Socio-Economic Assessment for the Tonto National Forest

Prepared for the Southwest Region
USDA Forest Service

The University of Arizona
School of Natural Resources

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Prepared for:

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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 four-county socioeconomic assessment of the area surrounding the Tonto National Forest. 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
AMA	Active Management Area
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
CAAG	Central Arizona Association of Governments
CDP	Census Designated Places
CLIMAS	Climate Assessment for the Southwest
CYMPO	Central Yavapai Municipal Planning Organization
COF	Coconino National Forest
DEIS	Draft Environmental Impact Statement
FS	Forest Service
FSH	Forest Service Handbook
GIS	Geographic Information System
HOV	High Occupancy Vehicle
IMI	Inventory and Monitoring Institute
IRA	Inventoried Roadless Areas
ITS	Intelligent Traffic Systems
MAG	Maricopa Association of Governments
MCD	Minor Civil Division
MIG	Minnesota IMPLAN Group
NAICS	North American Industry Classification System
NFMA	National Forest Management Act
NRIS	Natural Resource Information System
NSRE	National Survey on Recreation and the Environment
NVUM	National Visitor Use Monitoring
OHV	Off-Highway Vehicle
PAD	Planned Area Development
PAG	Planning Analysis Group
PILT	Payments in Lieu of Taxes
PPI	Per-Capita Personal Income
PRIA	Public Rangelands Improvement Act
RAP	Roads Analysis Process
RARE	Roadless Area Review and Evaluation
ROS	Recreation Opportunity Spectrum
RTP	Regional Transportation Plan
SOPA	Schedule of Proposed Action
TEIM	Tourism Economic Impact Model
TNF	Tonto National Forest
USFS	United States Forest Service
VMT	Vehicle Miles Traveled

Executive Summary

The purpose of this assessment is to profile the social and economic environment surrounding the Tonto National Forest. The collection and analysis of quantitative and qualitative socioeconomic data in this report will serve as a baseline by which the Tonto National Forest 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 needed 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 Tonto National Forest extend into four counties in northern and central Arizona. 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 Maricopa County over the twenty-year period. The population of Yavapai County, however, grew at a faster rate over the same period. Total population growth within the entire four-county area of assessment was greater than that for the state of Arizona as a whole over the same period (104% versus 89% respectively). Population growth was considerably less in Gila County. Among individual cities, Chandler, Payson, Apache Junction, Prescott Valley, and Camp Verde experienced the greatest increases in total population between 1980 and 2000.

Population age

The four counties within the area of assessment demonstrated divergent trends with respect to the population of individuals age 65 and over and those under age 18. Amid strong overall population growth in Yavapai and Maricopa Counties, the population of individuals 18 and under grew much more than the 65-and-over population between 1990 and 2000. The opposite was true in Gila and Pinal Counties, with the latter reporting the greatest disparity between the growth of the 65-and-over and under-18 populations. The cities of Chandler, Prescott Valley, Apache Junction, Casa Grande, and Florence experienced increases in 65-and-over populations that were the largest among all of the selected cities within the area of assessment.

Racial / ethnic composition

The decade between 1990 and 2000 saw a significant increase in individuals of multiple-race and Hispanic origin in three of the four counties within the area of assessment, mirroring statewide trends for Arizona. The lone exception to this trend was Gila County, which reported increases in both categories that were lower than overall county population growth for the same period. Despite substantial increases in individuals of multiple-race and Hispanic ethnicity, whites remain the predominant racial group in each county within the area of assessment.

Housing

Increases in total housing and housing density were greatest in Pinal and Yavapai Counties between 1990 and 2000, mirroring growth in the county populations as a whole. Both of these counties also reported a significant increase in the number of houses for seasonal use. Overall, the area of assessment reported increases in housing density and median home value that exceeded statewide increases for Arizona over the same period.

Economic Characteristics and Vitality

Employment

Economic growth for the area of assessment was relatively strong between 1990 and 2000. Gains in total full- and part-time employment for the area of assessment as a whole exceeded that for the state of Arizona over the same period. Employment growth was particularly strong in the construction, services, and finance, insurance, and real estate (F.I.R.E.) industries. Within the assessment area, Pinal County reported the lowest increase in total employment between 1990 and 2000.

Occupational structure

Data show that each of the four counties within the area of assessment maintains occupational structures very similar to that of the state as a whole. Management, professional, and related occupations joined sales and office occupations as the two most common occupational areas within each county. At both the state and county level, construction, extraction and, maintenance and production, transportation, and material moving were also among the five most dominant occupations as of 2004.

Income

As of 2000, three of the four counties within the area of assessment maintained levels of per capita and median family income that were lower than state averages. The lone exception was Maricopa County which exceeded the state average in both categories. Pinal County saw the greatest increases in per capita and median family income between 1990 and 2000. Pinal County also experienced a significant decline in individual and family poverty over the same period. Nonetheless, as of 2000, both Pinal and Gila Counties maintained rates of poverty that were greater than average for the state of Arizona as a whole. Conversely, Yavapai and Maricopa Counties reported rates of poverty that were below the state average as of 2000.

Natural resource dependent economic activity

The area of assessment experienced a relatively strong increase in income from wood products and processing between 1990 and 2000, outstripping gains at the state level over the same period. Meanwhile, losses in income from special forest products and processing were also greater than those for the state of Arizona as a whole. Within the area of assessment, Yavapai and Maricopa Counties reported the greatest increases in tourism employment between 1990 and 2000.

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 to fit arising needs but are 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 Maricopa County between 1990 and 2000—an expected result of continued urban population growth. However, the *rate* of increase in VMT was greater for Yavapai and Pinal Counties over the same period. Peak traffic flow for most of the area of assessment occurs between the months of February and April, though areas around the Mogollon Rim also experience significant summer traffic. 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 Tonto National Forest over the next five years, many of which entail road widening and resurfacing and stabilization. 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 Tonto National Forest.

Barriers to access

On external road networks, the greatest barrier to access is likely congestion and poor road maintenance resulting from constrained county transportation budgets. Internally, there are few, if any, significant barriers to access in the Tonto National Forest. Information obtained from forest personnel suggests that wilderness areas and impassable terrain are the most common reasons for limited access to forest lands.

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 private acreage and State Trust land, both of which are likely to have a considerable impact on future development patterns throughout the region. Maricopa, Pinal, and Yavapai Counties reported the greatest amounts of private land. Pinal County also reported the greatest percentage of State Trust land (35%) as of 2005. By contrast, Gila County reported the greatest percentages of land owned by Native American tribes and the Forest Service and had the least amount of private and State Trust land.

Land coverage and land use

Shrub, brush, and mixed range constituted the predominant land cover in three of the four counties in the area of assessment. The lone exception was Gila County, which reported a considerable portion of evergreen forest land. Within the area of assessment, Maricopa County reported the highest percentage of residential, commercial, services, and industrial land cover.

Long range land use plans and local policy environment

County land use within the area of assessment ranges from traditional uses such as farming and 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. Although the number of grazing permits has remained constant on the TNF, recent studies have shown an overall decrease in permits for sawtimber, fuelwood and mining on the forest since 1990.

Non-extractive uses

Although recreational 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 Tonto National Forest received around 5.7 million visits during fiscal year 2002—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 Tonto National Forest including Native American tribes, OHV users, wildlife users, and wilderness users. The management and accommodation of these and other special user groups has had increasing administrative and political implications in recent years.

Designated Areas and Special Places

Natural, recreational and interpretive resources

The Tonto National Forest encompasses considerable natural, recreational, cultural, and interpretive resources including over 400 dispersed sites, campgrounds, picnic areas, information sites 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 the 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, the 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 Tonto National Forest have long been dependent upon natural resources for commodity production, tourism, and aesthetic enjoyment. A review of state and local newspapers reveals a continued local interest in the use and management of these resources and particularly intense concern surrounding water sources, recreational activities, and range management.

Communities of interest and historically underserved communities

The management activities of the Tonto National Forest 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 Tonto National Forest 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 grows, 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 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 Tonto National Forest.

Given rates of population growth and urban expansion in central Arizona, the Tonto National Forest stands 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 a significant impact on the forest given the abundance of State Trust land within the area of assessment. Likewise, the role of managing regional watersheds places the Tonto National Forest at the center of contentious debates over water provision, particularly in light of the recent regional drought.

Finally, specific issues under the heading of forest access and travel will undoubtedly affect the future management activities of the Tonto National Forest. 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 affect natural resource management in the Tonto National Forest 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 Tonto National Forest (TNF) 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 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 natural resource management activities of the Tonto National Forest.

1.2 Assessment methodology and topics

This assessment of the social and economic environment surrounding the TNF is based entirely on the analysis of secondary research. Secondary research is commonly understood as data which have already been collected and published for different purposes but which may prove useful to any number of other inquiries or applications. Examples of secondary data include demographic and economic information obtained from the United States Census Bureau or through a review of 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 USDA Forest Service (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 preferred 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 TNF, this includes Gila, Maricopa, Pinal, and Yavapai Counties in central Arizona. Where appropriate, social and economic trends for the area of assessment are compared to those for the state of Arizona as a whole. 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 Tonto NF. 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 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).

This 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 U.S. Forest Service Natural Resource Information System (NRIS), the Arizona Department of Transportation (ADOT), county comprehensive plans, 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 TNF and local communities in analyzing and monitoring 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 the 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 the 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 Tonto NF and discusses their importance to forest management. Chapter 8 assesses relationships between the TNF 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 conditions affecting local populations and illustrates demographic trends for each of the four counties within the area of assessment for Tonto National Forest (TNF). 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 Maricopa County remains the primary population center for the region and the state despite the fact that both Pinal and Yavapai Counties have experienced higher rates of population increase in the last twenty years. Data show a clear disparity between cities within the Phoenix Metro Area and those outside of Maricopa County in the area of assessment for the TNF. As a case in point, Tempe, the smallest of the selected cities for Maricopa County, reported a population of 158,625 in 2000. Outside of Maricopa County, the largest of the selected cities was Prescott with a population of 33,938. With the exception of Maricopa County, the last twenty years have also seen significant shifts from largely rural county populations to current populations that that are predominantly urban. While much of Yavapai County's growth was supported by increases in the under-18 population, growth in Pinal County was driven in large part by similar increases in the number of individuals 65 and over. Despite significant gains in Phoenix-area cities such as Chandler and Scottsdale, increases in total housing units in both Pinal and Yavapai County exceeded that of Maricopa County between 1990 and 2000. With the exception of Gila County, each of the counties within the area of assessment became more racially and ethnically diverse between 1990 and 2000, largely as the result of substantial increases in multiple race and Hispanic populations.

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 entrada 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 17th 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).

The TNF was established in 1905 as part of the General Land Law Revision Act which put aside the land for forest reserves and national forests. Some of its present land was, at the time, also dispersed among the Pinal Mountains, Verde, and Crook Forest Reserves. The primary reason for its inception as preserved land was to protect its valuable watersheds. By 1930, Tonto was one of fourteen forests in the region. After a period of slowing land transfers surrounding World War II, the Tonto National Monument was established from lands previously in TNF, and, in 1953, the Crook National Forest was dissolved, lending a portion of its land to Tonto. By the mid-1980s, Tonto was one of twelve forests in the region (Baker et al. 1988).

Today, the Tonto NF, at 2,969,602 acres, is by far the largest forest in Arizona and is the fifth largest in the country. It ranges in altitude from 1,000-8,000 feet and contains eight separate wilderness areas, which, due to the harsh weather conditions and steep, rugged terrain, allow for limited access during most of the year. It is bordered by the Coconino and Apache-Sitgreaves forests to its north and the Fort Apache and White Mountain Indian Reservations on its east. Due to its size and variety, it serves numerous vital purposes to the state. It provides a good deal of grazing land and remains a primary source of water, being second in the region in water production, due in part to the Roosevelt Dam on the Salt River, which for many years was the largest dam in the world. Its mountains are also the home of numerous communications links. Encompassing both rough, saguaro-studded desert and juniper and pine-topped mountains in the shadow of the Mogollon rim, TNF provides a variety of landscapes that, in turn, allow for a myriad of outdoor opportunities. This is part of what makes it one of the most widely visited of Arizona's national forests.

The demographic history of the area surrounding the TNF, 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). Yavapai County has, in general, grown steadily over the past ninety years with the exception of fluctuations during the 1940s and 1950s. Over the past century, the counties surrounding the TNF have grown from a total of 47,000 residents to over 3.4 million (U.S. Census Bureau 2005, Forstall 1995). Arizona has grown from 120,000 residents to well over 5 million—along with Washington, one of only two states to show such a startling demographic expansion (U.S. Census Bureau 2005). The average age in the state of Arizona has been steadily increasing: 31% of the population was under 15 in 1950, but only 22.4% is in the under-15 bracket today. Some of these shifts can be attributed to the region's amenable climate, relatively affordable property values, and the continued importance of area military bases. 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. While the Hispanic population of Arizona 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). [1]

[1] 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.

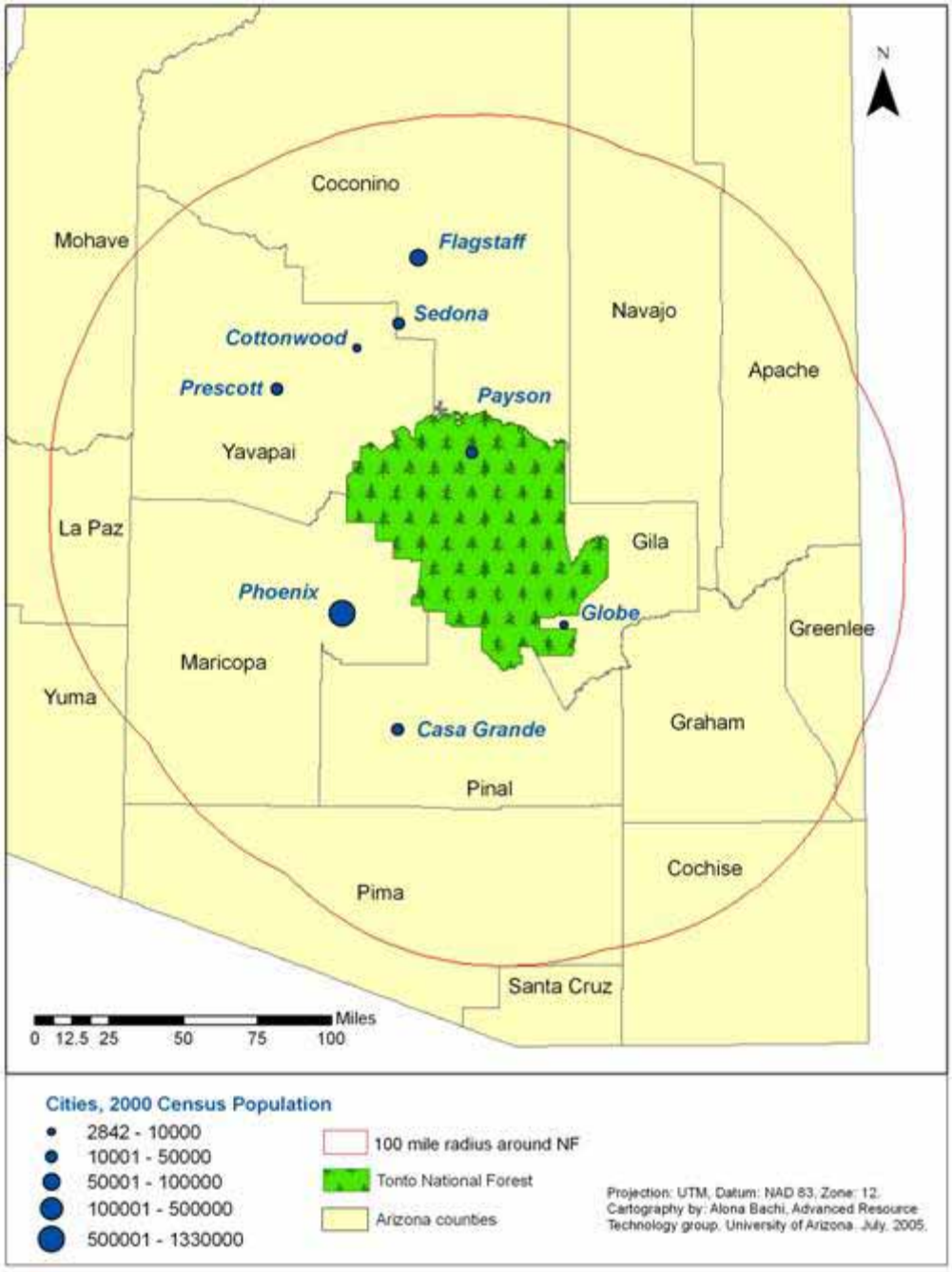


Figure 1. Map of Forest Boundaries and Counties in Area of Assessment

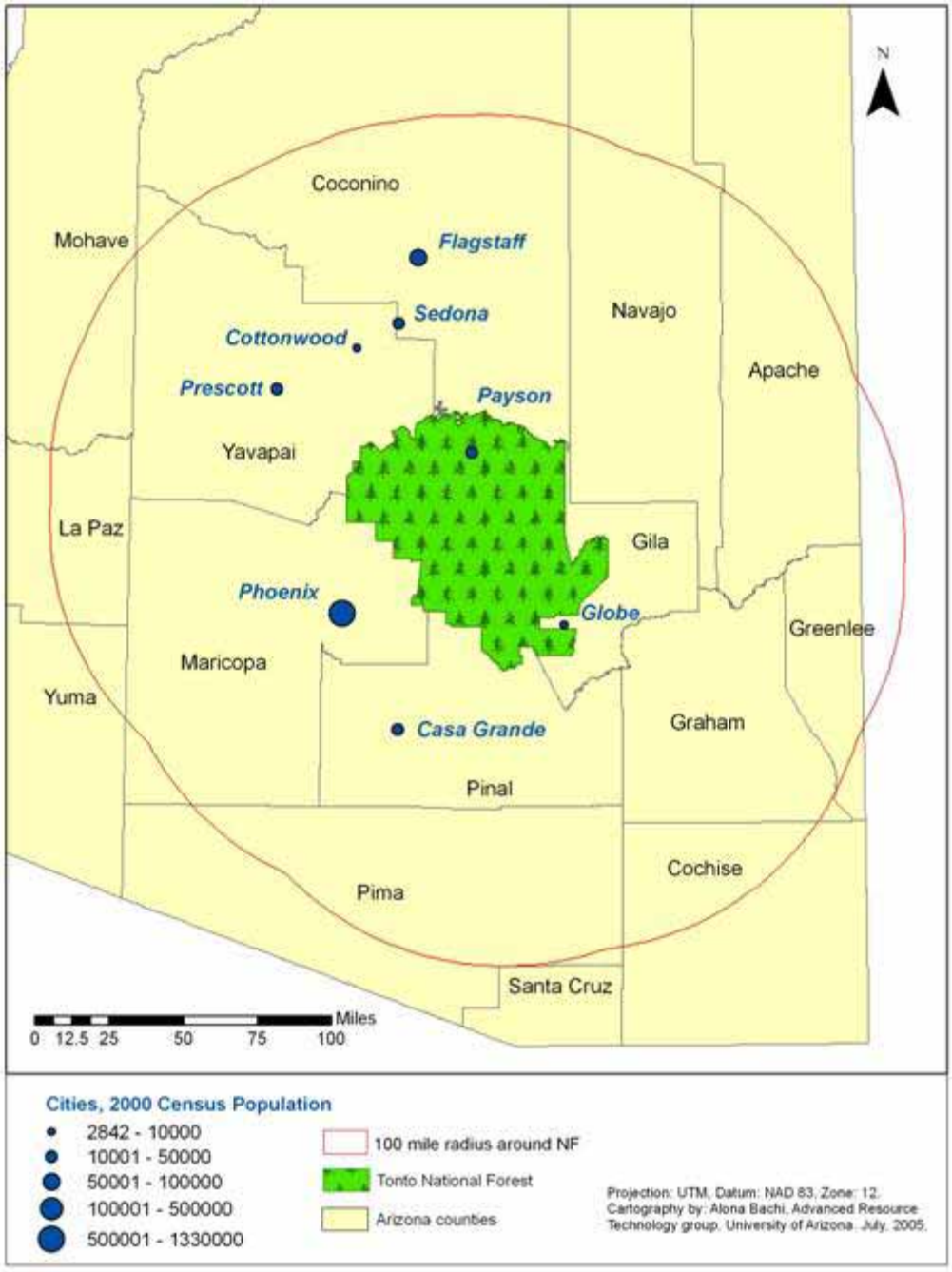


Figure 2. Proximity of Population – Municipalities within 100-Mile Radius

2.2 Population, age structure, net migration, and tourism

Total land area, U.S. Forest Service acreage, total population and population density for each of the four counties is presented in Table 1. Data clearly demonstrate that Maricopa County is the dominant population center not only for the region, but for the state as a whole. With over 3 million residents, Maricopa County is home to nearly 60% of the total population of Arizona.

Maricopa County is also the largest in total land area within the area of assessment with 9,224 square miles. In contrast, Gila County is the smallest both in terms of land area (4,796 sq. mi.) as well as total population (51,335). Population density in Maricopa County is several times greater than any other county in the state (333 per sq. mi.) primarily due to the Phoenix metropolitan area. Each of the selected cities within Maricopa County supported a population several times greater than those within other counties in the area of assessment. In Maricopa County, city populations range from a high of 1,321,045 in Phoenix to 158,625 in Tempe as of 2000. The smallest town in the area of assessment is Hayden with a 2000 population of 892. In terms of Forest Service acreage, Yavapai County holds the largest area with nearly 2 million acres while Pinal County holds the smallest with just over 220,000 acres.

County and state population changes between 1980 and 2000 are presented in Table 2. Data show that with the exception of Gila County, population growth within the region has exceeded that for the state as a whole. In spite of Maricopa County's status as the primary population center for the region, Pinal and Yavapai Counties both experienced higher rates of population growth between 1990 and 2000 (54.43% and 55.52% respectively). Chandler, Mesa, Prescott Valley, and Camp Verde were among a number of cities in the region that experienced dramatic population growth between 1980 and 1990. Population increase slowed considerably for most cities between 1990 and 2000 although Prescott Valley and Chandler have sustained particularly high rates of growth over the ten-year period (165.69% and 95.07% respectively). Despite the considerable growth of Payson and an increase in county-wide population growth rates between 1990 and 2000, Gila County continued to grow at a slower pace than the state of Arizona.

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

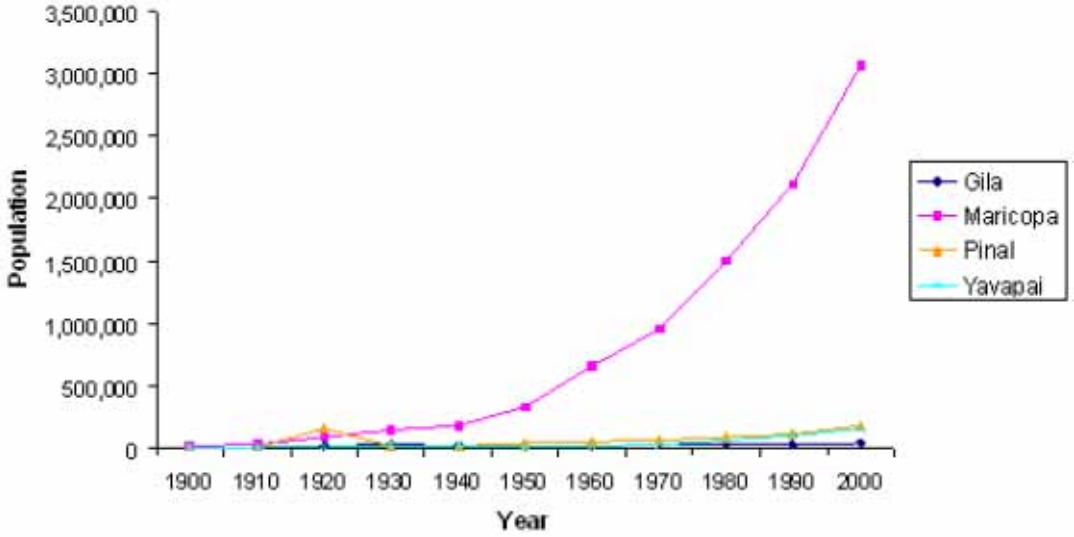
County/Place	Total Area Sq. Miles	2000 population	Pop. Density per sq. mile	USFS Acres
Gila County	4,796	51,335	10.80	1,704,652
Payson	19.5	13,620	698.46	n/a
Globe	18.0	7,486	415.89	n/a
San Carlos	8.8	3,716	422.27	n/a
Miami	1.0	1,936	1,936.00	n/a
Hayden	1.3	892	686.15	n/a
Maricopa County	9,224	3,072,149	333.05	657,695
Phoenix	474.9	1,321,045	2,781.73	n/a
Mesa	125	396,375	3,171.00	n/a
Glendale	55.7	218,812	3,928.40	n/a
Scottsdale	184.2	202,705	1,100.46	n/a
Chandler	57.9	176,581	3,049.76	n/a
Tempe	40.1	158,625	3,955.74	n/a
Pinal County	5,374	179,727	33.44	223,155
Apache Junction	34.2	31,814	930.23	n/a
Casa Grande	48.2	25,224	523.32	n/a
Florence	8.3	17,054	2,054.70	n/a
Eloy	71.7	10,375	144.70	n/a
Coolidge	5	7,786	1,557.20	n/a
Queen Creek	25.8	4,316	167.29	n/a
Yavapai County	8,128	167,517	20.60	1,968,976
Prescott	37.1	33,938	914.77	n/a
Prescott Valley	31.7	23,535	742.43	n/a
Cottonwood - Verde Village*	8.8	10,610	1,205.68	n/a
Sedona	18.6	10,192	547.96	n/a
Camp Verde	42.6	9,451	221.85	n/a
Cottonwood	10.7	9,179	857.90	n/a
Chino Valley	18.6	7,835	421.24	n/a

*Cottonwood - Verde Village is an unincorporated Census Designated Place (CDP)
Source: NRIS - Human Dimensions
http://www.city-data.com/city/Arizona.html

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

County/Place/State	Total Population			1980-1990 % Change	1990-2000 % Change
	1980	1990	2000		
Gila County	37,080	40,216	51,335	8.46%	27.65%
Payson	5,068	8,377	13,620	65.29%	62.59%
Globe	6,708	6,152	7,486	-8.29%	21.68%
San Carlos	2,668	2,954	3,716	10.72%	25.80%
Miami	2,716	2,035	1,936	-25.07%	-4.86%
Hayden	1,205	878	892	-27.14%	1.59%
Maricopa County	1,509,052	2,122,101	3,072,149	40.62%	44.77%
Phoenix	789,704	983,403	1,321,045	24.53%	34.33%
Mesa	152,453	288,091	396,375	88.97%	37.59%
Glendale	97,172	148,134	218,812	52.45%	47.71%
Scottsdale	88,412	130,069	202,705	47.12%	55.84%
Chandler	29,673	90,524	176,581	205.07%	95.07%
Tempe	106,743	141,865	158,625	32.90%	11.81%
Pinal County	90,918	116,379	179,727	28.00%	54.43%
Apache Junction	9,935	18,196	31,814	83.15%	74.84%
Casa Grande	14,971	19,082	25,224	27.46%	32.19%
Florence	6,851	7,510	17,054	9.62%	127.08%
Eloy	6,240	7,201	10,375	15.40%	44.08%
Coolidge	3,391	6,927	7,786	104.28%	12.40%
Queen Creek	n/a	2,478	4,316	n/a	74.17%
Yavapai County	68,145	107,714	167,517	58.07%	55.52%
Prescott	20,055	26,427	33,938	31.77%	28.42%
Prescott Valley	2,284	8,858	23,535	287.83%	165.69%
Cottonwood - Verde Village	n/a	7,037	10,610	n/a	50.77%
Sedona	4,907	7,645	10,192	55.80%	33.32%
Camp Verde	1,125	6,243	9,451	454.93%	51.39%
Cottonwood	4,550	5,918	9,179	30.07%	55.10%
Chino Valley	2,858	4,837	7,835	69.24%	61.98%
Arizona	2,718,215	3,665,228	5,130,632	34.84%	39.98%

Source: NRIS - Human Dimensions



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

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

Table 3 presents urban and rural population data from the three most recent censuses and percent change by county. Data confirm an overall trend towards urbanization in Arizona over the last two decades. Throughout this time Maricopa County has maintained its status as the most urban county in the entire state with a 97% urban population as of 2000. Significant shifts in rural and urban populations are seen, however, for both Yavapai and Pinal Counties, particularly between 1980 and 1990. As of 1980, both counties were predominantly rural whereas by 1990, a majority of the populations of both had become urban.

Although Pinal County undoubtedly underwent a process of urbanization during this decade, the dramatic increase in urban population depicted in Table 3 (593%) is likely due to a change in reporting criteria adopted by the U.S. Census Bureau. In 1980, urban populations were defined strictly as those living in urban areas—areas determined according to minimum total population and population density criteria not met by the city of Casa Grande and expanding areas such as Apache Junction, Queen Creek, and others outside of the Phoenix and Tucson metropolitan areas. In 1990, however, reporting criteria for urban populations was changed to include those living in urban areas as well as those living outside urban areas in the suburbs. This shift likely captures much of the total population growth for Pinal County between 1980 and 1990, contributing to a somewhat skewed increase in urban versus rural populations. Nonetheless, both Pinal and Yavapai Counties became more urban beginning in the 1980s, a trend that held through 2000.

The urban and rural structure of Gila County's population fluctuated less during the same period, remaining the least urbanized county in the area of assessment with 44% of its total population living in rural areas as of 2000.

