits, totaling 87,080 animal unit months (AUMs). One AUM is defined as the amount of forage required by an animal unit (the equivalent of one 1,000 pound cow and her suckling calf) for a one-month period. Thus, the total number of AUMs is equal to the number of animal units multiplied by the number of months they are on the range. Permits have decreased since 2000, with permitted AUMs reduced from over 130,000 at that time (Jevons, pers. comm.). Forest plan monitoring documents show that $525,000 was spent on range betterment and range vegetation management programs. The forests' 1987 management plan expressed concern about livestock damage, especially in riparian areas, and the plan was extensively litigated over the course of several years and eventually amended (USFS 1987a).

The Forest Service sells timber for a variety of reasons, most commonly to support local mills and communities that were, in some cases, built around a specific forest's timber supply and to modify forest structure or composition to meet a variety of management goals (Gorte 2004). Timber sales on national forest land have been steadily decreasing since the late 1980s, when total production reached 11 billion board feet annually (GAO 1999b). In contrast, just over 2 billion board feet were harvested during fiscal year 2004, at a total value of approximately $218 million. An additional $3.17 million in special forest products, including Christmas trees, fuel wood, mushrooms and berries, and the like, were harvested that year (USFS 2005g). In 1997, the FS timber sales program reported a loss of $88.6 million (GAO 2001a).

Timber cutting in the Apache-Sitgreaves National Forests includes salvage logging and mechanical thinning treatments as well as more traditional logging. In 2000, the last year for which data are currently available, the forest harvested slightly less than 2,000 mbf of saw-timber and slightly more than 3,000 cords of pulpwood in addition to commercial fuel wood and other wood products. With growing awareness of fire regimes and wildland-urban interface issues, the Apache-Sitgreaves forests have initiated several mechanical thinning and salvage logging projects in recent years. Some of these projects have faced substantial opposition from citizen groups. For example, following the 2002 Rodeo-Chedeski fire, a series of timber sales was planned to clear commercial-size trees killed by the fire. Portions of the sales were litigated by the Forest Conservation Council but were eventually allowed to proceed by the Ninth Circuit Court of Appeals in 2004 (USFS 2004i). The forests are also the site of the White Mountain stewardship contract, an initiative aimed at large-scale forest restoration and the Forest Service's first large ten-year contract under new guidelines for federal-private stewardship contracts and agreements. This program was designed to promote timber harvesting for purposes of forest restoration and management and was in part a response to declining federal timber sales (USFS 2005h).

Mining in the national forests is directed by the General Mining Law of 1872, which allows individuals and corporations free access to prospecting on Forest Service lands. Upon discovery of a mineral resource, an individual or corporation can then stake a claim, which allows full access to mineral development, and can in turn be patented to claim full title to the deposit. Small fees are generally required to stake, maintain, and patent a claim (Humphries and Vincent 2004). Nationally, mineral and

[4] Data given are the most recent available.

energy production, from gravel to gold to carbon dioxide, totaled about $2 billion in fiscal year 2003 (USFS 2005i). In 2002, Region 3 issued $557,042 in sale permits and $1,773,756 in free use permits for mineral extraction (Jevons, pers. comm.).

Mining permits in the Apache-Sitgreaves forests are largely comprised of landscaping materials. In 2004, sale and/or free use permits were issued for river rock, pumice cinder, sand and gravel, landscape and decorative rock (including malpais), and crushed basalt/tuft. 3000 tons of cinders were also extracted for FS use. A total of 156 sale and free use permits were issued for the extraction of 71,391 tons at a total value of just under $60,000. This was a substantial increase from 2003 but a considerable decrease from 2002, when a much greater value of free use permits was issued (Jevons, pers. comm.).

Forests also commonly allow communities and other entities to use public lands for infrastructure, including power lines, rights of way, telecommunications, and the like. Permits for communications, utilities, and other infrastructure comprise nearly half of the 532 special use permits currently issued by the Apache-Sitgreaves National Forests. These include permits to local communities for debris and waste disposal areas, sewage transmission lines and other pipelines, power lines, road easements, water transmission lines, and school sites (Jevons, pers. comm.).

## 6.3 Non-extractive users and uses

Non-extractive users, particularly recreation users, play a major role in forest use and planning. The national forests are mandated to provide outdoor recreation opportunities in natural settings, to maintain and enhance open spaces and public accessibility, and to maintain and enhance "cultural, wilderness, visual, and natural resource values" through a variety of management tasks and activities (FSH 2302). However, unmanaged recreation has also been identified by the Forest Service as one of four "key threats" to the nation's forests and grasslands. As participation in outdoor recreation increases, the Forest Service predicts that recreation pressure on undeveloped areas in most of the Southwest and Rockies regions will be heavy. Much of this pressure can be traced back to population trends throughout the West. The use of off-highway vehicles (OHVs, discussed below) is seen as a major component of unmanaged use (USDA 2005j).

Recreation use has increased steadily throughout the history of the national forests. Over the past few decades, the growth in recreation has been truly extraordinary. For example, participation in camping has increased from about 13 million people in 1960 to 19 million people in 1965 to almost 58 million people in 1994-95 (Cordell et. al. 2004). The 2004 Roper Report estimated that nine in ten Americans had participated in some sort of outdoor recreation during the previous twelve months (RoperASW 2004). However, the same report showed a decline in recreation participation beginning in 2001. It attributes this trend in part to travel concerns following September 11, 2001 but also to the expansion of indoor recreation opportunities through Internet and television (RoperASW 2004). Cordell and others (2004) also note slight decreases in several categories of outdoor recreation following September 11. Nationally, there were 209 million national forest visits in 2001. The forests of the Southwest (Region 3) received 19.5 million visits[5] (USFS 2001e).

Arizona in particular (but also the West and the nation in general) has experienced significant demographic changes in recent years, and these demographic trends have likewise influenced recreation trends. In Arizona, where more than 42% of the land base is managed by federal agencies for public use, the population has increased about tenfold since 1940 to more than 5 million people in 2000. The state had the second largest growth rate in the nation in the 1990s (Arizona State Parks 2003). Perhaps even more importantly, the proportion of Arizonans living in urban areas has increased dramatically, so that more than 88% of Arizona residents lived in urban settings by the year 2000 (Arizona State Parks 2003).

[5] However, for the latter figure there is a 41.2% margin of error at the 80% confidence level.

In phone surveys conducted by the Arizona state parks in 1994 and 1998, nearly 50% of Arizonans said that they had visited an Arizona national forest within the previous twelve months (Arizona State Parks 2003). Access to public lands is considered a major contributor to quality of life by many Arizonans, and many parks and forests are experiencing very high recreational use even while urban expansion is decreasing the amount of available open space. As a result, this trend of increasing pressure on recreational resources can be expected to continue well into the future.

According to National Visitor Use Monitoring (NVUM) data, the Apache-Sitgreaves forests received nearly 2 million visits during fiscal year 2001. A majority of these were male (approximately 73.7%). Visitors were predominately white (an estimated 89.8%); Spanish, Hispanic, or Latino visitors made up approximately 7.7% of total visits, while American Indian/Alaska Native and Asian users comprised only about 0.8% of visits each. About 21% of users were under the age of 16, while relatively few visitors were between 16 and 30 or over 70-years old. An estimated 63.2% of visitors were between the ages of 31 and 70 (Kocis et. al. 2002a). Cordell and others (2004) note a trend of increasing participation by older Americans in a variety of different recreational activities. Less than 1% of visitors to the ASNF were from a foreign country. The most frequently reported zip codes suggest that, while local residents of town such as Lakeside, Alpine, Holbrook, and Showlow are relatively frequent visitors, they tend to be outnumbered by visitors from the Phoenix metro area (Kocis et. al. 2002a).

The Recreation Opportunity Spectrum (ROS) system provides a framework for understanding recreation users, their needs and wishes, and the abilities of forests to accommodate them (USFS 1982). As understood through an ROS lens, a recreation opportunity consists of three elements: the activities, the setting, and the experience. All land and water resources are classified in one of six categories, based on physical, social, and managerial criteria.

**Table 19. Description of ROS Classifications**

| Category | Description |
|---|---|
| Primitive | Setting is unmodified and remote and of a fairly large size. Users are generally isolated from one another, and typical activities include hiking and walking, viewing scenery, horseback riding, tent camping, and hunting. |
| Semi-Primitive Non-Motorized | The environment is predominately natural and of moderate to large size. Users' opportunities to experience solitude are less than in primitive areas, but user density remains low. Motorized activities are not permitted. |
| Semi-Primitive Motorized | Setting is similar to semi-primitive non-motorized, but off-road motor vehicles are permitted. |
| Roaded Natural | Setting is predominately natural but with a moderate level of human impact. There is a probability of contact with other users. Roads are present, and there may be substantial motorized use, including automobiles, buses, trams, and boats. |
| Rural | Setting is substantially modified. Facilities and management practices allow multiple uses and a large number of users and may be designed to facilitate specific activities. There is convenient access, and user density is moderate to high. |
| Urban | Levels of modification and user convenience are high and characteristic of urbanized areas. Opportunities to interact with other individuals and groups are emphasized. |

Source: USFS 1982

Another important element of recreational setting is scenic integrity, or the visual quality of the landscape. The Scenery Management System guides forests in planning management activities that harmonize with existing natural landscapes (USFS 2001e).

The activities that recreation users prefer can also provide a guide for land management planning. The National Survey on Recreation and the Environment (NSRE), which tracks national outdoor recreation trends, lists the ten most popular recreation activities, summarized in Table 30 below:

**Table 20. Ten Most Popular Recreation Activities, NSRE 2000-2001**

| Activity | Percent of Population Participating |
|---|---|
| 1. Walking for pleasure | 83.0% |
| 2. Family gatherings | 73.5% |
| 3. Visiting nature centers | 57.1% |
| 4. Picnicking | 54.5% |
| 5. Sightseeing | 51.8% |
| 6. Attending outdoor sports events | 49.9% |
| 7. Viewing historic sites | 46.2% |
| 8. Viewing/photographing wildlife | 44.7% |
| 9. Swimming (lakes, streams) | 41.8% |
| 10. Swimming (outdoor pools) | 41.0% |

Source: Cordell et. al. 2004

At the national level, walking is currently the most popular outdoor activity (Table 30). 83% of the adult population participates annually. Of the nearly 177 million people estimated to have walked outdoors for pleasure within the last year, an estimated 71 million did so in the form of a day hike or a visit to a wilderness or primitive area (Cordell et. al. 2004). The most popular activities, such as picnicking, sightseeing, and swimming, tend to be available in a variety of settings and readily accessible to families and groups. Less popular activities, such as specialized hunting, rock climbing, and sailing, tend to require specialized equipment, specific skills and knowledge, and greater physical stamina (Cordell et. al. 2004). Even activities that are only moderately popular, such as mountain biking, driving off-road, canoeing, or sledding, attract many millions of users annually (45.6 million, 37.2 million, 20.7 million, and 31.2 million respectively). The three least popular activities, snowshoeing, orienteering, and migratory bird hunting, claim a combined total of approximately 13.1 million participants annually (Cordell et. al. 2004). NSRE data for several general kinds of outdoor activities are summarized in Table 31 (Cordell et. al. 2004):

**Table 21. Participation in General Outdoor Activities, NSRE 2000-2001**

| Activity | Percent of Population Participating |
|---|---|
| Viewing/learning/gathering activities[6] | 88.4% |
| Developed site activities | 94.9% |
| Trail activities | 40.4% |
| Swimming/surfing/beach activities | 62.8% |
| Motorized activities | 62.0% |
| Hunting and fishing | 38.1% |
| Snow activities | 19.3% |
| Risk activities | 35.2% |
| Other non-motorized activities | 22.8% |

Source: Cordell et. al. 2004

[6] Viewing/learning/gathering activities are defined as, "visits to… recreation sites, wildland, or open space sites… to watch study, identify, photograph, sample, observe, and learn about natural or cultural history, or to gather natural products" (121).

Locally, the Apache-Sitgreaves National Forests contain forty-six campgrounds, seven group campgrounds, four organizational camps, one horse camp, and many other dispersed camping sites. There are more than 700 miles of managed trails, including ATV, bicycle, hiking, pack and saddle, snowmobile, snowshoe, and cross-country trails. Notably, the forests report that demand for mountain biking is increasing while horseback riding is decreasing. These trends have significant implications, especially in the management of wilderness areas (see below).

Forest managers identify winter and water-based recreation as key components of Apache-Sitgreaves recreation. The forests offer lake and river access, including more than twenty developed boating and fishing sites. These kinds of sites are relatively rare in Arizona and in the Southwest in general, and they no doubt add to the forests' popularity. There are also three privately owned marinas (at Woods Canyon, Luna Lake, and Big Lake) in the forests that are managed under special use permits. Key winter uses include cross-country skiing, snowmobiling, snowshoeing, sledding, and dogsledding although these make up a very small percentage of visitor use (Jevons, pers. comm.; Kocis et al. 2002a).

The five most popular activities for visitors to Apache-Sitgreaves were relaxing (84.2% participation), viewing natural features (79.3%), viewing wildlife (73.5%), hiking/walking (62.2%), and driving for pleasure (53.3%)[7]. Camping, picnicking and family gatherings, fishing, and gathering forest products were also very popular (Kocis et al. 2002a).

### 6.4 Special users and uses

A number of special user groups merit attention in Arizona's national forests. They are unique in that they do not fit into the profile of the majority users described above. Some user groups need special accommodation, and this accommodation can at times become politically charged.

#### *Tribes*

Federally recognized American Indian tribes occupy about 53.5 million acres (7%) of land in the western states. These tribes are legally considered to be sovereign nations, so the relationship between the FS and tribes is a government-to-government relationship (Toupal 2003). Tribes that enter into contracts with the federal government do so just as state governments or sovereign nations do (NFF and USFS 2005). However, the federal government also holds a special responsibility to consult with tribes over management issues that may affect them. This process is governed by a variety of federal regulations and policies, including the Forest Service Handbook (FSH 1509.13), the National Environmental Policy Act, the National Indian Forest Resources Management Act, the Tribal Forest Protection Act, the Archeological Resources Protection Act, and several presidential executive orders.

Tribes' use of forest service land includes free, non-permitted activities such as gathering boughs and basket materials as well as the use of products such as saw-timber, for which fees are charged (Jevons, pers. comm.). In 2003, the National Tribal Relations Task Force recommended a legislative proposal that would authorize the USDA Forest Service to allow federally recognized tribes to use forest products for traditional cultural purposes free of charge. In addition, the Apache-Sitgreaves National Forests include traditional cultural places, the locations of which are known only to the tribes. Because the tribes cannot divulge the locations, they cannot apply for permits (Jevons, pers. comm.).

[7] In addition to regular forest roads, the forests have two designated Scenic Byways, the Coronado Trail Scenic Byway and the White Mountain Scenic Byway (Jevons, pers. comm.).

### *OHV Users*

On public lands throughout the country, the use of off-highway vehicles (OHVs) has increased in popularity and is now a major concern to many forest managers. Between 1982 and 2000, off-road vehicle users increased by more than 109% nationally (Cordell et al. 2004). In 1995, a GAO study found OHV use on federal lands to be generally undermanaged. The Forest Service devoted limited funding and staffing to managing OHV use, and forests relied heavily on state funding (GAO 1995). According to surveys conducted by the Arizona State Parks, most Arizonans consider the provision of OHV recreation opportunities to be a lower priority than other services, such as the preservation of cultural resources and natural areas; however, more Arizonans considered management for OHVs to be important in a 1998 survey than in an earlier survey (Arizona State Parks 2003).

In 2004, the Forest Service proposed a new rule to help manage OHV recreation in the national forests. Under the proposed rule, forests would establish a system of roads, trails, and areas designated for motor vehicle use and would prohibit the motor vehicle use that is off the designated system or inconsistent with the designations. This system would replace the previous assumption that all areas are open to OHV use unless specifically posted otherwise (USFS 2004j).

In the 1987 Apache-Sitgreaves National Forests Plan, OHV recreation was identified as a source of conflict among user groups and a cause of resource damage. At that time, about 84% (all but 322,954 acres) of the forests' 2 million acres were open to OHV use although users in some areas were restricted to existing or designated roads and trails (USFS 1987a). In 2002, about 11% of forest visitors reported participating in OHV travel; however, only 3% reported using designated OHV areas, and less than 2% used trails developed for motorized vehicles (Kocis et al. 2002a).

### *Wildlife Users*

The National Survey of Hunting, Fishing, and Wildlife-Associated Recreation collects longitudinal data on anglers, hunters, and wildlife watchers in the United States (USFWS 2001). The 2001 survey found that 82 million U.S. residents 16-years and older participated in some wildlife-associated recreation during that year: 34.1 million fished, 13.0 million hunted, and 66.1 million engaged in some sort of wildlife watching activity (including photographing, observing, or feeding fish and other wildlife).[8] Their spending totaled an estimated $108 billion, or 1.1% of the U.S. GDP. That year's 38.7 million hunters and anglers accounted for approximately $70 billion of that amount (USFWS 2001). Generally, the rate of growth in fishing participation has been greater than U.S. population growth since the survey began in 1955 whereas the growth in hunting participation has failed to keep up with population growth during that time. There has also been an overall decrease in wildlife-watching activities since 1980 (USFWS 2001). However, birding (viewing or photographing birds) has been the fastest growing recreational activity since the early 1980s, adding more than 50 million participants and growing 231% in just under twenty years (Cordell et al. 2004).

In the Apache-Sitgreaves National Forests, wildlife viewing is a more common activity that either fishing or hunting. NVUM data from 2002 show that 73.5% of the visitors interviewed participated in some sort of wildlife viewing activity; however, only 1% described it as their primary activity.[9] Approximately 50% of interviewed visitors fished (with about 19.6% describing it as their primary activity), and only 3% hunted. 34.8% used a developed fishing site or dock (Kocis et al. 2002a). The heavy use by anglers reflects the popularity of the forests' water resources, which are rare in Arizona.

[8] Notably, however, an estimated 21.6% of ASNF visitors are under the age of 16.

[9] The NVUM definition of wildlife viewing appears to be somewhat broader that that used by the national survey discussed above.

### *Wilderness users*

With the Wilderness Act of 1964, Congress laid the foundation for a National Wilderness Preservation System comprised of federal lands, "where the earth and its community of life are untrammeled by man, where man himself is a visitor and does not remain" (16 USC 1131 et seq.). Wilderness areas are designated by Congress and are generally protected from commercial enterprises, road construction, mechanical vehicles, and structural development. The Forest Service Handbook directs managers to minimize the impact of human use while protecting the wilderness character and public values of wilderness land (FSH 2320.2).

As a result of these management requirements, wilderness areas are open to some uses (e.g., primitive camping, backpacking, horseback riding, hunting, and fishing) and closed to others (many extractive uses, bicycling, and OHVs), and the decision to designate a roadless area as wilderness can be controversial. However, many forest users value the solitude and isolation, closeness to nature, and self-reliance experienced in wilderness areas. Activities available in wilderness or primitive areas attract millions of visitors nationally. For example, an estimated 34.1 million Americans participated in primitive camping in 2000-2001 while participation in backpacking and mountain climbing drew an estimated 22.8 million and 12.9 million visitors respectively (Cordell et al. 2004).

The Apache-Sitgreaves National Forests include three designated wilderness areas, the nation's sole designated primitive area, and 322,000 acres of inventoried roadless areas (Jevons, pers. comm.; USFS 2001b). Users of designated wilderness areas fit a profile similar to other forest users: they are predominantly male (81.1%), white (92.0%) or Hispanic/Latino (5.3%), and often travel from the Phoenix area to use Apache-Sitgreaves' wilderness. NVUM data suggest that roughly 45,000 wilderness visits were made during fiscal year 2001 although the error rate on this data is very high (+/- 56%) because of the relatively low number of visitors interviewed (Kocis et al. 2002a).

### *Illegal uses*

The Forest Service uses a computerized database, LEIMARS (the Law Enforcement and Investigations Management Attainment Reporting System), to collect information on crimes and rule violations that occur on lands in the national forest system (USDA and OIG 2004). The ten most common offenses are summarized below in Table 32.

**Table 22. Most common offenses on Apache-Sitgreaves National Forests, 1995-2005**

| Activity |
|---|
| 1) Littering |
| 2) Leaving an un-extinguished fire |
| 3) Unauthorized timber cutting |
| 4) Property damage |
| 5) Dumping |
| 6) Building a fire when prohibited by order |
| 7) Use of vehicle in a manner which damages or disturbs resources |
| 8) Unauthorized burning |
| 9) Illegal motor vehicle use or parking in a developed recreation site |

Source: Jevons, personal communication

### *Special use permits*

While research is rarely considered by the public to be a major use of federal lands, the Apache-Sitgreaves forests, like most forests, issue special use permits for research purposes. Research on flora, fauna, water quality, seismic activity, weather, and wildland fire effects is conducted on the forests by universities, private institutions, and other federal, state, and local agencies. A variety of special use permits are issued for different forest uses by the public. These include permits for privately managed facilities, including organizational camps, marinas, and a golf course, as well as one-time recreation events (varying from dog trials to historic reenactments to family reunions). Special permits can also be purchased for a number of gathering activities. Permits for gathering firewood and cutting Christmas trees are the most common among these (Jevons, pers. comm.).

## 6.5 Key issues for forest planning and management

Extractive uses and non-extractive uses of national forests are often seen as competing with one another, and balancing the uses of these different groups can be challenging. Livestock grazing is no exception. Overgrazing, especially on arid lands, can seriously damage ecosystems. Soil erosion, watershed destruction, and the loss of native plants are commonly cited as potential impacts. In the late 1980s, the most recent reports issued by the USDA and Department of Interior on the condition of grazing allotments showed that more than half of the public rangeland was in either poor or fair condition, and a GAO survey of range managers' professional opinions showed that the BLM and FS authorized grazing levels higher than the land could support on 19% of allotments (GAO 1988). Disagreements among citizen groups over the appropriate fee system for public-lands grazing, the refusal of some operators to pay grazing fees, the retirement of allotments, and calls for government buy-outs of permits are all key issues for both ranchers and other user groups (Vincent 2004).

Timber harvesting in the national forests has declined since the late 1980s (GAO 1999b). Meanwhile, a new emphasis is being placed on the utilization of small-diameter fuels, which are increasingly being removed from western forests to manage fire frequency and behavior. As public concern over wildland fire grows, the Forest Service and other federal agencies have emphasized the development of a market for these fuels to help mitigate the costs of removal. For example, the 2004 Healthy Forests Restoration Act provides direct subsidies for the development of industries that use previously unmarketable biomass from mechanical thinning projects (16 USC 6531).

The policies that govern mineral extraction in the national forests have also come under increasing scrutiny over the past two decades. Public concern over the Mining Law of 1872, under which about 3.2 million acres of public land had been sold by the late 1980s, was sparked in 1986 when the federal government, under the law's patent provision, sold 17,000 acres for $42,500 to patent holders who then almost immediately resold the land to oil companies for $37 million (GAO 1989). A GAO report called for substantial changes to the law. Many of these controversial aspects of mining law remain unchanged today, and calls for reform continue (Humphries and Vincent 2004).

As the western United States becomes increasingly urbanized, national forests are experiencing increasing demand for recreational uses and, in many cases, decreasing support and demand for extractive uses. While these trends generally have not caused a clear rise in environmental or pro-conservation politics and policy, the forces of supply and demand are changing the face of the national forests (Davis 2001). The following figure, provided by the USDA Forest Service to the General Accounting Office, clearly illustrates these changes (GAO 1999a).

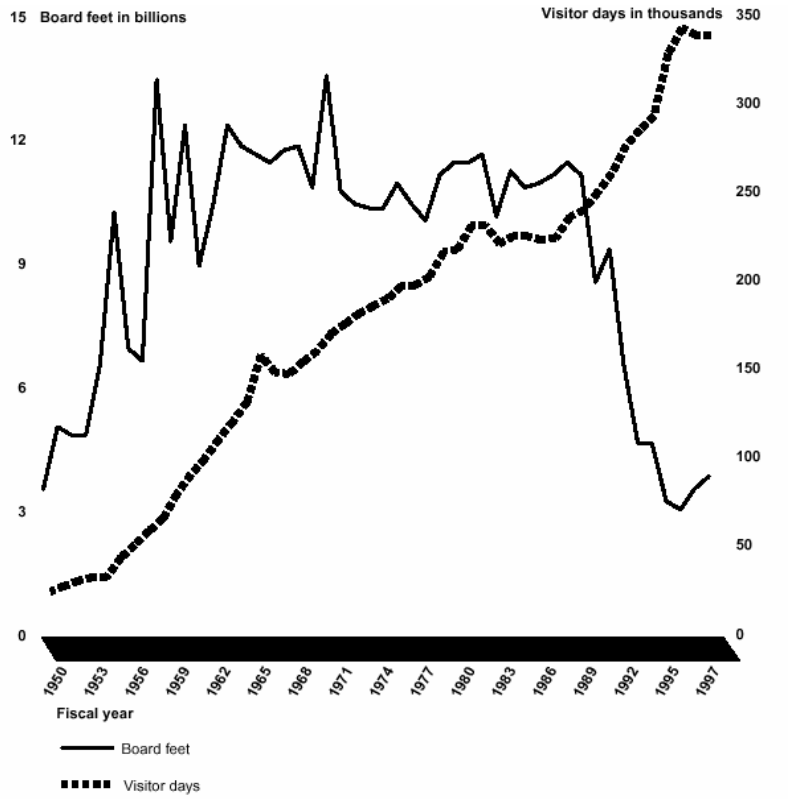



**Figure 11. Visitor Recreation Days as Compared to Timber Extraction, 1950-1997**

As the West becomes increasingly urbanized, managing recreation and its conflicts with other uses will doubtless be a priority for forest managers and planners.

Several important management issues have arisen from demographic and use changes. As discussed above, recreation users represent a wide variety of uses, and their management priorities also differ significantly and occasionally come into conflict. NRSE surveys identify trends in characteristics of outdoor recreation trips, wildlife as a component of recreation trips, service and accessibility issues for persons with disabilities, and user attitudes and opinions concerning site attributes, funding, and management policy. These data show that, nationally, large proportions of recreation users visit both more developed areas, such as developed campgrounds, restaurants, and less developed areas, such as primitive camping areas, trails away from roads, and wilderness areas. At the same time, significant proportions of users prioritize such potentially contradictory values as accessibility and wilderness preservation or service provision and low use fees (Cordell, Teasley, and Super 1997). Striking an acceptable balance among these values will continue to be a major challenge for forest managers.

Under conditions of increasing recreation demand, simply maintaining services and facilities has become a challenge for many forests. Between 1989 and 1991, the GAO issued several reports on the condition of the Forest Service's recreational sites and areas and found that funding levels were hundreds of millions short of what would be needed to complete backlogged maintenance and reconstruction for trails, developed recreation sites, and wilderness areas. Funding shortages and a lack of consistent, uniform monitoring data were sited as the primary roadblocks to recreation management (GAO 1991). However, the practice of increasing recreation fees to fill funding gaps has been contentious. In 1996, Congress authorized a recreational fee demonstration program, allowing land management agencies to test new or increased fees to help address unmet needs for visitor services, repairs and maintenance, and resource management. Evaluations of fee demo programs have cited concerns about equity, administration,

interagency coordination, and the use of fee monies, but concluded that increasing fees have not negatively impacted overall visitor numbers (GAO 1998, 2001b). Conversely, the fees charged for recreational special use permits, especially for large-scale commercial operations such as ski lodges, resorts, and marinas, have been criticized for remaining well below fair market value (GAO 1996).

Changes over time in forest uses and user groups can and should help guide forest managers in land use planning. The need to balance the priorities and values of a wide variety of extractive and non-extractive users aptly demonstrates both the challenges and the benefits of multiple use doctrine.

# 7. Designated Areas and Special Places

This section describes those places in and around the Apache-Sitgreaves National Forests (ASNF) which have been designated for public uses such as camping and picnicking, biking, hiking, OHV use, rock climbing, fishing, scenic drives and vistas, and so forth or have been recognized as important to the public as so-called undesignated special places. An attempt was made to identify all designated areas and special places on the ASNF; however, the nature of these resources makes this task difficult. As will be discussed in later subsections, some of these areas are held in secrecy by the parties who regard them as special (indeed that is why they are "special") and, thus, these people are reluctant to disclose the nature and location of these places.

A review of available information on designated areas and special places suggests that the ASNF contains considerable recreational, interpretive, and cultural resources. Forest GIS Staff provided specific designations and names of over 250 areas within the ASNF, including boating sites, campgrounds, picnic areas, trailheads, and wilderness areas. Additionally, the mountain ranges and water sources that characterize the ASNF are home to numerous special places for the area's numerous Native American communities.

### 7.1 Historical context and methods of designation

Although the concept of special places has existed in social science literature for decades, the idea of incorporating it into forest management plans is relatively new. Traditionally, forest professionals focused on science-based management policies rather than on the subjective, difficult-to-quantify issues of public values (McCool 2001, Mitchell et al. 1993).

Special places can be described as spaces that have been given meaning by the humans who have experienced them in a way that inspired an emotional response (Cheng, Kruger, and Daniels 2003). Although often unrecognized in any official way, special places are significant to visitors of our national forests; however, the FS also recognizes special areas for their "unique or special characteristics" (USFS 2005c) and for the contributions the areas make to our public lands. These areas are noted for generally agreed-upon attributes such as scenic qualities, habitat significance, and other virtues and are delineated on FS maps. But, as will be shown, the distinction between those designated areas and special places—the subject of this section—involves more than semantics and, thus, is worthy of discussion.

The key difference between the two terms is that *areas* are considered special for their own attributes whereas the value of *places* derives from the people who experience them. A pristine riparian area, for example, is not necessarily a special place until a person or group forms an emotional attachment to it. More detailed explanations emphasize place as the intersection and integration of "ecological, economic, and spiritual values" (Williams and Patterson 1996) or of "biophysical attributes and processes; social and behavioral processes; and social and cultural meanings" (Cheng, Kruger, and Daniels 2003). All of these definitions make clear that the idea of special places is complex, subjective, and often exceedingly difficult to define in a concise manner.

The methods used to identify these places were as follows. For the first category (i.e., designated areas) the Forest GIS Coordinator was asked to query the INFRA data base in order to identify the designated areas. Furthermore, many of these areas are also identified on the ASNF website found at http://www.fs.fed.us/r3/asnf/recreation/. Maps, geographic coordinates and brochures for these designated places can be found at http://www.fs.fed.us/r3/asnf/maps/.

The method used to identify the more elusive second category (i.e., undesignated special places) was to contact the Forest Archaeologist and Heritage Specialists. These individuals were given the opportunity to name and describe, to the best of their ability, the key special places in the forest. Also, they were asked to identify the key user publics and, finally, to specify the main management issues associated with these special places. Native American tribes are a particularly important constituency in the designation and

protection of special places. The involvement of area tribes with the ASNF is discussed in greater detail in the following section, Community Relationships.

### 7.2 Designated areas

Table 33 provides information on the designated areas within the Apache-Sitgreaves National Forests.

**Table 23. Designated Areas on the Apache-Sitgreaves National Forests**

| Designated Area Type | Name |
|---|---|
| Boating Site | Big Lake Boating/Launch Site |
| Boating Site | Big Lake Marina |
| Boating Site | Big Lake-North Shore Boat. Day Use Area |
| Boating Site | Big Lake Railroad Cove Boating Site |
| Boating Site | Big Lake South Cove Boating Site |
| Boating Site | Bunch Reservoir |
| Boating Site | Crescent Lake Dam Area |
| Boating Site | Crescent Lake West Side (Store Area) |
| Boating Site | Fool Hollow East Launch |
| Boating Site | Fool Hollow West Launch |
| Boating Site | Lee Valley Reservoir |
| Boating Site | Luna Lake Boat Launch |
| Boating Site | Luna Lake Marina |
| Boating Site | Nelson Reservoir North |
| Boating Site | Nelson Reservoir South |
| Boating Site | River Reservoir - Main |
| Boating Site | Scott Reservoir Boat Launch |
| Boating Site | South Crescent Lake Boat Site |
| Boating Site | Tunnel Reservoir |
| Boating Site | Willow Springs Boat Launch |
| Boating Site | Woodland Lake Park |
| Boating Site | Woods Canyon Lake Area |
| Botanical Area | Phelps Cabin |
| Campground | Alpine Divide CG |
| Campground | Aspen CG |
| Campground | Bear Canyon Lake CG |
| Campground | Benny Creek |
| Campground | Black Canyon Rim CG |
| Campground | Black Jack CG |
| Campground | Blue Crossing CG |
| Campground | Brookchar CG |
| Campground | Brown's Creek |
| Campground | Buffalo Crossing CG |
| Campground | Canyon Point CG |
| Campground | Chevelon Crossing CG |
| Campground | Chevelon Lake CG |
| Campground | Coal Creek CG |
| Campground | Crook CG |

## Table 33 (cont.). Designated Areas on the Apache-Sitgreaves National Forests

| Designated Area Type | Name |
|---|---|
| Campground | Cutthroat CG |
| Campground | Deer Creek (East Fork-Black River) |
| Campground | Diamond Rock CG |
| Campground | Fool Hollow Lake Recreation Area |
| Campground | Gentry CG |
| Campground | Granville CG |
| Campground | Grayling CG |
| Campground | Hannagan CG |
| Campground | Honeymoon CG |
| Campground | Horse Springs CG |
| Campground | KP Cienega CG |
| Campground | Lakeside |
| Campground | Los Burros |
| Campground | Lower Juan Miller CG |
| Campground | Luna Lake CG |
| Campground | Mogollon CG |
| Campground | Raccoon CG |
| Campground | Rainbow CG |
| Campground | Rim CG |
| Campground | Rolfe C. Hoyer CG |
| Campground | Scott Reservoir |
| Campground | Sink Hole CG |
| Campground | South Fork CG |
| Campground | Spillway CG |
| Campground | Strayhorse CG |
| Campground | Upper Blue CG |
| Campground | Upper Juan Miller CG |
| Campground | West Fork CG |
| Campground | Winn CG |
| CUA Camping Area | FR 171 |
| CUA Camping Area | FR 195 |
| CUA Camping Area | FR 9350 |
| CUA Camping Area | Frisco Camp |
| Fishing Site | Aker Lake |
| Fishing Site | Big Lake Dam Parking |
| Fishing Site | Crescent Lake Point Area |
| Fishing Site | Hulsey Lake |
| Fishing Site | Lake Sierra Blanca |
| Fishing Site | River Reservoir South |
| Group Campground | Black Jack Group CG |
| Group Campground | Canyon Point Group CG |
| Group Campground | Horse Springs Group CG |
| Group Campground | Lewis Canyon |
| Group Campground | Luna Lake Group CG |
| Group Campground | Spillway Group CG |
| Group Campground | Winn Group CG |
| Group Campground | Woods Canyon Group CG |
| Group Picnic Site | Fool Hollow Day Use Area |

## Table 33 (cont.). Designated Areas on the Apache-Sitgreaves National Forests

| Designated Area Type | Name |
|---|---|
| Horse Camp | Gabaldon CG |
| Information Site | Mogollon Rim Visitor Center |
| Information Site | Sheep's Crossing Point Parking |
| Information Site | White Mtn. Reservoir East Parking |
| Information Site | White Mtn. Reservoir North Parking |
| Information Site | White Mtn. Reservoir NW Parking |
| Interpretive Site (Admin) | Big Lake Visitor Center |
| Interpretive Site (Major) | Woods Canyon Amphitheater |
| Interpretive Site (Minor) | Big Springs |
| Observation Site | Blue Vista |
| Observation Site | Chase Creek Overlook |
| Observation Site | Military Sinkhole Vista |
| Observation Site | Pintail Lake |
| Observation Site | Point Of Mountain Scenic Overlook |
| Observation Site | Red Mtn. Overlook |
| Observation Site | Rim Lakes Vista |
| Observation Site | Woods Canyon Lake Vista |
| Other Rec. Concess. Site | Big Lake Dump Station |
| Other Rec. Concess. Site | Big Lake Shower |
| Picnic Site | Al Fulton Picnic Ground |
| Picnic Site | Bear Track Camp |
| Picnic Site | Black Canyon Lake Picnic Area |
| Picnic Site | Cherry Lodge |
| Picnic Site | Frisco Camp |
| Picnic Site | Hl Saddle Family Picnic |
| Picnic Site | Rocky Point Picnic |
| Picnic Site | Rose Peak Picnic Area |
| Picnic Site | Sardine Saddle Family Picnic |
| Picnic Site | Sheep Saddle Family Picnic |
| Picnic Site | Squirrel Springs Day Use Area |
| Picnic Site | Willow Springs Picnic Ground |
| Picnic Site | Woodland Lake Park |
| Primitive Area | Blue Range |
| Research Natural Area | Escudilla Mountain |
| Research Natural Area | Hayground |
| Research Natural Area | Phelps Cabin |
| Research Natural Area | Thomas Creek |
| Research Natural Area | Wildcat |
| Trailhead | 237B Trailhead |
| Trailhead | Ad Bar Trailhead (#14) |
| Trailhead | Aker Lake/Fish Creek Trailhead |
| Trailhead | Alma Trailhead (#41) |
| Trailhead | Baseline Trailhead (#310) |
| Trailhead | Bear Canyon Trailhead (#46) |
| Trailhead | Bear Creek Trailhead |
| Trailhead | Bear Pen Trailhead (#32) |
| Trailhead | Bear Springs Trailhead (#19) |
| Trailhead | Bear Wallow Trailhead |

## Table 33 (cont.). Designated Areas on the Apache-Sitgreaves National Forests

| Designated Area Type | Name |
|---|---|
| Trailhead | Big Springs |
| Trailhead | Big Tree Trailhead |
| Trailhead | Billy Creek |
| Trailhead | Blue Admin Trailhead |
| Trailhead | Blue Peak Trailhead |
| Trailhead | Blue Ridge #1 |
| Trailhead | Blue Ridge #2 |
| Trailhead | Blue River Trailhead (#101) |
| Trailhead | Bonanza Bill Trailhead |
| Trailhead | Buena Vista |
| Trailhead | Butler Canyon Trailhead |
| Trailhead | Carr Lake Trailhead |
| Trailhead | Cave Creek Trailhead (#10) |
| Trailhead | Charlie Moore Trailhead (#307) |
| Trailhead | Cottonwood Wash Trailhead |
| Trailhead | Country Club |
| Trailhead | Crescent Lake Trailhead |
| Trailhead | Divide Hill Trailhead |
| Trailhead | Drew Trailhead |
| Trailhead | Durfee Trailhead |
| Trailhead | Eagle Trailhead |
| Trailhead | East Baldy |
| Trailhead | East Fork Of The Little Colorado Trailhead |
| Trailhead | Escudilla Trailhead |
| Trailhead | Fish Creek Trailhead |
| Trailhead | Forest Lakes OHV Trailhead |
| Trailhead | Four-Springs |
| Trailhead | Fry Trailhead (#12) |
| Trailhead | General Crook Trailhead |
| Trailhead | Ghost Of The Coyote |
| Trailhead | Gobbler Point Trailhead |
| Trailhead | Government Springs |
| Trailhead | Grant Creek Trailhead |
| Trailhead | Granville Trailhead (#572) |
| Trailhead | Hagen Trailhead (#31) |
| Trailhead | Hangman Trailhead |
| Trailhead | Hannagan Meadow Trailhead |
| Trailhead | Hannagan Snowmobile Trailhead |
| Trailhead | Highline Trailhead (#47) |
| Trailhead | Homestead Trailhead |
| Trailhead | Horse Canyon Trailhead (#36) |
| Trailhead | Horse Ridge Trailhead |
| Trailhead | Horse Trap Trailhead |
| Trailhead | Horton Trailhead |
| Trailhead | Hot Air Trailhead (#15) |
| Trailhead | Ice Cave |
| Trailhead | Indian Springs #627 Trailhead |
| Trailhead | Juniper Ridge #1 |