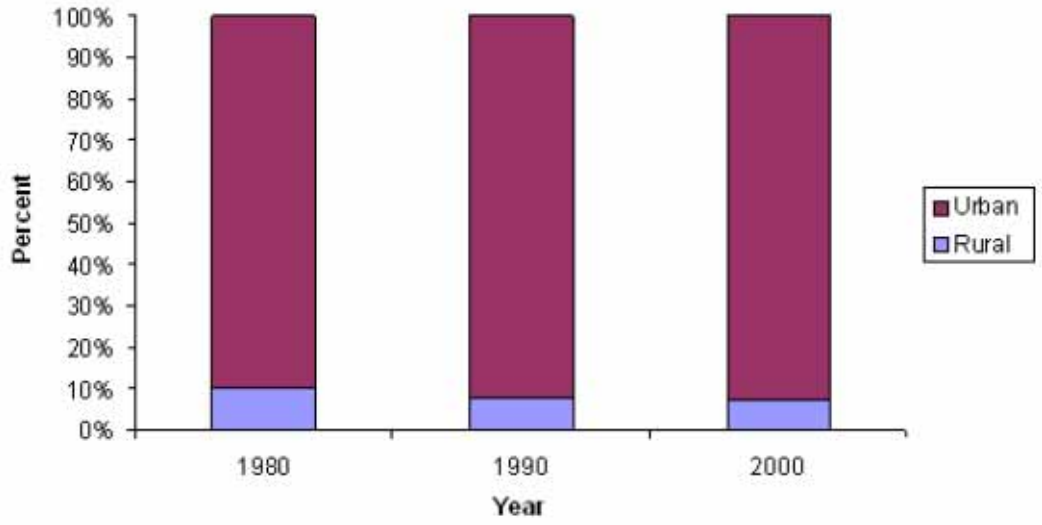
Table 3. Urban and Rural County Populations 1980-2000 and % Change

County		1980*			1990			2000		
		Population	% of Total	% Change	Population	% of Total	% Change	Population	% of Total	% Change
Gila	Urban	19,951	53.81%	n/a	20,362	50.63%	2.06%	28,741	55.99%	41.15%
	Rural	17,129	46.19%	n/a	19,854	49.37%	15.91%	22,594	44.01%	13.80%
Maricopa	Urban	1,399,344	92.73%	n/a	2,045,280	96.38%	46.16%	2,981,673	97.05%	45.78%
	Rural	71,660	4.75%	n/a	76,821	3.62%	7.20%	90,476	2.95%	17.78%
Pinal	Urban	9,935	10.93%	n/a	68,908	59.21%	593.59%	116,082	64.59%	68.46%
	Rural	36,841	40.52%	n/a	47,471	40.79%	28.85%	63,645	35.41%	34.07%
Yavapai	Urban	31,053	45.57%	n/a	70,641	65.58%	127.49%	104,862	62.60%	48.44%
	Rural	37,092	54.43%	n/a	37,073	34.42%	-0.05%	62,655	37.40%	69.00%

Note: % 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. Four-County Assessment Area Urban/Rural Composition, 1980-2000

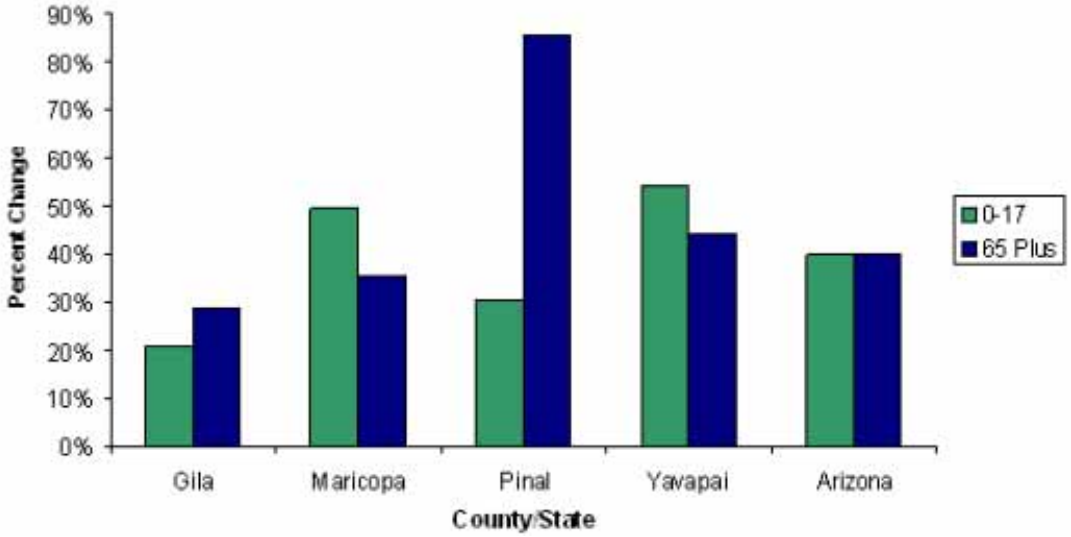
The age structure of populations for each of the four counties and selected cities is presented in Table 4. A comparison of growth rates for both the under-18 and the 65-and-over cohorts reveals interesting trends when compared to overall population growth rates for each county. While the under-18 population of Gila County grew by over 20% between 1990 and 2000, the rate of growth was less than that for the 65-and-over population as well as the growth of the county population as a whole (Table 2). The exception to this pattern was Payson, which experienced significant increases in both cohorts over the ten-year period. Similarly, the growth rate of the under-18 population in Pinal County was well short of the 65-and-over population. This is in spite of considerable increases in the under-18 population seen in Chandler, Scottsdale and Glendale between 1990 and 2000. Chandler experienced the largest increase in the 65-and-over population of any city in the area of assessment at 127.27% over ten years. The under-18 populations of both Maricopa and Yavapai Counties grew the most between 1990 and 2000, approximating the

growth rates of their overall populations. Particularly high rates of increase for both cohorts between 1990 and 2000 attest to the dramatic population growth of Prescott Valley over the ten-year period.

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**
Gila County	10,684	12,890	20.65%	7,902	10,159	28.56%
Payson	1,673	2,739	63.72%	2,625	3,974	51.39%
Globe	1,640	1,931	17.74%	1,188	1,169	-1.60%
San Carlos	1,200	1,566	30.50%	122	199	63.11%
Miami	611	575	-5.89%	296	331	11.82%
Hayden	281	296	5.34%	136	126	-7.35%
Maricopa County	554,688	828,003	49.27%	264,650	358,979	35.64%
Phoenix	266,520	382,435	43.49%	94,997	106,795	12.42%
Mesa	82,324	108,377	31.65%	35,503	52,876	48.93%
Glendale	43,036	65,862	53.04%	11,685	16,179	38.46%
Scottsdale	23,165	39,165	69.07%	21,044	33,884	61.02%
Chandler	28,764	52,625	82.95%	4,525	10,284	127.27%
Tempe	30,393	31,481	3.58%	9,266	11,406	23.10%
Pinal County	34,537	45,081	30.53%	15,731	29,171	85.44%
Apache Junction	4,051	6,515	60.82%	4,611	8,050	74.58%
Casa Grande	6,247	7,797	24.81%	1,994	3,469	73.97%
Florence	865	1,294	49.60%	760	1,626	113.95%
Eloy	2,872	3,501	21.90%	557	661	18.67%
Coolidge	2,431	2,558	5.22%	929	1,040	11.95%
Queen Creek	986	1,528	54.97%	155	209	34.84%
Yavapai County	22,959	35,403	54.20%	25,517	36,816	44.28%
Prescott	4,645	5,387	15.97%	6,894	9,085	31.78%
Prescott Valley	2,224	6,299	183.23%	1,821	4,045	122.13%
Cottonwood - Verde Village	1,782	2,610	46.46%	1,711	2,324	35.83%
Sedona	1,098	1,401	27.60%	2,456	2,605	6.07%
Camp Verde	1,527	2,265	48.33%	1,365	1,936	41.83%
Cottonwood	1,450	2,149	48.21%	1,478	2,184	47.77%
Chino Valley	1,295	2,079	60.54%	887	1,273	43.52%
Arizona	978,783	1,366,947	39.66%	477,200	667,839	39.95%

Source: NRIS - Human Dimensions



Source: NRIS - Human Dimensions

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

Table 5 presents data on net migration for each county for 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 the 2000 data indicate location of residence in 1995. Once again, net migration data show that population growth in Pinal and Yavapai Counties has been especially strong, fueled by in-migration of individuals previously living outside the county. The greatest numbers of individuals moving from out-of-state came from the West and the Midwest; however, both Pinal and Yavapai Counties reported a significant increase in the number of migrants from the Northwest between 1990 and 2000. Finally, Maricopa, Pinal, and Yavapai Counties each 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 the TNF is located primarily within the region referred to as the “Valley of the Sun” Region. The 2003 Profile for the Valley of the Sun Region reported 13.1 million domestic overnight leisure visitors representing a 95.8% increase over the 6.69 million domestic overnight leisure visitors a decade earlier. This established it as the most visited region in the state in terms of the number of domestic overnight visitors. By comparison, the second most visited region was the Old West Territory with 4.77 million domestic overnight leisure visitors in 2003. 77% of Valley of the Sun visitors came to the area for leisure while the remaining 23% were visiting on business (AZOT 2004b).

In 2002, 31.1% of tourist visitors to the Valley of the Sun came from California while 13.6% were visitors from within Arizona. Illinois, Colorado, Washington, New Mexico, Texas, and Ohio also contributed significant numbers of tourists from outside the state. AZOT data suggest that general spending (dining, shopping, entertainment) and sightseeing were both popular among visitors to the Valley of the Sun with 52% and 39% engaging in these activities respectively. By comparison, 21% of visitors reported participating in nature activities (camping, eco-travel, visiting national and state parks). The flow of visitors is greatest during winter with 51% of the FY2002 visits taking place between the months of November and March (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

	Gila County			Maricopa County			Pinal County		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Total*	37,492	48,370	29.01%	1,952,796	2,832,694	45.06%	106,788	167,639	56.98%
Same House	20,628	26,365	27.81%	807,736	1,177,221	45.74%	50,936	79,159	55.41%
Different House	16,864	22,005	30.49%	1,145,060	1,655,473	44.58%	55,852	88,480	58.42%
In United States	16,651	21,670	30.14%	1,101,199	1,524,382	38.43%	54,574	84,554	54.93%
Same County	7,652	9,089	18.78%	654,805	965,603	47.46%	26,325	32,275	22.60%
Different County	8,999	12,581	39.80%	446,943	558,779	25.02%	28,249	52,279	85.06%
Same State	5,058	7,875	55.69%	51,854	66,720	28.67%	12,632	26,642	110.91%
Different State	3,941	4,706	19.41%	394,540	492,059	24.72%	15,617	25,637	64.16%
Northwest	266	263	-1.13%	42,707	56,345	31.93%	1,196	2,261	89.05%
Midwest	813	789	-2.95%	124,337	131,690	5.91%	4,450	7,655	72.02%
South	524	761	45.23%	69,794	85,372	22.32%	2,925	3,796	29.78%
West	2,338	2,893	23.74%	157,702	218,652	38.65%	7,046	11,925	69.24%
In Puerto Rico	0	0	n/a	434	948	118.43%	0	50	n/a
Elsewhere	206	335	62.62%	42,929	130,143	203.16%	1,278	3,876	203.29%

	Yavapai County			Arizona		
	1990	2000	% Change	1990	2000	% Change
Total*	101,667	158,931	56.33%	3,374,806	4,752,724	40.83%
Same House	42,240	70,108	65.98%	1,454,319	2,103,907	44.67%
Different House	59,427	88,823	49.47%	1,920,487	2,648,817	37.92%
In United States	58,759	86,079	46.50%	1,840,216	2,465,345	33.97%
Same County	21,154	34,448	62.84%	1,026,332	1,456,345	41.90%
Different County	37,605	51,631	37.30%	813,884	1,009,490	24.03%
Same State	14,513	20,461	40.98%	164,063	213,070	29.87%
Different State	23,092	31,170	34.98%	649,821	796,420	22.56%
Northwest	1,522	2,997	96.91%	63,950	84,288	31.80%
Midwest	4,374	6,359	45.38%	179,202	190,720	6.43%
South	3,422	4,419	29.14%	118,041	140,608	19.12%
West	13,774	17,395	26.29%	288,628	380,804	31.94%
In Puerto Rico	21	12	-42.86%	665	1,745	162.41%
Elsewhere	637	2,732	328.89%	78,618	181,237	130.53%

* Totals do not include persons under the age of 5

Source:1990- US Census of Population- Social and Economic Characteristics
2000- US Census American Factfinder- http://factfinder.census.gov

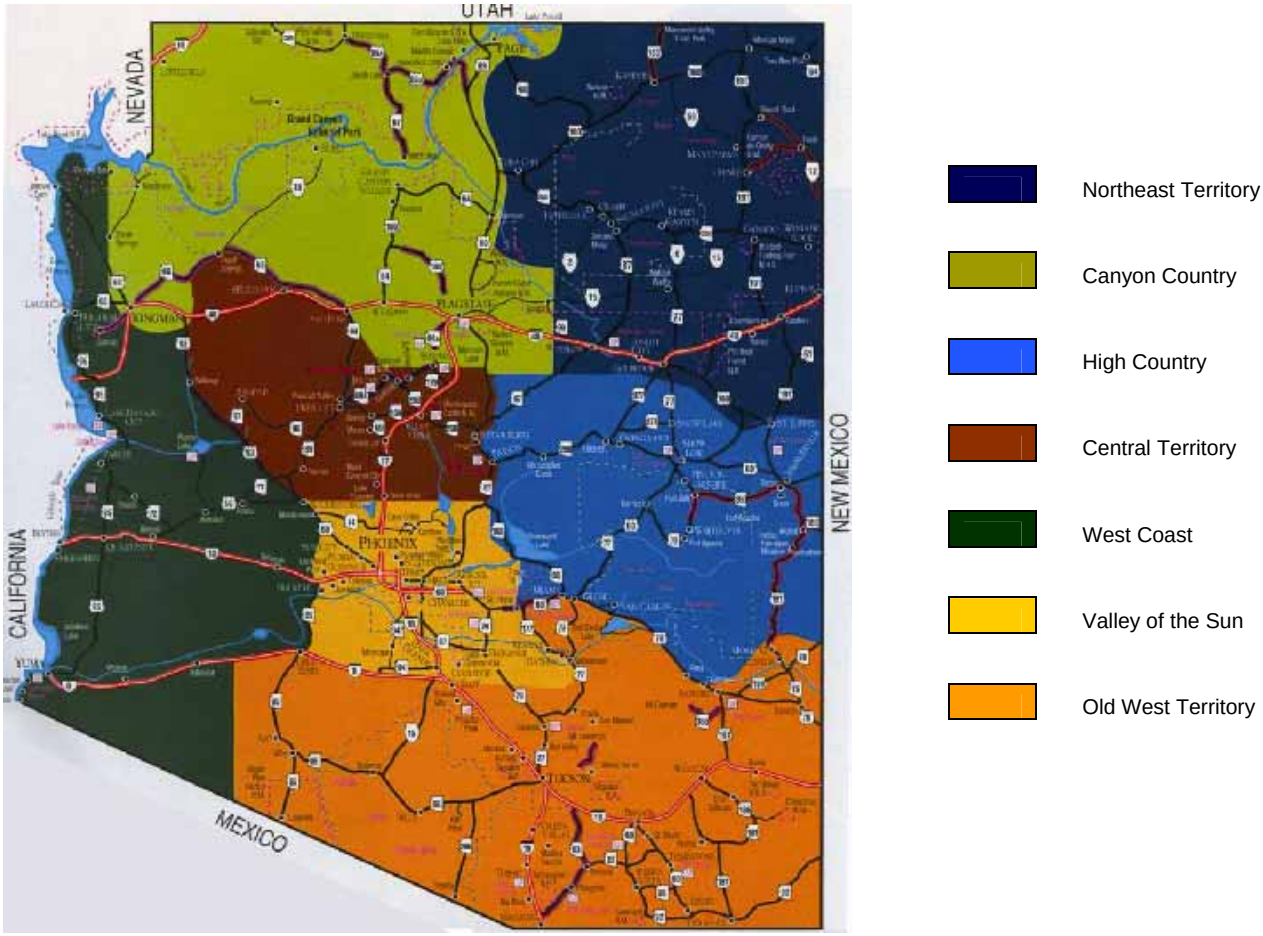


Figure 6. Map of Arizona Tourism Regions

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 four counties as well as the state of Arizona. 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 races for three of the four counties, mirroring the overall trend for the state of Arizona (Table 6). The exception to this trend was Gila County, which experienced relatively slight increases in both multiple race and Hispanic populations between 1990 and 2000. Table 7 demonstrates that dramatic increases in the multiple race populations of both Maricopa and Pinal Counties resulted in significant changes in terms of proportional representation within overall

county populations. Conversely, despite a 350% increase in the number of multiple race individuals in Yavapai County, as a group, the multiple race population remains minimally represented in the overall population of the county (5.52%).

Educational attainment for the population 25-years of age and older is shown for each of the four counties in Table 8. Data show that Maricopa and Yavapai Counties are near or above state averages for percentage of high school and college graduates. Gila County and Pinal County, on the other hand, are well below statewide graduate rates. Pinal County is particularly restricted in terms of educational achievement with the percentage of college graduates nearly ten percent lower than that for the state of Arizona. Over 10% of Pinal County's population has less than a 9th-grade education.

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

	Gila County			Maricopa County			Pinal County		
Race/Ethnicity	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
American Indian or Alaska Native	5,269	6,630	25.83%	38,309	56,706	48.02%	11,150	14,034	25.87%
Asian or Pacific Islander	102	248	143.14%	35,208	67,136	90.68%	677	1,121	65.58%
African American or Black	96	197	105.21%	74,295	114,551	54.18%	3,639	4,958	36.25%
Multiple Races	3,932	4,309	9.59%	172,719	453,682	162.67%	13,721	32,944	140.10%
White	30,817	39,951	29.64%	1,801,570	2,376,359	31.90%	87,192	126,559	45.15%
Hispanic	7,417	8,546	15.22%	340,117	763,341	124.43%	34,158	53,671	57.13%
	Yavapai County			Arizona					
	1990	2000	% Change	1990	2000	% Change			
American Indian or Alaska Native	1,764	2,686	52.27%	204,589	255,879	25.07%			
Asian or Pacific Islander	492	861	75.00%	54,127	98,969	82.85%			
African American or Black	244	655	168.44%	110,062	158,873	44.35%			
Multiple Races	2,053	9,254	350.75%	328,768	743,300	126.09%			
White	103,161	153,933	49.22%	2,967,682	3,873,611	30.53%			
Hispanic	6,854	16,376	138.93%	680,628	1,295,617	90.36%			

Source: NRIS - Human Dimensions

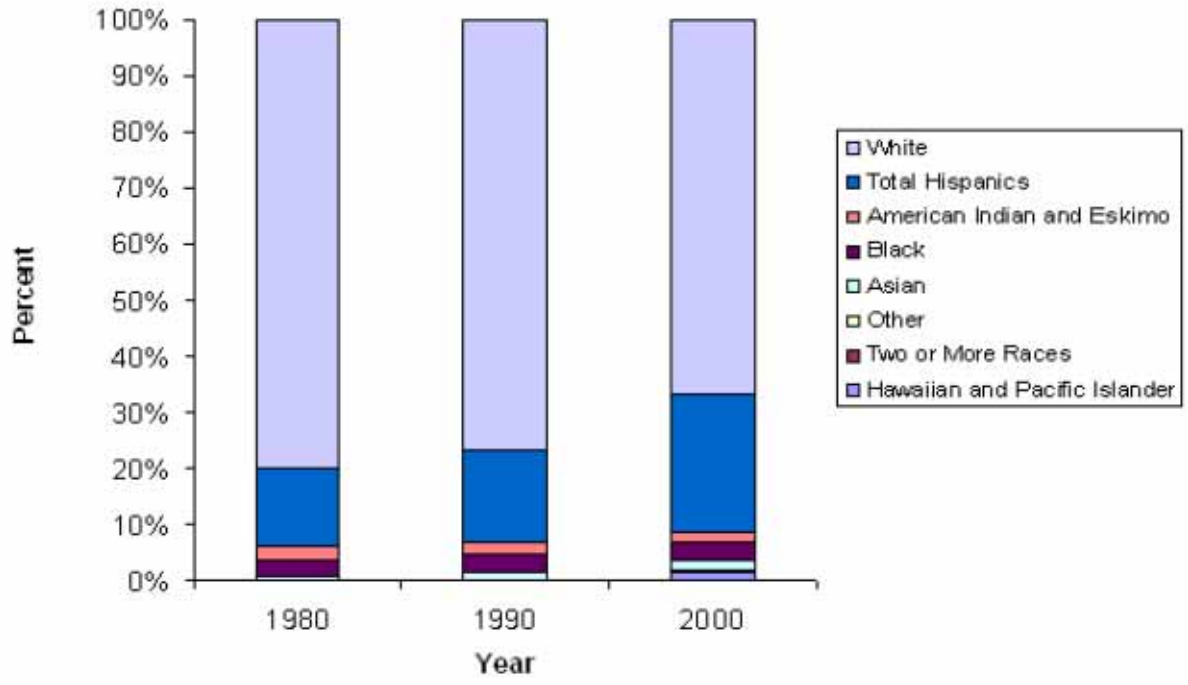
Table 7. Racial/Ethnic Composition of County and State Populations by Percentage, 1990-2000 and Change

	Gila County			Maricopa County			Pinal County		
Race/Ethnicity	**1990**	**2000**	**Change**	**1990**	**2000**	**Change**	**1990**	**2000**	**Change**
American Indian or Alaska Native	13.10%	12.92%	-0.19%	1.81%	1.85%	0.04%	9.58%	7.81%	-1.77%
Asian or Pacific Islander	0.25%	0.48%	0.23%	1.66%	2.19%	0.53%	0.58%	0.62%	0.04%
African American or Black	0.24%	0.38%	0.15%	3.50%	3.73%	0.23%	3.13%	2.76%	-0.37%
Multiple Races	9.78%	8.39%	-1.38%	8.14%	14.77%	6.63%	11.79%	18.33%	6.54%
White	76.63%	77.82%	1.20%	84.90%	77.35%	-7.54%	74.92%	70.42%	-4.50%
Percent Non-white	23.37%	22.18%	-1.20%	15.10%	22.53%	7.42%	25.08%	29.52%	4.44%
Hispanic	18.44%	16.65%	-1.80%	16.03%	24.85%	8.82%	29.35%	29.86%	0.51%

	Yavapai County			Arizona		
	1990	**2000**	**Change**	**1990**	**2000**	**Change**
American Indian or Alaska Native	1.64%	1.60%	-0.03%	5.58%	4.99%	-0.59%
Asian or Pacific Islander	0.46%	0.51%	0.06%	1.48%	1.93%	0.45%
African American or Black	0.23%	0.39%	0.17%	3.00%	3.10%	0.10%
Multiple Races	1.91%	5.52%	3.62%	8.97%	14.49%	5.52%
White	95.77%	91.89%	-3.88%	80.97%	75.50%	-5.47%
Percent Non-white	4.23%	8.10%	3.88%	19.03%	24.50%	5.47%
Hispanic	6.36%	9.78%	3.41%	18.57%	25.25%	6.68%

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. Four-County Assessment Area Racial/Ethnic Composition, 1980-2000

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

	Gila County		Maricopa County		Pinal County	
	Number	Percent	Number	Percent	Number	Percent
Population 25-years and over	35,150	100.00%	1,934,957	100.00%	119,102	100.00%
Less than 9th grade	2,257	6.42%	144,042	7.44%	12,681	10.65%
9th to 12th grade, no diploma	5,397	15.35%	194,549	10.05%	19,832	16.65%
High school graduate (includes equivalency)	10,087	28.70%	446,445	23.07%	36,255	30.44%
Some college, no degree	10,340	29.42%	513,823	26.55%	29,418	24.70%
Associate degree	2,199	6.26%	135,217	6.99%	6,739	5.66%
Bachelor's degree	2,971	8.45%	332,315	17.17%	8,964	7.53%
Graduate or professional degree	1,899	5.40%	168,566	8.71%	5,213	4.38%
Percent high school graduate or higher	n/a	78.20%	n/a	82.50%	n/a	72.70%
Percent bachelor's degree or higher	n/a	13.90%	n/a	25.90%	n/a	11.90%

	Yavapai County		Arizona	
	Number	Percent	Number	Percent
Population 25-years and over	120,223	100.00%	3,256,184	100.00%
Less than 9th grade	5,547	4.61%	254,696	7.82%
9th to 12th grade, no diploma	12,829	10.67%	364,851	11.20%
High school graduate (includes equivalency)	33,877	28.18%	791,904	24.32%
Some college, no degree	34,625	28.80%	859,165	26.39%
Associate degree	7,940	6.60%	219,356	6.74%
Bachelor's degree	15,685	13.05%	493,419	15.15%
Graduate or professional degree	9,720	8.08%	272,793	8.38%
Percent high school graduate or higher	n/a	84.70%	n/a	81.00%
Percent bachelor's degree or higher	n/a	21.10%	n/a	23.50%

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

2.4 Housing characteristics and population projections

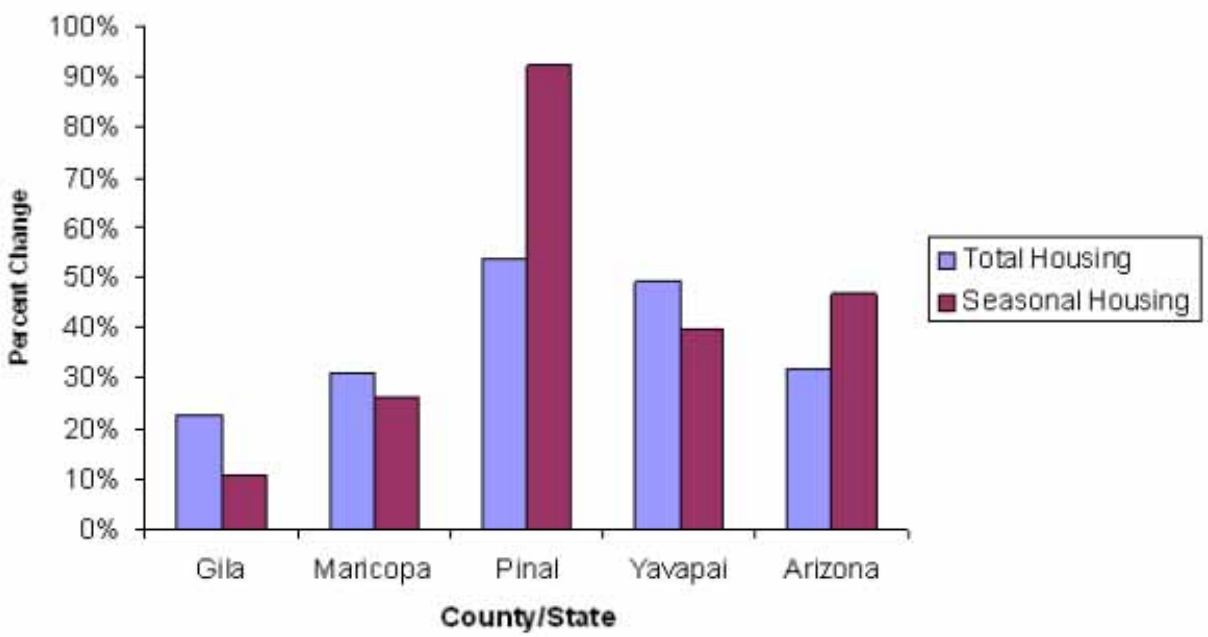
Housing characteristics for the area of assessment are presented in Table 9. Once again, the data confirm the dominance of Maricopa County as the primary population center in the state with over 1 million homes and a housing density of 135 homes per square mile in 2000. The largest growth in housing units between 1990 and 2000, however, was seen in Pinal and Yavapai Counties. Of the selected cities within the area of assessment, Prescott Valley, Cottonwood, Chandler, Apache Junction, and Queen Creek experienced the greatest increases in total housing units over the ten-year period. Pinal County also experienced a dramatic increase in seasonal housing units (92.22%) between 1990 and 2000. Significant increases in seasonal housing units over the same period were seen in Casa Grande, Coolidge, Chandler and Scottsdale. Between 1990 and 2000, Scottsdale, Queen Creek, Florence, and Chino Valley had the greatest increases in median home value. Housing characteristics for Gila County remained well below state averages throughout the same time period.

Table 10 suggests that population growth rates at the county and state level are expected to continue to increase, peaking between 2010 and 2020 before declining by 2030. Of all the counties in region, Maricopa County is projected to continue its accelerated growth, outpacing both surrounding counties and the state as a whole. While Yavapai County is projected to experience relatively strong population growth compared to surrounding counties, Gila County is expected to see relatively limited population growth over the next three decades.

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
Gila County	22,961	28,189	22.77%	5,168	5,725	10.78%	5.00	6.00	20.00%	$58,600	$100,100	70.82%
Payson	4,792	7,279	51.90%	728	779	7.01%	368	374	1.63%	$78,300	$134,900	72.29%
Globe	2,615	3,181	21.64%	35	32	-8.57%	313	177	-43.45%	$49,500	$79,700	61.01%
San Carlos	875	1,015	16.00%	5	13	160.00%	98	115	17.35%	$17,200	$23,000	33.72%
Miami	923	944	2.28%	10	7	-30.00%	956	983	2.82%	$30,500	$44,800	46.89%
Hayden	370	325	-12.16%	0	2	0.00%	293	258	-11.95%	$18,400	$23,100	25.54%
Maricopa County	952,041	1,250,231	31.32%	39,277	49,584	26.24%	103.44	135.85	31.34%	$84,700	$129,200	52.54%
Phoenix	422,036	495,793	17.48%	2,986	4,545	52.21%	1,005	1,044	3.88%	$76,600	$112,600	47.00%
Mesa	140,468	175,717	25.09%	17,617	18,103	2.76%	1,294	1,406	8.66%	$86,200	$122,100	41.65%
Glendale	61,218	79,645	30.10%	403	326	-19.11%	1,172	1,430	22.01%	$84,800	$118,600	39.86%
Scottsdale	69,028	104,949	52.04%	4,260	7,938	86.34%	374	570	52.41%	$114,300	$220,800	93.18%
Chandler	34,967	66,634	90.56%	466	1,045	124.25%	735	1,151	56.60%	$89,800	$137,600	53.23%
Tempe	61,452	67,008	9.04%	515	560	8.74%	1,555	1,673	7.59%	$91,300	$132,100	44.69%
Pinal County	52,732	81,154	53.90%	6,120	11,764	92.22%	9.82	15.11	53.91%	$53,400	$93,900	75.84%
Apache Junction	12,760	22,781	78.53%	3,393	6,797	100.32%	776	666	-14.18%	$58,800	$98,400	67.35%
Casa Grande	7,404	10,936	47.70%	163	861	428.22%	340	227	-33.24%	$64,300	$86,600	34.68%
Florence	2,143	3,255	51.89%	492	628	27.64%	370	393	6.22%	$46,500	$88,000	89.25%
Eloy	2,333	2,737	17.32%	10	22	120.00%	34	38	11.76%	$36,400	$51,500	41.48%
Coolidge	2,806	3,179	13.29%	119	370	210.92%	588	632	7.48%	$40,500	$59,800	47.65%
Queen Creek	769	1,306	69.83%	0	15	n/a	70	51	-27.14%	$106,300	$202,900	90.87%
Yavapai County	54,805	81,730	49.13%	4,325	6,048	39.84%	7.00	10.00	42.86%	$85,300	$138,000	61.78%
Prescott	13,393	17,431	30.15%	787	1,026	30.37%	414	470	13.53%	$93,400	$162,700	74.20%
Prescott Valley	3,913	9,481	142.29%	134	162	20.90%	237	299	26.16%	$64,500	$108,100	67.60%
Verde Village*	3,200	4,327	35.22%	84	43	-48.81%	376	493	31.12%	$78,000	$114,900	47.31%
Sedona	4,658	5,709	22.56%	430	446	3.72%	237	307	29.54%	$159,600	$253,700	58.96%
Camp Verde	2,839	3,988	40.47%	179	136	-24.02%	67	94	40.30%	$75,900	$129,600	70.75%
Cottonwood	2,768	4,386	58.45%	31	55	77.42%	525	411	-21.71%	$61,600	$106,800	73.38%
Chino Valley	2,156	3,251	50.79%	24	56	133.33%	116	175	50.86%	$76,400	$135,500	77.36%
Arizona	1,659,430	2,189,189	31.92%	96,687	141,965	46.83%	15.00	19.00	26.67%	$79,700	$121,300	52.20%

* Cottonwood - Verde Village is an unincorporated Census Designated Place (CDP)
Source: NRIS - Human Dimensions



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
Gila County	51,335	54,603	6.37%	60,757	11.27%	66,378	9.25%
Maricopa County	3,072,149	3,709,566	20.75%	4,516,090	21.74%	5,390,785	19.37%
Pinal County	179,727	199,715	11.12%	231,229	15.78%	255,695	10.58%
Yavapai County	167,517	198,052	18.23%	240,849	21.61%	278,426	15.60%
Arizona	5,130,632	6,145,108	19.77%	7,363,604	19.83%	8,621,114	17.08%

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

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

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.