## Table 33 (cont.). Designated Areas on the Apache-Sitgreaves National Forests

| Designated Area Type | Name |
|---|---|
| Trailhead | Juniper Ridge #2 |
| Trailhead | Kellar Trailhead (#619) |
| Trailhead | KP North Fork/KP Rim Trailhead #93 |
| Trailhead | KP Trailhead (#70) |
| Trailhead | Land Of The Pioneers |
| Trailhead | Larson Ridge Trailhead |
| Trailhead | Lengthy Trailhead (#89) |
| Trailhead | Lightning Ridge Trailhead |
| Trailhead | Limestone Trailhead (#84) |
| Trailhead | Long Draw North Trailhead |
| Trailhead | Long Draw South Trailhead |
| Trailhead | Los Burros #1 |
| Trailhead | Los Burros #2 |
| Trailhead | Los Caballos |
| Trailhead | Lower East Eagle Trailhead |
| Trailhead | Lower Robinson Trailhead (#27) |
| Trailhead | Lower Squirrel Trailhead (#34) |
| Trailhead | Luna Lake Bike Trailhead |
| Trailhead | Malay ATV Trailhead (#711) |
| Trailhead | Mallard Trailhead |
| Trailhead | Maverick Trailhead (#568) |
| Trailhead | McBride Trailhead (#26) |
| Trailhead | Meadow Trailhead |
| Trailhead | Merganser Trailhead |
| Trailhead | Mexican Hay Lake Trailhead |
| Trailhead | Military Sinkhole Trailhead |
| Trailhead | Mogollon Rim |
| Trailhead | Murray Basin Trailhead |
| Trailhead | Old Rim Trailhead |
| Trailhead | Painted Bluff Trailhead (#13) |
| Trailhead | Panorama |
| Trailhead | P-Bar Lake Trailhead |
| Trailhead | Pigeon Loop Trailhead (#301) |
| Trailhead | Pigeon Trailhead (#319) |
| Trailhead | Pintail Lake |
| Trailhead | Point of the Mountain Trailhead |
| Trailhead | Pole Knoll Parking Trailhead |
| Trailhead | Railroad Cove Trailhead |
| Trailhead | Railroad Grade Trailhead |
| Trailhead | Raspberry Trailhead (#35) |
| Trailhead | Red Hill Trailhead |
| Trailhead | Red Mtn. Trailhead (#25) |
| Trailhead | Reno Trail Trailhead |
| Trailhead | Rim Top Trailhead |
| Trailhead | Robinson Trailhead (#27) |
| Trailhead | Rocky Point Trailhead |
| Trailhead | Rose Spring Trailhead |
| Trailhead | Saffel Canyon OHV Trailhead |

**Table 33 (cont.). Designated Areas on the Apache-Sitgreaves National Forests**

| Designated Area Type | Name |
|---|---|
| Trailhead | Salt House Trailhead (#18) |
| Trailhead | Sawmill Trailhead |
| Trailhead | See Canyon Trailhead |
| Trailhead | Sheep Saddle Trailhead (#16) |
| Trailhead | South Fork Trailhead |
| Trailhead | Springs |
| Trailhead | Spur Cross Trailhead (#8) |
| Trailhead | Stateline Trailhead (#618) |
| Trailhead | Steeple (Only) Trailhead |
| Trailhead | Steeple Creek/Foote Creek Trailhead |
| Trailhead | Strayhorse Trailhead (#20) |
| Trailhead | Sunrise Trailhead |
| Trailhead | Tall Timbers Trailhead |
| Trailhead | Telephone Ridge Trailhead |
| Trailhead | Thompson Trailhead |
| Trailhead | Three Oaks Trailhead |
| Trailhead | Timber Mesa |
| Trailhead | Toboggan Hill Trailhead |
| Trailhead | Tutt Creek Trailhead |
| Trailhead | Two-o-Eight Trailhead |
| Trailhead | Upper East Eagle Trailhead (#33) |
| Trailhead | Upper Squirrel Trailhead (#34) |
| Trailhead | Warren Canyon Trailhead (#46) |
| Trailhead | Water Canyon Trailhead |
| Trailhead | West Baldy |
| Trailhead | West Fork of Black River Trailhead |
| Trailhead | West Fork of The Little Colorado Trailhead |
| Trailhead | Wildbunch Trailhead (#7) |
| Trailhead | Williams Valley Bike Trailhead |
| Trailhead | Williams Valley Snowmobile Trailhead |
| Trailhead | Williams Valley Trailhead |
| Trailhead | Willow Springs Lake Trailhead |
| Trailhead | Woodland Lake Park |
| Trailhead | Woods Canyon Lake Vista Trailhead |
| Trailhead | XXX Cabin Trailhead |
| Wilderness | Bear Wallow |
| Wilderness | Escudilla |
| Wilderness | Mt Baldy |

Source: Apache–Sitgreaves National Forests GIS Coordinator
GIS and INFRA Databases

## 7.3 Special places

The following information on Special Places was prepared by Charlotte Tsali Hunter, Forest Archaeologist/Tribal Liaison for the Apache-Sitgreaves National Forests.

Ten federally recognized American Indian tribes are affiliated with the Apache-Sitgreaves National Forests: the Fort McDowell Yavapai Nation, the Hopi Tribe, the Navajo Nation, the Ramah Navajo Chapter, the San Carlos Apache Tribe, the Tonto Apache Tribe, the White Mountain Apache Tribe, the Yavapai-Apache Nation, the Yavapai-Prescott Tribe, and the Pueblo of Zuni. Public Law 95-341, the American Indian Religious Freedom Act (AIRFA), declares that the policies of the United States shall preserve and protect the American Indian's freedom to practice their religion. This includes the right to have access to religious sites, to use and retain sacred objects, and to conduct ceremonials and practice traditional rites on the Apache-Sitgreaves National Forests.

Most Native American belief systems exhibit a strong sense of place. Deities have visited many of the sacred places and some of these sacred places are thought to be the homes of these deities. The power of the supernatural is inherent in all of nature including mountains, plants, and animals, all of which are interdependent. Reciprocity regulates the persisting relationships between humans and all other beings. Sacred places may be places of prayer, places to collect material for ceremonies, places to gather medicine, or places to carry out other privileged, sensitive, or confidential activities which cannot be shared with the uninitiated. Visual aspects may in themselves be sacred. The responsibility to respect these sacred places is inherent in tribal belief systems. The places are known to the communities that consider them important. They are rooted in the communities' histories and pre-histories, and they are important in maintaining the continuing cultural identities of these communities. They are not necessarily regularly visited by tribal members but are known to the communities. Some tribes consider all ancestral archaeological sites as sacred sites and Traditional Cultural Properties (TCPs) as defined by the Department of the Interior.

In the ASNF, Mount Baldy, Rose Peak, and Escudilla Mountain are but a few of the sacred places. Many mountain tops have shrines but these locations are not divulged in respect for the tribes' need for confidentiality. For the same reason, specific areas which may be the ancestral home of clans are not revealed. Springs, rivers, pictograph and petroglyph panels, and places where sacred objects are found are TCPs to the Puebloan peoples and some other tribes. The White Mountains in general and the Little Colorado River are also TCPs to many of the tribes.

In the past, most ethnographic research was conducted by non-Indian contractors. More and more tribes prefer to conduct their own research and many have the needed capability. The process by which the locations of confidential sacred sites and TCPs can be designated without making the locations public has long been a difficult concept upon which the government and the tribes have been unable to agree, and it remains a challenge today. The ASNF relies upon tribal consultation and notification of individual projects to fulfill the government's obligation to preserve and protect the American Indian's freedom to practice their religion.

### 7.4 Scenery management

The USFS has explored the issue of scenery management on the national forests, and several publications have been written which can serve as guides to the forest manager for management of scenic resources. Some of the more important publications are available on-line at http://www.esf.edu/es/via/. Two of these publications, which might be particularly useful, are *Our National Landscape: A Conference on Applied Techniques for Analysis and Management of Visual Resources* (Elsner and Smardon 1979) and *Landscape aesthetics: A handbook for scenery management* (USFS 1995).

The latter deals with the character and nature of landscapes, the integrity of natural scenes, the means to obtain information from constituent publics regarding scenic preferences, the determination of landscape visibility, and the application of the Scenery Management System. The appendices contain information about the history of the scenery management issue in the USFS. The scenery management issue, according to this handbook, arose during the 1960s as a result of public concern over the visibility of

forest management activities, particularly timber cutting. This handbook provides a guide to practical methods for minimizing the impact of those activities on the user public, principally recreationists. The Forest Service also provides guidance to the national forests regarding landscape management in the Forest Service Manual, Chapter 2380: "Landscape management."

### 7.5 Key issues for forest planning and management

Special places exist because humans form emotional attachments to them based on sensory connections. Sometimes people are aware of this experience and the feelings they develop, but often, this is an unconscious process. The ability and opportunity to form these connections fulfills people's need to feel a part of something greater than themselves, which is "an essential aspect of human existence" (Brandenburg and Carroll 1995). Researchers advise that the recognition of unique and special places is of growing importance because people in today's age of cultural homogenization seek unique and special qualities in their public lands (Williams and Stewart 1998). This, in turn, places higher demands on public lands, particularly in a rapidly growing state like Arizona.

With the complexities of special places in mind, researchers like Williams and Stewart (1998) caution that it is unwise to reduce special places to "single attributes" as they are clearly a collection of values, contexts, and experiences. Consequently, it is not always possible to identify special places as discrete points on a map. The challenge of mapping special places is thus ideally accomplished in cooperation with the individuals that value the place, marking the general boundaries of the area (rather than a point) on the map (Richard and Burns 1998). Using a Geographic Information System (GIS) as a tool to combine the special place maps of different groups or individuals can be very helpful to forest planners seeking to identify overlapping areas that might indicate future sources of conflict (Brandenburg, Carroll, and Blatner 1995). Disputes can arise over the diverse place definitions people give the same physical space, and, given the subjective emotional nature of special places, these disagreements can be quite contentious. Forest professionals are advised that "various sentiments—whether local or non-local in origin, new or long established—are all legitimate, real, and strongly felt" (Williams and Stewart 1998).

Given that these places require sensory experiences, distant landmarks and conditions can affect one's experience of a particular special place and thus are a part of the place even if only to that person. Thus, management of forests for traditional extractive resources and the motorized vehicle use of some may have an impact on forest places that are considered special to others. These potential effects can generate conflict. Therefore, a better awareness of the significance of special places can potentially enhance forest planning and management.

Researchers have recognized that the relationships people form with special places often cut across traditional categories of liberal/conservative, extractive/environmentalist, urban/rural, and so on (Brandenburg and Carroll 1995). Wondolleck and Yaffee (2000) advise that "places can be powerful symbols that encourage people…to interact with [others] that historically have been viewed as outside their geographic, interest-based, or perceptual boundaries." As a result, it can be difficult to pin down special places in public town-hall meetings—people who strongly identify with a particular lifestyle group are often reluctant to speak out in a way not supported by that group and yet may feel strongly about a very personal place relationship. Therefore, it becomes important to consider a combination of styles of data collection in order to represent all of these interests. Some findings have suggested that the traditional public meeting may serve to exclude some interested groups or individuals and to encourage a "majority (or loudest) rules" mentality (Brandenburg and Carroll 1995; Brandenburg, Carroll, and Blatner 1995). The potential loss of social capital within the community when voicing a dissenting opinion in a public meeting may outweigh one's strong special place connection: "an individual may not share his or her emotive personal values regarding the place in a public or group setting because of the pressures of the primary social groups' common values" (Brandenburg and Carroll 1995). Thus, a mixture of town-hall meetings, surveys, and open-ended individual interviews and conversations may provide a more

balanced and clearer picture of special places in the forest (Brandenburg and Carroll 1995; Brandenburg, Carroll, and Blatner 1995).

Cheng, Kruger, and Daniels (2003) emphasize the importance of understanding human-place relationships in planning for, anticipating, and mitigating potential conflicts in multiple-use public land (e.g. forests). According to these researchers, "a key goal of place-based inquiry is to foster more equitable, democratic participation in natural resource politics by including a broader range of voices and values centering around places rather than policy positions." Another study suggested that attention to stakeholders' place-value concerns could help avoid "continued acrimonious debate" (Brandenburg, Carroll, and Blatner 1995).

Often, decision makers lack the tools and training necessary to achieve a deeper understanding of social issues (McCool 2003). Nonetheless, studies have displayed that by becoming more aware of community values, the FS shows good will toward the public and is better equipped to make management decisions that consider all of the potentially affected people (Mitchell et al. 1993, Richard and Burns 1998). In a recent social assessment prepared for two Idaho forests, researchers noted that "[s]entiments about attachment to place…result in a configuration of social life, individual life, and geographic space that is likely to influence how forest management issues will be evaluated [by the public]" (Adams-Russell 2004). Thus, it benefits the forest managers to know the local communities and consider their individual interests during planning. Increased and continued interactions between forest managers and the visitor public are interpreted as a sign of respect for local knowledge and culture (Mitchell et al. 1993, Williams and Stewart 1998).

Unfortunately, it is not safe to assume that visitors to public lands will recognize and share the values for that landscape that are in its best interest (McCool 2003). By encouraging special place relationships, the Forest Service stands to gain caring partners in the stewardship of forest resources. This occurs because when people develop a bond with a location, they become emotionally invested in the continued health and balance of the ecosystem (Mitchell et al. 1993, Wondolleck and Yaffee 2000).

Arizona is one of the fastest growing states in the country, and like many states in the Interior West, the majority of its population is concentrated in a few urban areas. The FS should expect significant impacts on public lands near or adjacent to urban areas in Arizona. These stresses may come from increased day use, conflicts over traditional versus new uses, the desire of developers to build directly to the forest's edge, and more.

# 8. Community Relationships

The purpose of this chapter is to describe the relationship between the Apache-Sitgreaves National Forests (ASNF) and their neighboring communities. Knowledge of local communities is of interest to the Apache-Sitgreaves due to the importance of the reciprocal relationship that exists between the forests and these communities. Also, in some instances, there are legal authorities that require interaction with external communities. The subsections of this chapter are as follows: historical context and methods of designation, community profiles and involvement with natural resources, communities of interest and forest partnerships, historically underserved communities and environmental justice, community/forest interaction, and key issues for forest planning and management.

Information gathered on the nature of the relationships between the ASNF and surrounding communities reveals a complex network of interests involved in a variety of issues that affect forest management and planning. In addition to wider public concern for issues such as water provision, wildlife protection, and fire prevention, a growing number of local government organizations and special advocacy groups are seeking to participate directly with the ASNF in the formation of policy. Although a comprehensive analysis of the social network surrounding the forest is beyond the scope of this assessment, this section provides insight into the roles and purposes of key stakeholders and establishes a framework for the development of a comprehensive community-relations strategy.

### 8.1 Historical context and methods of designation

The concept of community relations in a culturally diverse society is about working together as one, both respecting and valuing individual differences (McMillan 1999). It encourages a greater degree of acceptance and respect for, as well as communication between, people of different ethnic, national, religious, cultural, and linguistic backgrounds. Furthermore, it promotes notions of inclusiveness, cohesion, and commitment to the way we shape our future. Above all, a good community relations system ensures that people from all backgrounds have full access to programs and services offered by government service providers, recognizing and overcoming barriers faced by some groups to enjoy full participation in the social, cultural, and economic life of the community.

The act of understanding and maintaining good community relationships is one of the most central responsibilities of the National Forest System. Nonetheless, the importance placed on documenting and enhancing community relationships as part of the overall process of forest planning must be regarded as a relatively recent development. At the time of the creation of the National Forest System through the Forest Reserve Act of 1891 and the Transfer Act of 1905, the principal community of concern to the agency was limited, consisting for the most part of a select group of forestry professionals, scientific and professional societies, special interests, and politicians. As such, the forest "community" of the late 19$^{th}$ and early 20$^{th}$ century was considerably less complex than the collection of interested stakeholders today.

However, following World War II, the general public began to show a greater interest in the activities of the national forests. By the late 1960s, with the advent of modern environmental concern, the forest community had expanded to include an extremely broad spectrum of the general public. Statutes such as the National Environmental Policy Act of 1969, the National Forest Management Act of 1976, and more recently, laws such as the Native American Sacred Lands Act of 2002, have officially recognized the array of publics and mandated that the USFS actively involve them in management decisions. In addition to these and other statute laws, there are other written authorities that require and provide direction for external contacts: these include 36 CFR 219.9 (Public participation, collaboration, and notification), the Forest Service Manual chapters 1500 (External relations) and 1600 (Information services), and the Forest Service Handbook chapters 1509 and 1609. Effective public involvement requires knowledge, thus the purpose of this section is to assist in improving that knowledge base.

In this report, the term and concept "communities" received a broad interpretation and, hence, designation. In one sense, "communities" refers to the towns and cities located in the counties surrounding the ASNF. In a broader sense, however, "communities" refers also to tribes, governments, the media, educational entities, partners, and special advocacy groups. Both of these types of "communities" are examined in this section.

### 8.2 Community profiles and involvement with natural resources

This section presents links to community profiles of the towns and cities which are found in the counties surrounding the ASNF. It also provides information on local news sources as a gauge of community involvement with natural resources, including Arizona's national forests. Weblinks to community profiles for each of the counties and selected municipalities within the area of assessment are listed below in Table 34. These profiles generally contain the following information for each community: historical information, geographic/location information, population data, labor force data, weather data, community facilities (e.g., schools, airports), industrial properties, utilities, tax rates, and tourism information. They were developed by the Arizona Department of Commerce which also provides data for many other communities than those listed in Table 34. Table 35 categorizes national forest acreage in Arizona according to current congressional districts.