Population growth in the communities surrounding Tonto National Forest has been stronger than in any other region of the state. This growth, combined with other 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 (mild climate, 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 rural western communities. In particular, migrants are increasingly attracted to communities with relatively affordable housing, employment opportunities, 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 Tonto National Forest which show substantial increases in population and housing in both Pinal and Yavapai Counties as well as 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 these areas through greater employment opportunities and an expanding tax base, it can also challenge the capacity of 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 Tonto National Forest 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 influence not 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, newly arrived 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 four counties surrounding the Tonto National Forest (TNF) 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 TNF has experienced relatively strong economic growth over the past two decades. In fact, growth in total part- and full-time employment for the assessment area as a whole exceeded that for the state of Arizona over the same period (52.31% versus 47.62%). The region's occupational structure closely resembled that for the state of Arizona overall with management, professional, and related occupations joining sales and office occupations as the primary sectors in the regional economy. Maricopa and Pinal Counties experienced significant gains in income from wood products and processing between 1990 and 2000, leading to a net increase in this sector for the area of assessment as a whole. However, each of the counties reported significant losses in income from special forest products and processing over the same period. Despite gains in per capita and household income, as well as significant cuts in poverty, three of the four counties in the area of assessment remain economically challenged when compared to statewide figures for the same period. The exception is Maricopa County, which reported income rates above, and poverty rates below, state averages as of 2000. In terms of federal-lands related revenue, Gila County has consistently been the largest recipient of Payment in Lieu of Taxes (PILT) benefits over the last several years whereas Yavapai County has reported the greatest amount in forest receipts or "twenty-five percent monies."

3.1 Historical context and regional economic conditions

The economy of the region surrounding TNF 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 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[2] (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).

[2] 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.

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 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 TNF are, collectively, some of the more economically secure compared to those surrounding the other forests in the state. The 2002 PPI of the four U.S. counties abutting forest land was $22,739[3], representing a 13.6% differential from the state average at that time, a 3.8% drop from 1969. Compared to the national averages, the PPI of the counties containing the Tonto NF represents 73.8% of the national total, down nearly 7.9% over the past thirty years. Yet, despite the larger setbacks, the thirty-year average rate of income growth in this region is 9.9%, just below the average for Arizona (10.1%) (BEA 2002).

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 strong growth in Maricopa and Yavapai Counties when compared to neighboring counties and state averages. In fact, the increase in total full- and part-time employment in both counties (53.12% and 65.17% respectively) significantly outpaced job growth at the state level between 1990 and 2000 (47.62%). Growth in wage and salary employment was particularly strong in Yavapai County (74.58%) while both wage and salary, as well as proprietor's employment, exhibited strong gains in Maricopa County over the same period. The greatest increase in proprietor's employment was seen in Gila County, which reported an 84% increase over the ten-year period. Despite an increase in total employment that was well below the state average, Gila County showed strong gains in agricultural services and forestry, wholesale trade, finance/real estate, and government. Yavapai County reported similar increases in these same categories as well as considerable job growth in construction and services. For Maricopa County, the strongest job growth was also seen in construction, agricultural services and forestry, finance/real estate, and the service sector. Pinal County reported the least growth in total employment between 1990 and 2000 (20.89%) and was clearly affected by job losses in the agricultural services and forestry as well as the mining sectors.

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. Despite a decline in the percentage of proprietor's employment in Yavapai County, both it and Gila County maintained percentages of proprietor employment that were well above the average for the state. Despite declining percentages of employment in manufacturing, farming, and mining, Pinal County maintained workforces that were larger than the state average in the latter two categories. Both Gila and Yavapai Counties reported a relatively high percentage of employment in retail trade between 1990 and 2000, and Yavapai County maintained a larger-than-average construction work force over the same period. Both Gila and Pinal Counties maintained a relatively high percentage of governmental employment throughout the reporting period. Employment percentages for Maricopa County closely resembled statewide figures for most categories

[3] 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.

with the possible exception of the finance/real estate sector, which was higher than the statewide percentage for this sector.

Table 11. Employment by Industry, County, and State, 1990-2000 and % Change

	Gila County			Maricopa County			Pinal County		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Employment by place of work									
Total full-time and part-time employment	15,108	20,655	36.72%	1,235,513	1,891,817	53.12%	41,577	50,262	20.89%
By type									
Wage and salary employment	11,932	14,810	24.12%	1,051,995	1,604,574	52.53%	34,947	41,939	20.01%
Proprietors employment	3,176	5,845	84.04%	183,518	287,243	56.52%	6,630	8,323	25.54%
Farm proprietors employment	162	198	22.22%	2,382	2,108	-11.50%	807	747	-7.43%
Non-farm proprietors employment	3,014	5,647	87.36%	181,136	285,135	57.41%	5,823	7,576	30.10%
By industry									
Farm employment	201	242	20.40%	6,953	7,588	9.13%	2,088	2,110	1.05%
Non-farm employment	14,907	20,413	36.94%	1,228,560	1,884,229	53.37%	39,489	48,152	21.94%
Private employment	11,739	15,492	31.97%	1,070,390	1,694,490	58.31%	27,667	31,997	15.65%
Ag. services, forestry, fishing and other	89	253	184.27%	13,617	24,270	78.23%	1,350	1,069	-20.81%
Mining	(D)	(D)	n/a	2,418	2,807	16.09%	4,111	1,411	-65.68%
Construction	922	(D)	n/a	70,419	140,657	99.74%	1,370	2,049	49.56%
Manufacturing	1,448	(D)	n/a	143,645	168,591	17.37%	3,681	3,416	-7.20%
Transportation and public utilities	537	664	23.65%	59,956	94,275	57.24%	1,518	1,070	-29.51%
Wholesale trade	138	348	152.17%	65,624	97,165	48.06%	848	1,347	58.84%
Retail trade	3,071	3,893	26.77%	216,499	320,027	47.82%	6,095	7,915	29.86%
Finance, insurance, and real estate	739	1,620	119.22%	127,050	215,097	69.30%	1,904	2,479	30.20%
Services	(D)	5,225	n/a	371,162	631,601	70.17%	6,790	11,241	65.55%
Government and government enterprises	3,168	4,921	55.33%	158,170	189,739	19.96%	11,822	16,155	36.65%
Federal, civilian	483	560	15.94%	19,925	19,744	-0.91%	727	901	23.93%
Military	152	119	-21.71%	16,135	13,105	-18.78%	437	415	-5.03%
State and local	2,533	4,242	67.47%	122,110	156,890	28.48%	10,658	14,839	39.23%
State government	244	454	86.07%	33,540	38,127	13.68%	4,593	4,939	7.53%
Local government	2,289	3,788	65.49%	88,570	118,763	34.09%	6,065	9,900	63.23%

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

	Yavapai County			Arizona		
	1990	2000	% Change	1990	2000	% Change
Employment by place of work						
Total full-time and part-time employment	42,555	70,286	65.17%	1,909,879	2,819,302	47.62%
By type						
Wage and salary employment	29,717	51,881	74.58%	1,607,628	2,355,299	46.51%
Proprietors employment	12,838	18,405	43.36%	302,251	464,003	53.52%
Farm proprietors employment	509	527	3.54%	8,027	7,572	-5.67%
Non-farm proprietors employment	12,329	17,878	45.01%	294,224	456,431	55.13%
By industry						
Farm employment	598	752	25.75%	19,297	19,842	2.82%
Non-farm employment	41,957	69,534	65.73%	1,890,582	2,799,460	48.07%
Private employment	35,585	59,510	67.23%	1,583,146	2,410,566	52.26%
Ag. services, forestry, fishing and other	531	1,017	91.53%	27,817	46,873	68.50%
Mining	1,107	1,184	6.96%	15,475	12,607	-18.53%
Construction	3,877	7,302	88.34%	108,918	200,373	83.97%
Manufacturing	2,847	4,189	47.14%	194,529	225,767	16.06%
Transportation and public utilities	1,454	1,866	28.34%	84,360	124,954	48.12%
Wholesale trade	895	2,031	126.93%	82,812	122,582	48.02%
Retail trade	9,168	13,592	48.25%	344,297	484,207	40.64%
Finance, insurance, and real estate	3,431	6,216	81.17%	170,005	281,675	65.69%
Services	12,275	22,113	80.15%	544,933	911,528	67.27%
Government and government enterprises	6,372	10,024	57.31%	307,436	388,894	26.50%
Federal, civilian	1,076	1,198	11.34%	45,843	48,135	5.00%
Military	414	394	-4.83%	38,197	33,258	-12.93%
State and local	4,882	8,432	72.72%	223,396	307,501	37.65%
State government	652	(D)	n/a	61,595	81,026	31.55%
Local government	4,230	(D)	n/a	161,801	226,475	39.97%

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.
Source: Bureau of Economic Analysis
http://www.bea.doc.gov/bea/regional/reis/action.cfm

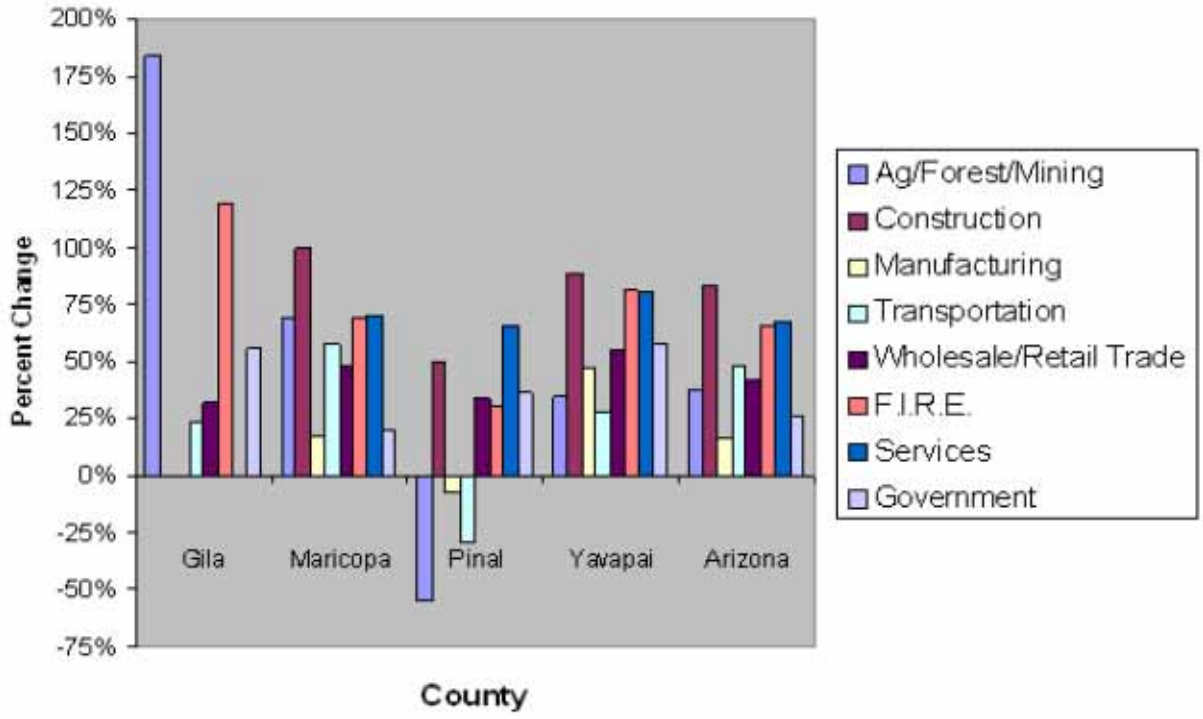
Table 12. Employment by Industry Percentages, County, and State, 1990-2000 and % Change

	Gila County			Maricopa County			Pinal County		
	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	78.98%	71.70%	-9.21%	85.15%	84.82%	-0.39%	84.05%	83.44%	-0.73%
Proprietors employment	21.02%	28.30%	34.61%	14.85%	15.18%	2.22%	15.95%	16.56%	3.84%
Farm proprietors employment	1.07%	0.96%	-10.60%	0.19%	0.11%	-42.20%	1.94%	1.49%	-23.43%
Non-farm proprietors employment	19.95%	27.34%	37.04%	14.66%	15.07%	2.80%	14.01%	15.07%	7.62%
By industry									
Farm employment	1.33%	1.17%	-11.94%	0.56%	0.40%	-28.73%	5.02%	4.20%	-16.41%
Non-farm employment	98.67%	98.83%	0.16%	99.44%	99.60%	0.16%	94.98%	95.80%	0.87%
Private employment	77.70%	75.00%	-3.47%	86.64%	89.57%	3.39%	66.54%	63.66%	-4.33%
Ag. services, forestry, fishing and other	0.59%	1.22%	107.93%	1.10%	1.28%	16.40%	3.25%	2.13%	-34.50%
Mining	(D)	(D)	n/a	0.20%	0.15%	-24.19%	9.89%	2.81%	-71.61%
Construction	6.10%	(D)	n/a	5.70%	7.44%	30.45%	3.30%	4.08%	23.72%
Manufacturing	9.58%	(D)	n/a	11.63%	8.91%	-23.35%	8.85%	6.80%	-23.23%
Transportation and public utilities	3.55%	3.21%	-9.56%	4.85%	4.98%	2.69%	3.65%	2.13%	-41.69%
Wholesale trade	0.91%	1.68%	84.45%	5.31%	5.14%	-3.30%	2.04%	2.68%	31.40%
Retail trade	20.33%	18.85%	-7.28%	17.52%	16.92%	-3.46%	14.66%	15.75%	7.42%
Finance, insurance, and real estate	4.89%	7.84%	60.34%	10.28%	11.37%	10.57%	4.58%	4.93%	7.70%
Services	(D)	25.30%	n/a	30.04%	33.39%	11.13%	16.33%	22.36%	36.95%
Government and government enterprises	20.97%	23.82%	13.62%	12.80%	10.03%	-21.66%	28.43%	32.14%	13.04%
Federal, civilian	3.20%	2.71%	-15.19%	1.61%	1.04%	-35.28%	1.75%	1.79%	2.52%
Military	1.01%	0.58%	-42.74%	1.31%	0.69%	-46.96%	1.05%	0.83%	-21.44%
State and local	16.77%	20.54%	22.49%	9.88%	8.29%	-16.09%	25.63%	29.52%	15.17%
State government	1.62%	2.20%	36.10%	2.71%	2.02%	-25.76%	11.05%	9.83%	-11.05%
Local government	15.15%	18.34%	21.04%	7.17%	6.28%	-12.43%	14.59%	19.70%	35.03%

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

	Yavapai County			Arizona		
	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%
By type						
Wage and salary employment	69.83%	73.81%	5.70%	84.17%	83.54%	-0.75%
Proprietors employment	30.17%	26.19%	-13.20%	15.83%	16.46%	4.00%
Farm proprietors employment	1.20%	0.75%	-37.31%	0.42%	0.27%	-36.10%
Non-farm proprietors employment	28.97%	25.44%	-12.20%	15.41%	16.19%	5.09%
By industry						
Farm employment	1.41%	1.07%	-23.86%	1.01%	0.70%	-30.34%
Non-farm employment	98.59%	98.93%	0.34%	98.99%	99.30%	0.31%
Private employment	83.62%	84.67%	1.25%	82.89%	85.50%	3.15%
Ag. services, forestry, fishing and other	1.25%	1.45%	15.96%	1.46%	1.66%	14.15%
Mining	2.60%	1.68%	-35.24%	0.81%	0.45%	-44.81%
Construction	9.11%	10.39%	14.03%	5.70%	7.11%	24.62%
Manufacturing	6.69%	5.96%	-10.91%	10.19%	8.01%	-21.38%
Transportation and public utilities	3.42%	2.65%	-22.30%	4.42%	4.43%	0.34%
Wholesale trade	2.10%	2.89%	37.39%	4.34%	4.35%	0.28%
Retail trade	21.54%	19.34%	-10.24%	18.03%	17.17%	-4.73%
Finance, insurance, and real estate	8.06%	8.84%	9.69%	8.90%	9.99%	12.24%
Services	28.85%	31.46%	9.07%	28.53%	32.33%	13.32%
Government and government enterprises	14.97%	14.26%	-4.75%	16.10%	13.79%	-14.31%
Federal, civilian	2.53%	1.70%	-32.59%	2.40%	1.71%	-28.87%
Military	0.97%	0.56%	-42.38%	2.00%	1.18%	-41.02%
State and local	11.47%	12.00%	4.57%	11.70%	10.91%	-6.75%
State government	1.53%	(D)	n/a	3.23%	2.87%	-10.89%
Local government	9.94%	(D)	n/a	8.47%	8.03%	-5.18%

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.
Source: Bureau of Economic Analysis
http://www.bea.doc.gov/bea/regional/reis/action.cfm



Source: Bureau of Economic Analysis

Figure 9. 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 ADOC Community Profiles. Dominant occupations, as determined by number of employees and percentage of total employment, are shown for each county in Table 14. Data show that each of the four counties within the area of assessment maintains occupational structures very similar to that of the state as a whole. Management/professional and sales/office are the two most common occupational areas in the state as well as in Gila, Yavapai, Pinal, and Maricopa Counties. For both the state of Arizona and each of the counties within the area of assessment, construction, extraction, and maintenance and production, transportation, and material moving were also among the five most dominant occupations as of 2004.

Table 15 presents annual unemployment rates for the counties, the state of Arizona, and the United States as well for selected cities within the area of assessment. The area of assessment appears evenly split with both Maricopa and Yavapai Counties reporting unemployment rates that were below the statewide average while Gila and Pinal Counties reported higher-than-average unemployment over the same period. Average annual unemployment ranged from a high of 7.4% in Gila County to a low of 4.0% in Maricopa County. Among selected cities within the area of assessment, average annual unemployment ranged from a high of 21.3% in San Carlos to a low of 2.2% in Sedona. The cities of Eloy, Miami, Coolidge, and Chino Valley each reported average annual employment rates that were higher than the statewide average over the same period. Within the area of assessment, Yavapai County appears to have made the greatest gains in employment with most cities reporting net decreases in unemployment over the period.

Table 16 provides per capita and median family incomes as well as rates of individual and family poverty. Data demonstrate that three of the four counties within the area of assessment experienced increases in per capita and median family income that were greater than increases at the state level during the same period. Pinal County, for example, saw substantial increases in both per capita and median family income between 1990 and 2000 (31.76% and 25.06% respectively). Despite these increases, however, per capita

and median family income remained lower than the state average in three of the four counties as of 2000. Maricopa County was the lone exception to this trend, maintaining per capita and median family incomes that were both above the state average despite rates of increase that were below that of the state over the ten-year period. A similar trend is evident in individual and family poverty between 1990 and 2000. Both Pinal and Yavapai Counties saw substantial declines in individual and family poverty that were greater than reductions in poverty at the state level over the same period. Here again, Pinal County saw the greatest improvement with cuts in individual and family poverty of -29.17% and -36.84% respectively. Nonetheless, as of 2000, Pinal and Gila Counties maintained rates of poverty greater than those for the state of Arizona. Among individual cities within the area of assessment, the city of Cottonwood demonstrated perhaps the most significant change with substantial increases in income and decreases in poverty over the ten-year period. Scottsdale and Chandler maintained the highest levels of per capita and median family income as of 2000. Between 1990 and 2000, the cities of Florence, Coolidge, Queen Creek, and Camp Verde made significant cuts in the rates of both individual and family poverty. As of 2000, San Carlos remained severely limited economically with 58.8% of individuals and 57.5% of families living in poverty.

Household income distribution for each county is presented in Table 17. Again, the economic status of Gila County is seen to be considerably limited with over 40% of households earning less than $25,000 per year. Median household income was greatest in Maricopa County at $45,358 in 2000. By comparison, Gila County reported the lowest median family income at $30,917. Maricopa County is clearly the most affluent of the four counties with 13.2% of households earning more than $100,000 as of 2000.

Table 13. Major Employers by County, 2004

Gila County	Maricopa County
Apache Gold, Globe	American Express
APS, Globe/Payson	America West Holdings
Asarco Inc., Hayden	Arizona State University
Asarco Ray Complex, Hayden	Bank One Corp.
Basha's, San Carlos	Banner Health System
B.J. Cecil Trucking, Claypool	Basha's Inc.
BHP Copper, Miami	Honeywell
Cobre Valley Community Hospital, Claypool	The Kroger Company
Copper Mountain Inn, Globe	Intel
Phelps Dodge Corporation, Claypool	Maricopa County
Fry's, Globe/Payson	Mesa Public Schools
Gila County	Motorola
Globe Unified School District	City of Phoenix
Heritage Healthcare Center, Globe	Qwest
Payson Regional Medical Center	Safeway Inc.
Manzanita Manor, Payson	State of Arizona
Mazatzal Casino, Tonto Apache Tribe, Payson	Tosco Marketing Co.
Miami Unified School District	U.S. Postal Service
Payson Unified School District	Wal-Mart Stores Inc.
Safeway, Globe/Payson	Wells Fargo Bank
San Carlos Unified School District	
Town of Payson	
Wal-Mart, Globe/Payson	
U.S. Forest Service, Globe/Payson	

Table 13 (cont.). Major Employers by County, 2004

Pinal County	Yavapai County
Abbott Labs/Ross Prod. Div., Casa Grande	Ace Hardware
Albertson's	APS
Apache Junction Health Center	The Arbors
Apache Junction Schools	Atria and Kachina Point Assisted Living
Arizona State Prison, Florence	Camp Verde Public Schools
Asarco, Hayden	Caradon Better Bilt, Inc.
Basha's	Chino Valley Unified School District #51
Casa Grande Regional Medical Center	Cliff Castle Casino
Casa Grande Elementary School Dist.	City of Cottonwood
Casa Grande Union H.S. Dist.	Cottonwood/Oak Creek Schools
Casa Grande Valley Newspapers	Cyprus Bagdad Copper Corporation
Central Arizona College, Coolidge	Double Tree Sedona Resort
City of Apache Junction	Embry-Riddle Aeronautical University
City of Casa Grande	Enchantment Resort
City of Eloy	Humboldt Unified School District
Coolidge Unified School District	Exsil, Inc.
Corrections Corp. of America, Eloy/Florence	Los Abrigados Resort
Eloy Schools	Mingus Union High School District
Evergreen Air Center, Marana	Phelps & Sons Trusses
Frito-Lay, Casa Grande	Phoenix Cement Co.
Fry's Food and Drug Stores	City of Prescott
Gila River Indian Community Government Farms	Prescott Resort
Harrah's Ak-Chin Casino	Prescott Unified School District
Hexcel Corp.	Price Costco Store
Hunter Douglas Wood Products	Ruger Investment Castings
K-Mart	Safeway Inc.
Pinal County	Sedona/Oak Creek Unified School District
Tanger Outlet Center	Sturm Ruger & Co.
Westile Roofing Products	Target Store
	Town of Prescott Valley
	U.S. Forest Service
	Veterans Administration Medical Center
	Wal-Mart
	West Yavapai Guidance Clinic
	Wulfsberg Electronics
	Yavapai Community College
	Yavapai County
	Yavapai Gaming Agency
	Yavapai Regional Medical Center

Source: Arizona Department of Commerce - Community Profiles
http://www.azcommerce.com/Communities/community_profiles.asp

Table 14. Dominant Occupations of State and County Populations, 2000

County/State	Number	Percent
Gila County		
Sales and office occupations	4,481	24.8%
Management, professional, and related occupations	4,386	24.3%
Service occupations	4,122	22.8%
Construction, extraction, and maintenance occupations	2,959	16.4%
Production, transportation, and material moving occupations	1,963	10.9%
Maricopa County		
Management, professional, and related occupations	483,582	33.9%
Sales and office occupations	423,504	29.7%
Service occupations	208,498	14.6%
Production, transportation, and material moving occupations	156,842	11.0%
Construction, extraction, and maintenance occupations	149,539	10.5%
Pinal County		
Sales and office occupations	14,937	24.4%
Management, professional, and related occupations	13,523	22.1%
Service occupations	13,432	21.9%
Production, transportation, and material moving occupations	8,998	14.7%
Construction, extraction, and maintenance occupations	8,727	14.2%
Yavapai County		
Management, professional, and related occupations	13,125	26.7%
Sales and office occupations	13,012	26.4%
Service occupations	8,697	17.7%
Production, transportation, and material moving occupations	5,989	12.2%
Construction, extraction, and maintenance occupations	5,289	10.7%
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%

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

Table 15. 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
Gila County	7.1%	7.6%	8.7%	7.9%	8.6%	7.9%	7.4%	7.1%	5.9%	6.0%	8.0%	7.8%	6.7%	7.4%
Payson	7.6%	3.7%	4.2%	3.9%	4.2%	3.9%	3.6%	3.5%	2.8%	2.9%	3.9%	3.8%	3.2%	3.9%
Globe	3.8%	4.7%	5.3%	4.9%	5.3%	4.9%	4.5%	4.4%	3.6%	3.6%	4.9%	4.8%	4.1%	4.5%
San Carlos	16.3%	22.2%	24.6%	22.9%	24.4%	22.9%	21.5%	20.9%	17.7%	17.9%	23.0%	22.6%	19.8%	21.3%
Miami	1.4%	7.0%	8.0%	7.3%	7.9%	7.3%	6.8%	6.6%	5.3%	5.5%	7.3%	7.2%	6.1%	6.4%
Maricopa County	5.4%	4.5%	4.7%	3.4%	3.6%	3.0%	2.7%	3.0%	2.7%	3.9%	5.6%	4.9%	4.1%	4.0%
Phoenix	5.4%	4.9%	5.2%	3.8%	4.0%	3.3%	2.9%	3.3%	3.0%	4.3%	6.2%	5.4%	4.5%	4.4%
Mesa	5.1%	3.8%	4.0%	2.9%	3.1%	2.5%	2.3%	2.5%	2.3%	3.3%	4.8%	4.2%	3.5%	3.7%
Glendale	5.4%	4.5%	4.7%	3.4%	3.7%	3.0%	2.7%	3.0%	2.7%	3.9%	5.6%	4.9%	4.1%	4.2%
Scottsdale	3.9%	3.2%	3.4%	2.5%	2.6%	2.1%	1.9%	2.1%	1.9%	2.8%	4.1%	3.6%	2.9%	3.0%
Chandler	4.8%	3.4%	3.5%	2.6%	2.7%	2.2%	2.0%	2.2%	2.0%	2.0%	4.2%	3.7%	3.1%	3.4%
Tempe	4.5%	3.8%	4.0%	2.9%	3.1%	2.5%	2.3%	2.5%	2.3%	3.4%	4.8%	4.2%	3.5%	3.5%
Pinal County	7.7%	6.5%	5.8%	4.8%	5.9%	5.0%	4.2%	5.5%	3.9%	4.7%	7.0%	6.5%	5.5%	5.6%
Apache Junction	11.2%	4.7%	4.2%	3.4%	4.3%	3.6%	3.0%	4.0%	2.8%	3.4%	5.1%	4.7%	4.0%	4.5%
Casa Grande	6.2%	5.5%	4.9%	4.1%	5.1%	4.3%	3.6%	4.7%	3.3%	4.0%	6.0%	5.6%	4.7%	4.8%
Florence	3.1%	4.7%	2.9%	2.4%	3.0%	2.5%	2.1%	2.8%	2.0%	2.4%	3.6%	3.3%	2.7%	2.9%
Eloy	12.6%	12.8%	11.5%	9.6%	11.7%	10.0%	8.4%	11.0%	7.9%	9.5%	13.8%	12.9%	10.9%	11.0%
Coolidge	13.4%	6.5%	5.8%	4.9%	6.0%	5.1%	4.2%	5.6%	3.9%	4.8%	7.1%	6.6%	5.6%	6.1%
Queen Creek	n/a	2.8%	2.9%	2.1%	2.3%	1.8%	1.7%	1.8%	1.6%	2.4%	3.5%	3.1%	2.5%	2.4%
Yavapai County	8.0%	4.7%	5.4%	4.8%	4.8%	4.0%	3.3%	3.4%	2.8%	3.0%	3.7%	3.3%	2.9%	4.2%
Prescott	7.3%	5.3%	6.0%	5.4%	5.3%	4.5%	3.7%	3.8%	3.2%	3.3%	4.1%	3.7%	3.3%	4.5%
Prescott Valley	n/a	4.1%	4.8%	4.2%	4.2%	3.5%	2.9%	3.0%	2.5%	2.6%	3.3%	2.9%	2.6%	3.4%
Cottonwood - Verde Village	n/a	4.8%	5.5%	4.9%	4.9%	4.1%	3.4%	3.5%	2.9%	3.0%	3.8%	3.4%	3.0%	3.9%
Sedona	5.3%	2.4%	2.8%	2.4%	2.4%	2.0%	1.7%	1.7%	1.4%	1.5%	1.9%	1.7%	1.5%	2.2%
Camp Verde	n/a	4.2%	4.8%	4.2%	4.2%	3.5%	2.9%	3.0%	2.5%	2.6%	3.3%	2.9%	2.6%	3.4%
Cottonwood	n/a	6.1%	7.0%	6.2%	6.2%	5.2%	4.3%	4.4%	3.7%	3.8%	4.8%	4.3%	3.7%	5.0%
Chino Valley	6.6%	6.9%	7.9%	7.0%	7.0%	5.8%	4.9%	5.0%	4.2%	4.4%	5.4%	4.8%	4.3%	5.7%
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%
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%