**Table 24. Weblinks to Community Profiles for Counties and Municipalities in the Area of Assessment**

| | |
|---|---|
| **Apache County** | **http://www.azcommerce.com/doclib/COMMUNE/Apache%20County.pdf** |
| Eagar | http://www.azcommerce.com/doclib/commune/eagar.pdf |
| St. Johns | http://www.azcommerce.com/doclib/COMMUNE/saint%20johns.pdf |
| Springerville | http://www.azcommerce.com/doclib/COMMUNE/springerville.pdf |
| **Coconino County** | **http://www.azcommerce.com/doclib/COMMUNE/Coconino%20County.pdf** |
| Flagstaff | http://www.azcommerce.com/doclib/COMMUNE/flagstaff.pdf |
| Sedona | http://www.azcommerce.com/doclib/COMMUNE/sedona-oak%20creek%20canyon.pdf |
| Page | http://www.azcommerce.com/doclib/commune/page.pdf |
| Williams | http://www.azcommerce.com/doclib/commune/williams.pdf |
| Fredonia | http://www.azcommerce.com/doclib/COMMUNE/fredonia.pdf |
| **Greenlee County** | **http://www.azcommerce.com/doclib/COMMUNE/Greenlee%20County.pdf** |
| Clifton | http://www.azcommerce.com/doclib/COMMUNE/clifton-morenci.pdf |
| Morenci | http://www.azcommerce.com/doclib/COMMUNE/clifton-morenci.pdf |
| **Navajo County** | **http://www.azcommerce.com/doclib/COMMUNE/Navajo%20County.pdf** |
| Show Low | http://www.azcommerce.com/doclib/COMMUNE/show%20low.pdf |
| Fort Apache Indian Reservation | http://www.azcommerce.com/doclib/COMMUNE/ft%20apache.pdf |
| Snowflake | http://www.azcommerce.com/doclib/COMMUNE/snowflake.pdf |
| Pinetop- Lakeside | http://www.azcommerce.com/doclib/COMMUNE/pinetop-lakeside.pdf |
| Heber-Overgaard | http://www.azcommerce.com/doclib/COMMUNE/heber-overgaard.pdf |

Source: Arizona Department of Commerce

**Table 25. Acreage of Arizona National Forests in Federal Congressional Districts**

| Congressional District | County | National Forest | Total Forest Service Acres |
|---|---|---|---|
| **2nd** | | | |
| | Pima | Coronado NF | 42,961 |
| | Santa Cruz | Coronado NF | 418,879 |
| | | | **461,840** |
| **3rd** | | | |
| | Coconino | Coconino NF | 848,725 |
| | | Kaibab NF | 1,528,594 |
| | | Prescott NF | 43,695 |
| | Mohave | Kaibab NF | 5,487 |
| | Yavapai | Coconino NF | 431,119 |
| | | Kaibab NF | 25,119 |
| | Yavapai | Prescott NF | 1,195,551 |
| | | Tonto NF | 317,051 |
| | | | **4,395,341** |
| **5th** | | | |
| | Cochise | Coronado NF | 489,396 |
| | Graham | Coronado NF | 396,174 |
| | Pima | Coronado NF | 346,910 |
| | | | **1,232,480** |
| **6th** | | | |
| | Apache | **Apache NF** | 447,223 |
| | | **Sitgreaves NF** | 45,591 |
| | Coconino | Coconino NF | 569,772 |
| | | **Sitgreaves NF** | 285,693 |
| | Gila | Coconino NF | 6,063 |
| | | Tonto NF | 1,698,631 |
| | Greenlee | **Apache NF** | 751,151 |
| | Maricopa | Tonto NF | 657,695 |
| | Navajo | **Sitgreaves NF** | 488,158 |
| | Pinal | Coronado NF | 23,331 |
| | | Tonto NF | 199,558 |
| | | | **5,172,866** |
| | | **State Total** | **11,262,527** |

Source: USFS Lands and Realty Management
http://www.fs.fed.us/land/staff/lar/LAR04/table6.htm

The communities surrounding the Apache-Sitgreaves NF have a history of involvement with the national forests and with natural resource issues in general. East-central Arizona, like the rest of the state, has long been dependent upon natural resources for commodity production, tourism, and aesthetic enjoyment. As a result, the public has frequently expressed intense interest in the use and management of these resources.

The best and most generally available record of community involvement and interest in the ASNF and in natural resources is to be found in the state's newspapers. Journalists publish hundreds of articles each year dealing with almost every aspect of community involvement surrounding natural resources and the forests. Links to Arizona's major newspapers can be found at http://www.50states.com/news/arizona.htm.

A search of natural resource keywords was conducted for six state newspapers: *The Arizona Daily Star* (Tucson), *The Arizona Daily Sun* (Flagstaff), *The Arizona Republic* (Phoenix), *The High Country Sentinel* (Heber-Overgaard), *The Prescott Valley Tribune* (Prescott), and *The Grand Canyon News* (Williams). These newspapers were chosen because they represent the principal newspapers for cities located near each of the six national forests. In addition to the names of the six Arizona national forests, the keyword search included terms such as "forest," "conservation," "wildlife," and "endangered" species. The results of this keyword search are presented in Table 36. *The High Country Sentinel* (Heber-Overgaard) is a newspaper proximate to the ASNF and thus will be of special interest to this assessment. However, the other five newspaper searches are also presented because journalism today has broad statewide and even national coverage which might reveal stories related to the Apache-Sitgreaves in many of the state's newspapers.

The keyword search (Table 36) indicated that the six newspapers have collectively published more than 100,000 articles potentially related to natural resources since 1999. This would indicate a tremendous public interest and opportunity for involvement with the state's natural resources. Also, the data indicate that the ASNF's nearest paper, *The High Country Sentinel*, is important in terms of natural resource news coverage. Furthermore, the search indicated that the Apache-Sitgreaves themselves were the subject of 278 news articles during the period examined (approximately 1999-2005 although the exact period varied by newspaper).

## Table 26. Natural Resources-related Keyword Search of Six Arizona Newspapers

| City: | Flagstaff | Phoenix | Williams | **Heber-Overgaard** | Prescott | Tucson | | |
|---|---|---|---|---|---|---|---|---|
| Newspaper: | Arizona Daily Sun | Arizona Republic | Grand Canyon News | **High Country Sentinel** | Prescott Valley Tribune | Arizona Daily Star | Total | Percent of |
| Nearest National Forest: | Coconino | Tonto | Kaibab | **Apache-Sitgreaves** | Prescott | Coronado | Articles | Total Articles |
| Issues Searched: | 1999-April 2005 | 1999-April 2005 | 2000-April 2005 | **2000-April 2005** | 2003-April 2005 | 1999-April 2005 | Found | Found |
| **Key Word Searched:** | | | | | | | | |
| Forest | 8,066 | 319 | 732 | **399** | 367 | 3,414 | 13,297 | 13.2% |
| Natural Resources | 690 | 79 | 29 | **23** | 16 | 688 | 1,525 | 1.5% |
| Conservation | 732 | 133 | 109 | **7** | 62 | 732 | 1,775 | 1.8% |
| Water | 0 | 1,382 | 741 | **244** | 728 | 10,960 | 14,055 | 14.0% |
| Lake | 7,313 | 788 | 294 | **294** | 178 | 2,708 | 11,575 | 11.5% |
| River | 5,033 | 625 | 370 | **131** | 279 | n/a | 6,438 | 6.4% |
| Stream | 1,602 | 169 | 24 | **36** | 67 | n/a | 1,898 | 1.9% |
| Recreation | 3,224 | 2,334 | 483 | **314** | 211 | 1,969 | 8,535 | 8.5% |
| Fish | 4,708 | 5,028 | 131 | **248** | 285 | 2,646 | 13,046 | 13.0% |
| Native fish | 98 | 2 | 15 | **15** | 3 | 135 | 268 | 0.3% |
| Sportfish | 22 | 0 | 0 | **0** | 2 | 1 | 25 | 0.0% |
| Fishing | 480 | 502 | 55 | **434** | 147 | 1,035 | 2,653 | 2.6% |
| Forest Fire | 247 | 15 | 28 | **3** | 16 | 2,491 | 2,800 | 2.8% |
| Mining | 165 | 282 | 25 | **9** | 43 | 1,504 | 2,028 | 2.0% |
| Endangered species | 544 | 18 | 23 | **2** | 14 | 638 | 1,239 | 1.2% |
| Wildlife | 2,747 | 167 | 185 | **135** | 120 | 2,824 | 6,178 | 6.1% |
| Native Wildlife | 22 | 4 | 5 | **0** | 0 | 24 | 55 | 0.1% |
| Bird Watching | 17 | 26 | 1 | **30** | 1 | 153 | 228 | 0.2% |
| Hunting | 3,231 | 514 | 56 | **253** | 63 | 1,114 | 5,231 | 5.2% |
| Range | 0 | 1,194 | 56 | **67** | 146 | 1,062 | 2,525 | 2.5% |
| Grazing | 865 | 41 | 40 | **11** | 19 | 402 | 1,378 | 1.4% |
| | | | | | | | | |
| **The National Forests:** | | | | | | | | |
| Coconino National Forest | 1,046 | 15 | 15 | **3** | 0 | 22 | 1,101 | 1.1% |
| Coronado National Forest | 120 | 9 | 2 | **20** | 0 | 755 | 906 | 0.9% |
| **Apache-Sitgreaves National Forests** | **109** | **12** | **2** | **87** | **0** | **68** | **278** | 0.3% |
| Kaibab National Forest | 441 | 16 | 245 | **0** | 0 | 20 | 722 | 0.7% |
| Tonto National Forest | 135 | 37 | 3 | **14** | 7 | 176 | 372 | 0.4% |
| Prescott National Forest | 141 | 11 | 7 | **73** | 78 | 27 | 337 | 0.3% |
| Total articles found | 41,798 | 13,722 | 3,676 | **2,852** | 2,852 | 35,568 | 100,468 | 100.0% |

Past issues of Arizona newspapers were also examined to determine the types of natural resource topics that were of interest to the public in the region surrounding the ASNF. Among the many natural resource issues of concern to the public, selected topics and their dates of publication are provided in Table 37 below:

**Table 27. Selected Key Public Issues for the Apache-Sitgreaves National Forests**

| Topic | Date |
|---|---|
| 1. Whistle blower alleges illegal pesticide use on SW NFs | April 2005 |
| 2. Poor prospects for Ponderosa pine following fire on A-S | March 2005 |
| 3. Rose Fire continues to grow on A-S | May 2005 |
| 4. Rodeo-Chediski Fire salvage hits a logjam | January 2003 |
| 5. FS limits OHV use to existing trails | April 2003 |
| 6. A-S to get thinning contract | March 2003 |

Source: http://www.50states.com/news/arizona.htm.

## 8.3 Communities of interest and forest partnerships

The Apache-Sitgreaves National Forests have many communities of interest: that is, entities that share an interest along with the Forest Service in the management of the forests. For the purpose of this assessment, a distinction should be made between communities of interest and forest partners. Communities of interest may include residents of physical communities or members of an interest group, agency, or private organization that are influenced by, and in turn, stand to influence forest planning and management. Consideration of their stake in forest management is important, but not specifically directed through formal partnership agreements. Following, in Table 38, is a listing of some of those communities of interest. These are grouped according to government agencies, special advocacy groups, educational, business, and media organizations. Specific contact information and the names of principal individuals are available from the ASNF. Some especially noteworthy communities of interest to the ASNF are the Native American tribes. The tribal contact list for the ASNF is found in Table 39. There are eight tribes for which the ASNF have consultation responsibilities.

## Table 28. Communities of Interest for the Apache-Sitgreaves National Forests

**Governmental**

Apache County Board of Supervisors
Apache County Planning Dept.
Apache County Sheriff's Dept.
Arizona Dept. of Transportation
Arizona State Land Department
Arizona Department of Public Safety
Arizona Game and Fish Department
Arizona State Parks
City of Show Low
Clay Springs / Pinedale Fire Dept.
Coconino County Board of Supervisors
Elder's Council - San Carlos Apache Tribe
Greenlee County Board of Supervisors
Greer Fire Dept.
Navajo County Board of Supervisors
Navajo Cultural Splst. / Trad. Cultural Prog.
Northern Arizona Council of Government
Salt River Project
San Carlos Apache Tribe
San Carlos Game & Fish Department
Town of Eagar
Town of Pinetop-Lakeside
U.S. EPA Region 9
U.S. Congressman
U.S. Fish & Wildlife Service
U.S. Post Office
U.S. Senator
USDA - NRCS / Apache NRCD
USDA Animal Damage Control
USDA Forest Service / Forestry Science Lab
USDA, APHIS, ADC
USDI Bureau of Indian Affairs
USDI Bureau of Land Management
W. Mtn. Apache Tribe / WL & Outdoor Recr.
White Mountain Apache Game & Fish
White Mountain Apache Tribe

**Educational**

NAU - School of Forestry
U of A - School of Renewable Resources
University of Arizona
Utah State Univ. - National Research Library

**Special Advocacy Groups**

American Fisheries Society AZ-NM Chapter
American Rivers
Apache County Historical Society
Arizona Wildlife Federation
Arizonans for Wildlife Conservation
AZ Riparian Council
AZ Association of Conservation Districts
AZ Wilderness Coalition
AZ Wool Producers Assoc.
Center for Biological Diversity
Coronado Scenic Trail Association
Economic Development for Apache County
Forest Conservation Council (FCC)
Forest Guardians
Greer Property Owners Association
Land and Water Fund
Little Colorado River Plateau RC & D
Montlure Presbyterian Church Camp
National Wildlife Federation
Natural Resource Conservation Service
Northern Arizona Audubon Society
Pacific Rivers Council
Sierra Club
Sonoran Bio Diversity Project
Southwest Environmental Center
Southwest Forest Alliance
The Nature Conservancy
The Wilderness Society
Western Land Exchange Project
White Mountain Conservation League
Wilderness Watch

**Media**

Eastern AZ Courier
KRVZ-AM / KQAZ - FM
KVWM-AM/FM
The Raven Review
White Mountain Independent

**Business**

Butler Farms Inc
Chevelon Butte Cattle Co
Cooke Ranches, Inc
Crosby & Sons Land & Cattle Ltd
Dobson & Dobson Livestock
Dobson Estate
Earl Dobson Estate
Flying Box Ranch
Fort Apache Timber Co
Greenlee County Cattlegrowers
Hunter Realty and Investment Inc
Jim's Garage
Lazy YJ Ranch
Lines, Lines and Lines
Lop Ear Ranch
Luna Irrigation Company
Milky Ranch
Navopache Electric Co-op
New Mexico Cattle Growers Assoc.
Norman R. Brown Ranch
Pacific Rivers Council
Page Land and Cattle Co
Pine Graphics
Powder River Ranch
Rancho Alegre Cattle Co
Red Hill Ranch Corp
Reid Smith Trucking
Reidhead Bros Lumber Mill
Round Valley Chamber of Commerce
Schubert & Associates
Sheep Springs Sheep Company
Steve Udall Ranch, Inc
Stone Container Corporation
T Link Ranches
U.S. West Communications
URS Environ. Eng. Consulting
Western Drug
Yost Ranch

Source: D. Jevons, Planning Staff Officer, Apache-Sitgreaves National Forests

**Table 29. Tribal Consultation Responsibilities for the Apache-Sitgreaves National Forests**

| Native American Tribes |
|---|
| Hopi Tribe |
| Navajo Nation |
| Ramah Navajo Chapter |
| San Carlos Apache Tribe |
| Tonto Apache Tribe |
| White Mountain Apache Tribe |
| Yavapai-Apache Nation |
| Pueblo of Zuni |

Source: D. Firecloud, Regional Tribal Program Manager, Southwestern Region, USDA Forest Service

### *National Forest Partnerships*

Although the USFS claims responsibility for approximately 193 million acres of forests and grasslands throughout the United States, it acknowledges that effective management and protection of the vast resources within forest boundaries would be virtually impossible without the involvement of individuals and organizations from neighboring communities. Given the agency's constraints on personnel, funding, and other resources, as well as the direct links between forest management and community well being, the FS places a high priority on the development of partnerships. In addition to the obvious financial benefits that accrue from partnerships, the agency views them as part of its continuing cultural shift from "lone rangers" and "rugged individualists" to facilitators and conveners. As such, partnerships have become a central strategy for strengthening relationships between the Forest Service and surrounding communities (USFS 2005c).

In an effort to promote partnerships and guide individual forest managers through the process of establishing and maintaining cooperative relationships with surrounding communities, the USFS has recently updated its Partnership Guide. Intended as a reference tool for employees and partners of the FS, the guide offers insight into the structure and management of non-profit organizations, issues surrounding forest cooperation with volunteers, and use of grants and other agreements as well as information on the common challenges and ethical issues involved in sustaining effective partnerships. The guide also includes an array of resources and tools based on previous partnership efforts of the Forest Service (NFF and USFS 2005).

Like other forests throughout the country and the region, the ASNF are involved in multiple partnerships that contribute to forest health and fire management, the construction of community infrastructure, economic involvement with natural resources, and issues involving Native American peoples and tribes. Previous planning processes such as the National Forest Management Act (NFMA) have attempted to implement policies aimed at enhancing participation of a growing number of interested stakeholders in forest planning and management.

Meanwhile, the Southwest Region (Region 3) of the FS has also outlined several priorities which directly affect the development of partnerships. They include the restoration of ecological functionality to forests and rangelands, the protection of communities adjacent to national forests, and the contribution to the economic vitality of communities. In addition to these priorities, the Southwestern Region of the FS has established five objectives regarding the formation and maintenance of partnerships. They are to continue to increase the visibility and understanding of successful partnerships and collaboration, encourage and promote cultural change that supports

and expands partnerships and collaboration, develop and maintain an accessible and user-friendly partnership process, identify the opportunities and needs for forest and regional coordination, and educate and train for a common understanding of partnerships.

Although the term "partnership" may be defined differently by individual stakeholders with distinct agendas, the FS has identified nine broad categories of forest partnerships. They are volunteers, cost-share contributions, donations and gifts, memoranda of understanding, cooperating associations, grants, "payments to states," stewardship contracting, and interagency collaboration.

Obviously, the number and quality of forest partnerships varies over time according to the level of interaction between individual forests and their communities. The Southwest Region, however, has established a list of partner organizations according to the nature of their involvement. This list, obtained from the regional partnership website, is included as Table 40 below. Additional information on partnerships in the Southwest Region is available at http://www.fs.fed.us/r3/partnerships/. Table 41 presents a list of the partnerships between the ASNF and external groups.

**Table 30. United States Forest Service, Southwest Region Partners**

| | |
|---|---|
| **Conservation Organizations** | |
| Ducks Unlimited | http://www.ducks.org/ |
| Environmental Systems Research Institute (ESRI) | http://www.conservationgis.org/ |
| Federation of Flyfishers | http://www.fedflyfishers.org/ |
| Mule Deer Foundation | http://www.muledeer.org/ |
| National Wild Turkey Federation (NWTF) | http://www.nwtf.org/ |
| Quail Unlimited | http://www.qu.org/ |
| Rocky Mountain Elk Foundation | http://www.rmef.org/ |
| Trout Unlimited | http://www.tu.org |
| Wildlife Management Institute | http://www.wildlifemanagementinstitute.org/ |
| **Arizona Conservation Partners** | |
| Arizona Department of Game and Fish | http://www.gf.state.az.us/ |
| Arizona Wildlife Foundation | http://www.azwildlife.org/ |
| Sonoran Institute | http://www.sonoran.org/ |
| **New Mexico Conservation Partners** | |
| New Mexico Department of Game and Fish | Http://www.wildlife.state.nm.us/ |
| New Mexico Wildlife Federation | Http://leopold.nmsu.edu/nmwf/ |
| Audubon Society – New Mexico State Office | Http://www.audubon.org/chapter/nm/nm/rdac/index.html |
| New Mexico Museum of Natural History | Http://museums.state.nm.us/nmmnh/nmmnh.html |
| **Youth Conservations Organizations** | |
| AmeriCorps – New Mexico | http://www.nationalservice.gov/state_profiles/overview.asp?ID=38 |
| National Association of Conservation and Service Corps | http://www.nascc.org/ |
| Student Conservation Association | http://www.thesca.org/ |
| Rocky Mountain Youth Corps | http://youthcorps.org/ |
| **National Ecosystem Health Organizations** | |
| National Arbor Day Foundation | http://www.arborday.org/ |

## Table 40 (cont). United States Forest Service, Southwest Region Partners

| | |
|---|---|
| **Arizona Ecosystem Health Organizations** | |
| The Nature Conservancy – Arizona | http://www.nature.org/wherework/northamerica/states/arizona/ |
| Sky Island Alliance | http://www.skyislandalliance.org/ |
| Grand Canyon Trust | http://www.grandcanyontrust.org/ |
| Greater Flagstaff Forest Partnership | http://www.gffp.org/ |
| Northern Arizona University | http://www.for.nau.edu/cms/ |
| **New Mexico Ecosystem Health Organizations** | |
| New Mexico Forestry Division | http://www.emnrd.state.nm.us/forestry/index.cfm |
| New Mexico Highlands University | http://www.nmhu.edu/forestry/ |
| The Nature Conservancy – New Mexico | http://www.nature.org/wherework/northamerica/states/newmexico/ |
| **National Interpretive Recreation** | |
| Public Lands Information Center | http://www.publiclands.org/home.php?SID= |
| Association of Partners for Public Lands | http://www.appl.org/ |
| Tread Lightly | http://www.treadlightly.org/ |
| National Outdoor Leadership School | http://www.nols.edu/ |
| Leave No Trace | http://www.lnt.org/ |
| **Arizona Interpretive Recreation** | |
| Arizona Trail Association | http://www.aztrail.org/ |
| Arizona State Association of 4-Wheel Drive Clubs | http://asa4wdc.org/ |
| **New Mexico Interpretive Recreation** | |
| New Mexico Environmental Education Association | http://www.eeanm.org/ |
| Back Country Horsemen – New Mexico | http://www.bchnm.org/ |
| New Mexico Council of Guides and Outfitters | http://nmoutfitters.org/ |
| New Mexico Volunteers for the Outdoors | http://www.nmvfo.org/ |
| **Arizona Environmental Organizations** | |
| Sierra Club – Arizona Chapter | http://www.sierraclub.org/az/ |
| **New Mexico Environmental Organizations** | |
| New Mexico Wilderness Alliance | http://www.nmwild.org/ |
| Sierra Club – New Mexico Chapter | http://www.sierraclub.org/nm/ |