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

Source: Arizona Department of Commerce, Arizona Workforce Informer

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

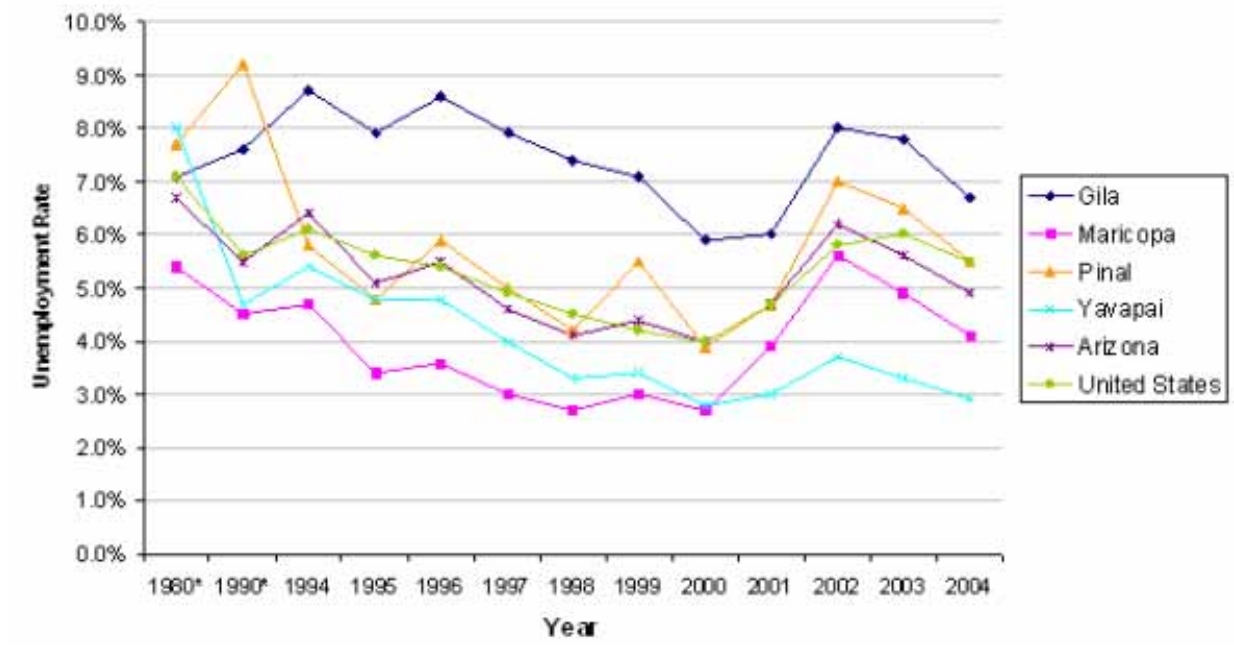
U.S. Bureau Of Labor Statistics

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

Table 16. Per Capita and Family Income by County and State, 1990-2000 and % Change

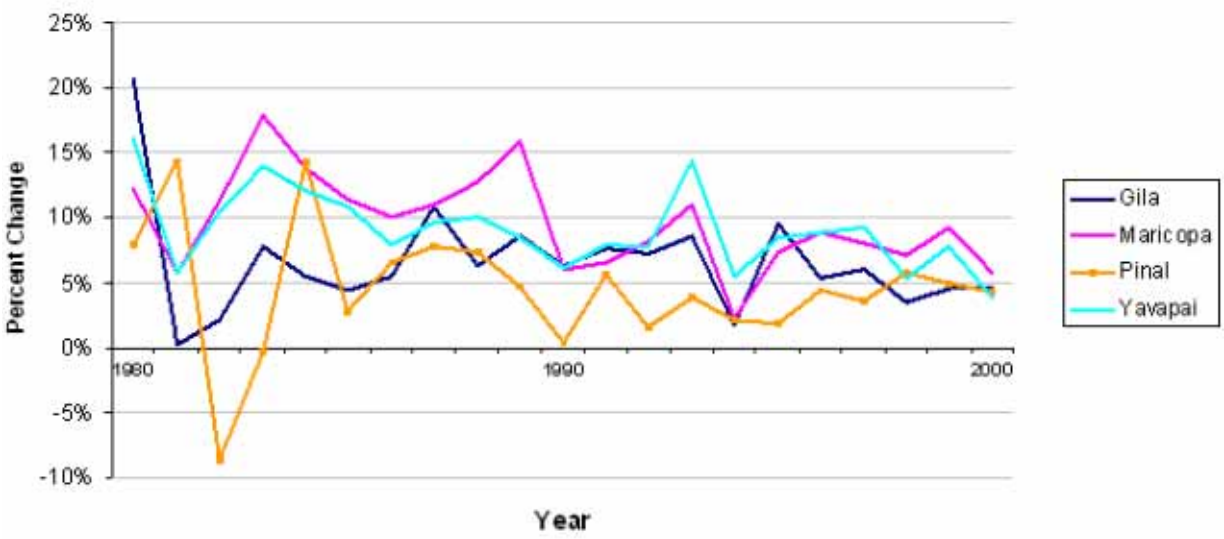
County/Place	Per Capita Income			Median Family Income			% Individuals in Poverty			% Families in Poverty		
	1990	2000*	% Change	1990	2000*	% Change	1990	2000	% Change	1990	2000	% Change
Gila County	$10,297	$12,379	20.22%	$24,877	$27,764	11.61%	18.3%	17.4%	-4.92%	13.5%	12.6%	-6.67%
Payson	$26,464	$29,373	10.99%	$11,748	$14,805	26.02%	11.9%	9.9%	-16.81%	7.8%	6.5%	-16.67%
Globe	$32,071	$32,079	0.02%	$11,493	$12,237	6.47%	11.7%	11.4%	-2.56%	8.3%	8.8%	6.02%
San Carlos	$10,678	$10,788	1.03%	$3,692	$3,502	-5.16%	58.8%	58.8%	0.00%	55.0%	57.5%	4.55%
Miami	$21,650	$23,236	7.33%	$8,115	$10,375	27.85%	21.1%	23.6%	11.85%	17.6%	20.5%	16.48%
Maricopa County	$14,970	$16,882	12.77%	$36,078	$39,322	8.99%	12.0%	12.0%	0.0%	9.0%	8.0%	-11.1%
Phoenix	$14,096	$15,048	6.75%	$34,172	$35,256	3.17%	14.2%	15.8%	11.27%	10.5%	11.5%	9.52%
Mesa	$13,506	$14,872	10.11%	$35,297	$37,354	5.83%	9.5%	8.9%	-6.32%	6.9%	6.2%	-10.14%
Glendale	$13,524	$14,510	7.29%	$37,086	$38,818	4.67%	11.5%	11.9%	3.48%	9.0%	8.8%	-2.22%
Scottsdale	$23,482	$29,710	26.52%	$48,202	$56,029	16.24%	5.9%	5.8%	-1.69%	3.5%	3.4%	-2.86%
Chandler	$14,720	$18,137	23.21%	$41,361	$47,587	15.05%	9.7%	6.6%	-31.96%	7.1%	4.6%	-35.21%
Tempe	$15,530	$17,000	9.47%	$40,512	$41,910	3.45%	13.6%	14.3%	5.15%	7.0%	7.5%	7.14%
Pinal County	$9,228	$12,159	31.76%	$23,993	$30,006	25.06%	24.0%	17.0%	-29.17%	19.0%	12.0%	-36.84%
Apache Junction	$9,946	$12,751	28.20%	$23,151	$28,624	23.64%	16.7%	11.6%	-30.54%	11.8%	7.3%	-38.14%
Casa Grande	$11,388	$12,077	6.05%	$28,639	$30,976	8.16%	17.4%	16.0%	-8.05%	16.1%	12.4%	-22.98%
Florence	$10,101	$8,557	-15.29%	$24,397	$31,835	30.49%	17.6%	7.0%	-60.23%	14.9%	6.1%	-59.06%
Eloy	$5,836	$6,976	19.53%	$19,839	$21,619	8.97%	36.7%	31.9%	-13.08%	31.2%	27.8%	-10.90%
Coolidge	$7,634	$10,366	35.79%	$18,733	$25,445	35.83%	36.2%	24.7%	-31.77%	29.5%	20.9%	-29.15%
Queen Creek	$12,057	$16,382	35.87%	$37,083	$49,832	34.38%	14.4%	9.2%	-36.11%	10.7%	6.0%	-43.93%
Yavapai County	$12,657	$14,967	18.25%	$26,238	$31,039	18.30%	13.6%	11.9%	-12.50%	9.8%	7.9%	-19.39%
Prescott	$13,851	$17,121	23.61%	$29,473	$35,266	19.66%	13.3%	13.1%	-1.50%	8.1%	7.4%	-8.64%
Prescott Valley	$9,848	$12,328	25.18%	$23,947	$28,268	18.04%	9.6%	10.9%	13.54%	7.3%	7.8%	6.85%
Cottonwood - Verde Village	$10,328	$12,697	22.93%	$25,089	$29,284	16.72%	11.3%	8.7%	-23.01%	9.1%	6.7%	-26.37%
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%
Camp Verde	$19,514	$11,436	-41.40%	$21,865	$28,110	28.56%	20.3%	14.0%	-31.03%	13.2%	9.5%	-28.03%
Cottonwood	$9,235	$13,291	43.92%	$18,932	$28,675	51.46%	22.7%	13.5%	-40.53%	20.5%	8.9%	-56.59%
Chino Valley	$8,821	$11,802	33.79%	$21,972	$26,565	20.91%	17.0%	15.5%	-8.82%	13.3%	12.6%	-5.26%
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%

*2000 Income data adjusted to reflect 1990 constant dollars by applying deflation factor calculated by Consumer Price Index
Source: NRIS - Human Dimensions



Source: Arizona Department of Commerce, Arizona Workforce Informer

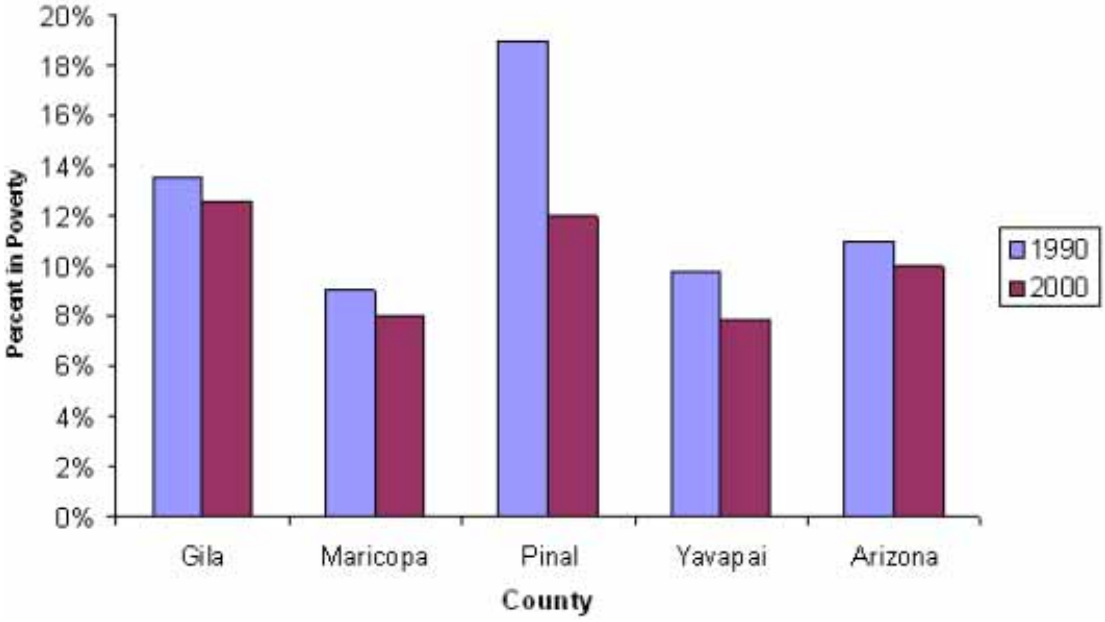
Figure 10. Unemployment Rates by County and State, 1980-2004



Source: Bureau of Economic Analysis

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

Figure 11. Annual Percent Change in Per Capita Income by County, 1980-2000



Source: NRIS – Human Dimensions

Figure 12. Percent of Families in Poverty by County, 1990-2000

Table 17. Household Income Distribution by County, 2000

	Gila County		Maricopa County		Pinal County		Yavapai County	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Less than $10,000	2,491	12.4%	77,072	6.8%	6,319	10.3%	6,298	9.0%
$10,000 to $14,999	2,025	10.0%	59,431	5.2%	4,604	7.5%	5,692	8.1%
$15,000 to $24,999	3,688	18.3%	138,318	12.2%	9,488	15.4%	12,019	17.2%
$25,000 to $34,999	3,017	15.0%	148,972	13.1%	9,380	15.3%	11,115	15.9%
$35,000 to $49,999	3,446	17.1%	197,855	17.5%	12,082	19.7%	13,098	18.7%
$50,000 to $74,999	3,254	16.1%	234,729	20.7%	11,221	18.3%	11,709	16.7%
$75,000 to $99,999	1,174	5.8%	126,525	11.2%	4,435	7.2%	4,924	7.0%
$100,000 to $149,999	639	3.2%	95,166	8.4%	2,683	4.4%	3,285	4.7%
$150,000 to $199,999	205	1.0%	26,506	2.3%	605	1.0%	762	1.1%
$200,000 or more	226	1.1%	28,474	2.5%	596	1.0%	1,167	1.7%
Median household income ($)	$30,917	(x)	$45,358	(x)	$35,856	(x)	$34,901	(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 "ripplelike" 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 that both Pinal and Maricopa Counties reported relatively strong gains in total labor income from wood products and processing between 1990 and 2000 while Gila County reported a substantial loss of income from this category over the same period. In Maricopa County, the increase was due in part to particularly strong income gains from reconstituted wood and paper products while in Pinal County, the strongest increases were reported for wood household furniture and structural wood members. Interestingly, each of the four counties within the area of assessment reported losses in total labor income from special forest products and processing during the decade. Table 18 shows that in comparison to statewide figures, the area of assessment realized a large increase in income from wood products and processing and a relatively significant loss in income from special forest products and processing between 1990 and 2000.

Table 18. 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
Gila	$3,958,866	$534,774	-86.49%	$366,480	$202,780	-44.67%
Maricopa	$141,455,612	$273,053,463	93.03%	$63,946,522	$26,232,873	-58.98%
Pinal	$1,857,089	$3,403,790	83.29%	$14,124,030	$9,449,586	-33.10%
Yavapai	$4,044,339	$5,661,275	39.98%	$2,229,247	$975,281	-56.25%
Assessment Area Total	$151,315,906	$282,653,302	86.80%	$80,666,280	$36,860,520	-54.30%
Arizona	$263,558,989	$369,474,539	40.19%	$175,994,087	$137,825,248	-21.69%

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

Information on tourism employment for each of the counties within the area of assessment, as well as the state of Arizona, is provided in Table 19. Calculating the direct impact of tourism is made particularly difficult given the fact that a limited percentage of business activity in any given industry can be considered the result of tourism. For the purposes of this assessment, we have assessed tourism employment based on percentages derived from the Travel Industry Association of America Tourism Economic Impact Model (TEIM). This is the same model used in the Arizona Tourism Statistical Report issued by the Arizona Office of Tourism (AZOT).

Table 19 suggests that the most substantial gains in tourism employment between 1990 and 2000 took place in Yavapai and Maricopa Counties. The increase in tourism employment for Yavapai County far exceeded the rate of increase at the state level over the same period (104% and 32% respectively). Alternatively, Pinal County reported an increase in tourism employment that was well below increases in the same category for neighboring counties between 1990 and 2000.

Table 19. Tourism Employment by County and State, 1990-2000 and % Change

	Gila County			Maricopa County			Pinal County		
Industry Sector	**1990**	**2000**	**%Change**	**1990**	**2000**	**%Change**	**1990**	**2000**	**%Change**
Retail	187	238	27.0%	13,619	20,319	49.2%	456	535	17.4%
Restaurant/Bar	235	349	48.7%	16,715	24,457	46.3%	375	574	53.1%
Lodging	296	245	-17.2%	29,842	32,439	8.7%	665	510	-23.3%
Amusement	3	76	2,666.5%	858	2,427	183.0%	34	80	134.3%
Total	**721**	**908**	**26.0%**	**61,033**	**79,642**	**30.5%**	**1,530**	**1,700**	**11.1%**
	Yavapai County			**Arizona**					
Industry Sector	**1990**	**2000**	**%Change**	**1990**	**2000**	**%Change**			
Retail	514	828	61.0%	21,655	30,376	40.3%			
Restaurant/Bar	747	1,241	66.2%	26,393	38,395	45.5%			
Lodging	839	2,157	157.1%	47,848	56,848	18.8%			
Amusement	26	112	324.0%	1,442	3,462	140.1%			
Total	**2,126**	**4,338**	**104.0%**	**97,338**	**129,081**	**32.6%**			

Source: IMPLAN 2000 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 funds 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. Yavapai County holds the greatest entitlement acreage with over 2.5 million acres, 1.9 million of which are Forest Service lands. Gila County also holds a significant amount of Forest Service lands entitled to PILT with over 1.7 million acres. Actual PILT payments for each county are presented in Table 21. Despite holding fewer entitlement acres than either Yavapai or Maricopa County, Gila County has consistently been the largest recipient of PILT payments, averaging an annual payment of $1.55 million between 2000 and 2004. Pinal County received the least in PILT payments, averaging $616,090 over the same period.

Annual forest receipts for the years 1986-1999 are presented for each county in Table 22. Between 1986 and 1999, average annual forest receipts ranged from a high in Yavapai County of $546,200 to a low of $29,400 in Pinal County.

Table 20. Payment in Lieu of Taxes (PILT) Entitlement Acreage by County and Agency, FY 2004

County	BLM	FS	BOR	NPS	COE	ARMY	FISH	URC	TOTAL
Gila	64,368	1,704,384	13,535	1,120	0	0	0	0	1,783,407
Maricopa	1,749,429	657,695	40,112	11	2,119	0	6,896	0	2,456,262
Pinal	382,231	222,889	21,312	473	0	0	0	0	626,905
Yavapai	606,237	1,967,402	12,319	727	0	0	0	0	2,586,685
TOTAL	2,802,265	4,552,370	87,278	2,331	2,119	0	6,896	0	7,453,259

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

Table 21. County PILT Payments, 2000-2004

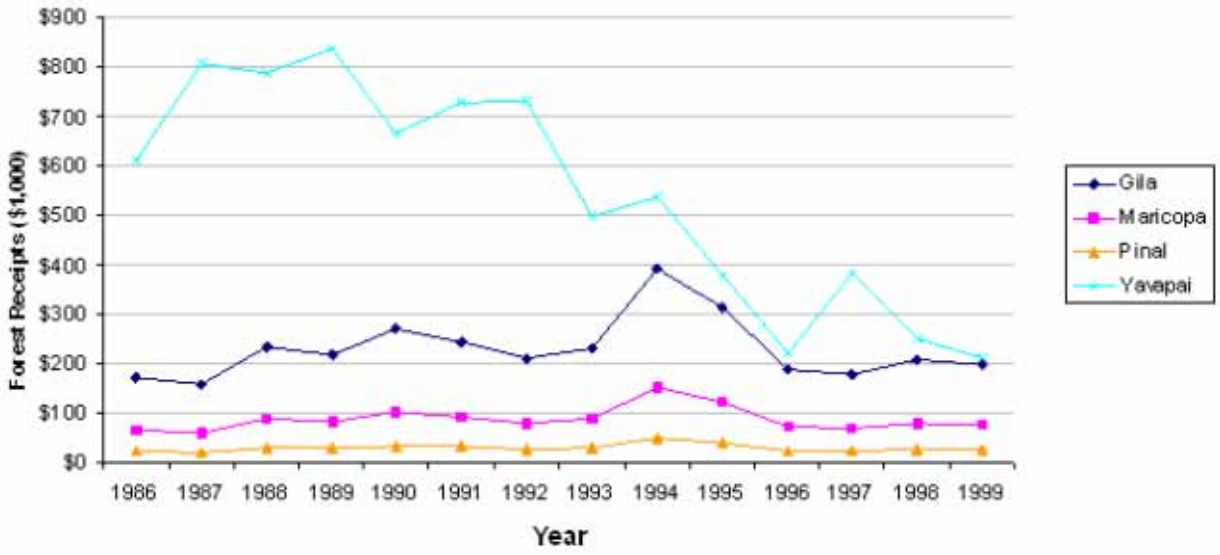
County	2000	2001	2002	2003	2004	Average
Gila	$1,046,543	$1,498,572	$1,574,039	$1,798,227	$1,849,029	$1,553,282
Maricopa	$1,019,264	$1,465,414	$1,539,003	$1,725,495	$1,775,295	$1,504,894
Pinal	$396,290	$568,264	$599,120	$673,798	$842,978	$616,090
Yavapai	$973,796	$1,417,178	$1,473,737	$1,359,624	$1,280,574	$1,300,982
TOTAL	$3,435,893	$4,949,428	$5,185,899	$5,557,144	$5,747,876	$4,975,248

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

Table 22. Forest Receipts by County, 1986-1999 (Amounts in 1,000s)

County	1986	1987	1988	1989	1990	1991	1992	1993
Gila	$172.8	$158.3	$234.1	$216.8	$270.5	$245.6	$211.4	$231.9
Maricopa	$65.5	$59.4	$88.8	$82.0	$103.2	$93.3	$80.1	$88.7
Pinal	$21.8	$20.1	$29.0	$28.1	$34.4	$31.5	$27.5	$30.3
Yavapai	$610.9	$806.9	$787.5	$837.5	$664.5	$729.2	$732.2	$498.8
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**Average**	
Gila	$391.3	$314.5	$188.5	$178.4	$206.3	$197.6	$229.9	
Maricopa	$150.5	$121.2	$72.8	$68.8	$79.3	$76.1	$87.8	
Pinal	$48.9	$39.6	$24.5	$23.5	$26.6	$25.7	$29.4	
Yavapai	$538.7	$378.7	$219.4	$382.3	$249.5	$210.8	$546.2	

Source: NRIS - Human Dimensions



Source: NRIS – Human Dimensions

Figure 13. 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 negative impacts 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 TNF illustrate this trend, evincing substantial growth in the F.I.R.E. (finance, insurance

and real estate), services, and construction industries. When matched with a simultaneous decline in extractive and productive industries, these changes have made the composition of the area's economy increasingly urban in nature, following a statewide trend over the last twenty years (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. In light of relatively strong economic growth for the area surrounding TNF, 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 seasonal housing units, when combined with increases in the service/professional, retail trade, and construction industries, mirrors a common trend in rural western economies.

These trends support the notion that growth in many western communities is partly driven by individuals and households with the wherewithal to support increasingly non-extractive economies. Despite considerable growth in per capita and median household incomes, three of the four counties within the area of assessment maintained income levels below the state average as of 2000. 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, the growth of many western 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 transportation and information technology 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 that carries important implications for natural resource management. Many of the 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 those powerful interests determined to protect established industries from such changes (Baden and Snow 1997). Finally, data for the area surrounding the TNF demonstrate the reciprocal cause-and-effect relationships between economic and demographic trends. Although economic growth of rural communities may be fueled by households with relatively "footloose" sources of 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 examines historic and current factors affecting access patterns and transportation infrastructure within the four counties surrounding Tonto National Forest (TNF). The information gathered is intended to outline current and future trends in forest access as well as potential barriers to access 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 (ADOT), the Arizona Department of Commerce (ADOC), and 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 TNF 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 show that the area surrounding Tonto National Forest saw relatively large increases in VMT between 1990 and 2000, mirroring the region's relatively strong population growth over the same period. Information gathered from the Arizona Department of Transportation (ADOT) and county comprehensive plans suggest that considerable improvements are currently scheduled for the region's transportation network, particularly when compared to areas surrounding Arizona's other national forests.

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 extractive economy. Today, many regions of the state, including the area surrounding the TNF, 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, the rate of population growth, and expansion of commercial, industrial, and residential land uses. The comprehensive plans further admit that current transportation networks have been developed as needs have arisen and are therefore inadequate for handling projected long-term growth (MAG 2003, Gila County 2003, Yavapai County 2003, ADOT 2004a).

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 (MAG 2003, Pinal County 2001). 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, 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 on 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. Figure 14 shows a particularly dense road network surrounding the metropolitan Phoenix are and a considerable network of interstates, state highways and Indian routes. Additionally, the majority of major roads follow a north-south orientation, with the exception of Interstates 10 and 8 which are primarily situated east to west through the area of assessment.

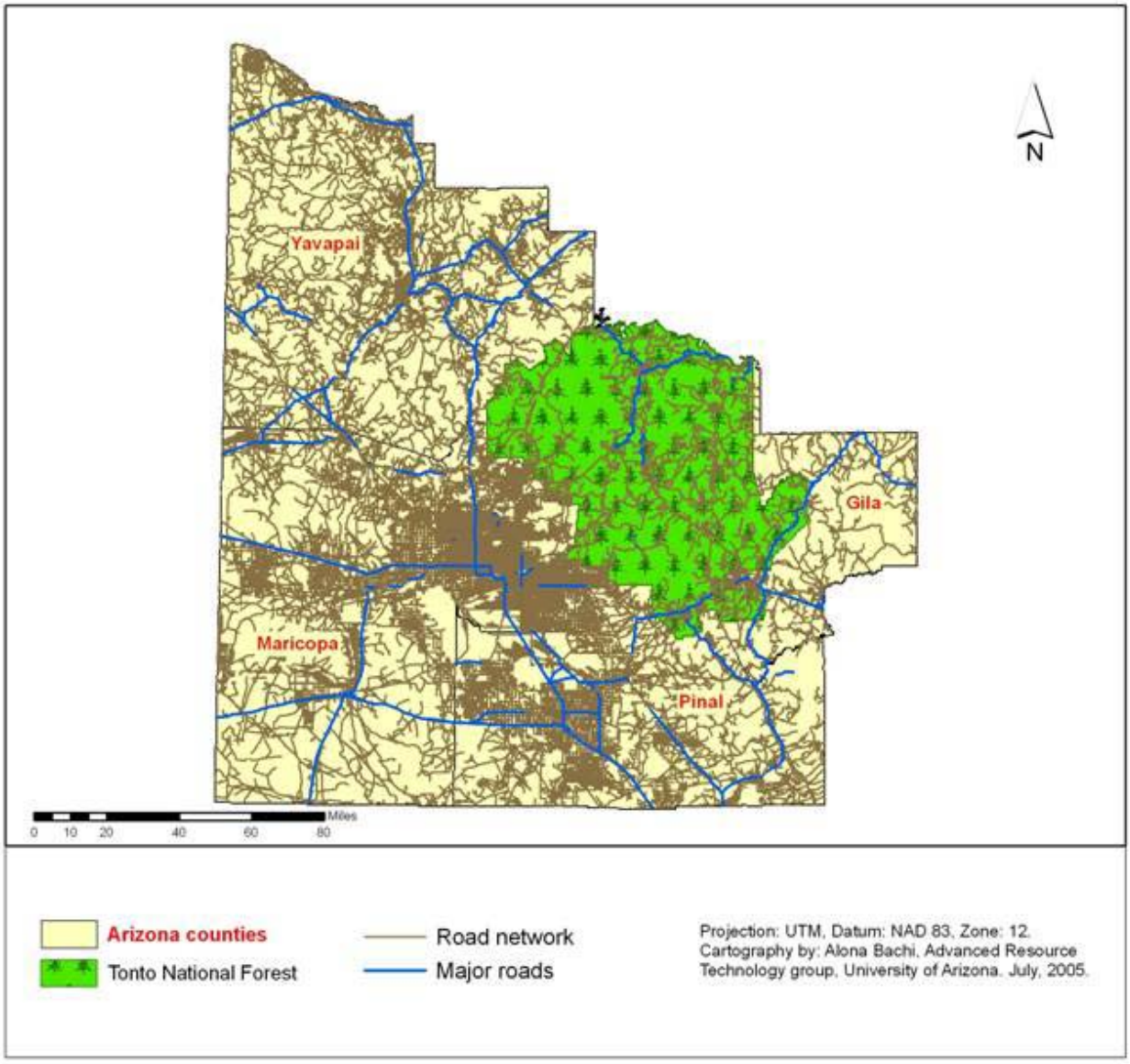


Figure 14. Road Network within the Area of Assessment

Table 23. U.S., State, and Indian Routes by County

	Interstates / U.S. Highways	State Highways	Indian Routes
Gila County			
	US 60	State Highway 73	
		State Highway 77	
		State Highway 87	
		State Highway 88	
		State Highway 170	
		State Highway 188	
		State Highway 260	
Maricopa County			
	Interstate 8	State Highways 51	
	Interstate 10	State Highways 74	
	Interstate 17	State Highways 85	
	US 60	State Highways 87	
		State Highways 88	
		State Highways 101	
		State Highways 143	
		State Highways 153	
		State Highways 202	
		State Highways 238	
		State Highways 303	
		State Highways 347	
Pinal County			
	Interstate 8	State Highways 77	Indian Route 15
	Interstate 10	State Highways 78	
	US 60	State Highways 84	
		State Highways 87	
		State Highways 88	
		State Highways 187	
		State Highways 237	
		State Highways 287	
		State Highways 347	
		State Highways 387	
		State Highways 177	
Yavapai County			
	Interstate 17	State Highways 69	
	Interstate 40	State Highways 71	
	US 93	State Highways 89A	
		State Highways 96	
		State Highways 97	
		State Highways 169	
		State Highways 260	

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. 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, planning agencies 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 (MAG 2003, Gila County 2003, Yavapai County 2003, Pinal County 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 twelve percent of the total highway network are state facilities, over fifty-seven percent of the daily vehicle miles traveled (VMT) occur on these roads. The Interstate System—which is part of the state highway system—carries twenty-eight percent 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 seventy percent of the land in Arizona. Federal lands agencies, including the USFS, the BLM, and others, own forty-two percent 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 twenty-eight percent of Arizona land. An additional 1,200 miles of state highway pass 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 Pinal County over the ten-year period. Similar, though relatively modest, increases in traffic for all roads were also reported within the county over the same time period. These increases are obviously due in part to substantial increases in population and housing units in Pinal County. The extraordinary increase in travel on non-state roads is likely attributable to significant increases in VMT on county roads and roads serving private residential and commercial developments. Table 24 also shows a substantial increase in VMT on state roads within Maricopa County. This increase is likely to the expanded use of state routes in an around the Phoenix metropolitan area.