Source: USDA Forest Service, Southwest Region – Partnerships

http://www.fs.fed.us/r3/partnerships/

## Table 31. Partnerships for the Apache-Sitgreaves National Forests

Apache County
Apache Natural Resource Conservation District
Arizona Department of Corrections
Arizona Department of Environmental Quality
Arizona Department of Transportation
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona State Land Department
Arizona State Parks
Arizona State University
Arizona Wilderness Coalition
Chevelon Butte Cattle Company
Coconino County
Coconino County Sheriff's Office
Coconino Rural Environment Corps
Collins Park Milling, LLC
Eagar, Town of
Eastern Arizona Counties Resource Advisory Comm.
Environmental Economic Communities Organization
Environmental Forest Solutions
Federal Land Exchange, Inc
Fernau, Rick and Kim
Garrett, Dave, Dr.
Genesis Real Estate & Development, Inc
Gila County
Greenlee County
Gust, Morgan
Heber-Overgaard Fire District
High Country Green Waste
Hopi Tribe
Kent State University
Kohany, Patty
Little Colorado River Plateau RC&D
Mountain Top Wood Products
Mt. Graham Regional Medical Center
National Arbor Day Foundation
National Wild Turkey Federation
Natural Resources Working Group
Nature Conservancy
Navajo County
Navajo County Natural Resource Conservation Dist.
Navajo County Sheriff's Office
Northeastern Arizona Fire Chief's Association
Northern Arizona Natural History Association
Northern Arizona Wood Products Association
Nutrioso Contracting
Old Woodland Log Accents
Pinetop-Lakeside, Town of
Precision Components, Inc
Prowlers Off Road Organization
Public Lands Interpretive Association
R.E.B. Properties
Recreation Resource Management of America, Inc.
Rim Community Library Corporation
Rocky Mountain Elk Foundation
Round Valley Chamber of Commerce
San Carlos Apache Tribe
Springerville, Town of
Student Conservation Association
Tonto Weed Management Area, Inc
University of Arizona
University of Virginia
US Department of the Army, Corps of Engineers
US Department of the Treasury, FEDSOURCE
USDA Natural Resource Conservation Service
USDI Bureau of Indian Affairs
USDI Bureau of Land Management
USDI Bureau of Reclamation
USDI Fish and Wildlife Service
USDI National Park Service
USDOT Federal Highways Administration
W.B. Contracting, Inc
Webb Ways, Inc
White Mountain Apache Tribe
White Mountain Stewardship Monitoring Board
Youth Corps of Southern Arizona

Source: R. Dyson, Apache-Sitgreaves NF

### 8.4 Historically underserved communities and environmental justice

This section deals with special communities located near the ASNF which may have been historically underserved in terms of public services received and their participation in business. This information will be of particular interest to ASNF managers as they consider ways to improve delivery of services to minority groups which may have been underserved in the past.

Arizona's rapid population growth has affected the availability of affordable housing and fundamental social services, segregated social groups, created urban sprawl, stressed the state's infrastructure, and caused financial burdens and conflicts for local and state governments (Arizona Town Hall 1999). These factors can have an especially negative influence on Arizona's ethnic and racial minorities and their employment opportunities.

Data on individual racial and ethnic groups as a percentage of total county population were presented in Chapter 2 of this report (Table 7). In 2000, Native Americans were the largest minority group in Apache, Coconino County, and Navajo Counties (76.88%, 28.51%, and 47.74% respectively) while Hispanics represented the predominant minority group in Greenlee and Catron Counties (43.07% and 19.42% respectively). Note that individuals claiming Hispanic heritage may also claim identification with other ethnic and racial groups and be counted in those categories as well. As of 2000, individuals of Hispanic origin accounted for 25.25% of the statewide population.

The Census Bureau has estimated that, by 2025, Whites will comprise 57.5% of Arizona's population. The number of people of Hispanic origin is expected to increase from its 1995 level of 20.6% of the population to 32.2% in 2025. The African American population is projected to grow by 65.7% and the Native American population by 34.9% (U.S. Census Bureau 2005, Partnership for Community Development 2000). Thus, in the future, the national forests must prepare to serve even larger minority populations than at present.

Possible assistance in the formation of minority- and woman-owned businesses is another issue for the ASNF to consider. Table 42 presents data on minority- and woman-owned businesses for surrounding Arizona counties. As the data indicate, minorities currently own a smaller number of businesses than the size of their populations might suggest.

**Table 32. Minority- and Women-owned Businesses by County, 2002**

| County | All Businesses | Total Minorities | African American | Native American | Asian or Pacific Islander | Hispanic | Women |
|---|---|---|---|---|---|---|---|
| **Apache** | 4,855 | 1,404 | - | 1,202 | - | - | 1,189 |
| **Coconino** | 17,940 | 2,456 | - | 1,046 | 341 | 927 | 5,339 |
| **Greenlee** | 697 | - | - | - | - | - | - |
| **Navajo** | 10,045 | 1,884 | - | 1,393 | - | 357 | 1,977 |

Sources: Arizona Dept. of Commerce, 2002

U.S. Census Bureau – 1997 Economic Census

Finally, the long-term goals of the USFS have led to the development of specific outreach activities designed to enhance the participation of underserved populations in forest planning and management. They include the provision that each FS unit will perform the following tasks (USFS 2000b):

*Ecosystem Health*

- plan for underserved communities and develop an outreach analysis
- ensure the representation of underserved communities in team membership, participation, and implementation of decisions
- develop a nationally coordinated effort to establish dialogue with underserved communities about FS programs and land management
- expand financial and technical support for underserved communities' participation in land management activities

*Multiple Benefits to People*

- develop relationships by establishing a FS presence within networks of urban and rural community-based organizations that represent underserved people and conduct community assessments with underserved populations by working closely with existing leadership and resources
- partner with a broad range of non-governmental organizations to increase benefits and other FS resources to underserved communities to help them organize and develop national and localized programs of work which reflect their priorities
- collaborate with underserved populations to create customized delivery systems

*Scientific and Technical Assistance*

- conduct a research and development review with the direct involvement of underserved people to identify their concerns
- share and conduct collaborative social science research through a Federal Center of Excellence to share information across organizations, foster effective use of federal research resources, and include the needs of underserved communities in setting social science research priorities
- improve access to and distribution of information, including research findings and technical assistance, through partnerships with existing public and private networks involving cities and counties (such as the Joint Center for Sustainable Communities), federal agencies (such as the Sustainable Development Network), culturally sensitive employees (such as employee resource groups), and professional marketing specialists with expertise that benefits underserved communities

*Effective Public Service*

- develop training programs that strengthen the capabilities of employees and partners to engage underserved communities
- increase scholarship, education, and work experience opportunities to train employees and partners in how to engage underserved groups
- implement grants and training agreements for employees along with representatives of underserved communities

In addition to these general guidelines, the FS currently interacts with its neighboring communities in the following ways:

*Rural Community Assistance*

The FS implements the national initiative on rural development in coordination with the USDA Rural Business and Cooperative Development Service and State rural development councils. The goal is to strengthen rural communities by helping them diversify and expand their economies through the wise use of natural resources. Through economic action programs, the FS provides technical and financial

assistance to more than 850 rural communities that are adversely affected by changes in availability of natural resources or in natural resource policy.

*Urban and Community Forestry*
The FS provides technical and financial assistance to more than 7,740 cities and communities in all States, the District of Columbia, and Puerto Rico for the purpose of building local capacity to manage their natural resources.

*Human Resource Programs*
Human Resource Programs provide job opportunities, training, and education for the unemployed, underemployed, elderly, young, and others with special needs, simultaneously benefiting high-priority conservation work. These programs are a major part of the FS work force.

*Southwestern Strategy*
In November of 1997, the Secretaries of Agriculture and the Interior issued a directive to their agency leaderships to develop a collaborative approach to resolving the quality of life, natural resource, and cultural resource issues in Arizona and New Mexico. The result was the Southwest Strategy, which addresses community development and natural resources conservation and management within the jurisdictions of the involved federal agencies.

Environmental justice is the fair treatment and involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, or tribal programs and policies. Inequities can result from a number of factors, including distribution of wealth, housing and real estate practices, and land use planning that may place African Americans, Latinos, and Native Americans at greater health and environmental risk than the rest of society (Bullard 1993).

The White House, with Executive Order 12898, elevated environmental justice issues to the federal agency policy agenda. EO 12898 instructs each federal agency to identify and address “disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations” (Clinton 1994).

The USDA’s goals in implementing EO 12898 are as follows (from USDA 1997):

- To incorporate environmental justice considerations into the USDA's programs and activities and to address environmental justice across mission areas;

- To identify, prevent, and/or mitigate disproportionately high or adverse human health and environmental effects of USDA programs and activities on minority and low-income populations;

- To provide the opportunity for minority and low-income populations to participate in planning, analysis, and decision making that affect their health or environment, including the identification of program needs and designs;

- To review and revise programs in order to ensure incorporation and full consideration of the effects that agency decisions have on minority and low-income populations;

- To develop criteria consistent with the USDA's environmental justice implementation strategy which determine whether the agency's programs and activities have, or will have, a disproportionately adverse effect on the health or the environment of minority or low-income populations;

- To collect and analyze data to determine whether agency programs and activities have disproportionately adverse human health or environmental effects;

- To collect, maintain, and analyze information on the consumption patterns of populations that principally rely on fishing, hunting, or trapping for subsistence;

- To develop, as part of ensuring the integration of the USDA's environmental justice strategy, outreach activities that include underserved populations in rural and urban America, including women, minorities, persons with disabilities, low-income people, and tribal governments in natural resource management activities;

Native Americans pose a special environmental justice case since few reservations possess environmental regulations or waste management infrastructures equivalent to those of the state and federal governments. In the past, these areas have been targeted for landfills and incinerators. However, these ecological inequities have met with an increasingly resistant environmental justice movement.

### 8.5 Community/forest interaction

As the national forests and other federal agencies focus on stakeholder and community-based management, the social linkages, or social networks, formed by different groups and individuals are becoming increasingly important. Social networks provide a framework for balancing needs and priorities in the forest, and they often provide a cadre of willing and eager participants in the forest planning process. Nonetheless, they can also represent a significant challenge to managers trying to accommodate conflicting multiple uses.

The Forest Service has identified three processes resulting from greater agency attention to the social value of forests, the need for greater public involvement, and the ecosystem approach to management. Frentz and others (1999) describe them as follows:

- An increasing demand by the general public, interest groups, and local communities to become more involved in resource management planning and decision-making;
- An awareness that stewardship of natural resource systems by knowledgeable and committed community members is more effective than top down governmental mandates and regulatory procedures; and
- Growing support for an ecosystem management approach that is community based and incorporates both ecosystem and community sustainability into an overarching theory of holistic ecosystem health.

As awareness and commitment to these processes grow, so does the need for forest managers and planners to understand the social linkages within and surrounding the national forests. The FS emphasizes these ideas in many of its policies and publications. For example, it lists among its guiding principles,

- Striving to meet the needs of our customers in fair, friendly, and open ways;
- Forming partnerships to achieve shared goals; and
- Promoting grassroots participation in decisions and activities. (USFS 2005n)

Recent changes to the NFMA planning process similarly underscore the role of social linkages in forest management, stating, “Public participation and collaboration needs to be welcomed and encouraged as a part of planning. To the extent possible, Responsible Officials need to work collaboratively with the public to help balance conflicting needs, to evaluate management under the plans, and to consider the need to adjust plans” (USFS 2005o). A careful examination of existing and potential social networks can help guide these planning processes.

A social network analysis visualizes social relationships as a set of "nodes" (individual actors within the network) and "ties" (the relationships between the actors) (Hanneman 1999). Formal network analyses generally diagram social networks of interest and often attempt to quantify the personal relationships involved. Computer software is available to conduct formal network analyses by calculating aggregate measures of centrality, density, or inclusiveness and aiding in the visualization of social networks (Garson 2005). A variety of methods exist for graphically displaying these networks (Brandes et al. 1999).

In addition to displaying and/or quantifying the relationships among individuals, sociologists and other social scientists often use social network theory to study relationships among organizations (Stevenson and Greenberg 2000). The distinguishing feature of social network analysis is that it focuses on the relationships among individuals or organizations instead of analyzing individual behaviors, attitudes, or beliefs. The social interactions are seen as a structure that can be analyzed, and formal network analysis aims to describe social networks as compactly and systematically as possible (Galaskiewicz and Wasserman 1994, Hanneman 1999).

While social network analysis offers a significant alternative to analyzing individuals and organizations as if they were isolated from one another, it also contains some problematic simplifications. First, in viewing social networks as analyzable structures, this method inevitably treats networks as static and overlooks the dynamic nature of interpersonal and inter-organizational relationships (Sztompka 1993). It is assumed that the position of the actor in the network is static (Stevenson and Greenberg 2000); however, most managers that work with the public would agree that the relations among network members are not only changeable but are, in many cases, in almost constant flux.

In addition, the focus on quantitative features of social linkages overlooks a wide variety of important qualitative factors, including the kinds of ties involved and the power relationships among the actors (Bodemann 1988). For example, the ties in a social network can represent relationships as different as kinship, patronage, reciprocity, avoidance, or assistance (Breiger 1988). Managers attempting to explain community relationships through social network analysis would no doubt consider ties between network members involved in cooperative management and those between opponents in litigation to be very different; however, in the mere visual representation of a network it would be difficult, if not impossible, to represent this difference.

Finally, network analysis often assumes that social networks operate as constraints on action (or, at the very least, as constraints on peripheral actors) and fail to recognize the agency of individuals acting within the network (Stevenson and Greenberg 2000). This is not a necessary function of network analysis, but this common assumption can easily hamper attempts at cooperative management.

As such, a reliance on formal network analysis for understanding stakeholder linkages can be somewhat misleading. Unfortunately, the graphic representations and statistical conclusions of social networks offered by formal network analyses often convey an impression of objectivity and inclusiveness. It is important to note that research on networks has thus far generally failed to draw reliable conclusions on the actions of individuals based on the characteristics of their networks (Stevenson and Greenberg 2000). In line with many social researchers, this assessment suggests that the qualities of relationships and strategies used by actors should be of more concern than a visual or mathematical representation of networks.

In place of a formal network analysis, which is both time consuming and based in an incomplete conception of social interactions, a view of the ASNF's social linkages is offered that communicates the importance of relationships and the uncertain, active, and dynamic nature of the actors.

Provan and Milward (2001) outline three broad groups of "network constituents," or stakeholders: principals, agents, and clients. Principals are individuals or groups which "monitor and fund the network and its activities." Agents "work in the network both as administrators and service-level professionals," and clients "actually receive the services provided by the network." However, as Provan and Milward

also note, actors can and often do fulfill multiple roles, acting, for example, as a client at one geographical or political level and as an administrator at a different level. Figure 20 illustrates the interactions of these groups in the context of natural resource management. Different stakeholders interact with one another and with the resource being managed.

According to this view, a national forest is managed, not simply by a USDA chain of command, but by a network that includes a wide variety of stakeholders. The resource itself forms the "center" of the network, and these stakeholders both affect the management of the resource and are in turn affected by its management direction. In a very real sense, non-USDA actors such as county officials, the U.S. Border Patrol, and even media and citizen groups participate in forest management. Figure 21 provides examples of principals, agents, and clients involved in the management of ASNF (see Table 38 for a more complete list).

While this network is by no means exhaustive, Figure 21 shows how different actors interact in the social network involved in managing the Apache-Sitgreaves; however, this typology is neither unambiguous nor static. For example, forest-level administrators can function as principals, agents, or clients, depending on the situation and geographic scale. They monitor and administrate the network, but they also receive services provided by other stakeholders, such as recreation users and those with special permits. Local residents are generally seen as clients of the forest, but some residents also actively participate in network monitoring to ensure that they receive the services they expect. Environmental groups, while perhaps most often seen as clients, can also play an important role in monitoring management and even directly helping manage the forests. While none of these designations is set in stone, this framework provides a unique perspective on the linkages among and the roles of different stakeholders (or network members) in managing the forest.

The framework and diagrams presented here are intended to facilitate a discussion of social networks and the roles of stakeholders which effectively describes the actors and relationships in the Apache-Sitgreaves' social network. Future research might address the different needs, priorities, skills, and challenges of different kinds of stakeholders. For example, how does policy or practice differentiate among principles, agents, and clients? Does the Forest Service's vision of visitors and users (i.e., clients) as customers in any way influence the latter's ability to participate in forest planning processes? What management practices help Forest Service personnel treat different kinds of stakeholders in a fair and equitable manner? And, perhaps most importantly, how can managers and planners use existing networks to bring maximum benefit to the forest itself?

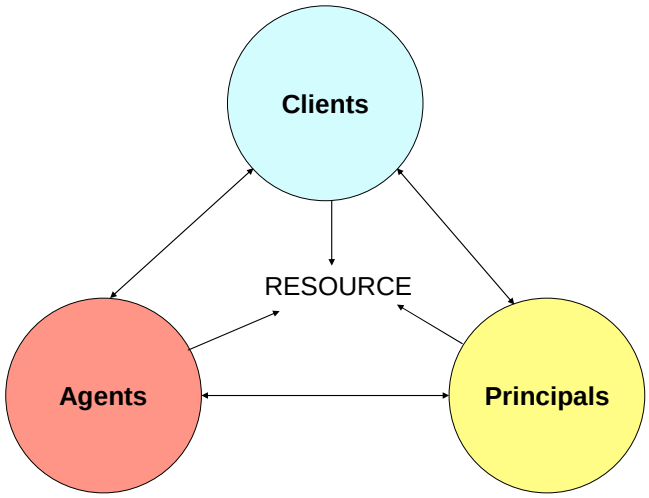



**Figure 12. Social Networks in Natural Resource Management**

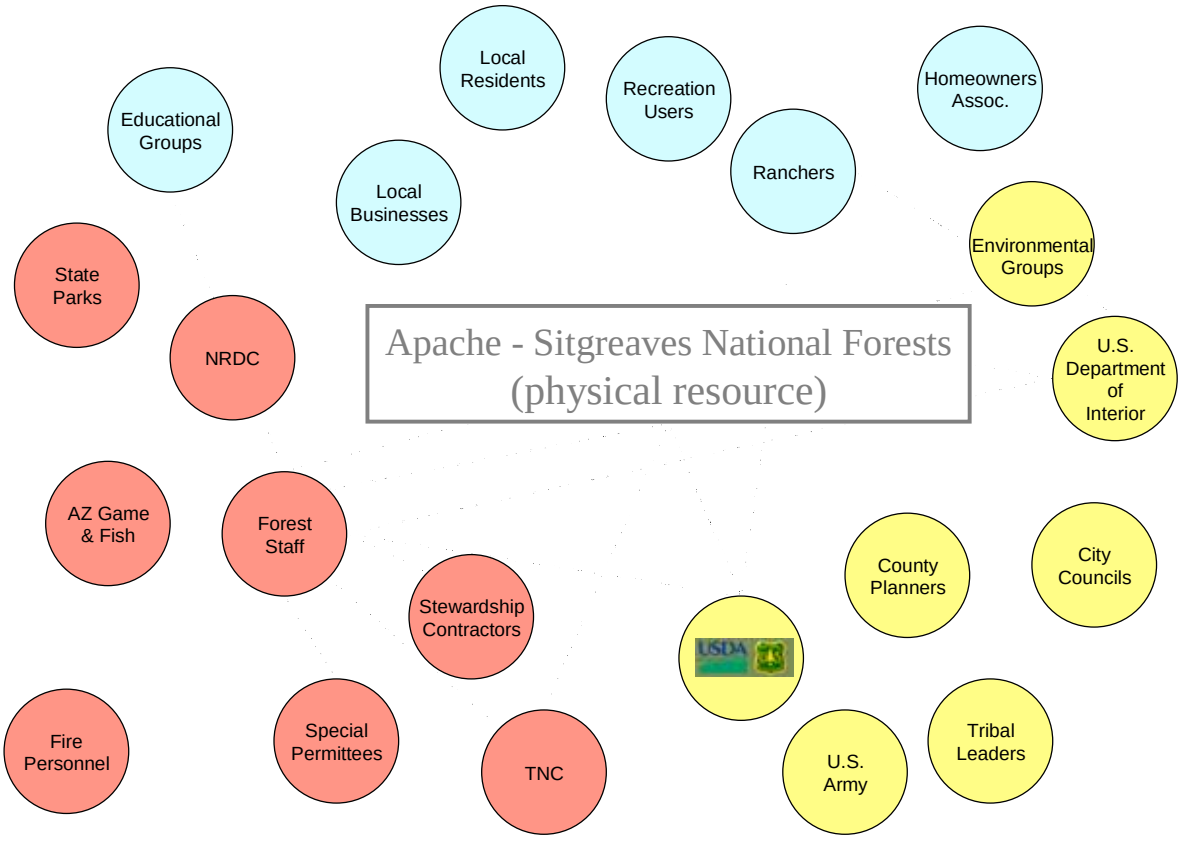



**Figure 13. Partial Social Network for the Apache-Sitgreaves National Forests**

## 8.6 Key issues for forest planning and management

Arizona communities are experiencing rapid economic and demographic transformation, resulting in considerable changes in racial and economic diversity, multiculturalism, and social values. These trends have been well documented in other parts of this assessment through analysis of both quantitative and qualitative data which point to the challenges the national forests face as they try to accommodate diversity while delivering forest-based goods and services to the public.

Such an identification and analysis of social and economic trends, however, does not provide sufficient information on community stability, satisfaction, or capacity needed to fully analyze interactions between individual communities and national forests. Therefore, increasing attention has been paid to assessing community interaction with natural resource managers. Methods such as social impact assessments and community surveys have gained prominence as communities evolve from rural to urban patterns of development while striving to incorporate more diverse interests in participatory decision making. An added benefit of these community-based approaches is that they can provide opportunities for community members to verify, comment on, and learn from collected secondary economic and social data. Perhaps most importantly, previous studies have shown that participants in these types of social assessments are better able to identify common concerns and links to structural conditions in a manner that contributes to resource and community development planning (Kruger 1996, Kruger 2003)

Although the size and organization of communities have traditionally been considered important influences in the fields of natural resource and forest management, there remains a lack of appreciation for the various roles and modes of interaction between communities and resource managers. The failure to recognize these different roles and purposes contributes to increasingly polarized debates over the appropriateness of forest management practices. A case in point is the common conflict between communities clinging to historic dependence on commodity use and those expanding communities seeking to capitalize on natural amenities to support retirement and recreation-based activity. Such disputes often make management objectives for stewardship and sustainability difficult, if not impossible, to achieve. Alternatively, a better understanding of the nature of relationships between forests and neighboring communities can provide important insight into divergent and sometimes competing interests and concerns. Ultimately, this process could provide for an enhanced analysis of forest management alternatives and their potential affect on communities (Kruger 2003).

The task of planning for multiple resource use is further complicated by the number and nature of interest groups and stakeholders that interact with the forest in a given community. In fact, as a Forest Service Technical Report asserts, “There are as many potential measures of organization and interaction in social communities as there are ecological interactions in biophysical systems” (Kruger 2003). Evidence of the dynamic nature of relationships between the ASNF and various groups, individuals, and organizations is found in ongoing debates over the preservation of open space, the administration of recreation and grazing fees, and the protection of water resources and wildlife.

Despite a growing consensus as to the importance of analyzing community relationships for forest planning and management, there remain relatively few applicable guidelines for developing an effective community-forest relations strategy. Whereas the Forest Service Manual and the Forest Service Handbook provide some guidance for the conduct of external relations, there is an opportunity for a more comprehensive plan to guide the management of local community relations. A good starting point for the development of such a plan is offered by research conducted by the Queensland Government in Australia on strengthening relationships between communities and government agencies (McMillan 1999).

The study focuses on five principal recommendations for enhancing the effectiveness and sustainability of community relations that may also prove useful to Arizona’s national forests. They include 1) development of a concept and definition of community relations relevant to the national forest, 2) development of an understanding of the possible benefits of a positive community relations program, 3) development of a common agency image of what a positive community relations program might

resemble, 4) development of some essential principles of an effective community relations program, and 5) development of a list of potential community relations questions and issues to be dealt with by the community relations plan (McMillan 1999).

Although identification of the essential principles in an effective community relations program will require community input and therefore vary in individual cases, the Queensland study offers the following examples:

- *Leadership*—improvements in community relations require leadership at the forest level.
- *Local Ownership*—community relations strategies work best when they are owned and designed by the local community, the groups in that community, and the institutions that serve that community.
- *Administrative Support*—community relations needs to be supported by appropriate forest administrators.
- *Planning*—in seeking to ensure positive conditions for community relations, planning is the key.
- *Positive Framework*—community relationships seek to provide a positive framework and infrastructure for dealing with community-related problems.
- *Integration*—community relationships work better when they are integrated into existing forest processes and procedures rather than regarded as add-ons that can be addressed outside the framework of those processes and procedures.
- *Holistic Approach*—effective community relations strategies frequently need to be multi-pronged and very frequently require the collaboration of a number of organizations, groups, and agencies in order to work effectively.
- *Informed Decision Making*—information from the community is vital in informing community relations, as is information from other sources (including research literature), from other organizations who have tried community relations projects, and from people with knowledge and expertise in the field.
- *Inclusion of Diversity*—community relations values and respects diversity and works to include all cultural and linguistic backgrounds into the social, cultural, and economic life of the community as well as into the decision-making mechanisms of the community.
- *Ongoing Effort*—recognize that improved community relations is an on-going effort and requires a long-term commitment by the agency. (McMillan 1999)

Finally, a list of issues and potential questions for inclusion in a comprehensive community-forest relationships plan should address the following:

- *Access to services*—how will the forest improve its delivery of goods and services and what will those goods and services be?
- *Employment opportunities*—does the forest have a role in providing improved employment opportunities for the community?
- *Information*—how might the forest improve its flow of information to the community?
- *Racial sensitivity*—how might the forest be more sensitive in accommodating the needs of different racial and ethic groups who use the forest?
- *Youth*—is there a special role for the forest in helping the community's youth?

- *Media*—how might the forest develop a positive working relationship with the community's media services?
- *Change*—finally, how will the forest cope with the future in terms of changes in the community and in the delivery of forest-based goods and services to that community? (McMillan 1999)

Although these lists represent a fraction of the elements that may be addressed in any single plan for community-forest relations, they reflect the diversity and urgency of the issues the Apache-Sitgreaves National Forests face as they take positive steps to respond to a rapidly-changing demographic, political, and physical environment.

# 9. Key Resource Management Topics

The following section offers brief overviews of several topics that are highly relevant to current and future forest management. The issues addressed in this section have been discussed throughout the assessment; however, this section offers a more detailed analysis of their potential impact on the socioeconomic environment surrounding the Apache-Sitgreaves National Forests (ASNF). Forest planners from Arizona's six national forests identified these topics as being key to forest management. Although each topic can affect forests in distinct ways and to varied extents, they represent issues of common concern to national forests and communities throughout the state.

## 9.1 Forest health

Maintaining and improving overall forest and ecosystem health is an important goal of the USFS. However, forest health is a complex and wide-ranging concept, and its exact meaning can be difficult to define. At the national level, the Forest Service has identified four key threats to the health of the nation's forests and grasslands, namely (USFS 2005j):

- Fire and fuels,
- Invasive species,
- Loss of open space, and
- Unmanaged recreation.

Each of these threats, along with the trends associated with them and the implications for managing forest and grassland health will be considered.

### *Fire and Fuels*

Nationally, fire on FS lands has been a subject of considerable attention. The Federal Wildland Fire Management Policy estimates that during the pre-industrial period (1500-1800), an average of 145 million acres burned annually in what is now the contiguous United States. Today, an average of about 14 million acres burn on both federal and non-federal lands. Nonetheless, wildland fire regimes and fire-management practices are a major concern for a wide variety of forest stakeholders, including Forest Service staff, recreational users, tribes, and neighboring communities. The White House Healthy Forests initiative describes 190 million acres of national forest land as dangerously susceptible to wildfires, and it states that ponderosa pine density is now fifteen times greater than it was 100 years ago (Office of the President 2002). Federal and state fire-management agencies have reported fires on over more than 5 million acres in five of the last ten fire seasons. During the 2000 fire season, these agencies reported 8,422,237 acres of wildland fire, a record in the more than forty years for which the National Interagency Fire Season has compiled data (NIFC 2005). These numbers pale in comparison to the fires experienced in the western United States before modern fire suppression techniques.

The last few fire seasons have provided several examples that illustrate the costs, financial and otherwise, that can be associated with large wildland fires in the state of Arizona as a whole. The Rodeo-Chediski fire of 2002 spread across over 450,000 acres of land, including over 170,000 acres of the Tonto and Apache-Sitgreaves National Forests. Costs associated with the fire surpassed $40 million (USFS 2003d). According a CLIMAS report of September, 2004, the number of such fires continues to rise with the total in Arizona and New Mexico surpassing 3,000, showing a noted increase in the final months of 2004. Locally, on average, about 300-350 fires occur annually in the Apache-Sitgreaves forests. This general

increase in wildfire threat is likely due, at least in part, to the increased population of those counties surrounding the national forests (USFS 1999a).

Due to this fire activity, Arizona's national forests are at the center of the fuels and fire debate. The Coconino, for instance, appears in the White House's Healthy Forests Initiative as an example of the interactions of fire and endangered species and is often cited as an example of mechanical fuels reduction projects and the litigation issues surrounding them (Office of the President 2002, Bonnickson 2000, Suckling 1996, Elperin 2004). The White House's initiative calls for aggressive thinning projects and places much of the blame for the recent Rodeo-Chediski fire and other fires in the region on the overly dense forests and "nuisance" litigation. Nationally, some researchers echo this claim, blaming no-cut environmentalists for creating a setting for apocalyptic wildfires, while others join environmentalists in arguing that thinning projects that remove larger trees may actually increase the frequency and/or intensity of fires (Segee and Taylor 2002, Omi and Martinson 2002). Other citizen groups in this region argue against what they consider a preoccupation with fuel-reduction projects at the expense of other protection efforts, such as the recent postponement of a project to protect Anderson Mesa (Eilperin 2004). At the state level, litigation has undeniably delayed, prevented, or changed some fuel-reduction projects. For example, the Grand Canyon Partnership Assessment Project, which was scuttled by litigation in 2001, was replaced by smaller projects. However, several studies have shown that the impact and scope of litigation on national forest logging plans nationwide has been substantially overstated (Cortner et al. 2003, Carter 2003).

It is important to note, however, that wildland fire has also proven to be a useful management tool in many areas. For example, the wilderness areas associated with the Gila National Forest in New Mexico now make extensive use of fire as a wilderness management tool, utilizing prescribed fire and naturally-ignited "wildland fire use" projects to help meet management objectives on more than 175,000 acres in 2003 (Madrid, pers. comm.).

Generally, wildland fire behavior is determined by several factors, including climate and weather conditions and the type, distribution, and abundance of fuels. Because other elements are difficult or impossible for managers to control, management efforts generally focus on changing the likelihood of ignition and the behavior of fires by modifying fuels. For a fire to ignite and burn, fine fuels must be abundant, and fuel moisture must be low (Wright and Bailey 1982, Wink and Wright 1973). However, the chemical and structural properties of fuels also greatly influence a fire's behavior. Particularly abundant or combustible fuels result in fires that are more intense and are more likely to show extreme behaviors such as spotting; firewhirls; crowning; and long, fast runs (Pyne 1997). Intense fires can threaten species and landscapes that are better adapted to slow-burning, low-intensity fires, such as some ponderosa pine forests, and extreme fire behavior can make cultural resources and developed areas more difficult to protect. Heavy surface fuels, such as thick needle layers, can result in long-burning, low intensity fires while dry grasses are consumed very quickly. Understory shrubs and small trees can act as ladders, carrying surface fires into the crowns of trees (Graham, McCaffrey, and Jain 2004). The most common strategies for managing wildland fire are mechanical treatments[1], controlled fire treatments (used here to include both prescribed and natural-ignition "wildland fire use" fires), and direct suppression of fires.

Managers often also attempt to control human-caused ignitions. As of September 2004, more than 3,260 large, non-prescribed fires had been reported in Arizona and New Mexico. Humans caused 1,308 of these, affecting more than 62,000 acres (CLIMAS 2004, Sept.). Increases in human-ignited fires are likely due at least in part to the increased population of the counties surrounding the national forests (discussed further in the "Unmanaged Recreation" section below). With increased population in Arizona comes an

[1] Although mechanical treatments and fire use projects generally have the common goal of altering fuels to reduce fire intensity, they are discussed separately here because risks and benefits of each are substantially different. Many policies implicitly or explicitly favor one method over the other.

increase in visitors and in potential ignition sources, including campfires, debris burning, and faulty vehicle exhaust (USFS 1999a).

The focus of fire policy is now shifting from fire suppression to fire management (CNF 2003b). The protection of life and property is always the first priority; however, forests also aim to protect and improve overall ecosystem health through fire-management practices. The 2001 Federal Wildland Fire Management Policy states that "the role of wildland fire as an essential ecological process and natural change agent" should be incorporated into the planning process (NIFC 2003). In addition, the more recent Healthy Forests Initiative has also emphasized that the "real solution to catastrophic wildfires is to address their causes by reducing fuel hazards and returning our forests and rangelands to healthy conditions (Office of the President 2002).

One of the more controversial topics to come out of fire management in recent years is the use of post-fire "salvage" logging to extract some economic gain from burnt areas. Locally, following the Rodeo-Chediski fires, several salvage operations to collect the fallen trees began, using Categorical Exclusions (CE) to hasten the process (ALA 2003). Although salvage logging is generally considered to "rescue" any remaining economic value from affected trees, recent reports have questioned the efficacy and benefits to the national forests of such enterprises. Forest Service documents suggest, for example, that such logging further disrupts the landscape, increasing soil erosion and disturbing wildlife, and can actually increase the likelihood of another fire (USFS 2003d, USFS 1999a).

### *Invasive species*

The view held by some that ecosystem health has declined since the arrival of Europeans on the North American continent is linked in large part to a reduction in biodiversity; the falling population numbers of native species; and a concomitant explosion in non-native, invasive species (Ecological Restoration Institute 2005). Native species populations have fallen drastically under pressure from changing land uses and habitat fragmentation, but invasions of non-native species have been identified as the second greatest cause of species extinction (Vitousek et al. 1997). Pimentel, Zuniga, and Morrison (2005) estimate that approximately 50,000 alien-invasive species have been introduced into the United States, costing an estimated $120 billion per year (including both damages and control efforts). Furthermore, nearly half of the species federally listed as threatened or endangered are in jeopardy primarily because of competition with or predation by non-native species.

Nationwide, invasive species affect forest ecosystems to the detriment of biological diversity, forest health, forest productivity, soil and water quality, and socioeconomic values (Chornesky et al. 2005). Researchers estimate that the roughly 360 non-native insect species that have invaded U.S. forests cost about $2.1 billion per year in the loss of forest products alone. A similar value is also lost to non-native plant pathogens (Pimentel, Zuniga, and Morrison 2005). The invasions of several species of bark beetles currently pose a serious threat to Arizona's forest resources.

In the Southwest regional scale, a 2002 bark beetle infestation in Arizona and New Mexico caused significant damage. The infestation was likely the result of a combination of factors, including drought and high tree density. This outbreak killed millions of ponderosa pine and piñon trees, and mortality, which reached up to 90% at a few localized sites, was highly visible in some areas. 2003 brought an increase in juniper and Arizona cypress mortality, which was also partially attributed to bark beetle infestations (USFS 2004o). Statewide, the round-headed pine beetle actually decreased its impact area from 11,120 acres in 2002 to 4,530 acres in 2003. Almost all of the 2003 round-headed pine beetle damage occurred within the Coronado National Forest. In the Apache-Sitgreaves NF, spruce aphid defoliation affected upwards of 100,000 acres in the White Mountains, and *Ips* beetle activity was recorded on over 122,000 acres of ASNF pine forest land. Piñon mortality in the forest from the beetles affected 145,485 acres (USFS 2004d).

In western deserts, invasive grass species have also resulted in significant ecosystem damage. Annual grasses from Europe were unintentionally introduced through grazing and have changed fire regimes, increasing fire frequency, intensity, and extent (D'Antonio and Vitousek 1992). Likewise, invasions of cheatgrass (*Bromus tectorum*) and Lehman lovegrass (*Eragrostis lehmanniana*) in grassland ecosystems increase fire frequency and intensity. This can be particularly problematic when these invasions occur adjacent to dense forests that are susceptible to wildfire (Chornesky et al. 2005). In the spring and early of summer of 2005, above-average winter rains led to significant accumulations of grass and weeds in desert environments, which then carried several large human-ignited fires through desert ecosystems (Johnson 2005, Meahl 2005, Becerra and Pierson 2005). These ecosystems are normally characterized by high concentrations of succulents, which evolved with little or no fire and are poorly adapted to withstand it (D'Antonio and Vitousek 1992). Many non-native plant species also reduce forage quality. Forage losses due to invasive weed species have been estimated at nearly $1 billion per year (Pimentel, Zuniga, and Morrison 2005).

As invasive species threaten a wide variety of forest resources and uses, including both recreational and extractive uses, Chornesky and others (2005) suggest three complementary strategies for controlling non-native species invasions on forested lands:

- Prevention of harmful new introductions by identifying and impeding pathways for invasive species introduction and spread,
- Detection and eradication of invaders that elude prevention, and
- Long-term management of well-established invasive species.

The U.S. Bureau of Entomology and Plant Quarantine, Forest Health Protection, part of the U.S. Department of Agriculture, provides technical assistance on forest health issues and focuses much of its attention on non-native insects, pathogens, and plants (USFS 2005q). Forest Health Protection provides a variety of services aimed at lessening the impacts of these invasive species, including management, monitoring, technology development, pesticide use guidance, and technical assistance programs. A joint project of the University of Georgia and the USDA, available at http://www.invasives.org, provides detailed information on a wide variety of invasive weeds, diseases, insects, and other species. The Forest Service has also developed the National Strategy and Implementation Plan for Invasive Species Management, which aims to "reduce, minimize, or eliminate the potential for introduction, establishment, spread, and impact of invasive species across all landscapes and ownerships" (USFS 2004o).