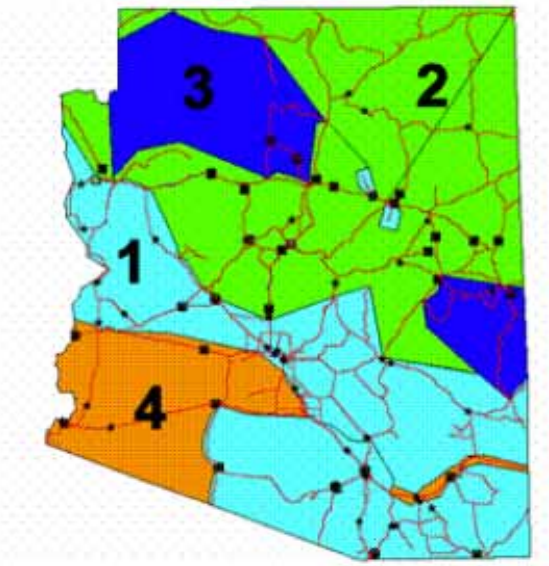
Table 24. Daily Vehicle-Miles of Travel (VMT) by County, 1990-2000 and % Change

	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
Gila County	1,312	1,948	48.48%	1,005	1,470	46.27%	307	478	55.70%
Maricopa County	47,388	67,486	42.41%	11,599	25,963	123.84%	35,789	41,523	16.02%
Pinal County	3,446	6,917	100.73%	3,361	4,805	42.96%	85	2,112	2,384.71%
Yavapai County	3,439	6,803	97.82%	3,182	4,776	50.09%	257	2,027	688.72%
Arizona	97,139	134,345	38.30%	40,252	66,671	65.63%	56,887	67,674	18.96%

Source: Arizona Department of Transportation, Transportation Planning Division
HPMS Data for the Calendar years 1990 and 2000

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. 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 15. 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 TNF extend into the portions of the state designated as Areas 1 and 2 by ADOT's Transportation Planning Department. Data in Table 25 show that peak traffic flow for Area 1 occurs between February and April and is lowest from July to September. Conversely, peak traffic flow for Area 2 occurs between June and August and is at its lowest from December to February. These distinct seasonal flows 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 25. 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 Tonto NF.

Planned improvements to the state highway system surrounding TNF 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 26. ADOT Current 5-Year Transportation Facilities Construction Program, Tonto National Forest

Year	Route	Milepost	County	Funding Source	Location	Length (miles)	Type Of Work	Cost ($1000)
2006	60	212.17	Pinal	Surface Transportation Program	Florence Junction T-Picket Post	6	Reconstruct roadway (widening)	$37,000
2007	60	230	Pinal	STATE	Pinto Valley Bridge - Mine Turnoff		Design passing lane	$300
2008	60	230	Pinal	Surface Transportation Program	Oak Flat - Devil's Canyon		Construct passing/climbing lane	$3,000
2006	60	236.2	Gila	Surface Transportation Program	County Line - Pinto Valley	3.3	Resurface & passing lane	$4,033
2005	87	194	Maricopa	STATE	Forest Boundary - Dos "S" Ranch Rd.		Design	$500
2006	87	194.1	Maricopa	National Highway System	Forest Boundary to Dos "S" Ranch	9.8	Construct Roadway	$3,000
2005	87	263	Gila	STATE	Tonto Natural Bridge	0.1	Road Design, Phase II	$125
2006	87	263	Gila	STATE	Tonto Natural Bridge	0.1	Construct Road, Phase II	$775
2005	88	213.3	Maricopa	STATE	Apache Trail	29.4	District Force Account.	$150
2006	88	213.3	Maricopa	STATE	Apache Trail	29.4	District Force Account.	$150
2006	88	223	Maricopa	Surface Transportation Program	Fish Creek Hill		Construct retaining walls	$1,500
2005	88	223	Maricopa	STATE	Fish Creek Hill		Design (retaining walls)	$150
2005	188	214.87	Gila	Surface Transportation Program	Wheatfields - US 60	4.1	Construct Roadway	$10,000
2008	260	263.1	Gila	National Highway System	Little Green Valley	6.9	Reconstruct Roadway	$21,700
2009	260	269	Gila	National Highway System	Doubtful Canyon Section	3.5	Reconstruct Roadway	$31,000
2009	260	269	Gila	STATE	Doubtful Canyon Section	0.2	Utility Relocation.	$30
2005	260	269	Gila	STATE	Doubtful Canyon Section	0	Design (Roadway)	$1,500
2005	260	280	Gila	STATE	SR 260, Gordon Canyon Bridge & Mogollon Rim Viaduct	1.18	Construction of erosion control and stream stability facilities.	$337

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 TNF, the Maricopa Association of Governments (MAG), the Central Arizona Association of Governments (CAAG), and the Central Yavapai Municipal Planning Organization (CYMPO) 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 (Gila County 2003, Yavapai 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.

Gila County

The primary routes within Gila County consist of State Routes, including US 60, US 70, SR 87, SR 188, SR 288, and SR 260. Most of the secondary routes are FS roads that provide access to pockets of private lands located within the TNF boundaries. Most roadways directly under the jurisdiction of Gila County are located in rural areas and consist of two-lane collector and local roadways. The urban roadways under Gila County's jurisdiction include those within the communities of Claypool, Central Heights, Strawberry, and Pine.

Among the primary transportation-related issues identified in the *Gila County Comprehensive Master Plan* are adequacy of emergency access, all-weather property accessibility, lack of alternative transportation mode facilities, and deficiencies in roadway construction and maintenance funding. In an effort to address these issues, the county has recently developed the *Gila County Roadway Design Standards Manual* to standardize the construction of all new roadways and improvement for existing roadways under its jurisdiction as well as to establish policies regarding roadway issues such as all-weather access standards, emergency access standards, etc. (Gila County 2003). As of 2003, the county was in the process of developing a Capital Improvement Plan to identify and prioritize all transportation improvement projects for county roads; however, a copy of the plan was not available at the time of this assessment.

Maricopa County

As the designated Metropolitan Planning Organization for the Maricopa region, MAG plans and finances the regional transportation system. These responsibilities include the development of a Regional Transportation Plan (RTP), management of the regional Transportation Improvement Program, collection of traffic data, and monitoring of transportation safety programs.

The RTP planning area includes all of Maricopa County, encompassing the cities of Apache Junction, Avondale, Chandler, El Mirage, Glendale, Goodyear, Litchfield Park, Mesa, Peoria, Phoenix, Scottsdale, Surprise, Tempe, Tolleson, Buckeye, Carefree, Cave Creek, Fountain Hills, Gila Bend, Gilbert, Guadalupe, Paradise Valley, Queen Creek, Wickenburg, Youngtown, and the Gila River and Salt River Pima-Maricopa Indian Communities. Given the rates of current and projected growth throughout the region, much of the RTP focuses on the impacts of development on the regional transportation system. In recent decades, regional development patterns have been characterized by sustained residential growth on the fringes of the urbanized area, combined with infill development within the urban core. Together, these patterns contribute to increases in urban density which the RTP claims necessitate a variety of transportation approaches to respond to the different types of development occurring in the region. In

response to these trends, the RTP presents an improvement plan that includes increases in highway capacity, expanded mass transit service and alternative mode options (MAG 2003).

In describing current roadway conditions, the RTP describes certain advantages of the established transportation system. For example, it claims that the existing regional freeway system, having been built over the past twenty years, is relatively new and not yet in need of extensive rehabilitation. Furthermore, it claims that an extensive grid of regional arterial roads adds significant flexibility to the system. The RTP also explains that further development of the region's system for traffic management has the potential to increase system capacity with less expansion of lane capacity than would otherwise be required (MAG 2003).

The RTP presents planned freeway and highway improvements according to individual transportation corridors. The plan states that overall funding for new corridors under MAG jurisdiction totals $3.7 billion. It is expected that these new corridors will provide approximately 490 additional new lane miles to the network. Funding for widening and other improvements to the existing regional freeway/highway network totals an additional $4.4 billion. These improvements include an additional 530 lane miles of general purpose lanes and 300 lane miles of HOV lanes, covering essentially the entire existing system, including the loop elements now under construction (MAG 2003). Planned improvements to transportation corridors are summarized below. Maps of the current freeway and highway system as well as planned improvements for the MAG area are available at http://www.mag.maricopa.gov/pdf/cms.resource/RTP-Final-11-25-03.pdf

- **Interstate 10**

This freeway provides links to population centers throughout the southwestern U.S. and also provides passenger and freight mobility within the region. It connects built-up urban areas within the MAG Region and areas planned for commercial, industrial, and residential development. It is the only existing major east-west freeway serving the central urban area of the MAG Region. Already highly congested, I-10 is also a major truck route. Major improvements to increase the capacity of I-10 include the addition of general purpose lanes between I-17 and State Route 85 as well as an extension of HOV lanes as far west as Loop 303. In the southeast, general purpose lanes will be added between Baseline Road and Riggs Road, and HOV lanes will be extended as far south as Riggs Road.

- **Interstate 10 Reliever**

The RTP also funds the development of a new six-lane freeway corridor parallel to and south of the existing I-10 in order to relieve congestion in the corridor. The facility will be constructed in stages with the initial stage including construction of a full freeway between Loop 202 and Loop 303. An interim (minimum two-lane) roadway will also be constructed between Loop 303 and SR 85. Between Loop 303 and SR 85, sufficient right-of-way for the future construction of a full freeway will also be acquired. Construction of a full freeway in this section is planned as part of the ultimate concept for this facility.

- **Interstate 17**

This freeway route connects the Phoenix metropolitan area with I-40 to the north and serves as the north-south backbone of the MAG region. It terminates at the junction of I-10 in the center of the urban area. As with I-10, this facility carries very high volumes of traffic and experiences lengthy periods of congestion. New residential and commercial development in the vicinity of Loop 101 and rapid development to areas north of Loop 101 are expected to add to traffic demands on I-17. Planned improvements aimed at

alleviating congestion on I-17 include the addition of general purpose lanes from Peoria Avenue to New River Road and the extension of HOV lanes as far north as Anthem Way.

- **Loop 101**

This circumferential freeway route loops around the northern part of the MAG Region. It is divided into three segments: the Agua Fria Freeway (I-10 to I-17), the Pima Freeway (I-17 to Loop 202/Red Mountain), and the Price Freeway (Loop 202/Red Mountain to Loop 202/Santan). Several segments of the facility are already experiencing considerable peak period congestion. In order to address current and future demands on the route, the RTP calls for the addition of both general purpose lanes and HOV lanes along the entire length of Loop 101. Once completed, Loop 101 will have a minimum of four general-purpose and one HOV lane in each direction, or ten lanes total.

- **Loop 202**

This circumferential freeway serves the southeastern part of the MAG Region. It is divided into two segments: the Red Mountain Freeway (I-10 to US 60) and the Santan Freeway (US 60 to I-10 East). The areas served by both the Red Mountain and Santan facilities are expected to reach build-out levels of population and employment within the next twenty years. In addition, areas in northern Pinal County adjacent to Maricopa County are projected to experience major growth. In an effort to respond to projected growth expansion of Red Mountain and Santan freeway facilities to three lanes in each direction (six lanes total) is currently underway. Construction is scheduled to be completed by FY 2007. The RTP also calls for the addition of both general purpose lanes and HOV lanes on the Red Mountain and Santan Freeways, from Loop 101 (Pima) to US 60 (Superstition) and to I-10 East. Once completed, the Red Mountain and Santan Freeways will each have a minimum of four general-purpose and one HOV lane in each direction, or ten lanes total.

- **Loop 303**

Originally part of the MAG Plan in 1985 but dropped due to funding shortfalls, Loop 303 was carried as an expressway in the 2002 update of the MAG Long Range Transportation Plan. The route is intended to provide service to a number of West Valley communities which collectively represent a large area of growth in the region. The RTP funds the construction of Loop 303 as an initial six lane freeway from I-17 near Lone Mountain Road to Grand Avenue and then south to I-10 and the I-10 Reliever. The segment of Loop 303 between I-17 and 75th Avenue, as well as the portion in the Surprise area, will be initially constructed as an at-grade expressway.

- **State Route 85**

This two-lane highway travels in a north-south direction in the Southwest Valley, extending from I-8 at Gila Bend north to I-10. This segment is a component of the CANAMEX Corridor within the MAG Region. Between I-8 and I-10, State Route 85 is a major link for automobile and truck traffic traveling to points west on I-8. In conjunction with I-8, it also serves as by-pass for the metropolitan area for truckers using I-10. In order to increase the currently limited capacity, the RTP funds the widening of SR 85 between I-8 and I-10 to a four-lane, divided facility.

- **US 60**

This east-west freeway route serves the Southeast Valley and continues into Pinal County and eastern Arizona. At its eastern end, new areas of residential, commercial, and industrial development extending into Pinal County are expected to contribute to future congestion. Planned improvements include the addition of general purpose lanes at various points along the facility, primarily from Val Vista Drive and east to the Pinal County line. HOV lanes will also be extended as far east as Meridian Road.

- **Williams Gateway Freeway**

The RTP includes funding for the Williams Gateway Freeway, a new six-lane freeway corridor extending from Loop 202 (Santan) south to the Williams Gateway Airport and east to the Pinal County line. The high-level facility is expected to address future needs for access to job centers, commercial areas, and residential development as the eastern MAG region and northern Pinal County continue to build out. RTP funding for this project is limited to the section of freeway located within Maricopa County.

Pinal County

The Pinal County roadway network consists of two interstates, one US route, twelve state routes, Bureau of Indian Affairs routes, BLM and National Forest roads, county roads, and municipal streets. Many of these roads, especially the main thoroughfares, are north-south aligned. The concentration of east-west aligned roads connects the larger communities such as Casa Grande, Apache Junction, Coolidge, and Florence (Pinal County 2001).

The *Pinal County Comprehensive Plan* points to the rapid population growth in northern areas of Pinal County and southern portions of Maricopa County as the single most pressing issue affecting transportation planning in the region. Current travel patterns in the county are not focused on a central area where services and employment are concentrated. Rather, residents in different parts of the county flow toward the closest area for services or employment. For example, residents of Apache Junction are closely tied to the Phoenix area, persons in the Superior region may travel to Globe, and persons in Oracle access Tucson for basic services. The travel patterns in the center of the county—the region that includes Casa Grande, Eloy, Arizona City, Coolidge, and Florence—also include significant travel to and from the metropolitan area, due to the proximity of Phoenix and Tucson, the strong employment base that Casa Grande and Florence provide, and the varied and specialized services that can be found in the metropolitan areas. In an effort to respond to projected growth, Pinal County has emphasized the need for an efficient multimodal transportation system with special priority given to expanded public transit capacity (Pinal County 2001).

The *Pinal County Comprehensive Plan* does not provide details on planned improvements to the county roadway network but instead refers to two previous documents which further describe existing conditions, level-of-service, and identified transportation improvement projects. In April 2000, the CAAG adopted an RTP that identifies deficiencies along the regionally significant roadways and recommends necessary improvements for short-term, mid-term, and long-term transportation improvement plans. The 2000 Pinal County Transportation Plan discusses expected land use and transportation impacts of comprehensive plan implementation as well as the role of planning partnerships between human service providers, major employers, and municipalities throughout the county (Pinal County 2001). Both of these documents were produced by a private transportation-planning contractor, and were unavailable for review at the time of this assessment.

Yavapai County

The transportation element of the Yavapai County General Plan calls for transportation planning that complements the overall vision for the county. As such, the transportation element calls for improved efficiency of limited transportation corridors, maintenance of scenic routes, and the exercise of restraint in the construction of new routes in order to preserve the rural character of the county as well as the natural habitat. Although Yavapai County measures over 100 miles in its width and length at its extremes, there is a limited number of major transportation corridors within the county's large geographic area. Two major highway corridors running north/northeasterly through the county, SR 89 and I-17, serve the majority of Yavapai County communities, cities, and towns. Five other state highways, SR 179, SR 260, SR 89A, SR 69, and SR 169, provide connecting corridors for the Verde Valley area and the central Yavapai region (Yavapai County 2003).

Several large residential developments in Chino Valley and north of the Paulden community have been proposed and are expected to have a significant impact on SR 89 North, necessitating improvements. In the short term, ADOT proposes to complete the widening of SR 89 to a 5-lane section from the Prescott Lakes Parkway intersection to just north of the Willow Lake Road intersection. Following an inter-governmental agreement with the City of Prescott, ADOT planned to begin construction of the widening in 2004. Other improvements for North SR 89 and for the intersection area of SR 89 and SR 69, such as traffic roundabouts, are in long-range planning. In addition to these scheduled road improvements, the *Yavapai County General Plan* describes ongoing efforts by the towns of Prescott, Prescott Valley, and Sedona to develop alternative transportation networks in support of pedestrians and bicyclists (Yavapai County 2003).

4.4 Internal modes, barriers and access issues

At present, there are few, if any, prominent barriers to access within the Tonto National Forest. Unlike other forests in Arizona, there is a limited amount of private land abutting the TNF boundary. This limits the number and nature of access issues faced by private property owners seeking access to the forest. Similarly, the TNF does not regularly experience barriers associated with inclement weather, with the possible exception of seasonally impassible roads in the extreme northern portions of the forest. Currently, the primary barriers to access throughout the forest are simply due to extremely difficult terrain. Additionally, the forest currently maintains four individual wilderness areas. Access to these areas is regulated to prevent damage to sensitive areas (Alford, pers. comm.).

Currently, there are no significant differences in access afforded to different user groups on the TNF. From the perspective of Forest Planners, there has been a greater change in various percentages of modes of travel than in the overall number of forest visitors. In other words, the TNF has not experienced a significant increase in the numbers of individuals seeking access to the forest but has seen a substantial increase in certain modes of travel, most notably OHV use. Similarly, the majority of recent public feedback with respect to access issues on the TNF has been directed toward proposed OHV restrictions (Alford, pers. comm.).

There are currently no road projects scheduled for the TNF.

4.5 Key issues for forest planning and management

The FS has long been aware of the considerable impact of internal roads 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 tends 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, and 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 physical and ecological impacts, considerable attention has also been given to the direct and indirect socioeconomic consequences of road networks (or lack thereof) within the national forests. 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 growing OHV use.

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 TNF 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 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. Every county within the area of assessment experienced much greater increases in VMT over the same period with the greatest gains reported in Pinal and Yavapai Counties (100% and 97% respectively). Despite a smaller increase in VMT between 1990 and 2000, Maricopa County reported far and away the greatest amount of traffic with 67 million miles traveled in 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 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, the TNF is bound to be affected by increased traffic flow, congestion, and longer commute times, particularly surrounding the Phoenix Metropolitan Area.

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 of individual residents. Furthermore, studies have shown that transportation infrastructure is directly related to economic stability in that economic diversity, and therefore 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 Tonto National Forest (TNF) are examined. Land ownership and use are both variables that 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 TNF contains a relatively high percentage of private and State Trust land, both of which stand to have a considerable impact on future forest planning. Pinal and Yavapai Counties are particularly notable for their relatively high amounts of private and State Trust land. Each of these factors contributes to a land use policy environment that is increasingly focused on the economic and environmental sustainability of urban development in the face of increasing calls for the preservation open space. Additionally, the sustainability of regional water supplies will continue to have an impact on the nature and pace of development, particularly in and around rapidly expanding municipalities.

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 Tonto National Forest 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. The forests have added or released land regularly in an attempt to consolidate land within the outer boundaries of the national forests (Baker et al. 1988). Several House and Senate initiatives have involved land transfers around the TNF, specifically HR 622 which earmarked the exchange of 108 acres of FS land for nearly 500 acres of non-federal land near

Young, Arizona. The bill also suggested that just over 220 acres of federal land near the Payson Municipal Airport be exchanged for roughly 150 acres of private land near the Montezuma Castle National Monument and a private parcel of land just over 100 acres from within the boundaries of the Coconino National Forest. The bill became law in December, 2003. Earlier, Senate initiative S. 1752 recommended a transfer of land totaling about 550 acres to the private sector to replace facilities that, although once on the edges of local communities, had moved through town growth to the middle of commercial districts not easy accessible by visitors. However, much of the land in the TNF, specifically in Maricopa County, is immune from development (Maricopa 2001).

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 17 million acres of land in the four-county area of assessment for TNF. 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 significant amount of State Trust 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 TNF differs from overall ownership patterns for the state of Arizona. For example, the area contains a relatively large amount of private acreage compared to the state (23% versus 18% respectively) as well as a considerable amount of State Trust land (18% versus 13% respectively). Both 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 six individual counties within the area of assessment. Yavapai and Pinal Counties are notable for their relatively substantial amounts of private and State Trust land. Maricopa County also contains a relatively high percentage of private land. Gila County contains both the highest percentage of land owned by Native American entities (37.89%) as well as the greatest percentage of land held by the FS (55.44%). The FS also manages a considerable portion of land in Yavapai County (38.17%). Meanwhile, Gila County reports the least amount of private land (3.43%) and State Trust land (1.02%) of all counties within the area of assessment.

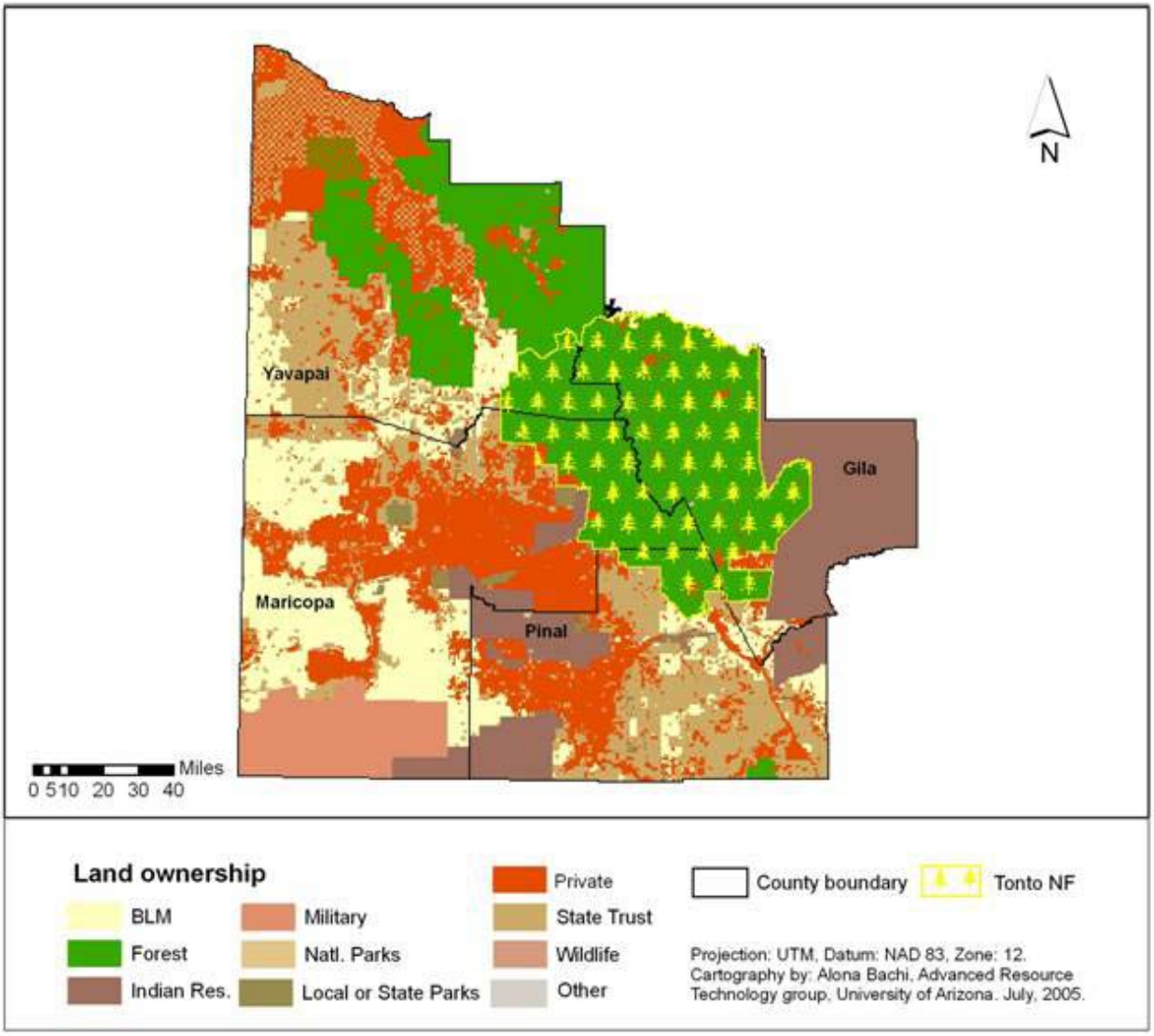
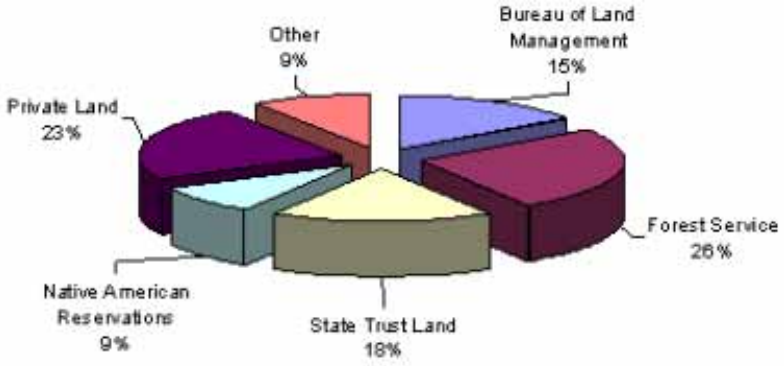


Figure 16. Land Ownership within Area of Assessment



Source: Arizona State Land Department

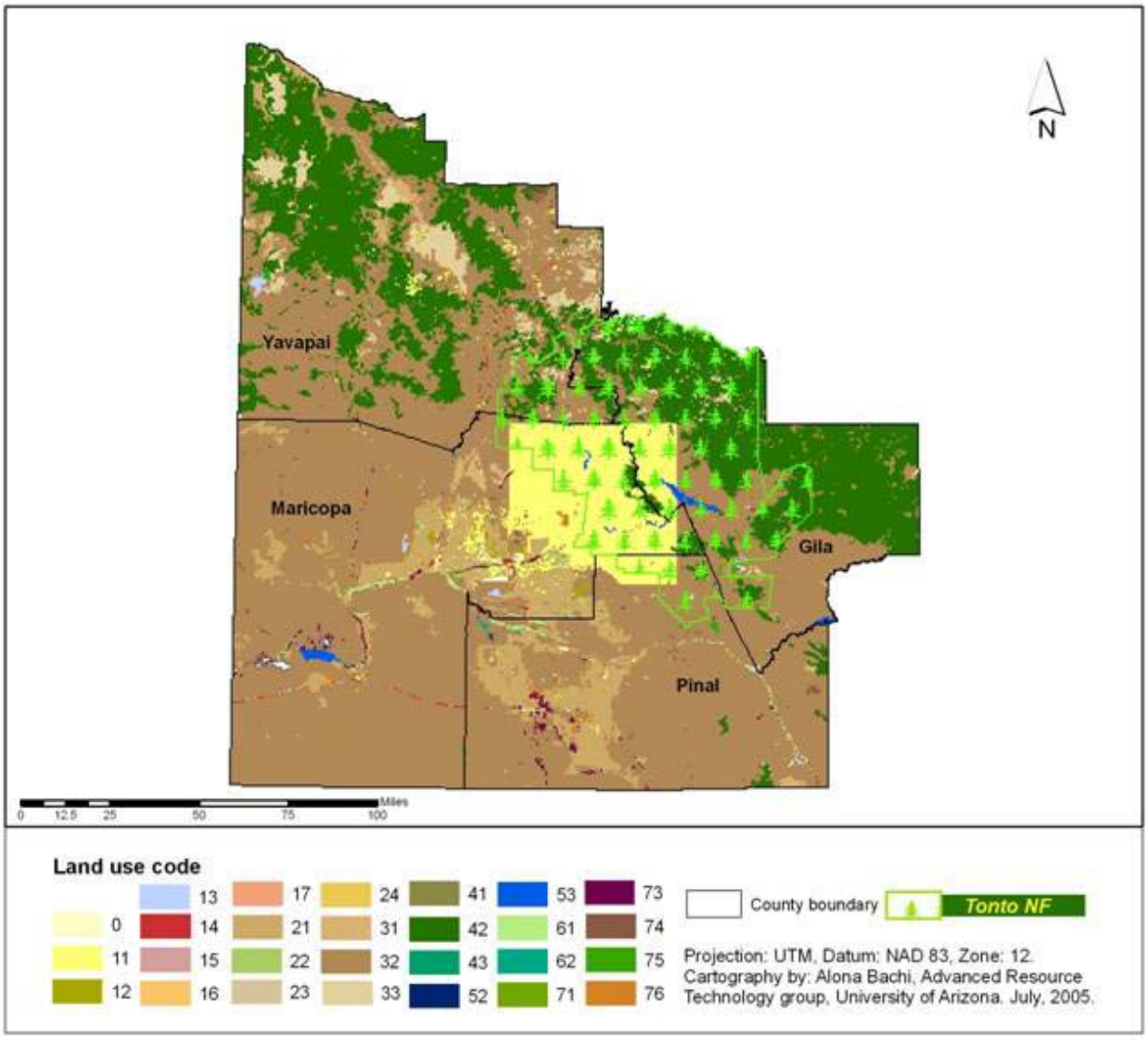
Figure 17. Percent Ownership by Major Land Owners in Four-County Area of Assessment

Table 27. Land Ownership by County, 2005

Land Ownership	Acres	Percent
Maricopa County		
Barry Goldwater Air	819,366.89	13.88%
BLM	1,631,562.36	27.64%
Bureau of Reclamation	13,811.93	0.23%
County Land	3,945.01	0.07%
Fort McDowell Indian Res.	24,868.97	0.42%
Game and Fish	5,337.47	0.09%
Gila Bend Indian Res.	452.6	0.01%
Gila River Indian Res.	96,024.92	1.63%
Luke A.F.B.	2,822.61	0.05%
Military Res.	2,447.58	0.04%
Painted Rock Wildlife Ref.	5,056.07	0.09%
Parks and Recreation	100,939.82	1.71%
Private Land	1,742,282.54	29.52%
Salt River Indian Res.	53,710.98	0.91%
State Trust Land	649,563.37	11.01%
Tohono Indian Res.	95,002.2	1.61%
Tonto NF	655,026.41	11.10%
Williams A.F.B.	2.30	0.00%
TOTAL	5,902,224.03	100.00%
Pinal County		
Ak-Chin Indian Res.	21,449.98	0.62%
BLM	374,035.32	10.88%
Bureau of Reclamation	40,204.42	1.17%
Casa Grande N.M.	469.42	0.01%
Coronado NF	23,281.87	0.68%
County Land	3,676.12	0.11%
Game and Fish	52.93	0.00%
Gila River Indian Res.	276,028.20	8.03%
Hohokam Pima N.M.	1,574.81	0.05%
Indian Allotments	1,090.45	0.03%
Military Res.	7,300.52	0.21%
Parks and Recreation	10,527.79	0.31%
Private Land	877,267.20	25.52%
San Carlos Indian Res.	133,544.31	3.88%
State Trust Land	1,204,920.53	35.05%
Tohono Indian Res.	266,350.41	7.75%
Tonto NF	195,735.84	5.69%
TOTAL	3,437,510.12	100.00%

Land Ownership	Acres	Percent
Gila County		
BLM	66,386.65	2.16%
Bureau of Reclamation	204.36	0.01%
Game and Fish	105.56	0.00%
Private Land	105,218.18	3.43%
San Carlos Indian Res.	633,998.74	20.67%
State Trust Land	31,220.90	1.02%
Tonto NF	1,700,171.68	55.44%
Tonto NM	1,107.14	0.04%
White Mountain Apache Res.	528,141.70	17.22%
Yavapai Tonto Apache	81.74	0.00%
TOTAL	3,066,636.65	100.00%
Yavapai County		
BLM	605,411.62	11.64%
Bureau of Reclamation	8,682.85	0.17%
Coconino NF	425,932.99	8.19%
County Land	5,784.83	0.11%
Game and Fish	1,033.74	0.02%
Hualapai Indian Res.	851.14	0.02%
Indian Allotments	254.12	0.00%
Kaibab NF	25,380.40	0.49%
Military Res.	257.75	0.00%
Montezuma Castle	534.34	0.01%
Montezuma Well	270.16	0.01%
Other	8.24	0.00%
Parks and Recreation	403.81	0.01%
Prescott NF	1,211,345.57	23.30%
Private Land	1,324,643.23	25.47%
State Trust Land	1,265,474.56	24.34%
Tonto NF	321,677.16	6.19%
Tuzigoot NM	43.24	0.00%
Yavapai Apache Ind. Res.	617.61	0.01%
Yavapai Prescott Ind. Res.	1,378.16	0.03%
TOTAL	5,199,985.52	100.00%

Source: Arizona Land Resource Information Service



* The apparent G.I.S. data anomalies in Maricopa, Gila and Pinal Counties (LULC 11, Residential) are likely the result of sampling and digitizing procedures that compile previous land use data from secondary sources for the specific area.
http://sagemap.wr.usgs.gov/ftp/n_dakota/NDGS/1_250_LULC.htm

Figure 18. 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 four 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. Maricopa County reported by far the greatest amount of residential cover at 15.80% compared to 7.13% for the assessment area as a whole. Maricopa County also reported the highest amount of commercial, services, industrial, and urban land cover of all counties in the area. Shrub, brush, and mixed range constituted the predominant land cover in three of the four counties in the area of assessment. The lone exception was Gila County, where evergreen forest land was the predominant land cover. Yavapai County also reported significant evergreen forest land cover (39.11%). Pinal County reported the largest percentage of crop and pasture land cover (13.98%).

Table 28. Land Cover by County and Assessment Area, 1990

Land Use Code	Coverage Type	Gila County		Maricopa County		Pinal County	
		Acres	Percentage	Acres	Percentage	Acres	Percentage
0	Unknown / Background	1,397	0.05%	13,922	0.24%	1,467	0.04%
11	Residential	177,606	5.79%	932,705	15.80%	116,038	3.38%
12	Commercial and services	635	0.02%	35,827	0.61%	3,511	0.10%
13	Industrial	3,771	0.12%	13,623	0.23%	5,510	0.16%
14	Transportation, communication, utilities	112	0.00%	16,202	0.27%	9,302	0.27%
15	Industrial and commercial complexes	0	0.00%	32	0.00%	0	0.00%
16	Mixed urban or built-up land	139	0.00%	2,741	0.05%	138	0.00%
17	Other urban or built-up land	516	0.02%	11,515	0.20%	2,399	0.07%
21	Cropland and pasture	3,296	0.11%	568,916	9.64%	480,601	13.98%
22	Orchards, groves, vineyards, nurseries, and ornamental horticultural areas	0	0.00%	26,474	0.45%	4,837	0.14%
23	Confined feeding operations	11	0.00%	4,653	0.08%	1,751	0.05%
24	Other agricultural land	23	0.00%	717	0.01%	374	0.01%
31	Herbaceous rangeland	7,350	0.24%	41,435	0.70%	13,962	0.41%
32	Shrub and brush rangeland	1,051,802	34.30%	4,036,382	68.39%	2,649,065	77.06%
33	Mixed rangeland	37,833	1.23%	32	0.00%	0	0.00%
41	Deciduous forest land	0	0.00%	0	0.00%	0	0.00%
42	Evergreen forest land	1,750,257	57.07%	52,332	0.89%	50,467	1.47%
43	Mixed forest land	286	0.01%	0	0.00%	279	0.01%
52	Lakes	0	0.00%	135	0.00%	0	0.00%
53	Reservoirs	23,153	0.75%	26,279	0.45%	1,847	0.05%
61	Forested wetland	206	0.01%	21,089	0.36%	23,472	0.68%
62	Non-forested wetland	31	0.00%	1,211	0.02%	6,347	0.18%
71	Dry salt flats	0	0.00%	797	0.01%	0	0.00%
73	Sandy areas not beaches	2,424	0.08%	26,915	0.46%	32,406	0.94%
74	Bare exposed rock	274	0.01%	12,078	0.20%	9,807	0.29%
75	Strip mines, quarries, gravel pits	5,145	0.17%	5,988	0.10%	5,577	0.16%
76	Transitional areas	368	0.01%	38,412	0.65%	18,354	0.53%
77	Mixed Barren Land	0	0.00%	11,813	0.20%	0	0.00%
	Total	**3,066,637**	**100.00%**	**5,902,224**	**100.00%**	**3,437,510**	**100.00%**

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

Land Use Code	Coverage Type	Yavapai County		Assessment Area	
		Acres	Percentage	Acres	Percentage
0	Unknown / Background	2,549	0.05%	19,335	0.11%
11	Residential	28,107	0.54%	1,254,457	7.13%
12	Commercial and services	3,431	0.07%	43,404	0.25%
13	Industrial	10,397	0.20%	33,301	0.19%
14	Transportation, communication, utilities	13,348	0.26%	38,964	0.22%
15	Industrial and commercial complexes	0	0.00%	32	0.00%
16	Mixed urban or built-up land	1,610	0.03%	4,628	0.03%
17	Other urban or built-up land	851	0.02%	15,281	0.09%
21	Cropland and pasture	94,142	1.81%	1,146,955	6.51%
22	Orchards, groves, vineyards, nurseries and ornamental horticultural areas	86	0.00%	31,398	0.18%
23	Confined feeding operations	90	0.00%	6,505	0.04%
24	Other agricultural land	1,412	0.03%	2,526	0.01%
31	Herbaceous rangeland	54,394	1.05%	117,140	0.67%
32	Shrub and brush rangeland	2,563,774	49.30%	10,301,023	58.51%
33	Mixed rangeland	343,004	6.60%	380,868	2.16%
41	Deciduous forest land	315	0.01%	315	0.00%
42	Evergreen forest land	2,033,524	39.11%	3,886,580	22.07%
43	Mixed forest land	1,214	0.02%	1,778	0.01%
52	Lakes	216	0.00%	351	0.00%
53	Reservoirs	4,441	0.09%	55,720	0.32%
61	Forested wetland	0	0.00%	44,768	0.25%
62	Non-forested wetland	0	0.00%	7,590	0.04%
71	Dry salt flats	0	0.00%	797	0.00%
73	Sandy areas not beaches	1,585	0.03%	63,330	0.36%
74	Bare exposed rock	13,536	0.26%	35,695	0.20%
75	Strip mines, quarries, gravel pits	13,387	0.26%	30,097	0.17%
76	Transitional areas	14,571	0.28%	71,705	0.41%
77	Mixed Barren Land	0	0.00%	11,813	0.07%
	Total	**5,199,986**	**100.00%**	**17,606,356**	**100.00%**

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 should 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. 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 format of the documents. While some offer a broad 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 forest.

Gila County Comprehensive Master Plan

Like many areas throughout the Mountain West, current patterns of existing land use in Gila County are rooted in the history of settlement by miners, ranchers, and loggers. The influence of mining activity on patterns of development is still seen in communities such as Hayden, Winkelman, Miami, and Globe, compact towns characterized by platted grid street networks and historic downtown cores. By comparison, the rural patterns of development that have been maintained in the northern communities of Young, Pine, and Strawberry reflect a past rooted in logging and ranching. While mining and ranching continue to make significant contributions to the county's overall economy, industries supported by recreation and tourism are becoming increasingly important and are likely to influence development patterns in the future (Gila County 2003).

Gila County covers an area of approximately 3,052,096 acres, just 4% of which (124,000 acres) is private property. 18,500 acres of private property in the county lie within incorporated municipalities such as Payson, Globe, and Miami. The remaining 105,000 acres of private property are held in parcels scattered around unincorporated communities such as Pine, Strawberry, Star Valley, Gisela, and Young as well as within larger land areas managed by the USFS and the BLM. In the southern part of Gila County, large parcels of private land are owned by ranching and mining interests north and west of Miami. Over ninety-five percent of the county's land area is collectively managed by the Fort Apache and San Carlos Apache Indian Reservations (38%), Tonto National Forest (55%), BLM and National Park Service (1.7%), and other local and state government agencies (Gila County 2003).

The limited amount of private land combined with moderate population growth in Gila County has resulted in a continuation of historical development patterns in unincorporated areas of the county. Recent development has been concentrated in northern portions of the county in the towns of Payson and Globe as well as the unincorporated areas surrounding Pine, Strawberry, Tonto Basin, and Star Valley. This concentrated growth has been due in part to the practices of developing pockets of residential use on vacant parcels as well as subdividing and lot splitting of scattered private properties (Gila County 2003).

The *Gila County Comprehensive Master Plan* was adopted by the Board of Supervisors on November 4, 2003. In addition to a discussion of existing conditions and land use preferences for the remote and sparsely inhabited areas of the county, the plan also includes five distinct "Area Land Use Plans" (one each for the northwest, northeast, west central, east central, and southern portions of the county) as well as individual "Community Land Use Plans" for the unincorporated communities of Pine, Strawberry, Star Valley, Tonto Basin, Young, Gisela, and Claypool. Rather than an exhaustive discussion of these more detailed plans, this assessment is limited to the more generally applicable policies and land use designations contained in the land use element of the *Gila County Comprehensive Master Plan*. Area and community land use plans can be reviewed at http://co.gila.az.us/default.aspx.

- Residential land use

The *Gila County Comprehensive Master Plan* provides for eight distinct residential designations based on the density of dwelling units. These designations range from very low-density rural detached residential development (one dwelling unit per ten-or-more acres) to high-density suburban residential detached or attached development (more than ten dwelling units per acre). Much of the residential development outside of unincorporated communities has been the result of lot splitting on large parcels and historic land grants and purchases. Many of these areas are located within the TNF, are accessed by unimproved forest roads, and have little, if any, developed infrastructure. Potable water is either hauled or provided by private wells, and waste water is disposed of in individual septic tanks.

In rural areas of northern and eastern Gila County, residential development is characterized by a mixture of seasonal, secondary, and full-time site-built and manufactured homes. Meanwhile residential development in southern portions of the county is concentrated in the Tonto Basin, Lake Roosevelt, and Dripping Springs area. The plan states that the southern areas of the county have a significantly lower number of seasonal and part-time residences (Gila County 2003).

- Commercial and industrial land use

The plan designates two distinct types of commercial land use: neighborhood commercial and community commercial. Neighborhood commercial areas are to be no larger than five acres and located at intersections of local roads. They are intentionally limited to serving the needs of residents in the immediately surrounding unincorporated areas. Community commercial land uses, such as grocery stores and supporting commercial services, are intended to provide for both community and regional commercial needs.

Similarly, industrial land uses are divided into two categories: light industrial and heavy industrial. Light industrial uses include low-intensity employment, manufacturing, and fabrication activities buffered from residential uses and are generally not served by heavy truck or delivery traffic. Heavy industrial uses include heavy manufacturing, smelting, mining, and other tasks that involve significant noise, dust, odor or other emissions. Historically, significant portions of southern Gila County have been designated as heavy industrial areas due to the substantial impact of the mining industry in the region (Gila County 2003).

Regarding the impact of land use on forest management, the plan notes that the *Gila County Land Use and Resource Policy Plan for Public Lands* was adopted by the Board of Supervisors in February 1997. It is described as a "tool to assist county, state, and federal decision makers in protecting, evaluating and enhancing Gila County's customs, culture, social sustainability, economy, tax base and overall public lands ecosystem health" (Gila County 2003). Copies of this plan were not available at the time of this assessment.

Maricopa County Comprehensive Plan

Land use in Maricopa County has undergone considerable change in recent decades due primarily to a dramatic increase in population. Historically, the agriculture industry has been a key determinant of county land use. Currently however, the county's agricultural land base is being rapidly converted to support urban uses. Meanwhile, reliance on automobile transportation by a growing number of residents has led to a significant expansion of the county roadway network, a factor that has resulted in patterns of dispersed development. For example, housing and employment centers have not often been well-coordinated, leading to increased congestion, longer commuting times, and a general concern for the future quality of life for county residents (Maricopa County 2002).

Maricopa County holds comprehensive planning and zoning authority for over 3,000 square miles of land. The Land Use element of the *Maricopa County Comprehensive Plan* seeks to promote a more efficient land use pattern in order to attract high-quality development, provide for projected growth, maximize the utility of infrastructure investments, and maintain the county's quality of life. The comprehensive plan identifies nine distinct land use designations intended to direct future land development within Maricopa County. Given the considerable area under county jurisdiction, as well as the rapid pace of development and population growth, the land use designations identify generalized land use, development or preservation concepts, rather than specific land uses or densities.

- Incorporated Areas

Maricopa County has no authority to regulate land use within incorporated areas. However, the comprehensive plan encourages the location of all new development within, or in close proximity to, established incorporated areas.

- Established Communities

Many established communities exist within unincorporated areas of Maricopa County. These communities typically have an established character and pattern of development. The intent of the Established Communities designation is to recognize such traits and ensure that the current character and lifestyle within these communities is maintained. Established communities in Maricopa County include New River, Desert Hills, Morristown, Tonopah, Laveen, Palo Verde, Wittman, Arlington, Little Rainbow Valley, Chandler Heights, Mobile, Circle City, Wintersburg, Agua Caliente, Cotton Center, Hopeville, Santa Maria, Norton's Corner, Gladden, Perryville, Liberty, Sunflower, Harquahala Valley, Hassayampa, Paloma, Aguila, and Sentinel.

- General Plan Development Area

General Plan Development Areas are those areas that are likely to be annexed by incorporated cities or towns as part of adopted municipal general plans. Under A.R.S. §11-831, a rezoning or subdivision plat of unincorporated areas will be guided by the adopted general plan and zoning standards of the concerned city or town.

- Rural Development Area

Rural Development Areas are typically vacant or rural in character, with minimal, if any, infrastructure or public services. Within such areas, residential development is allowed, but should not exceed one dwelling unit per five acres except where higher density zoning or an approved Development Master Plan exists. These areas are generally serviced by wells and on-site septic systems and do not have the level of access to schools, libraries, commercial industries, or parks that are common in more urban areas. Common uses in Rural Development Areas include residential, agriculture, agricultural support services, ranching, hunting clubs, recreational areas, dude ranches, RV parks, churches, home-based businesses, and small-scale cottage industries. Given the rate of conversion of agricultural land in previously rural areas, the general plan identifies specific methods of providing technical guidance to ensure the future viability of agriculture in Maricopa County. These methods include the transfer of development rights to areas more appropriate for urban development, encouragement of infill development and the directing of high density development toward urban service areas, establishment of land use buffers to mitigate the impact of urban development on agricultural resources, and provision of incentives to promote the preservation of agricultural lands such as clustered development and community-supported farms.

- Municipal Planning Areas

Municipal Planning Areas are unincorporated areas identified by surrounding municipalities as being of future interest, but which are not presently included in adopted general plans. As long as such areas remain unincorporated, they remain under the jurisdiction of Maricopa County.

- Dedicated Open Space

The majority of Dedicated Open Space areas are under public ownership and exhibit considerable environmental and physical qualities such as mountains and foothills, rivers and washes, canals, desert vegetation, wildlife habitat, and cultural resources. In Maricopa County, dedicated open spaces exist within regional parks, wilderness areas, wildlife areas, and the TNF. Together, these open space areas cover nearly 2,000 square miles, providing numerous recreation opportunities and visual resources for the residents of Maricopa County.

- County Area Plans

County Area Plans apply to areas outside municipal general plans that are contained within a county area land use plan. As long as they are unincorporated, these areas will maintain rural densities unless otherwise provided for in an approved Development Master Plan. Existing Area Plans within Maricopa County include the New River Land Use Plan, Goldfield Land Use Plan, Grand Avenue Land Use Plan, Little Rainbow Valley Land Use Plan, Tonopah Land Use Plan, Williams Regional Planning Study, Desert Foothills Policy and Development, Wickenburg Highway Scenic Corridor Development Guide, and the White Tanks-Agua Fria Policy and Development Guide.

- Proposed Open Space

There are nearly 650 square miles of Proposed Open Space in the unincorporated areas of Maricopa County. Approximately 350 square miles are publicly-owned. Privately-owned land, including that under the management of the State Land Department, accounts for approximately 290 square miles. If acquired for the public domain, these areas will be planned for the protection and maintenance of their recreational, aesthetic, and biological values and will be managed in such a way as to ensure public access and continued preservation. Potential methods of acquiring lands for proposed open space include fee simple purchase, dedication/donations, conservation easements, preservation easement, purchase of development rights, hillside ordinances, purchase of right-of-way easements, cluster development, environmentally sensitive land designations, conveyance of property to ordinance homeowner associations, right of first refusal, the Arizona Preserve Initiative, density transfers, lease/use agreements, and performance based zoning.

- Existing Development Master Plans

A number of Existing Development Master Plans have been established within Maricopa County. Each of these development master plans have been built out, are under construction, or have been formally proposed to county planners. Currently Existing Development Master Plans include, but are not limited to, Belmont, Sun City, the Villages at Desert Hills, Dreamland Villa, Sun City West, Tonto Hills, Leisure World, Sun Lakes Tonto Verde, Rio Verde, and The Preserve.

A detailed map of land use within Maricopa County is available at http://www.maricopa.gov/planning/compln/plan/plan.pdf

Pinal County Comprehensive Plan

The *Pinal County Comprehensive Plan* stresses the cultural and economic importance of managing land use in such a way as to protect the county's natural resource base. Although traditional land uses such as ranching, farming, and mining have experienced a gradual decline throughout the county, an increase in urban, commercial, and industrial developments has placed increasing pressure on the area's natural resources. Protection of desert open space, wildlife corridors, and undeveloped mountain areas is seen as a critical step towards sustaining a rural lifestyle as well as the economically vital components of retirement housing and tourism (Pinal County 2001).

Currently, Pinal County covers 3,441,920 acres, portions of which lie within the Gila River, Ak-Chin, Tohono O'odham, and San Carlos Native American communities. In addition to several rapidly growing incorporated cities and towns, the county is home to the unincorporated communities of Arizona City, Dudleyville, Gold Canyon, Maricopa, Oracle, Picacho, Queen Valley, Red Rock, San Manuel, and Stanfield. The comprehensive plan specifically mentions maintenance of mountain views as vital to the long-term economic and environmental interests of the county. These mountains include the San Tans, Superstitions, Sierra Estrella, Santa Catalina, Table Top, Palo Verde, Casa Grande, Sacaton, Picacho Peak, Sawtooth, Tortolita, Black, and Samaniego Hills (Pinal County 2001).

Adopted in December 2001 and amended in December 2004, the *Pinal County Comprehensive Plan* is seen as an important tool for managing land use during a period of dramatic growth and transition. In it, planners call for a reexamination of planning methods in order to ensure the sustainability of both the regional economy and standard of living in light of a projected sixty-percent increase in county population over the next decade. Stated objectives in the land use element of the comprehensive plan include the following: 1) more efficient land use enabled by clustered development, architectural controls and development standards; 2) an improved county roadway network that effectively links residential and employment centers while retaining panoramic views, natural washes, and wildlife habitat; and 3) a diverse mix of employment and housing opportunities that balances resource conservation and development needs. The comprehensive plan divides land use into several designations. The intent of the land use categories is to determine development patterns that will be both economically and environmentally sustainable during a period of rapid urban growth (Pinal County 2001).

"Rural Areas" are areas suitable for lower-density development and uses such as agriculture, grazing, mining, sand and gravel operations, large acreage home sites, and small farms. Multi-family development is discouraged in rural areas and single-family residency should not exceed one dwelling unit per acre. The "Transitional Area" designation is used for areas that are predominantly rural but are expected to serve as future centers of growth. A primary purpose of this designation is to retain existing large tracts for potential development. Here again, maximum residential density is one single-family unit per acre. A "Foothill Area" designation is intended to preserve sensitive areas by limiting foothill development to low densities that are in harmony with the natural landscape. Maximum density is one dwelling unit per acre. The "Rural Community Area" designation signifies a rural area with the capacity to provide goods, services, and increased residential uses. Growth is typically slower in these areas and is dependent on the level of public services, facilities, and infrastructure. Future rural community areas should be designed to allow for commercial uses, governmental activity, health and educational facilities, industrial uses, and parks and open space. For Planned Area Developments (PADs), under this designation, the maximum density is three-and-a-half single-family dwelling units per acre. This designation also allows for five attached homes (town houses, patio homes) per acre or twelve multiple-family units (apartments) per acre (Pinal County 2001).

The **"**Urban Area" designation is applied to areas with higher-density residential development and the existing infrastructure to support larger populations. Urban areas primarily include towns and cities and are likely to account for the majority of future growth in Pinal County. The purpose of the Urban Area designation is to encourage the provision of high quality, efficient public services as well as diverse housing and employment opportunities. Maximum density guidelines are three-and-a-half dwelling units per acre for PAD, five du/ac for attached homes, and twelve du/ac for multiple-family units. A "Commercial Activity Center" designation allows intense concentrations of commercial and high density residential development. Land uses include retail stores and services, office development, business parks, and high-density, multi-family development. An expected benefit of this designation is the proximate location of housing and employment centers. Multiple-family housing density ranges from twelve to twenty du/ac with an ideal density of sixteen du/ac. An "Interchange Mix Area" designation caters to the needs of travelers and businesses along the county's highways. Land uses include, but are not restricted to, hotels and motels, vacation resorts, restaurants, RV parks, service stations, and other small-scale commercial uses. "Corridor Mix Areas" are similar in that they provide for a variety of land uses and intensities oriented toward and compatible with interstate highways. In addition to the land uses prescribed for Interchange Mix Areas, Corridor Mix Areas may include industrial parks, research and development facilities, light industry, warehousing, and recreation facilities. Open space, landscaping, and noise buffering are encouraged to ensure compatibility with adjacent land uses and traffic (Pinal County 2001).

An **"**Industrial Area" designation applies specifically to areas suitable for industrial and other intense land uses. The plan specifies that these areas will be concentrated and separated from residential and

commercial uses in order to manage the impact of heavy truck traffic, noise, vibration, light, dust, and odors. A "Mining Area" designation applies only to those areas where mineral resources have been identified or are likely to be identified in the future. The designation recognizes the rights applied to exploration, mining, and mineral resource processing. All mining operations within the county are required to comply with federal, state, and local laws providing environmental protection. "Development Sensitive Areas" are intended to preserve natural resources and open space in areas that are particularly sensitive. Potential land uses include parks, ranching, livestock grazing, conservation leases, guest ranches, and single-family uses. Density is not to exceed three-tenths (.3) dwelling unit per acre. The "Natural Resource Area" designation is applied to private and public lands, which may be enhanced by the maintenance of large, undivided parcels. Land uses may include river corridors, natural areas, livestock grazing, conservation leases, national forests, wilderness areas, and State Trust lands (Pinal County 2001).

A detailed map of land use within Pinal County is available at http://www.co.pinal.az.us/PlanDev/PDCP/files/CompPlanFinal2004.pdf

Yavapai County General Plan

Like that of Coconino County, Yavapai County's General Plan of 2003 states the overall objective of promoting development that maintains the region's traditionally rural character while adequately planning for expected growth. The challenge of doing so is heightened given the fact that Yavapai County's population growth over the last two decades has more than doubled that of Coconino County and has been nearly 20% greater than overall population growth for the state of Arizona over the same period. This substantial growth in the County's population has coincided with a decline in traditional land uses such as ranching, agriculture and mining and has led to significant expansions of existing municipalities (Yavapai County 2003).

The majority of land in Yavapai County is publicly owned and managed by Federal and State agencies. 38% of total county land is under the jurisdiction of the USFS, 24% is managed by the AZSLD, and 11.6% is controlled by the BLM. Approximately 25% of land in Yavapai County is privately owned. USFS lands are concentrated in the eastern and southern portions of the county, and BLM lands are primarily located in the southwestern and south-central areas of the county. AZSLD holdings are also concentrated in the southern areas but are additionally present in checkerboard sections throughout northern Yavapai County.

In addition to Federal and State agencies, twelve other jurisdictions control limited portions of land within the county. Nine of these jurisdictions are incorporated cities and towns, and three are Tribal Reservations (Yavapai-Prescott Indian Reservation, Yavapai-Apache Reservation, and Hualapai Indian Reservation). As of 2002, these twelve jurisdictions held approximately 236 square miles of land, comprising 2.9% of the county's total land base (Yavapai County 2003).

Many of the county's current planning efforts are directed toward the designated "major growth areas." According to the *Yavapai County General Plan*, 2000 Census data suggest that 50% of the total county population lives in the Central Yavapai Region and another 32% live in the Verde Valley area. The areas surrounding Prescott and Prescott Valley have grown dramatically since the 1970s, largely as a result of the sale and conversion of former Fain family ranch holdings. Additionally, planned area developments such as Yavapai Hills, Hidden Valley Ranches, and Sandretto Hills have been annexed into the City of Prescott. Similar conversions of ranch and farm properties have led to substantial residential development in the Verde Villages, Chino Valley, and along the State Highway 69 and Williamson Valley Road corridors. This trend is expected to continue as other large ranches in Yavapai County are currently being proposed as sites for future development (Yavapai County 2003).

- Residential land use

The *Yavapai County General Plan* states that approximately 96% of the land in unincorporated Yavapai County is zoned for residential land use. This land is subject to two-acre minimum zoning and comprises 3.7 million acres of government-owned property and over 1 million acres of private property. Land use referred to as Rural Residential is primarily located in the southern and western portions of unincorporated Yavapai County. Rapid growth has also been experienced in areas referred to in the plan as "municipal influence areas." These areas are primarily residential developments adjacent to, but outside, the boundaries of existing municipalities.

Effective planning is made more difficult by the prevalent practice of lot-splitting. The plan states that between April 2000 and April 2001, 1,760 parcel splits were recorded in Yavapai County, accounting for 90% of home sites developed during the period. The result is that many large, private holdings have been continuously split into numerous two-acre parcels. Under current state law, the county has little authority to require infrastructure or dedication of open space for split parcels, nor does it review split properties for suitable access, water, sanitation, drainage, or available utilities. Importantly, state law also permits installation of "exempt wells." Wells qualify as exempt if they have less than thirty-five gallons per minute pumping capacity. This includes the vast majority of wells for residential consumption as wells with three to ten gallon per minute capacity are deemed sufficient for typical households. As a result of parcel splits and well exemption, the plan claims that a large percentage of current land development in unincorporated Yavapai County is "unplanned" (Yavapai County 2003).

- Commercial and industrial land use

The *Yavapai County General Plan* states a preference for general commercial and tourist related businesses to be located along the major intersections found on State Highways 69, 89, 89A, 179, 260 and Interstate 17. Although the mining industry has declined throughout the county, this land use continues in the community of Bagdad as well as various small mining entities in other parts of the county.

Local land use policy issues

The primary land use issues facing county residents within the area of assessment are the result of a transition from an area defined by its rural character to one facing increasing pressure from urban and economic development. While residents and planners prefer to maintain a rural character throughout unincorporated county lands, rapidly increasing populations and expanding city boundaries present challenges for doing so. Despite many similarities, the policies of the county comprehensive plans reviewed for this assessment also offer an array of differing perspectives on how best to deal with these issues.

Preservation of open space is a particularly important land use issue among planners and property owners within the area of assessment. While the counties generally share a common interest in preserving open space, comprehensive plans suggest different motivations for doing so. For more rural areas such as Gila and Yavapai Counties, a high priority is placed on the preservation of open space for the purpose of protecting and sustaining traditional farming and ranching land uses. Meanwhile, areas with rapidly growing urban populations—such as Maricopa and Pinal Counties—emphasize the cultural and environmental value of protected watersheds, mountain areas, wildlife habitat, native vegetation, riparian areas, and archeological sites. Several policies aimed at preserving open space are mentioned in each of the county comprehensive plans. These methods include the encouragement of "clustered development," purchase of development rights, and dedication of land such as conservation and agricultural easements (Gila County 2003, Maricopa County 2002, Pinal County 2001, Yavapai County 2003).

Related to the provision of open space, county land use planners also emphasize the need to ensure efficient and effective land use in areas suitable for development. A commonly mentioned policy for ensuring efficient land use is the encouragement of infill development. Infill development not only limits urban sprawl but also preserves open space and high natural resource value areas. Perhaps most importantly, infill maximizes the efficiency of infrastructure and minimizes traffic congestion, thereby lowering the overall cost of development. Policies aimed at encouraging infill include the provision of density bonuses and density transfers as well as zoning changes allowing for mixed uses in low-density areas (Pinal County 2001, Maricopa County 2002).

Another factor certain to influence the pattern of future development is the conversion of private land within the area surrounding TNF. Combined with the proximity of many rural communities to large parcels of public land, transition of private parcels has led to calls for greater collaboration on land use planning between county and municipal governments and their federal and state counterparts. County residents are particularly interested in coordinating efforts on land acquisition and exchange in order to address a variety of long-term land use concerns.

Proponents of development advocate consolidation and conversion of the current patchwork of State Trust lands in order to guide growth of expanding municipalities. They argue that the exchange and/or sale of these trust lands will alleviate land scarcity and provide much-needed funds for the state educational system. Others promote conversion and/or consolidation of public lands as a means of protecting environmentally and biologically sensitive lands while granting communities greater authority on local land-use decisions such as fire prevention and forest restoration (Pinal County 2001, Maricopa County 2002, Yavapai County 2003). A more detailed discussion of current policy regarding state trust land is presented later in this assessment.

The scarcity of private land has also fueled efforts to capitalize on the current land market and accommodate the need for residential and commercial development resulting from population growth. In response, each of the comprehensive plans reviewed for this assessment includes policies aimed at addressing the detrimental effects of “lot splitting.” Currently, county governments exercise little or no authority over this practice, resulting in developments that circumvent established density guidelines as well as the cost of installing critical infrastructure such as sewers, water, improved roads, and emergency access. In addition to advocating state legislation that would grant counties the power to regulate lot splitting, county planners propose sharing the cost of development with private interests through tools such as impact fees in order to ensure county infrastructure that meets state standards (Pinal County 2001, Maricopa County 2002, Yavapai County 2003).