### *Loss of Open Space*

Changing patterns in demography and land use (discussed in more detail in the following section) are leading to a loss of open spaces in U.S. landscapes. In the western United States, "exurbanization," the shift of populations to semi-rural areas outside suburban areas, is a major contributor to this phenomenon. Much of the rapid growth currently sweeping the Rocky Mountain States is occurring outside of metropolitan areas on land that was previously used for grazing, agriculture, private forestry, and/or recreation (Esparza and Carruthers 2000). The USFS has identified this fragmentation of forests and grasslands as a major threat to ecosystem health (USFS 2004n). Vitousek and others (1997) describe land transformation (including transformation of natural ecosystems to row-crop agriculture, urban and industrial areas, and pastureland) as "the primary driving force in the loss of biological diversity worldwide."

The negative effects of these changes are wide-ranging and also include local and global climate changes, air pollution, sediment and nutrient runoff, the destruction of aquatic ecosystems, and a reduction in opportunities for outdoor recreation (Vitousek et al. 1997). The FS notes that, although the loss of open space through residential and commercial development generally increases land values and taxes, it also

increases the cost of providing social services to local communities and undermines traditional and rural land uses (USFS 2004n).

A study of exurbanization in southeastern Arizona described how city- and county-level planning can inadvertently encourage exurban development by increasing the cost and complexity of residential development within the city limits and by promoting low-density development through zoning designations (Esparza and Carruthers 2000).

### *Increased Recreation on National Forests*

In its Agricultural Fact Book, the USDA identifies the Forest Service as supplying more recreational activities than any other federal agency. Given a rising involvement in wilderness recreation, the continuing availability of such opportunities is increasingly important (Cordell et al. 1999). Sixty years ago, public use of the national forests was limited, with only 600,000 visitor days in the state of Arizona. Twenty years ago, however, visitor days had increased to nearly 15 million, making the national forests the main recreational resource in the Southwest (Baker et al. 1988). Today, the National Forest System is an impressive source of outdoor recreation, education, and involvement. Nationwide, more than 200 million recreational visits are logged annually, and the national forests provide 50% of the nation's forested trail area and 60% of the skiing opportunities (USDA 2002). In the Apache-Sitgreaves National Forests alone, there are between 1.6-2.2 million visitors each year and between 20,000-70,000 wilderness visits, making tourism one of the single most vital economic factors to the communities surrounding the forest—eclipsing agriculture and trading (Kocis et al. 2002a). The area including the White Mountains and the Mogollon Rim provide some of the few winter sport environments in the state. When snowfall is adequate, cross-country skiing and snowmobiling are popular activities. In addition, pedestrian and biking activity for pleasure and exercise accounts for heavy use on the existing trails. The forest is "the communities' backyard" (Dykstra 2003). As a result, tourism has become one of the most vital economic factors to the communities surrounding the forests. Additionally, in 1996, almost half of all hunters used public lands and one-third of hunting days occurred entirely or in part on public lands (Flather, Brady, and Knowles 1999), and activities such as rock climbing have greatly increased in popularity although their inherent risk has caused park officials on the national level to consider special use fees to cover added ranger responsibilities surrounding climbing-related injuries (Cordell et al. 1999).

In the ASNF, following the 2002 Rodeo-Chediski fires, damage to forest resources constrained some recreational opportunities. Trails and OHV roads were damaged or closed and camping, smoking, and wood cutting restricted in many of the affected areas. Dead and felled trees and burned trail signs and markers have affected many recreational users. In addition, fishing opportunities have been reduced at Canyon Creek and Black Canyon Lake.

In Arizona, access to recreational activities on federal- and state-protected land is important and valuable. Over the past half-century, the demand for such outdoor experiences has grown tremendously nationwide. This change can be attributed to several trends, including an increase in leisure time and discretionary income and a greater appreciation for nature in response to growing urbanization (Clawson 1985). About 45% of registered Arizona voters frequently or occasionally go hiking, while 40% go picnicking or animal watching. Along with fishing, off-roading, boating, hunting, visiting archeological sites, mountain biking, and horse riding, it is clear that a substantial portion of Arizona residents make use of the National Forest System at one point or another (Merrill 1998). For example, on the local level, 93% of respondents in a Forest Service report on the Heber-Overgaard area of the Apache-Sitgreaves National Forests agreed that the availability of public lands for recreational activity was at least somewhat important, and nearly all of the respondents felt hiking should be allowed within reasonable parameters. 87% of these respondents even felt that OHVs should have access to forests with only very limited restrictions (USFS 1999a).

The explosive growth of recreational use presents challenges to managers even as the public gains ever-broader benefits from its forests and grasslands. The FS has acknowledged the increasing pressure on forest resources, particularly in the Rocky Mountain and Southwest regions. Similarly, it is currently emphasizing the need to effectively manage recreation, especially the use of OHVs (see Section 9.3, Forest Access and Travel). With the growing trend toward exurbanization, changing land patterns may threaten easy access to those environmental recourses of escaping urban stress and enjoying the serenity of a natural environment—the foremost reasons for forest usage (Peart 1995, Knopf 1987).

A related issue that has drawn some attention recently is the use of recreation fees for public lands. Some users feel that such fees amount to double taxation, adding costs on top of the money donated in taxes, and that these fees discourage lower-income individuals from accessing the park. These arguments echo the ideas of Frederick Law Olmstead, one of the designers of New York's Central Park and an instrumental voice in the formation of America's national parks. For Olmstead, public open spaces oiled the gears of democracy by bringing disparate classes together. Nevertheless, fees remain relatively low, and studies have shown that the primary cost-incurring activities involved with visits to public lands are those related to travel and lodging (Grewell 2004). However, given that in 2001 nearly 92% of the wilderness visitors to the ASNF were Caucasian (in a state with a 25% non-white population), the question of how fees might affect diversity on the public lands system merits some discussion (Kocis et al. 2002a).

## 9.2 Land and water resources

Previous sections have provided substantial information on recent demographic changes within the area surrounding ASNF. Here, the focus is not on the quantitative nature of demographic change but on the qualitative characteristics of change likely to affect forest management.

Arizona is among the fastest growing states. The United States' aging population—one in eight people in the U.S. is now over 65 as opposed to one in twenty-five 100 years ago—is leading to more and more people escaping to the warmer climates of the South and West (Alig et. al. 2003). The population in Arizona increased by more than a factor of four over the 1950-1995 period, and the demographic data within this report show that this trend exhibits no immediate signs of slowing. Some researchers predict another doubling in population between now and 2040 (Peart 1995). As noted throughout this report, Arizona is also becoming increasingly "exurban" (that is, residences are spreading further from metropolitan areas and becoming more widely spaced), and the popularity of many outdoor recreation activities continues to rise. It has been described how, as a result, many forests are seeing a growing trend toward recreational use and "ecosystem services" (i.e., the management of public lands to provide services such as improved water quality, wildlife habitat, and clean air to surrounding communities) and away from extractive uses such as mining, logging, and grazing. Availability of land and water is a growing concern for Arizona's rapidly expanding urban areas. Although national forests in the state are affected by urban growth to different extents, each will need to consider its role as a provider of open space and healthy watersheds. Livestock grazing, changes involving state trust lands, the increased utilization of forests' water resources, and roadless area rules were identified by forest planners as points of particular interest.

### *Grazing*

Livestock grazing has a long history in Arizona. The prominence of grazing in this area dates back to the middle of the 18th century, when Spanish explorers transported livestock into the region by way of Mexico (Allen 1989). Formal ranching began in the late 1800s following the Civil War and the widespread suppression of the local indigenous populations (Sheridan 1995). The U.S. government's primary interest was in land acquisition until the 1850s. The distribution of lands to Anglo settlers began

in earnest with the Homestead Act of 1862. Over the century following the Civil War (1865-1965), there was a 600% increase in the number of cattle in the western states. However, this transition was by no means linear. For example, the 1880s saw an immense boom in livestock numbers. Nearly a million head of cattle were reported in Arizona by the end of that decade, up from about 38,000 in 1870. However, a combination of environmental and economic pressures soon decimated the herds (and the range, which was devastatingly overgrazed by the mid-1890s), and by the end of that century, an estimated 50-75% of southern Arizona's cattle had perished (Sheridan 1995). The establishment of forest reserves in Arizona during the late 1800s appeared to threaten ranching in the state. A report submitted by Gifford Pinchot in 1900, however, changed the fate of grazing rights on federal lands. In his report, Pinchot stated that livestock grazing was compatible with the major objectives for establishing forest reserves and was essential to the economy of the region. Based on Pinchot's findings, the government began implementing the use of fees for grazing of private livestock on public land as early as 1901 (Putt 1995). As a consequence, when the Forest Service was established in 1905, they inherited the problems caused by decades of overgrazing. For this reason, a main focus of the Forest Service during the early years of operation was to work with ranchers to control existing herds and reduce any conflicts on the land. By the 1920s, however, continued damage by livestock was interfering with the range improvement programs initiated by the Forest Service. As early as 1910, studies of range conditions were being conducted which indicated that overgrazing was seriously impacting the growth of Ponderosa pine (Putt 1995). Such conditions forced the Forest Service to impose a strict range improvement program in 1925.

Nationally, in 1906, the Forest Service implemented the practice of collecting fees for grazing private livestock on public land. The amount of FS land devoted to livestock grazing has been stable over the past three decades, as has been the amount of BLM land (USFS 2000a). However, some studies have suggested that changes in land use will result in a decrease of grazing land in the Pacific and Rocky Mountain Assessment Regions (Mitchell 2000). At present, nearly 167 million acres of BLM land and 95 million acres of Forest Service land are allotted to fee-based grazing rights, the latter accounting for 65% of the entire National Forest System. Livestock graze over 90% of federal lands in the eleven western states (Carter 2003). The forage grazed on this land accounts for about 2% of the beef-cattle feed in the continental U.S. and financially supports one-tenth of western livestock producers, whose grazing fees continue to be charged based on the formula initiated by the Public Rangelands Improvement Act of 1978 (PRIA) (Cody 2001). The grazing leases provided by the Forest Service account for nearly one-quarter of the grazing land utilized by Arizona ranchers, and most Arizona ranching operations rely on one or more federal or state grazing permits (Ruyle et al. 2000).

The PRIA began the fee formula for the FS and the BLM on an experimental basis, but following continuing presidential and congressional support, it has remained the standard. Grazing fees have become controversial in part because the fee has increased only marginally from its inception and has not kept pace with the market rates. In 2002, for example, the grazing fee remained $1.35 per AUM[2] on federal land while the USDA estimated the average rate for grazing leases on non-irrigated private land among sixteen western states at $13.50 per AUM (NASS 2003). Some citizen groups assert that this leads to disproportionate financial output by the Forest Service in the interests of grazing (Coalition 2001). In Arizona, for example, conservation groups note that the Forest Service recently spent nearly $250,000 to establish and maintain cattle fences and borders for land that generates only $7,000 per year in grazing revenue as part of an attempt to protect Apache Trout and other threatened fish in livestock-impacted watersheds (Wolff 1999). Many groups also argue that livestock ranching interferes with other uses of the national forests

The National Forest System contains much of the summer range and a portion of the year-round grazing in the area, and as such, regional administrators help determine the success of southwestern livestock

[2] One AUM is defined as the amount of forage required by an animal unit (the equivalent of one 1,000 pound cow and her suckling calf) for a one-month period. Thus, the total number of AUMs is equal to the number of animal units multiplied by the number of months they are on the range.

industries. However, ecological impacts of ranching, including the persecution of "problem animals," the alteration of fire regimes, impacts to water supplies and riparian areas, introductions of exotic weeds, and the construction of fences and roads, can bring it into conflict with other uses (Freilich et al. 2003). For example, soil compaction from grazing herds can affect the water table and rainfall infiltration as well as erode streambanks. Watersheds that have been subjected to prolonged overgrazing are more susceptible to flooding and accelerated channel lowering (Belsky, Matzke, and Uselman 1999; Dreeson et al. 2002; USFS 2002a). A suitable balance and relationship between livestock grazers, environmentalists, and the Forest Service is important and, given the continuing decline of grassland ecosystems, even critical (Baker et al. 1988).

Many proponents of ranching point to the social and economic benefits of rural lifestyles, arguing, for example, that "the best way to preserve the open spaces, arid ecosystems, and diverse biota of the Southwest is to keep rural people on the land" (Brown and McDonald 1995). Thus, ranching on public and private lands may also be seen as a viable method of limiting urban sprawl and promoting the economic independence and cultural uniqueness of rural communities.

### *State Trust land reform*

The practice of allocating public lands for various beneficiaries in Arizona dates back to the founding of the territory in 1863. The current system of managing these lands, referred to as State Trust lands, was established with the Arizona State Land Department (AZSLD) in 1915. Since that time, the department has worked actively to manage these lands to help fund schools and other public institutions. In addition to original allotments granted by the federal government through Territorial and State Enabling Acts, the State Selection Board was allowed to select various lands throughout Arizona sufficient to ensure future financial support for selected beneficiaries. The selection of lands for state acquisition was completed in 1982 although most land selections were made between 1915 and 1960. Federal laws prohibited acquiring mineral lands or agricultural areas previously claimed by homesteaders, so the Selection Board chose lands with the greatest grazing potential. As a result, the majority of land selected between 1915 and 1960 was in central and southeastern Arizona with some additional "checkerboard" parcels near railroads in the north central portion of the state. Since that time, land exchanges have led to relocation of limited trust lands in western desert areas toward the region surrounding Phoenix and Tucson as well as western Yavapai County (AZSLD 2005).

Since its inception, the State Land Department has been granted authority over all trust lands as well as the natural products they provide. This authority over trust land is central to the AZSLD's primary mission of maximizing revenues for its beneficiaries, a role that distinguishes it from other agencies charged with management of public lands (national parks, national forests, state parks, and the like). As of 2005, the AZSLD managed land holdings for fourteen beneficiaries, the most prominent of which is the K-12 public school system. The public schools currently hold 87.4% of State Trust lands. The vast majority of Arizona trust lands currently are intended solely for livestock grazing. However, the Urban Lands Act, passed by the state legislature in 1981, has allowed the State Land Department to capitalize on the increased value of trust lands surrounding the state's rapidly growing municipalities. As a result, the Land Department's urban lands lease and sale program has become the largest revenue producer for the trust (AZSLD 2005).

Pressure for reform of the State Trust land system has been fed in recent decades by a relative scarcity of private developable land in areas that are continuing to experience massive population growth. Although various kinds of reforms have been proposed, the variety of stakeholders involved makes resolution a challenge. The competing interests involved include city and town governments and political lobbies representing educators, environmentalists, grazing interests, and homebuilders. Several cities throughout the state are striving to work with builders in order to ensure a sufficient supply of land for future housing. At the same time, educators would like to collect as much money as possible from the sale of

trust lands in order to supplement limited financial support from the state legislature. Finally, environmentalists and ranchers have an interest in preserving lands for their conservation value and existing grazing rights. Despite continued efforts to reach a compromise among these interests, a number of proposed reform plans have thus far failed to pass from committee in the Arizona State Legislature (Nintzel 2005, Davis 2004).

At issue is the process by which the State Land Department takes advantage of increased land values for educational funding while still preserving sensitive areas for conservation in the face of increasing urbanization. Policy makers suggest that the impasse over proposed reforms for the State Trust Land System can be broken down into the following key issues, all of which have been viewed as "deal breakers" by one or more of the interested parties: 1) the amount of land available to be set aside for conservation; 2) open, competitive auctioning for grazing leases; 3) federal and state land exchanges; and 4) the composition of the State Trust Land Board (Sherwood and McKinnon 2005, Nintzel 2005, Riske 2005).

Legislators have balked at proposals favored by organizations such as the Sonoran Institute and Grand Canyon Trust that call for protection of nearly 700,000 of the state's 9.3 million acres of Trust Land. Meanwhile, the Arizona Preserve Initiative, a measure that would allow the state to match payments from local jurisdictions to buy state land that qualified for open-space preservation, has been delayed by legal challenges to its constitutionality. Similarly, legal court challenges to State Trust Land reform have been posed by groups seeking to overturn the Arizona Supreme Court's decision in 2001 that allows non-ranchers to bid on state grazing leases as well as a 1990 Supreme Court ruling which prohibits the state from swapping parcels with federal agencies and/or private speculators. Finally, comprehensive reform of Arizona's State Trust Land system has also been held up by the education lobby's insistence that any reforms should be approved by a newly composed Board of Trustees charged with overseeing the management and disposal of trust lands (Sherwood 2005, Nintzel 2004).

These and other challenges have been addressed by various proposals for reform submitted by state lawmakers. As recently as October 2004, a coalition seeking the overhaul of state land management was "pronounced dead" after the facilitator resigned in the wake of failed attempts to pass a measure through the legislature. Still, Governor Napolitano, along with a number of state senators and representatives, remains committed to Trust land reform and aims to present voters with a reform package by the 2006 general election. Whatever the outcome, it should be noted that the ultimate resolution of these issues will likely have a significant impact on national forests in Arizona given the extent and value of State Trust lands in close proximity to forest boundaries (Davis 2004, Riske 2005). More information on the management of State Trust Lands by the Arizona State Land Department is available online at http://www.land.state.az.us/.

### *Water*

The U.S. uses a lot of water, and the primary uses are not always obvious to the general public. Even though per capita public consumption of water resources has increased by 400% over the past century, less than one-tenth of total freshwater removal is utilized in the areas most often considered under "primary water use": domestic and private use. The judicious use of water resources is particularly important in the West, and water is an immediate and everyday concern to Arizona residents. The National Forest System in the state is central to the question of water resources. Although USFS lands account for only 14% of the total land area, those lands contain 40% of the region's water resources (Brown 1999, Baker et al. 1988). In fact, national forests and grasslands function as the largest provider of water in the continental U.S., containing nearly 10 million acres of wetland and riparian areas and the headwaters of 15% of the nation's supply of water. These resources, valued at billions of dollars, supply water to more than 60 million people and provide opportunities for recreation, preservation, and employment (Schuster and Krebs 2003).

Throughout Arizona, a number of watersheds and aquifers provide communities with their water supplies. Among those in the Apache-Sitgreaves region is the Eagle Creek watershed at the base of the White Mountains, which serves a good portion of southern Arizona and helps recharge the Coconino aquifer. The latter, in turn, serves as the main aquifer for most of the northeast of the state. Additionally, reservoirs such as Lake Powell, Lake Mead, Show Low Lake, Lake Mohave, and Lake Havasu provide necessary water to various areas of the state (Pinetop-Lakeside 2004, ADWR 2005).

Regionally, below-average precipitation over the past several years has once again brought water to the forefront of natural resource management concerns. According to the U.S. Geological Survey, the period following 1999 is the driest in the hundred years that the Colorado River has been monitored. That river supplies 25 million people in seven states with water (USGS 2004, CRWUA 2005, Pontius 1997). Recently, the Secretary of the Interior noted that, barring changes, action would be necessary at the federal level within two or three years. Low rainfall has led to periodic drops in water levels in nearly all primary reservoirs in Arizona. Statewide, although Lake Mohave and Lake Havasu raised their levels by 1% and 3% respectively over the second half of 2004, other reservoirs dropped precipitously. The Salt River system dropped 8% against the maximum storage level, and Lyman Reservoir dropped 16%. By early 2005, both Lake Mohave and Havasu had already returned to the previous, lower levels. Above average rains last winter, however, have had a profound effect upon Arizona's primary reservoirs with four at over 90% capacity and nearly all at higher levels than the year before. One of the major watersheds closest to the ASNF, Show Low Lake, was up to 100% of capacity in June 2005. Lyman Reservoir, by contrast, remained very dry at 40% of capacity. The capricious nature of Southwest precipitation is one of the aspects that make management of water resources particularly difficult in this region (CLIMAS, September 2004; CLIMAS, February 2005; CLIMAS, May 2005; CLIMAS, June 2005).