Undoubtedly, the availability of sufficient water supplies is a growing concern for Arizona communities, particularly those experiencing relatively high rates of population growth. Recently, Governor Napolitano cited the “one-two punch of record drought and record growth” as the greatest threat to the state’s water supply and a serious concern for Arizona’s future development (Napolitano 2004). One of the statewide policies enacted through the Arizona Department of Water Resources (ADWR) is to require developers in Active Management Areas (AMAs) to identify a 100-year assured water supply, participate in banking water, expand use of effluent water, and convert homes and buildings to low water use fixtures. The ADWR has designated five AMAs in the state, three of which extend into the area of assessment for the Tonto NF. They are the Phoenix AMA (5,600 sq. miles), the Pinal AMA (4,000 sq. miles), and the Prescott AMA (485 sq. miles). Additionally, the 1998 *Growing Smarter* legislation passed by the state congress requires the inclusion of a Water Resource element in the comprehensive plans of all counties with a 2000 population of 125,000 or greater. Currently three of the four comprehensive plans reviewed for this assessment contain Water Resources elements that support making water availability a key consideration for all major developments and subdivision applications. Policies for effectively managing future growth with respect to projected water supplies include the development design requirements for low-water plumbing devices, drought-tolerant landscaping, and enhanced recharge of treated effluent for

water table and riparian area restoration (ADWR 2005, Maricopa County 2002, Pinal County 2001, Yavapai County 2003).

5.4 Changes in land ownership affecting the Tonto National Forest

A number of land acquisitions and exchanges proposed in recent years have either directly or indirectly involved lands managed by the TNF. A brief description of information available on these land transactions follows:

- 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 (TNF 2005).

- Cave Creek Administrative Site Land Conveyance (2005)

Portions of the Cave Creek Administrative Site were scheduled to be sold in March 2005. The sale was intended to reduce boundary irregularities as a result of certain parts of the property being isolated by county road easements (TNF 2005).

- 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).

- Montezuma Castle Land Exchange (2003)

In July 2003, a Senate report from Committee on Energy and Natural Resources directed the Secretary of Agriculture to implement house bill H.R. 622. The bill approves the Montezuma Land Exchange which calls for the transfer otherwise known as the Tonto and Coconino National Forests Land Exchange Act. The bill calls for two individual land exchanges. The Montezuma Castle Land Exchange involves the transfer of 222 acres of National Forest System land in the Tonto National Forest adjacent to the town of Payson and near the municipal airport for approximately 157 acres of private land adjacent to Montezuma Castle National Monument and nearly 108 acres of private land known as the Double Cabin Park Lands. Both private parcels involved in the exchange were located within the Coconino National Forest (Domenici 2003).

- Diamond Point/Q Ranch Land Exchange (2003)

The same bill, H.R. 622, called for the transfer of 108 acres of National Forest System land to the Diamond Point Summer Home Association in exchange for 495 acres of private land. The federal land was located approximately eight miles northeast of the city of Payson and was specifically identified for exchange in the TNF Management Plan. The private land, previously the Q Ranch, was the third and final parcel of a major private inholding conveyed to the TNF. The land was initially purchased by the Conservation Fund and optioned to the association for use in the land exchange. There was reportedly broad public support and no opposition throughout the exchange process (Domenici 2003, WLG 2005)

- Bellemont Land Exchange (2003)

In February 2003, the Director of Lands and Minerals for the Southwest Region of the Forest Service issued a Decision Memo approving the exchange of approximately 754 acres of federal land on the Coconino National Forest for approximately 1,160 acres of state land located within the COF, CNF, KNF, PNF, ASNF, and TNF. The land exchange was processed by the State of Arizona through the Arizona Game and Fish Department and was intended to allow the department to directly develop and operate a permanent shooting facility in a safe and efficient manner. Of the ten state parcels offered in exchange for federal lands, two were located in the Pleasant Valley Ranger district of the TNF. The acquisition of this non-federal parcel was intended to reduce boundary irregularities while providing for the key resource values of visual protection and critical wildlife habitat (USFS 2003g).

- Oak Flat Land Exchange (2005)

In May 2005, Representative Rich Renzi introduced House Bill H.R. 2618, entitled the Southeast Arizona Land Exchange and Conservation Act of 2005. On the same day, Senator Jon Kyle introduced S. 1122, the senate version of the same bill. Both versions call for the Delaware-based Resolution Copper Mining, LLC to transfer approximately 4,800 private acres scattered throughout five counties to the federal government in exchange for approximately 460 acres of federal land near the city of Superior. The private lands offered in the exchange include 147 acres of land in Gila County, 148 acres in Yavapai County, 149 acres in Maricopa County, 3,339 acres in Pinal County, and 1,031 acres of land in Santa Cruz County. The private land involved in the exchange involves land with considerable environmental value including parcels along the San Pedro River, grasslands in southern Arizona, and riparian areas north of Cave Creek. The federal lands involved in the exchange, sought by the resolution for their potential copper deposits, contain a popular rock climbing and camping spot known as the Oak Flat area of the Tonto NF. Audubon Arizona and the Sonoran Institute are among proponents of the exchange that believe it will allow federal protection for environmentally sensitive land. On the other hand, opponents, including the Sierra Club, the Maricopa County Audubon Society, and the Friends of Queen Creek, state that proposed mining on the exchanged lands will lead to significant subsidence and that the exchange process sidesteps adequate environmental review. By implementing the exchange as a legislative act, the transfer would avoid many of the requirements for environmental review typically involved in a direct land exchange involving the federal government. Particularly strong opposition to the exchange has been voiced by rockclimbers, birders, and campers who have been visiting the Oak Flat area since 1955, when President Eisenhower withdrew the area from mining activity. The land exchange does have the support of nine of Arizona's ten congressional delegates, Governor Janet Napolitano, and the Superior Town Council largely on the basis of expected economic benefits from increased mining activity (Kyl 2005, Pitzl 2005, Renzi 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 landowners, 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 TNF exemplifies many of the trends and controversial issues involving the economic stability and effective management of public lands. Without question, the continued urban expansion of the Phoenix Metropolitan Area continues to be a primary land use issue, not only for Maricopa County but for the entire state. The land, water, and infrastructure needed to support the Phoenix metro area will continue to influence the management alternatives of the TNF. At the county level, Yavapai County serves as a particularly poignant example of an area engaged in vigorous debate over land management practices. Collected data show that over 87% of land within the county is controlled by the FS, the AZSLD, and private owners. Meanwhile, Yavapai County has seen considerable population and housing growth in recent decades, much of which is attributable to the area's wealth of natural resource amenities.

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 homebuilders over the immediate and long-term value of open space. Meanwhile, all sides of the debate over 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 TNF 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 in 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 TNF in protecting the integrity of area watersheds is likely to become increasingly important given the rates of projected growth throughout the assessment area.

In order to facilitate resolution of current and future land use issues, the TNF 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 various past and current uses of the Tonto National Forest (TNF) as well as the multiple groups that engage in these uses. 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 Tonto NF is consistent with larger surveys of trends at the regional and national levels. These trends show a marked 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 TNF.

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 TNF is used, who uses it, 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 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 FS-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 2000, the TNF issued eighty-seven grazing permits. This number was unchanged from 1990 (Alford, pers. comm.).

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 TNF includes sawtimber, pulpwood, and fuelwood. In 2000, the last year for which data are currently available, the forest issued permits for 539 cords of commercial fuelwood, an increase of over 100% from 1990. Permits for sawtimber (2,421 mbf in 2000) and pulpwood (709 mbf in 2000) have decreased substantially since 1990. Timber data provided by the TNF also includes the gathering of fuelwood for non-commercial purposes. In 2000 the forest issued permits for 3,489 cords of gathered fuelwood. Permits for more than 10,000 cords were issued in 1990 (Alford, pers. comm.).

Mining in the national forests is directed by the General Mining Law of 1872, which allows individuals and corporations free access to prospecting on FS lands. Upon discovery of a mineral resource, an individual or corporation can, in turn, patent it 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 energy production, from gravel to gold to carbon dioxide, totaled about $2 billion in fiscal year 2003 (USFS 2005i).[5] In 2002, Region 3 issued $557,042 in sale permits and $1,773,756 in free use permits for mineral extraction (Jevons, pers. comm.). Also in 2002, the TNF issued ninety-one sale and ten free use permits, valued at more than $1.5 million. The most common materials permitted were sand and gravel, fill, and landscape rock. The number of mining permits issued decreased between 1990 and 2002 (Alford, 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.

[4] Data given are the most recent available.
[5] Data given are the most recent available.

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 FS as one of four "key threats" to the nation's forests and grasslands. As participation in outdoor recreation increases, the FS 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 OHVs (discussed below) is seen as a major component of unmanaged use (USFS 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. 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[6] (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). 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 nearly 3 million acres of the Tonto forest received approximately 5.7 million visits during fiscal year 2002. The majority of visitors to TNF are male (74.7%) and are predominately white (92.5%). Spanish, Hispanic, or Latino visitors make up approximately 6.1% of total visits. Most visitors, an estimated 63.8%, are between the ages of 31 and 60. 1% of the visitors interviewed in NVUM surveys were from a foreign country. The most frequently reported zip codes were from the Flagstaff area (Kocis et al. 2003b).

The Recreation Opportunity Spectrum (ROS) system provides a framework for understanding recreation users, their needs and wishes, and the abilities of forests to accommodate these (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 29).

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

Table 29. 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 for 2000-2001 (Cordell et al. 2004):

Table 30. 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

As Table 30 illustrates, walking is currently the most popular outdoor activity. 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 below:

Table 31. Participation in General Outdoor Activities, NSRE 2000-2001

Activity	Percent of Population Participating
Viewing/learning/gathering activities[7]	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

[7] 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).

The TNF includes fifty-nine campgrounds, twenty-six picnic sites, eighteen boating sites, ten fishing sites, three organization camps, eight commercial public service sites, and six interpretive sites. Four lakes, two reservoirs, the Salt and Verde Rivers, and numerous trout streams provide ample opportunities for water recreation. Fifty-two trailheads and 900 miles of trails are available for hiking, horseback riding, mountain biking, and/or OHV use. Recreational shooting, rockhounding, and mineral prospecting are also allowed in many areas of the forest.

The five most popular activities for visitors were viewing natural features (61.6% participation), viewing wildlife (53.7%), general relaxation (53%), hiking/walking (41.3%), and driving for pleasure on roads (38.3%). Using off-highway vehicles (OHV), camping in both primitive and developed sites, visiting historic and prehistoric sites, picnicking, and hunting and fishing were also very popular (Kocis et al. 2003b).

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 of 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 that the relationship between the FS and tribes is a government-to-government one (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, and the Archeological Resources Protection Act, and several presidential executive orders.

Tribes' use of FS land includes free activities such as gathering boughs and basket materials for which permits are unnecessary as well as the use of products such as sawtimber, for which fees are charged (Jevons, pers. comm.). In 2003, the National Tribal Relations Task Force recommended a legislative proposal that would authorize the USFS to allow federally recognized tribes to use forest products for traditional cultural purposes free of charge. In addition, many national forests contain traditional cultural places whose locations are known only to the tribes. Because the tribes cannot divulge the locations, they cannot apply for permits (Jevons, pers. comm.).

OHV Users

On public lands throughout the country, the use of OHVs has increased in popularity and is now a major concern to many forest managers. Between 1982 and 2000, OHV users increased more than 109% nationally (Cordell et al. 2004). In 1995, a GAO study found OHV use on federal lands to be generally undermanaged. The FS 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. More Arizonans, however,

considered management for OHVs to be important in a 1998 survey than in an earlier survey (Arizona State Parks 2003).

In 2004, the FS 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 its 1985 forest plan, the Tonto, noting an ongoing increase in OHV use, recognized it as a threat to some resources and a potential source of user conflict. At that time, about 900,000 acres of the forest was open (primarily in piñon-juniper and ponderosa pine ecosystems) and nearly 2,000,000 acres closed to OHV use (USFS 1985).

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 TNF, wildlife viewing is a more common activity than either fishing or hunting. NVUM data from fiscal year 2002 show that 53.7% of the visitors interviewed participated in some sort of wildlife viewing activity; however, only 4.8% described it as their primary activity.[9] Approximately 11.2% of interviewed visitors fished and about 11.4% hunted (with most of these describing it as their primary activity). 3.8% used a developed fishing site or dock (Kocis et al. 2003b).

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), making the decision to designate a roadless area as wilderness a potentially controversial one. 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

[8] Notably, however, an estimated 17% of Coconino 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.

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 TNF includes eight designated wilderness areas and 170,000 acres of inventoried roadless areas (USFS 2001c). Users of designated wilderness areas fit a profile similar to other forest users. They are predominantly male (72.1%), white (97.0%), and generally travel from the Flagstaff area. NVUM data suggest that roughly 110,000 wilderness visits were made during fiscal year 2002 (Kocis et al. 2003b).

Special use permits

While research is rarely considered by the public to be a major use of federal lands, the Tonto forest, like most forests, issues special use permits for research purposes.

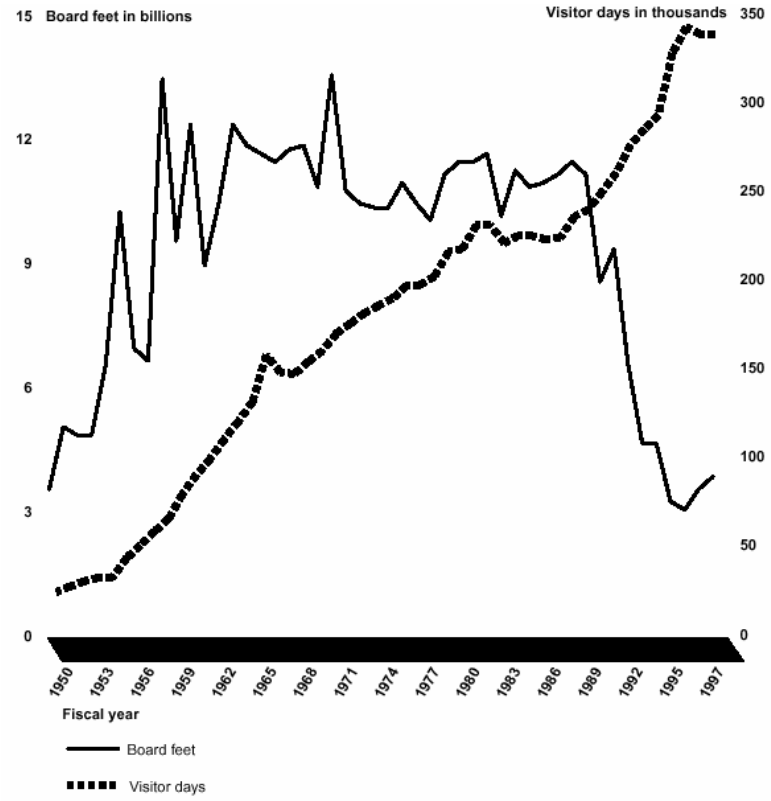
6.5 Key issues for forest planning and management

Extractive and non-extractive uses of national forests are often seen as competing with one another, and balancing the uses of 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 rangelands were in either poor or fair condition, and a GAO survey of range managers' professional opinions showed that the BLM and the USFS 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 FS 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 policies, 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).



Source: General Accounting Office (GAO) 1999a

Figure 19. 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 sometimes come into conflict. NRSE surveys identify trends in the 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 and 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 FS'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 recreation 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, GAO 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). For additional discussion regarding fees, see section 9.1.

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 Tonto National Forest (TNF) 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 recognized as important to the public as so-called undesignated special places. An attempt has been made in this section to identify all designated areas and special places on the TNF. 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, there is reluctance by these people to disclose these places and their locations.

A review of available information on designated areas and special places suggests that the TNF contains considerable recreational, interpretive, and cultural resources. Forest GIS Staff provided specific names and locations of over 400 designated areas within the TNF, including boating areas, dispersed sites, campgrounds, picnic areas, information sites and wilderness areas. Although not explicitly identified in this assessment, Forest Planners and Heritage Staff continue to work closely with tribal representatives in identifying and planning for the protection of the many "special places" known to exist throughout the TNF.

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 special places are complex, subjective, and often exceedingly difficult to define in a concise manner.

By way of identifying undesignated special places, the forest archeologist, landscape architect, and recreation officer 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 TNF is discussed in greater detail in the following section, Community Relationships.

7.2 Designated areas

Table 32 provides information on the designated areas within the Coconino National Forest.

Table 32. Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Boating	Bartlett Lake Marina	Cave Creek
Boating	Jojoba	Cave Creek
Boating	Ocotillo	Cave Creek
Boating	Yellow Cliffs	Cave Creek
Boating	Canyon Lake Marina	Mesa
Boating	Foxtail RAP	Mesa
Boating	Pobrecito	Mesa
Boating	Phon D Sutton RAP	Mesa
Boating	Goldfield RAP	Mesa
Boating	Water Users RAP	Mesa
Boating	Saguaro del Norte	Mesa
Boating	Saguaro Lake Marina	Mesa
Boating	Palo Verde	Mesa
Boating	Laguna	Mesa
Boating	Apache Lake Marina	Tonto Basin
Boating	Burnt Corral	Tonto Basin
Boating	Cholla	Tonto Basin
Boating	Grapevine	Tonto Basin
Boating	Indian Point	Tonto Basin
Boating	Roosevelt Lake Marina	Tonto Basin
Boating	Schoolhouse	Tonto Basin
Boating	Windy Hill	Tonto Basin
Boating	SR 288 Bridge RAP	Tonto Basin
Cave	Barberpole	Payson
Cave	Diamond	Payson
Cave	Ebony	Payson
Cave	Salamander Pit	Payson
Cave	Scout	Payson
Cave	Strawbones	Payson
Cave	Whispering Pines	Payson
Cave	Woman	Payson
Cave	Pishiboro	Pleasant Valley
Cave	Redman	Pleasant Valley
Dispersed Site	Rio Verde Airstrip	Cave Creek
Dispersed Site	Devil's Hole	Cave Creek
Dispersed Site	Shooting pit off FDR 24	Cave Creek
Dispersed Site	Dispersed sites near Seven Springs off FDR 24	Cave Creek
Dispersed Site	Tangle Creek FDR 269	Cave Creek
Dispersed Site	Houston Creek FDR 16	Cave Creek
Dispersed Site	Red Creek FDR 18	Cave Creek
Dispersed Site	Bloody Basin Road (FDR 269)	Cave Creek
Dispersed Site	Table Mesa Road at the cabin	Cave Creek

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Dispersed Site	Shooting pit off Bartlett Lake Road	Cave Creek
Dispersed Site	East side of Bartlett Lake	Cave Creek
Dispersed Site	Riverside River Rock Area	Cave Creek
Dispersed Site	Verde River Access FDR 3257	Cave Creek
Dispersed Site	Verde River Access FDR 161	Cave Creek
Dispersed Site	Willow Springs Wash	Cave Creek
Dispersed Site	Hidden Cove	Cave Creek
Dispersed Site	East of Horseshoe Dam Vista	Cave Creek
Dispersed Site	FR 479 corridor	Cave Creek
Dispersed Site	Riverside (south of campground)	Cave Creek
Dispersed Site	Childs river access	Cave Creek
Dispersed Site	Gleason Flats	Globe
Dispersed Site	FDR 303	Globe
Dispersed Site	Mercuria	Mesa
Dispersed Site	Romo Ranch/Lower Sycamore Creek	Mesa
Dispersed Site	Sugarloaf Mountain/Lower Sycamore Creek	Mesa
Dispersed Site	Mesquite Wash	Mesa
Dispersed Site	Picadilla	Mesa
Dispersed Site	Brushy Basin	Mesa
Dispersed Site	Busnell Tanks	Mesa
Dispersed Site	Mt Ord	Mesa
Dispersed Site	Alder Creek	Mesa
Dispersed Site	East Sycamore Creek	Mesa
Dispersed Site	West Sycamore Creek	Mesa
Dispersed Site	National Mine	Mesa
Dispersed Site	Whitlow Dam/Millsite Canyon	Mesa
Dispersed Site	Hewitt Canyon	Mesa
Dispersed Site	Queen Valley	Mesa
Dispersed Site	The Rolls	Mesa
Dispersed Site	Saguaro Lake shoreline coves	Mesa
Dispersed Site	Canyon Lake shoreline coves	Mesa
Dispersed Site	Mesquite Flats	Mesa
Dispersed Site	Coronado Mesa	Mesa
Dispersed Site	Usery Mountain west	Mesa
Dispersed Site	Bulldog Canyon	Mesa
Dispersed Site	Stewart Mountain	Mesa
Dispersed Site	Lower Salt River/Stewart Mountain Dam to Water Users	Mesa
Dispersed Site	Lower Salt River/Water Users to Phon D Sutton	Mesa
Dispersed Site	Lower Salt River/Phon D Sutton to Granite Reef	Mesa
Dispersed Site	A&A Pit/Cottonwood Spring	Mesa
Dispersed Site	Government Well/Sycamore Spring	Mesa
Dispersed Site	Cottonwood Camp	Mesa
Dispersed Site	Cane Spring	Mesa
Dispersed Site	Mine Mountain Road	Mesa
Dispersed Site	Mud Spring	Mesa
Dispersed Site	Amethyst Mine	Mesa
Dispersed Site	Alder Creek	Mesa
Dispersed Site	Brown's Cave	Mesa

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Dispersed Site	Adams Camp	Mesa
Dispersed Site	First Water North	Mesa
Dispersed Site	Superstition Mountain Face	Mesa
Dispersed Site	Hieroglyphic Canyon	Mesa
Dispersed Site	Fremount Saddle	Mesa
Dispersed Site	Zonderland/Land of Nod	Mesa
Dispersed Site	Weaver's Needle	Mesa
Dispersed Site	Boulder Basin	Mesa
Dispersed Site	Bluff Springs	Mesa
Dispersed Site	Charlebois Springs	Mesa
Dispersed Site	Boulder/Second Water Junction	Mesa
Dispersed Site	Hackberry Springs	Mesa
Dispersed Site	Reed's Water	Mesa
Dispersed Site	Fish Creek Canyon	Mesa
Dispersed Site	IV Ranch	Mesa
Dispersed Site	Reavis Canyon	Mesa
Dispersed Site	Reavis Ranch	Mesa
Dispersed Site	Mound Mountain/Circle Stone	Mesa
Dispersed Site	Angle Basin	Mesa
Dispersed Site	Rogers Spring	Mesa
Dispersed Site	Mt. Peeley	Mesa
Dispersed Site	McFarland	Mesa
Dispersed Site	Potato Patch	Mesa
Dispersed Site	Sharp Creek	Payson
Dispersed Site	Tonto Creek	Payson
Dispersed Site	Zane Grey	Payson
Dispersed Site	Preached Canyon	Payson
Dispersed Site	Control Road	Payson
Dispersed Site	Verde Glen	Payson
Dispersed Site	Webber	Payson
Dispersed Site	Cracker jack	Payson
Dispersed Site	Sycamore	Payson
Dispersed Site	Gisela	Payson
Dispersed Site	Sawmill Flat	Pleasant Valley
Dispersed Site	Rose Creek	Pleasant Valley
Dispersed Site	Workman Creek	Pleasant Valley
Dispersed Site	Honey Creek	Pleasant Valley
Dispersed Site	Parker	Pleasant Valley
Dispersed Site	FDR 203	Pleasant Valley
Dispersed Site	Bearhead	Pleasant Valley
Dispersed Site	Squaw Mesa	Pleasant Valley
Dispersed Site	Walnut	Pleasant Valley
Dispersed Site	Haigler Creek	Pleasant Valley
Dispersed Site	Bottle Springs	Pleasant Valley
Dispersed Site	Red Lake	Pleasant Valley
Dispersed Site	Naegelin Canyon	Pleasant Valley
Dispersed Site	Colcord	Pleasant Valley
Dispersed Site	Ramer	Pleasant Valley

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Dispersed Site	Valentine Canyon	Pleasant Valley
Dispersed Site	Lower Canyon Creek	Pleasant Valley
Dispersed Site	TR 119 at FR 83 Junction	Tonto Basin
Dispersed Site	Coon Creek	Tonto Basin
Dispersed Site	Cherry Creek	Tonto Basin
Dispersed Site	Mt. Ord	Tonto Basin
Dispersed Site	Upper Deer Creek (top of FR 201)	Tonto Basin
Dispersed Site	Bumblebee Wash	Tonto Basin
Dispersed Site	2 Mile site (at the cattle guard)	Tonto Basin
Dispersed Site	School House Wash	Tonto Basin
Dispersed Site	Cottonwoods on Salt River off FDR 333/333A	Tonto Basin
Dispersed Site	Brown's Saddle	Tonto Basin
Dispersed Site	Lone Pine Saddle	Tonto Basin
Family Campground	Box Bar	Cave Creek
Family Campground	Needle Rock	Cave Creek
Family Campground	Riverside	Cave Creek
Family Campground	Horseshoe	Cave Creek
Family Campground	Mesquite	Cave Creek
Family Campground	SB Cove	Cave Creek
Family Campground	Bartlett Flat	Cave Creek
Family Campground	CCC	Cave Creek
Family Campground	Seven Springs	Cave Creek
Family Campground	Oak Flat	Globe
Family Campground	Jones Water	Globe
Family Campground	Pioneer Pass	Globe
Family Campground	Upper/Lower Pinal	Globe
Family Campground	Sulfide del Rey	Globe
Family Campground	Bagley Flat	Mesa
Family Campground	The Point	Mesa
Family Campground	Laguna Beach-Canyon Lake Marina	Mesa
Family Campground	Tortilla	Mesa
Family Campground	Christopher Creek	Payson
Family Campground	Houston Mesa	Payson
Family Campground	Ponderosa	Payson
Family Campground	Upper Tonto Creek	Payson
Family Campground	Sharp Creek	Payson
Family Campground	Airplane Flat	Pleasant Valley
Family Campground	Alderwood	Pleasant Valley
Family Campground	Upper Canyon Creek	Pleasant Valley
Family Campground	Colcord Ridge	Pleasant Valley
Family Campground	Haigler Canyon	Pleasant Valley
Family Campground	Rose Creek	Pleasant Valley
Family Campground	Valentine Ridge	Pleasant Valley
Family Campground	Falls	Pleasant Valley
Family Campground	Cascade	Pleasant Valley
Family Campground	Creekside	Pleasant Valley
Family Campground	Bachelor Cove	Tonto Basin
Family Campground	Bermuda Flat Campground	Tonto Basin

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Family Campground	Burnt Corral	Tonto Basin
Family Campground	Cholla	Tonto Basin
Family Campground	Cholla Bay	Tonto Basin
Family Campground	Indian Point	Tonto Basin
Family Campground	Orange Peel	Tonto Basin
Family Campground	Schoolhouse	Tonto Basin
Family Campground	Windy Hill	Tonto Basin
Family Campground	Lakeview Trailer Park	Tonto Basin
Family Campground	Mills Cove	Tonto Basin
Family Campground	Windy Flat	Tonto Basin
Family Campground	Grapevine Bay	Tonto Basin
Family Campground	Schoolhouse Point	Tonto Basin
Family Campground	Three-Mile	Tonto Basin
Family Campground	Upper Burnt Corral	Tonto Basin
Family Campground	Lower Burnt Corral	Tonto Basin
Family Campground	Davis Wash	Tonto Basin
Family Campground	Crabtree Wash	Tonto Basin
Family Campground	Apache Lake Boat Access	Tonto Basin
Family Picnic	South Cove	Cave Creek
Family Picnic	Rattlesnake	Cave Creek
Family Picnic	Kellner	Globe
Family Picnic	Icehouse	Globe
Family Picnic	Capitan Pass	Globe
Family Picnic	Grantie Reef	Mesa
Family Picnic	Coon Bluff	Mesa
Family Picnic	Blue Point	Mesa
Family Picnic	Peeble Beach	Mesa
Family Picnic	Sheep Crossing	Mesa
Family Picnic	Saguaro del Norte	Mesa
Family Picnic	Butcher Jones	Mesa
Family Picnic	Acacia	Mesa
Family Picnic	Boulder	Mesa
Family Picnic	Phon D Sutton	Mesa
Family Picnic	Christopher Creek	Payson
Family Picnic	East Verde Crossing	Payson
Family Picnic	Flowing Springs	Payson
Family Picnic	Horton Creek	Payson
Family Picnic	Shoofly	Payson
Family Picnic	Burnt Corral	Tonto Basin
Family Picnic	Vineyard Canyon	Tonto Basin
Family Picnic	Cottonwood Cove	Tonto Basin
Fishing Site	Fisherman Point	Cave Creek
Fishing Site	Rattlesnake	Cave Creek
Fishing Site	Peregrine Point	Mesa
Fishing Site	Boulder	Mesa
Fishing Site	Diversion Dam North	Tonto Basin
Fishing Site	Diversion Dam South	Tonto Basin
Experimental Forest	Sierra Ancha Experimental Forest	Pleasant Valley

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Group Campground	Ashdale	Cave Creek
Group Campground	Cave Creek	Cave Creek
Group Campground	Horseshoe Dam	Cave Creek
Group Campground	Rattlesnake	Cave Creek
Group Campground	Timber Camp	Globe
Group Campground	Warnica Springs	Globe
Group Campground	Christopher Creek	Payson
Group Campground	Houston Mesa	Payson
Group Campground	Sharp Creek	Payson
Group Campground	Reynolds Creek	Pleasant Valley
Group Campground	Grapevine	Tonto Basin
Group Campground	Frazier	Tonto Basin
Group Picnic	Forbis	Mesa
Horse Camp	Houston Mesa	Payson
Horse Camp	Frazier	Tonto Basin
Hotel/Lodge/Resort Private	Saguaro Lake Guest Ranch	Mesa
Hotel/Lodge/Resort Private	Tortilla Flat	Mesa
Hotel/Lodge/Resort Private	Apache Lake Resort	Tonto Basin
Information Site	Cave Creek Ranger District Office	Cave Creek
Information Site	Bartlett Lake Aid Station	Cave Creek
Information Site	Globe Ranger District Office	Globe
Information Site	Mesa Ranger District Office	Mesa
Information Site	Saguaro Lake Aid Station	Mesa
Information Site	Canyon Lake Aid Station	Mesa
Information Site	Payson Ranger District Office	Payson
Information Site	Pleasant Valley Ranger District Office	Pleasant Valley
Information Site	Canyon Creek Fish Hatchery	Pleasant Valley
Information Site	Apache Lake Aid Station	Tonto Basin
Information Site	Roosevelt Lake Aid Station	Tonto Basin
Information Site	Tonto Basin Ranger District Office	Tonto Basin
Information Site	Mazatzal Rest Area (State Routes 87 and 188)	Tonto Basin
Information Site	Tonto National Forest Supervisors Office	Supervisors Office
Interpretive Site	Sears-Kay	Cave Creek
Interpretive Site	Sycamore Creek Outdoor Education Center	Mesa
Interpretive Site	Shoofly	Payson
Interpretive Site	Sierra Anch Experimental Station	Pleasant Valley
Interpretive Site	Blevins Cemetery	Tonto Basin
Interpretive Site	Roosevelt Lake Visitors Center	Tonto Basin
Interpretive Site	Roosevelt Dam Cemetery	Tonto Basin
Interpretive Site	Theodore Roosevelt Dam Overlook	Tonto Basin
Municipal	Carefree	Cave Creek
Municipal	Scottsdale	Cave Creek
Municipal	Globe	Globe
Municipal	Miami/Claypool	Globe
Municipal	Superior	Globe
Municipal	Payson	Payson
Municipal	Pine	Payson
Municipal	Strawberry	Payson