Much of the previous years' water worries can be attributed to below-average precipitation starting in October 2003. Below-average snow-pack in Payson, Arizona, has caused that community, and many others like it, to implement programs aimed at conserving water. The Salt River Project Board of Directors, which instituted cutbacks in residential, agricultural, and municipal use for 2005, has taken similar precautions. That was the third straight year such methods were implemented (CLIMAS, September 2004; CLIMAS, February 2005). Water providers in the Pinetop-Lakeside region of Navajo County are engaged in aggressive planning on how to meet demand through 2020 and beyond. Meanwhile, at the state level, the creation of groundwater Active Management Areas (AMAs) have initiated requirements for proof of 100-year water viability before any new development can begin (Pinetop-Lakeside 2004). These requirements lead some communities with adequate water supplies, like Pinetop-Lakeside, to foresee increased growth as developers search for areas with water resources within the purview of AMA requirements. Additionally, projects by the FS to protect Cottonwood/Sundown and other watersheds are either planned or currently underway. Statewide, other longstanding water protection initiatives are suffering setbacks. Regionally, the Colorado River Compact of 1922, for example, was meant to limit withdrawals from the Upper Colorado Basin to the lower basin states, including Arizona, to 8.23 million acre-feet (maf); however, deliveries at the end of the last decade were up to about 10 maf, well above the requirements of the compact (Brown 1999).

In the Apache-Sitgreaves National Forests, water quality has been a major point of concern in recent years. The Canyon Creek Aquatic Habitat Improvement Plan, developed in 1986, aimed to reduce water temperature in that area. Human activities had been increasing water temperatures through changes in pool depth, shade, and sediment levels. These changes threatened both native and sport fish populations. Over the eight years that followed its inception, water temperatures in Canyon Creek dropped dramatically, which showed marked results on trout populations in the area (Loftus and Flather 2000). Another, less recent success story was a project undertaken outside Show Low, where a wetlands environment sustained through treated effluvium has drawn more than 120 species of birds. These included no less than ten species listed on the endangered species list. In addition, vegetative species such

as cattail, spike rush, and different types of sedges naturally established themselves in the area. Meanwhile, project members have successfully planted some other species, including alkali bulrushes and sego pondweed (EPA 1993).

Active management of the water resources on public and private lands is a complex and multifaceted endeavor. Considering the value of water resources on forest service lands, continuing such management activities while working in partnership with tribal and other nongovernmental agencies is, in the words of Schuster and Krebs (2003), "simply good business."

### *Catron County and the County Movement*

The intersection of land use and community relations is particularly germane when it comes to those federal holdings that interact with Catron County, New Mexico. For much of the early and mid-nineties, a tense power struggle existed between the Forest Service—and, to a lesser extent, the State Land Department and the BLM—and residents of the county who felt that the resource benefits of the surrounding lands belonged to them. The conflict became a national story and spurred scores of other counties in the West and Midwest to either incorporate elements of the "county movement" into their local county plans or at least to research the possibility of incorporating such elements despite seemingly insurmountable legal complications in the long run. The roots of the county movement's position lie in a stringent Jeffersonian understanding of local rule which would argue that county seats represent the highest form of government and should retain direct control of their resources, with the federal government being limited to issues of international relations (Davis 1996, Ford 1995).

The specific disagreements in New Mexico led to standoffs between county representatives and federal lands agents following the closing of much of the county's timber industry as a result of Mexican spotted owl protection and a loss of significant portions of the surrounding grazing tracts as a result of environmental deterioration. In the opinion of many local residents, these shifts in local industry threatened to dismantle the very community itself. The county responded by amending its land use plan to make certain federal mandates illegal by county law. There were also concordant threats to exercise punishment for the breach of these laws upon the forest service rangers and environmentalists themselves ranging from the more legalized enforcement of county penalties to a more vigilante exercise of physical threats (Ford 1995, McCarthy and Hague 2004).

Much of the rationale for the county's dissent is the assertion that local residents and governments have not had a representative say in the management of local lands and desire to be fundamentally involved in decisions that affect the county's natural resource utilization. However, difficulties arise when those voices demand full and uninhibited usage of the lands without federal oversight of any kind, which the USFS, for its part, cannot grant (Davis 1996, Ford 1995).

Successes and setbacks followed for both sides of the conflict, but the height of the disagreements has passed in the intervening decade. While tensions have eased through the use of Memorandums of Understanding (MOUs) and other cooperative apparatuses, resolutions challenging federal authority remain in the *Catron County Comprehensive Land Plan*, and underlying tensions remain regarding to whom the lands in the county really belong (Davis 1996, Ford 1995, Catron County 1992).

## 9.3 Forest access and travel

Earlier chapters discussed forest access and travel, focusing on the transportation characteristics of communities surrounding the ASNF. This section provides a detailed assessment of recent interpretations of the Roadless Rule and current trends in OHV use—two internal access issues that are of particular concern to many forest planners and that are likely to have a significant impact on future forest planning.

### *Roadless areas in the National Forests*

The larger roadless areas in national forests have long received different treatment than more developed areas. Through Roadless Area Review and Evaluation (RARE) studies, these areas have been inventoried and their wilderness characteristics considered for potential designation as wilderness under the Wilderness Act of 1964 (Baldwin 2004). The National Wilderness Preservation System is comprised of federal lands, "where the earth and its community of life are untrammeled by man, where man himself is a visitor and does not remain" (16 USC 1131 et seq.). Wilderness areas are designated only by Congress and are generally protected from commercial enterprises, road construction, mechanical vehicles, and structural development.

Roadless areas provide a variety of social and ecological benefits, and these unfragmented lands have become even more important as unprotected areas are increasingly developed and converted to urban uses. Among other benefits, they provide clean sources of drinking water and help prevent downstream flooding, protect threatened and endangered species, provide a wide variety of recreation opportunities, and serve as barriers against invasions of nonnative species. The Apache-Sitgreaves National Forests include approximately 285,000 acres of inventoried roadless areas (USFS 2001c).

In 2001, the Forest Service published a final rule that prohibited several activities in inventoried roadless areas (IRAs). These activities were prohibited because they threatened to diminish the areas' suitability as designated wilderness (USFS 2001b). With significant exceptions, road construction and reconstruction and timber cutting were prohibited in IRAs. Implementation of this rule was administratively delayed, then enjoined by two separate Federal District Courts, and remains enjoined under appeal (Baldwin 2004). Subsequently, a new rule was adopted by the USDA on May 5$^{th}$, 2005, that provides individual states with significant flexibility in managing IRAs by allowing governors to petition the Secretary of Agriculture to create special, state-specific rules (USFS 2004g). According to a report from the nonpartisan Congressional Research Service, the new rule suggests that IRAs "would be presumed available for a variety of uses, including timber harvests, subject to unit-by-unit planning processes" (Baldwin 2004).

### *Off Highway Vehicle Use*

Historically, recreational use of the forests was non-motorized except on major forest roads. Beginning in the 1980s, however, the use of motorized recreational vehicles significantly increased (USFS 1999a). Currently, 1.1 million Arizonans, slightly more than 20% of the state's residents, identify themselves as motorized trail users (USFS 2003a, Arizona State Parks 2004). The popularity of OHVs creates yet another challenge to the FS's commitment towards balancing recreational use and forest health. OHV use can provide substantial economic advantages to surrounding communities. According to Silberman (2003), OHV users spent a combined 436.1 million in 2002 in Apache, Navajo, Greenlee, and Coconino Counties, representing 46.8 million in state tax revenue. However, a number of studies have shown that OHV use also poses a threat to resources through trail deterioration, vegetation damage, reduced air and water quality, noise pollution, wildlife disruption, and social conflicts arising between different groups of recreational users such as hikers or bikers.

This, combined with the increased problems caused by illegal use, makes managing OHVs a topic of importance to the forests (Stokowski and LaPointe 2000, Bluewater Network 1999). In response, the ASNF and four other Arizona national forests initiated a five-forest Amendment for OHV travel. Still in the early stages at the time of this assessment, the Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests adopted a Draft Environmental Impact Statement (DEIS) that proposes limitations and/or restrictions on cross-country travel by OHV users on lands managed by the five forests. Several issues need to be resolved before these amendments can be adopted into existing forest plans, among them the feasibility of enforcing new OHV restrictions and the right of entry for individuals into certain areas for the purposes of cultural practices, fuelwood gathering, or retrieval of big game (USFS 2003a,

USFS 2003c, Arizona State Parks 2004). Only the Coronado NF is not a party to the proposed amendment, having previously established forest rules regarding cross-country travel. Contrary to existing regulations in the ASNF and other forests in Arizona, areas within the Coronado are considered closed unless otherwise posted. This has effectively prohibited the cross-country travel by OHVs that the five-forest amendment currently seeks to address.

A review of the FS-wide policy regarding OHV travel is also taking place at the national level. The draft national OHV policy, published in July 2004, would require forests to designate a system of roads and trails for OHV use. This process will likely require a considerable amount of time, personnel, and financial resources to complete (Roth, pers. comm.).

# 10. Summary of Key Findings and Recommendations

The communities surrounding the Apache-Sitgreaves National Forests (ASNF) have undergone substantial social and economic changes over the last twenty years. The purpose of this assessment has been to illustrate some of the more dramatic trends in key indicators and discuss their likely implications for future forest planning and management.

Among the most noteworthy trends in the area of assessment is a relatively limited increase in population over the past two decades. Data show that overall population within the five counties surrounding the ASNF increased by 41%: less than half the rate of increase for the state of Arizona over the same period. Within the area of assessment, population growth was greatest in Coconino County. Between 1990 and 2000, growth in the retirement-age population and an upsurge in individuals of multiple race and Hispanic origin were particularly strong. Although increases in total housing were also below average for the state of Arizona, the area reported substantial increases in seasonal housing, particularly in Apache and Navajo Counties. Similarly, median home values in the area surrounding the ASNF increased much more than was average for the state of Arizona over the same period. Together, these trends warrant careful consideration by forest planners. Ultimately, a larger and more diverse population suggests not only an increased number of potential forest users but also a change in the level and nature of interaction between the ASNF and surrounding communities.

The economies of eastern Arizona and western New Mexico are also likely to have a substantial impact on future planning and management of the ASNF. Data suggest that economic growth in the region is relatively slow. This conclusion is supported in part by limited gains in total part- and full-time employment in for each of the five counties. The most significant economic gains between 1990 and 2000 were reported for the construction, F.I.R.E. (finance, real estate, and insurance), and government sectors. Despite significant increases in per capita and family income and decreasing rates of poverty, data show that each of the five counties remained economically limited when compared to statewide figures over the same period. Meanwhile, recent indicators of dependence on natural resources have shown mixed results. As a whole, the area of assessment experienced a substantial decline in income from wood and an even stronger increase in income from special products and processing between 1990 and 2000. Each of the counties reported a relatively strong increase in tourism-related employment over the same period. Although activities such as ranching and timber harvesting continue to play an important role in rural areas, recent years have seen a continued shift away from extractive industries and toward a regional economy that is increasingly dependent on the construction, real estate, and service sectors supporting growing urban populations. When combined with ongoing demographic changes, such factors are likely to have a direct impact on the ASNF's role within the local and state economy.

A review of county comprehensive plans and long-range policies has demonstrated the importance of both travel patterns and land use characteristics surrounding the ASNF. Though road conditions have generally improved over the last several decades, research shows that expansion of regional road networks has not kept pace with travel demands arising as a result of population and industry growth. Furthermore, previous transportation planning has not always been implemented in a way that supports long-range land use plans. Such plans reveal that the preservation of open space, the sustainable use of natural resources, and the use of public lands are of growing importance to regional planning authorities, government agencies, environmental advocates, and community residents. Increasing land values, the cost of infrastructure development, and limited water supplies are among the numerous factors that have made policy formation increasingly contentious in recent decades. The ASNF has an opportunity to play an important role in the resolution of current and future transportation and land use issues by promoting sustainable regional planning policies, informing local stakeholders of the environmental and economic impacts of transportation and land use alternatives, and effectively involving surrounding communities in forest planning and management.

Concurrent with trends in the regional economy, there has been a measurable shift away from extractive uses of national forests. This trend is supported by national surveys showing continued declines in timber harvesting as well as recent data on the Apache-Sitgreaves National Forests that suggest a gradual decline in grazing and timber harvesting on forest lands between 1990 and 2000. These same reports point toward a substantial increase in recreational uses of national forests in general and the ASNF in particular. Data suggest that a significant increase in the use of OHVs is a primary reason for the Forest Service's growing concern over unmanaged recreation. These trends are consistent with the recent expansion of communities with high levels of natural resource amenities and signal a shift in the perceived role of forest lands. The ASNF has the opportunity to incorporate these data on changing forest users and uses into future forest plan revisions and management priorities.

Although the incorporation of "special places" into forest management plans is a relatively new phenomenon, the ASNF has designated hundreds of natural, cultural, and recreation sites within forest boundaries. Forest archeologists and recreation staff have also made considerable progress in identifying a number of areas throughout eastern Arizona and western New Mexico that are considered special by Native American tribes, descendents of early settlers, and wilderness enthusiasts. In the future, the ASNF should continue to seek public input in identifying special places and planning for their protection.

Regional trends and Forest Service planning regulations have influenced the relationships between the ASNF and surrounding communities. In particular, the protection of wildlife, prevention of forest fire, sustainable management of area watersheds, and the formation of land use policy have involved a diverse array of stakeholders. In recent years, growing attention has been paid to these issues given the general public's expectation for adequate participation in decisions affecting public land management. Although such relationships are inherently unique and dynamic, specific frameworks for monitoring and improving community-forest interaction may aid future ASNF management objectives.

Finally, data suggest that a number of natural resource issues will continue to influence future management alternatives of the Apache-Sitgreaves National Forests. The control of invasive species, management of fire and fuels, preservation of open space, and protection of regional biodiversity each carries important implications for future forest plans. Although an exhaustive analysis of these issues is beyond the scope of this assessment, research shows that each will be significantly impacted by ongoing socioeconomic trends.

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# Appendix A. Industry Sectors for IMPLAN Data Analysis

| Income from wood products and processing | |
|---|---|
| **NAICS Sector** | |
| 133 | Logging camps and logging contractors |
| 134 | Sawmills and planing mills |
| 135 | Hardwood dimension and flooring mills |
| 136 | Special product sawmills |
| 137 | Millwork |
| 138 | Wood kitchen cabinets |
| 139 | Veneer and plywood |
| 140 | Structural wood members |
| 141 | Wood containers |
| 142 | Wood pallets and skids |
| 144 | Prefabricated wood buildings |
| 145 | Wood preserving |
| 146 | Reconstituted wood products |
| 147 | Wood products, N.E.C. |
| 148 | Wood household furniture |
| 152 | Wood T.V. and radio cabinets |
| 154 | Wood office furniture |
| 157 | Wood partitions and fixtures |
| 161 | Pulp mills |
| 162 | Paper Mills-Except Building Paper |
| 163 | Paperboard Mills |
| 164 | Paperboard containers and boxes |
| 165 | Paper Coated & Laminated Packaging |
| 166 | Paper Coated & Laminated N.E.C. |
| 168 | Bags-Paper |
| 169 | Die-Cut paper and Board |
| 170 | Sanitary Paper Products |
| 171 | Envelopes |
| 172 | Stationary Products |
| 173 | Converted Paper Products N.E.C. |

| Tourism employment* | |
|---|---|
| **NAICS Sector** | |
| **Retail** | |
| 449 | General Merchandise Stores |
| 450 | Food Stores |
| 451 | Automotive Dealers and Service Stations |
| 452 | Apparel & Accessory Stores |
| 455 | Miscellaneous Retail |
| **Restaurant / Bar** | |
| 454 | Eating and drinking |
| **Lodging** | |
| 463 | Hotels and lodging places |
| 477 | Automobile Rental and Leasing |
| **Amusements** | |
| 486 | Commercial Sports Except Racing |
| 487 | Racing and Track Operations |
| 488 | Amusement and Recreation Services |
| 489 | Membership Sports and Recreation Clubs |

| Income from special forest products and processing | |
|---|---|
| **NAICS Sector** | |
| 22 | Forest products |
| 24 | Forestry products |
| 26 | Agricultural-Forestry-Fishery Services |

* Discounted according to the Travel Industry Association of America Tourism Economic Impact Model (TEIM). TEIM attributes the following percentages of gross sales to tourism: lodging (95%), restaurant/bar (23.62%), retail (10.91%), and amusements (6.43%).

Source: Arizona Tourism Statistical Report 2003, Arizona Office of Tourism (AZOT)

## Appendix B. Indirect Economic Effects of Forest-Related Products in the Apache-Sitgreaves National Forests

# Output, Value Added and Employment

July 26, 2005

Base Year: 2002



| | Industry | Industry Output* | Employment | Employee Compensation* | Proprietor Income* | Other Property Income* | Indirect Business Tax* | Total Value Added* |
|---|---|---|---|---|---|---|---|---|
| 1 | 11 Ag, Forestry, Fish & Hunting | 335.177 | 2,153.273 | 14.050 | 5.148 | 23.690 | 8.444 | 51.332 |
| 19 | 21 Mining | 783.941 | 3,190.731 | 176.985 | 78.414 | 147.522 | 40.396 | 443.318 |
| 30 | 22 Utilities | 79.386 | 319.075 | 17.234 | 1.347 | 25.223 | 7.317 | 51.122 |
| 33 | 23 Construction | 767.805 | 7,185.058 | 193.167 | 67.341 | 30.083 | 3.457 | 294.048 |
| 46 | 31-33 Manufacturing | 885.175 | 3,712.443 | 172.219 | 40.457 | 128.510 | 6.218 | 347.403 |
| 390 | 42 Wholesale Trade | 118.376 | 1,181.955 | 42.905 | 4.202 | 18.739 | 19.858 | 85.704 |
| 391 | 48-49 Transportation & Warehousing | 512.239 | 3,810.187 | 186.055 | 13.540 | 63.747 | 13.829 | 277.171 |
| 401 | 44-45 Retail trade | 717.577 | 13,845.738 | 275.541 | 51.620 | 105.262 | 106.839 | 539.263 |
| 413 | 51 Information | 264.691 | 1,333.742 | 53.944 | 6.570 | 49.540 | 10.109 | 120.163 |
| 425 | 52 Finance & insurance | 191.353 | 1,518.830 | 50.803 | 3.774 | 54.249 | 3.508 | 112.335 |
| 431 | 53 Real estate & rental | 264.121 | 3,689.273 | 34.504 | 16.760 | 96.335 | 23.223 | 170.822 |
| 437 | 54 Professional- scientific & tech svcs | 176.128 | 2,532.445 | 62.824 | 44.747 | 17.207 | 2.343 | 127.120 |
| 451 | 55 Management of companies | 30.823 | 277.321 | 13.192 | 0.762 | 6.272 | 0.332 | 20.558 |
| 452 | 56 Administrative & waste services | 120.919 | 2,326.579 | 37.012 | 9.206 | 12.513 | 2.571 | 61.301 |
| 461 | 61 Educational svcs | 80.250 | 2,266.356 | 47.573 | -3.849 | -0.747 | 0.116 | 43.093 |
| 464 | 62 Health & social services | 758.063 | 10,015.277 | 343.097 | 36.474 | 36.116 | 5.403 | 421.091 |
| 475 | 71 Arts- entertainment & recreation | 139.421 | 2,324.270 | 44.143 | 4.690 | 15.689 | 8.671 | 73.193 |
| 479 | 72 Accommodation & food services | 599.812 | 14,260.228 | 202.830 | 14.541 | 69.968 | 37.597 | 324.937 |
| 482 | 81 Other services | 299.956 | 5,848.352 | 106.551 | 23.188 | 8.487 | 3.375 | 141.600 |
| 495 | 92 Government & non NAICs | 2,549.994 | 32,302.010 | 1,480.219 | 0.000 | 742.289 | 68.560 | 2,291.068 |
| | Totals | 9,675.205 | 114,093.141 | 3,554.848 | 418.933 | 1,650.692 | 372.169 | 5,996.642 |

*Millions of dollars