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Municipal	Young	Pleasant Valley
Municipal	Roosevelt	Tonto Basin
Municipal	Tonto Basin	Tonto Basin
National Monument	Tonto National Monument	Tonto Basin
National Recreation Trail	Highline Trail	Payson
Observation Site	Bartlett Lake Vista	Cave Creek
Observation Site	Needle Vista	Mesa
Observation Site	Canyon Lake Vista	Mesa
Observation Site	Fish Creek Vista	Mesa
Observation Site	Pleasant Valley Vista	Pleasant Valley
Observation Site	Apache Lake Vista	Tonto Basin
Observation Site	Inspiration Point	Tonto Basin
Observation Site	Roosevelt Dam Overlook	Tonto Basin
Organization Site	Dons Camp	Mesa
Organization Site	Arizona Cactus-Pine Girl Scout Camp	Payson
Organization Site	Grand Canyon Council Boy Scout Camp	Payson
Potential Wild/Scenic Rivers	Upper Verde	Cave Creek
Potential Wild/Scenic Rivers	Arnett/Telegraph	Globe
Potential Wild/Scenic Rivers	Pinto Creek	Globe/Tonto Basin
Potential Wild/Scenic Rivers	Upper Salt River	Globe/Tonto Basin
Potential Wild/Scenic Rivers	Lower Salt River	Mesa
Potential Wild/Scenic Rivers	Fossil Creek	Payson
Potential Wild/Scenic Rivers	East Verde River	Payson
Potential Wild/Scenic Rivers	Tonto Creek (upper segment)	Payson
Potential Wild/Scenic Rivers	Canyon Creek	Pleasant Valley
Potential Wild/Scenic Rivers	Cherry Creek	Pleasant Valley
Potential Wild/Scenic Rivers	Spring Creek	Pleasant Valley
Potential Wild/Scenic Rivers	Workman Creek	Pleasant Valley
Potential Wild/Scenic Rivers	Parker Creek	Pleasant Valley/Tonto Basin
Potential Wild/Scenic Rivers	Salome Creek	Pleasant Valley/Tonto Basin
Potential Wild/Scenic Rivers	Tonto Creek (lower segment)	Tonto Basin
Recreation Concession Site	Laguna Beach-Canyon Lake Marina	Mesa
Recreation Concession Site	Salt River Recreation Tube Rental and Shuttle Bus Service	Mesa
Recreation Concession Site	Christopher Creek	Payson
Recreation Concession Site	Houston Mesa	Payson
Recreation Concession Site	Ponderosa	Payson
Recreation Concession Site	Upper Tonto Creek	Payson
Recreation Concession Site	Sharp Creek	Payson
Recreation Residence	Lower Camp Creek	Cave Creek
Recreation Residence	Upper Camp Creek	Cave Creek
Recreation Residence	Pinal	Globe
Recreation Residence	Crabtree Wash	Tonto Basin
Research Natural Area	Bush Highway Research Natural Area	Mesa
Research Natural Area	Haufer Research Natural Area	Tonto Basin
Research Natural Area	Buckhorn Mountain Research Natural Area	Tonto Basin
Scenic/Sightseeing Route	Apache Trail National Scenic Byway	Mesa/Tonto Basin
Scenic/Sightseeing Route	From the Desert to the Tall Pines National Scenic Byway	Tonto Basin/Pleasant Valley
Sheep Driveway	Heber-Reno Sheep Driveway	Mesa/Tonto Basin/Pleasant Valley

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
State Park	Tonto Natural Bridge State Park	Payson
Swimming (Lake)	Rattlesnake	Cave Creek
Swimming (Lake)	Butcher Jones	Mesa
Swimming (Lake)	Acacia	Mesa
Trailhead	Cave Creek	Cave Creek
Trailhead	Cottonwood (Spur Cross)	Cave Creek
Trailhead	Bronco	Cave Creek
Trailhead	Miles	Globe
Trailhead	Picketpost	Globe
Trailhead	First Water	Mesa
Trailhead	Peralta	Mesa
Trailhead	Ballentine	Mesa
Trailhead	Cline	Mesa
Trailhead	Mormon Grove	Mesa
Trailhead	Peeley	Mesa
Trailhead	Woodbury	Mesa
Trailhead	Roger's Trough	Mesa
Trailhead	Reavis	Mesa
Trailhead	Cottonwood Camp	Mesa
Trailhead	Tortilla	Mesa
Trailhead	Crosscut	Mesa
Trailhead	Broadway	Mesa
Trailhead	Boulder	Mesa
Trailhead	Mud Springs	Mesa
Trailhead	City Creek	Payson
Trailhead	Fossil Springs	Payson
Trailhead	Geronimo	Payson
Trailhead	Hatchery	Payson
Trailhead	Pine	Payson
Trailhead	See Canyon	Payson
Trailhead	Two-Sixty	Payson
Trailhead	Doll Baby	Payson
Trailhead	Irving	Payson
Trailhead	Strawberry	Payson
Trailhead	Red Rock	Payson
Trailhead	Washington Park	Payson
Trailhead	Houston Mesa	Payson
Trailhead	Parker Creek	Pleasant Valley
Trailhead	McFadden Peak	Pleasant Valley
Trailhead	Reynolds	Pleasant Valley
Trailhead	Circle Ranch	Pleasant Valley
Trailhead	Barnhardt	Tonto Basin
Trailhead	Bull Canyon	Tonto Basin
Trailhead	Deer Creek	Tonto Basin
Trailhead	Frazier	Tonto Basin
Trailhead	Lone Pine	Tonto Basin
Trailhead	Roosevelt Cemetery	Tonto Basin
Trailhead	Tule	Tonto Basin

Table 32 (cont.). Designated Areas on the Tonto National Forest

Designated Area Type	Name	District
Trailhead	Upper Horrell	Tonto Basin
Wild Burro Territory	Saguaro Lake Wild Burro Territory	Mesa
Wild and Scenic River	Verde River	Cave Creek
Wilderness	Pine Mountain (portion shared with Prescott NF)	Cave Creek
Wilderness	Cedar Bench (portion shared with Prescott NF)	Cave Creek
Wilderness	Mazatzal	Cave Creek/Mesa/Payson
Wilderness	Superstition	Mesa/Globe/Tonto Basin
Wilderness	Four Peaks	Mesa/Tonto Basin
Wilderness	Hellsgate	Payson/Pleasant Valley
Wilderness	Salome	Pleasant Valley
Wilderness	Sierra Ancha	Pleasant Valley
Wildlife Management Area	Roosevelt Lake Wildlife Area	Tonto Basin
Wildlife Management Area	Three Bar Wildlife Area	Tonto Basin
Wilderness Study Area	Lime Creek (03020)	Cave Creek
Wilderness Study Area	Mazatzal Wilderness Contiguous (03016)	Cave Creek/Payson
Wilderness Study Area	Arnold Mesa (03092)	Cave Creek
Wilderness Study Area	Pine Mountain Wilderness Contiguous (03017)	Cave Creek
Wilderness Study Area	Picacho (03030)	Globe
Wilderness Study Area	Boulder (03024)	Mesa
Wilderness Study Area	Goldfield (03026)	Mesa
Wilderness Study Area	Black Cross (03027)	Mesa
Wilderness Study Area	Horse Mesa (03028)	Mesa
Wilderness Study Area	Hellsgate Contiguous (03021)	Payson
Wilderness Study Area	Salome Contiguous (03022)	Pleasant Valley
Wilderness Study Area	Cherry Creek (03023)	Pleasant Valley
Wilderness Study Area	Sierra Ancha Wilderness Contiguous (03019)	Pleasant Valley/Tonto Basin
Wildlife Viewing Site	Goose Point	Tonto Basin

Source: Tonto National Forest GIS Coordinator
GIS and INFRA Databases

7.3 Special places

The following information was supplied by the Tonto National Forest's Archeologist, J. Scott Wood. The Tonto National Forest was once home to some ancestors of the O'odham (Pima) Tribes, primarily the Salt River Pima-Maricopa Indian Community and the Gila River Indian Community, and some ancestors of today's Hopi and Zuni Tribes. More recently it was home to the Tonto, Cibecue, and San Carlos Apache and the Southeastern Yavapai (Tonto Apache Tribe, White Mountain Apache Tribe, San Carlos Apache Tribe, Yavapai-Apache Nation, Yavapai-Prescott Tribe, and Fort McDowell Yavapai Nation).

To the Hopi, Zuni, and O'odham, all archaeological sites on the TNF are considered "special places," especially those that contain the buried remains of their ancestors. Their concerns about these places center on leaving them undisturbed. When that is not feasible, they are concerned about the handling of human remains under the Native American Graves Protection and Repatriation Act (NAGPRA). Currently, based on a detailed study of cultural affiliations on the forest, done several years ago, all prehistoric human remains recovered from the Tonto NF are repatriated for reburial on their respective reservations. Apache human remains, following the direction of the Apache Tribes, are reburied by the forest at their discretion. Given that the subject has yet to be formally discussed, the Forest Service currently has no agreement in place with the Yavapai. In addition to the ancestral connections between

modern tribes and the prehistoric occupants of the forest, the Hopi maintain an active shrine on the forest that they built in the 1990s.

The association between tribes and the TNF is more intimate with the Apache and Yavapai, especially the Apache. The entire eastern boundary of the Forest is with the White Mountain and San Carlos Reservations and the Tonto Apache Reservation is entirely enclosed by the forest. The Fort McDowell Yavapai Nation and the SRPMIC also abut the forest. Having lived on the forest in many areas both prior to and after the creation of the forest—frequently within living memory and often during the lives of many elders now residing on the reservations—Apache knowledge of the Tonto landscape is quite precise. The forest is currently working with these tribes to identify specific "special places," but a number are already known as a result of a long history of research and consultations by the forest. Most of these areas are places where specific plant food and fiber resources were and often still are gathered (e.g. acorns, agave, beargrass, medicinal plants, etc.). Most areas are not described in terms that lend themselves to drawing distinct boundaries on maps, but the forest is currently working with the tribal representatives to better define the geographic extent of these areas in ways that can interface better with management planning.

Other Apache "special places" are more cultural/historical or religious in nature: clan origin areas (six to ten of these are known to the forest with some degree of precision with more to come), dance grounds and other ceremonial sites, and places where the *ga'an* spiritual figures originate and where they have appeared on special occasions. Former residential sites may also fall into this category. But, except for a few important camps associated with milestone events in Apache history (e.g., specific battles with the U.S. Army, the last camp occupied just prior to confinement on the reservations, etc.), these are not accorded any particular significance. Obviously, the tribes want to preserve these "special places" in perpetuity if at all possible. Native American representatives also wish to preserve the multitude of Apache and Yavapai place names that blanket the forest though there does not seem to be any current initiative to have the forest adopt many of them.

Tribes also are concerned that information regarding the nature and location of their sites be highly restricted with access to specific information confined to the Forest Heritage Staff exclusively. As a result, no specific location information is provided. Aside from the standard issues regarding the destruction of ancestral sites and the disturbance of human remains, either by projects or by vandals, the most critical management issues regarding these "special places" today have to do primarily with vegetation management. The tribes are concerned that prescribed fire and other fuels reduction treatments avoid changing the species compositions in the area by fostering the growth and reproduction of favored species. Along with this, there are issues involving tribal access and use of these resources. The Tonto NF is in the process of resolving these issues by expanding efforts to identify such "special places," institutionalizing tribal relationships and access requirements through the use of Memoranda of Agreement, and refining the planning process for large-scale vegetation treatment projects to accommodate tribal concerns wherever feasible.

7.4 Scenery management

The USFS has long 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 needs 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 the traditional extractive resources and 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 clearer and more balanced 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). These researchers propose that "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 planners 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 shown 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 Tonto National Forest (TNF) and its neighboring communities. Knowledge of local communities is of interest to the TNF due to the importance of the reciprocal relationship that exists between the forest and these communities. Also, there are legal authorities that require, in some instances, 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 TNF 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 TNF 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 19th and early 20th 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 statutes, 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 TNF. 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 TNF. 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 33. 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 33. Table 34 categorizes national forest acreage in Arizona according to current congressional districts.

Table 33. Weblinks to Community Profiles for Counties and Municipalities in the Area of Assessment

Gila County	**http://www.azcommerce.com/doclib/COMMUNE/Gila%20County.pdf**
Payson	http://www.azcommerce.com/doclib/commune/payson.pdf
Globe	http://www.azcommerce.com/doclib/COMMUNE/globe-miami.pdf
San Carlos	http://www.commerce.state.az.us/pdf/commasst/comm/sncarlos.pdf
Miami	http://www.azcommerce.com/doclib/COMMUNE/globe-miami.pdf
Maricopa County	**http://www.azcommerce.com/doclib/COMMUNE/Maricopa%20County.pdf**
Phoenix	http://www.azcommerce.com/doclib/commune/phoenix.pdf
Mesa	http://www.azcommerce.com/doclib/commune/mesa.pdf
Glendale	http://www.azcommerce.com/doclib/commune/glendale.pdf
Scottsdale	http://www.azcommerce.com/doclib/COMMUNE/scottsdale.pdf
Chandler	http://www.azcommerce.com/doclib/commune/chandler.pdf
Tempe	http://www.azcommerce.com/doclib/commune/tempe.pdf
Pinal County	**http://www.azcommerce.com/doclib/COMMUNE/Pinal%20County.pdf**
Apache Junction	http://www.azcommerce.com/doclib/COMMUNE/apache%20junction.pdf
Casa Grande	http://www.azcommerce.com/doclib/COMMUNE/casa%20grande.pdf
Florence	http://www.azcommerce.com/doclib/commune/florence.pdf
Eloy	http://www.azcommerce.com/doclib/commune/eloy.pdf
Coolidge	http://www.azcommerce.com/doclib/COMMUNE/coolidge.pdf
Queen Creek	http://www.azcommerce.com/doclib/COMMUNE/queen%20creek.pdf
Yavapai County	**http://www.azcommerce.com/doclib/COMMUNE/Yavapai%20County.pdf**
Prescott	http://www.azcommerce.com/doclib/commune/prescott.pdf
Prescott Valley	http://www.azcommerce.com/doclib/COMMUNE/prescott%20valley.pdf
Cottonwood - Verde Village	http://www.azcommerce.com/doclib/COMMUNE/verde%20village.pdf
Sedona	http://www.azcommerce.com/doclib/COMMUNE/sedona-oak%20creek%20canyon.pdf
Camp Verde	http://www.azcommerce.com/doclib/COMMUNE/camp%20verde.pdf
Cottonwood	http://www.azcommerce.com/doclib/COMMUNE/cottonwood.pdf
Chino Valley	http://www.azcommerce.com/doclib/COMMUNE/chino%20valley.pdf

Source: Arizona Department of Commerce

Table 34. 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 TNF have a history of involvement with the national forests and with natural resource issues in general. Southern 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 TNF 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 forest. 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 forests, the keyword search included terms such as "forest," "conservation," "wildlife," and "endangered" species. The results of this keyword search are presented in Table 35. *The Arizona Republic* (Phoenix) is the newspaper most proximate to the Tonto NF and thus will be of greatest 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 TNF in many of the state's newspapers.

The keyword search (Table 35) 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 TNF's nearest paper, *The Arizona Republic* is one of Arizona's most important in terms of natural resource news coverage. Furthermore, the search indicated that the TNF itself was the subject of 372 news articles during the period examined (approximately 1999-2005 although the exact period varied by newspaper).

Table 35. 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
Issues Searched:	1999-April 2005	**1999-April 2005**	2000-April 2005	2000-April 2005	2003-April 2005	1999-April 2005	Found	Articles 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 Nat. For.	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 *The Arizona Republic* were also examined to determine the types of natural resource topics that were of interest to the public in the region surrounding the TNF. Selected topics and their dates of publication in *The Arizona Republic* are provided in Table 36 below:

Table 36. Selected Key Public Issues for the Coconino National Forest

Topic	Date
1. Fire north of Cave Creek is 80% contained	July 2005
2. A large wild cat has forced temporary closure on TNF	February 2005
3. Officials stop campfires on TNF	June 2005
4. Law-enforcement officials douse annual Christmas tree disposal fires	January 2004
5. Fees on Tonto makes for unhappy campers	February 2004
6. Gila County investigators discover marijuana plantation in the Tonto NF	October 2003

Source: The Arizona Republic newspaper

8.3 Communities of interest and forest partnerships

The TNF has many communities of interest: that is, entities that share an interest along with the Forest Service in the management of the forest. 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 37, 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 TNF. Some especially noteworthy communities of interest to the TNF are the Native American tribes. The tribal contact list for the TNF is found in Table 38. There are thirteen tribes for which the TNF has consultation responsibilities.

Table 37. Communities of Interest for the Tonto National Forest

Governmental	Special Advocacy Groups	
ADOT Natural Resources	American Motorcyclist Assoc.	Roadrunner 4-Wheel Drive Club
Apache County Dev.& Comm. Svs	American Rivers	Rocky Mountain Elk Foundation
AZ Assoc. of Counties	Arizona Great Outdoors	Rod and Gun Club
AZ Dept. of Agriculture	Arizona OHV Association	Scottsdale Sea & Ski Club
AZ Dept. of Commerce	Arizona Rivers Coalition	Sierra Club SW Office
AZ Dept. of Environ Quality	Arizona Sprint Car Association	Sonoran Bioregional Diversity Project
AZ Dept. of Mines & Mineral Res.	Arizona Wilderness Coalition	Southwest Forest Alliance
AZ Game & Fish Dept.	Arizonans for Wildlife Conservation	The Nature Conservancy
AZ State Land Dept	ASA4WDC Conservation	The Wildlife Soc., AZ Chapter
AZ State Parks	Audubon Society-Tucson	Tonto Hills Community Assoc.
Bureau of Indian Affairs	AZ Archaeology Society	Tonto NRCD
Bureau of Land Management	AZ Cattle Grower's Association	Tonto Weed Management Board
Bureau of Reclamation	AZ Desert Bighorn Sheep Society	Trout Unlimited
City of Globe	AZ Wildlife Federation	United Four Wheel Drive Association
City of Mesa	Bat Conservation	Western States Public Lands Coalition
City of Payson	Camp Creek Association	Western Utilities Group
City of Scottsdale	Cave Creek Saddle Club	
Fort Apache Indian Agency	Center for Biological Diversity	
Gila Co. Board of Supervisors	Central Arizona Paddlers Club	
Gila Co. Dev. Office	Desert Awareness Committee	
Gila County Cooperative Extension	Desert Botanical Garden	
Glendale Chamber of Commerce	Desert Tortoise Council	
Maricopa Co. Bd. of Supervisor	Foothills Community Foundation	
National Park Service	Forest Conservation Council	
Pinal Co. Bd. of Supervisors	Forest Guardians	
Salt River Project	Friends of Arizona Rivers	
San Carlos Apache Tribe	Friends of Pinto Creek	
Scottsdale Dept. of Planning & Econ. Dev.	Grand Canyon Wildland Council	
Tonto Apache Tribe	Greater AZ Bicycle Assoc.	
Town of Carefree	Intl. Assoc. F&W Agencies	
Town of Cave Creek	Maricopa Audubon Society	
Town of Fountain Hills	Old Pueblo Bass Anglers, Inc.	
U.S. Fish & Wildlife Service	P.V. Trail Riders	
USDA NRCS	Phoenix Earth First	
White Mountain Apache Tribe	Pleasant Valley Comm. Council	
Yavapai County Board of Supervisors	Prescott NF Friends	
Yavapai-Prescott Tribe	Rio Verde Foothills Alliance	

Table 37 (cont.). Communities of Interest for the Tonto National Forest

Business	Educational
Arizona Bound Jeep Tours	ASU Center for Environmental Studies
ASARCO, Inc.	ASU Dept. of Zoology
Bar Eleven Land & Cattle Co.	ASU Plant Biology
Bar X Ranch Conservatory, Inc.	Isabelle Hunter Memorial Library
Black Brush Ltd. Partnership	Reevis Mt. School
Cave Creek/Carefree Chamber of Commerce	U of A Cooperative Extension
Cline Equity Trust	University of Arizona
Connolly Bro. Construction, Inc	
Cooper's Hay Hook Ranch	**Media**
Diamond A Ranch Corporation	Arizona Hunter and Angler
Dorothy Cline Wells Trust	Scottsdale Progress
Earnhardt Ranches, LLC	Tribune Newspapers
Equipment Maintenance Service	
Fenn Land & Cattle Co., LLC	
Greenvalley Ranch	
Griffin Cattle Ranch	
Johnson Farms Ltd. Part.	
Johnson Ranch Partnership	
Kampgrounds of America	
Kelly Clark Automotive	
Layton Family Trust	
Mad as Hell Ranch, Inc.	
Magma Copper Company	
Martin Ranch, Inc.	
Page Cattle Co.	
Payson Chamber of Commerce	
Phelps Dodge Miami, Inc	
Rambo Realty & Investment	
Roosevelt Marina, LLC	
Round Valley Ranch	
Saguaro Lake Associates	
Scottsdale Chamber of Commerce	
SEC, Inc.	
Spectrum Astro	
Stone Container Corp.	
W.J. Cattle Co.	
Withycombe Family, LLC	

Source: E. Alford, Group Leader for Biological Resources and Planning, Tonto National Forest

Table 38. Tribal Consultation Responsibilities for the Tonto National Forest

Arizona Indian Tribe
Ak-Chin Indian Community
Ft. McDowell Mohave-Apache Indian Comm.
Gila River Indian Community
Hopi Tribe
Salt River Pima-Maricopa Indian Community
San Carlos Apache Tribe
Tohono o'Odham Nation
Tonto Apache Tribe
White Mountain Apache Tribe
Yavapai-Apache Nation
Yavapai-Prescott Indian Tribe
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 effective 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 TNF is involved in multiple partnerships that contribute to forest health and fire management, the construction of community infrastructure, economic involvement with natural resources, and, most recently, issues surrounding the U.S.-Mexico border region. 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 39 below. Additional information on partnerships in the Southwest Region is available at http://www.fs.fed.us/r3/partnerships/. Officials at the Tonto NF reported that the forest has not had a partnership coordinator or an official grants and agreements specialist in recent years; hence, their partnership list is currently not up to date.

Table 39. United States Forest Service, Southwest Region Partner

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

Table 39 (cont). United States Forest Service, Southwest Region Partners

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/
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/

8.4 Historically underserved communities and environmental justice

This section deals with special communities located near the TNF 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 TNF 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). Individuals of Hispanic origin represent the largest minority group, ranging from 9% in Yavapai County to 29% in Pinal County as of 2000. Note that individuals claiming Hispanic heritage may also claim identification with other ethnic and racial groups and be counted in those categories as well. Gila and Pinal Counties also report a significant percentage of Native American residents (12% and 7% respectively). Maricopa County reported the highest percentage of African American residents at 3.7% of the total county population in 2000.

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 TNF to consider. Table 40 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 40. Minority- and Women-owned Businesses by County, 2002

County	All Businesses	Total Minorities	African American	Native American	Asian or Pacific Islander	Hispanic or Latino Origin	Women
Maricopa	411,961	39,867	4,958	3,683	9,699	26,578	106,313
Gila	6,645	1,183	-	224	-	822	2,506
Pinal	12,625	2,094	-	337	-	1,553	3,562
Yavapai	31,255	2,030	-	218	-	1,579	8,439

* 2002 Survey of Business Owners (including minority- and women-owned business) U.S., states, counties, places and metro areas projected early 2006
Sources: Arizona Dept. of Commerce, 2002
http://www.azcommerce.com/pdf/smallbus/Number%20of%20Businesses%20in%20Arizona%20050602%20FINAL.pdf

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 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, and low-income people, as well as 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 our 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, we offer a view of the TNF's social linkages 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 resources 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 TNF (see Table 37 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 Tonto. 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 to 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 that effectively describes the actors and relationships in the Tonto 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? Finally, how can managers and planners use existing networks to bring maximum benefit to the forest itself?

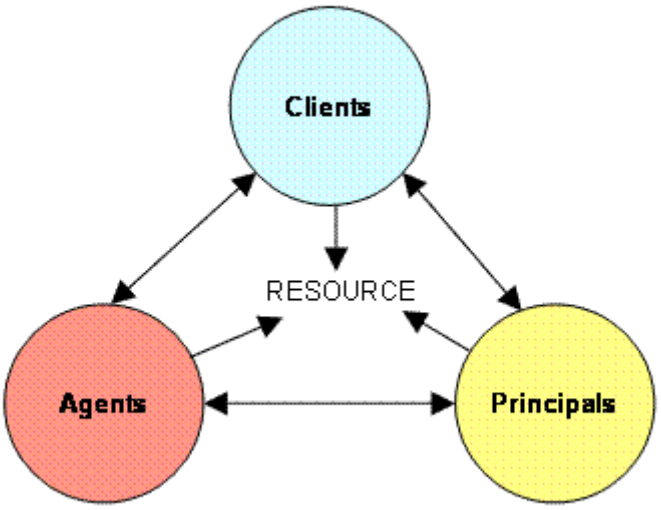


Figure 20. Social Networks in Natural Resource Management

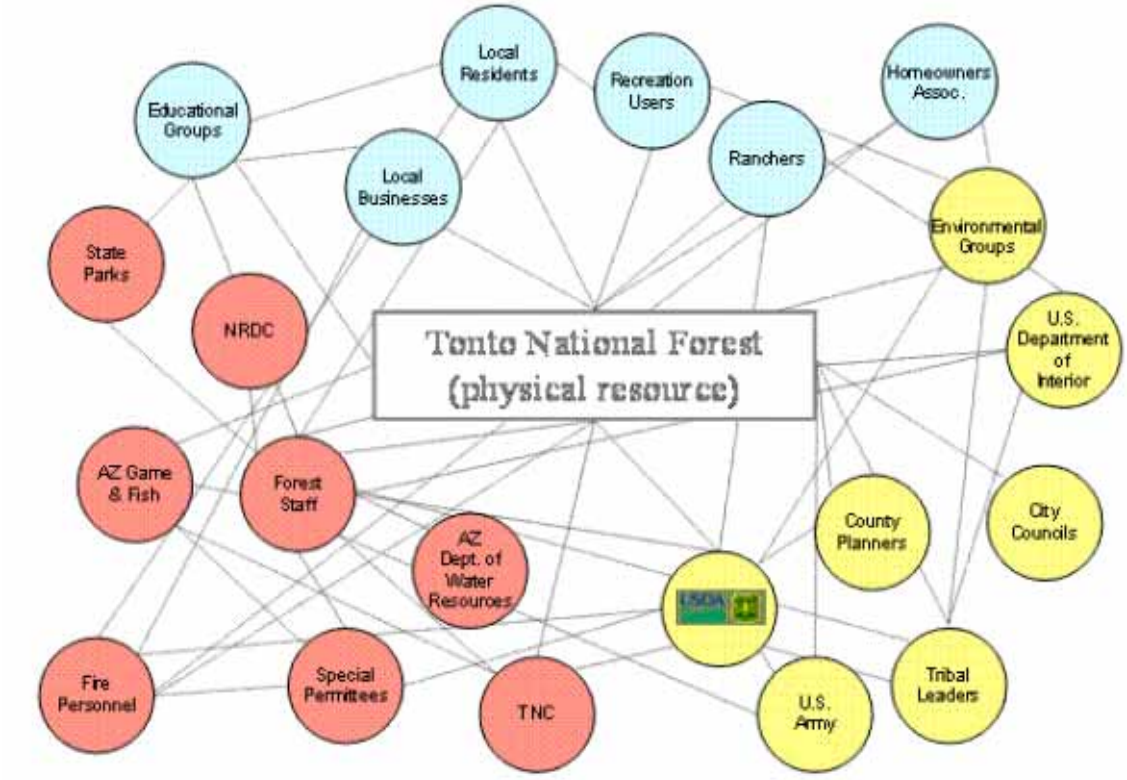


Figure 21. Partial Social Network for the Tonto National Forest

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, USFS 2003f).

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 (USFS 2003f).

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” (USFS 2003f). Evidence of the dynamic nature of relationships between the TNF 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 relationships need 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 Tonto National Forest faces as it takes positive steps to respond to a rapidly-changing demographic, political, and physical environment.

9. Key Resource Management Topics

The following section offers a brief overview 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 Tonto National Forest. 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 and varied ways and 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 USDA Forest Service (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 FS has identified four key threats to the health of the nation's forests and grasslands, namely:

- Fire and fuels;
- Invasive species;
- Loss of open space; and
- Unmanaged recreation. (USDA Forest Service 2005j)

We will consider each of these threats, the trends associated with them, and the implications for managing forest and grassland health.

Fire and Fuels

Wildland fire in national forests is of central importance to forest planning today. Nationally, 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 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, including 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.

Like any dryland forest or grassland, the Tonto National Forest is no stranger to wildfires. The Rodeo-Chediski fire of 2002 spread across 450,000 acres of land, including over 170,000 acres of the Tonto and Apache-Sitgreaves National Forests. Of this acreage, approximately 10,711 acres were on the Pleasant Valley Ranger District of the TNF affecting ponderosa pine stands which burned with high severity. Overall costs associated with the fire surpassed $40 million (USFS 2003d). In addition to the harm done to fish and tree populations, the Saguaro cacti population in the Tonto has suffered long-term damage from the Rodeo-Chediski and other fires. Over the past twenty years, nearly 30% of the saguaro cacti in the TNF were destroyed by large fires. Research shows that heightened mortality in these cacti from fires continues for a decade or longer, the exposed population suffering a 400% greater mortality than unaffected cacti (Narog and Wilson 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.).

In general, 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[10], controlled fire treatments (used here to include both prescribed and natural-ignition "wildland fire use" fires), and direct suppression of fires.

The White House 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. It also 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 (Office of the President 2002). Some researchers echo this claim, blaming no-cut environmentalists for creating an environment 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 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). Litigation has undeniably delayed, prevented, or changed some fuel-reduction projects. However, several studies have shown that the impact and scope of litigation on national forest logging plans has been substantially overstated (Cortner et al. 2003, Carter 2003).

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

Increased population density also puts added pressure on forest staff to prevent or immediately contain wildland fires. Data for Arizona show that almost 130,000 homes (housing more than 300,000 residents) are at risk from fires (Morehouse 2001). In the wildland-urban interface, where human developments meet often highly flammable wildlands, fire on public lands can be a major concern for neighbors on private lands.

[10] 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.

Nationally, 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. Although salvage logging is generally considered to "rescue" any remaining economic value from the 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, causes soil erosion, disturbs wildlife, and can actually increase the likelihood of another fire (USFS 2003d, USFS 1999a).

Invasive species

The widely acknowledged concept that ecosystem health has declined since the arrival of Europeans on the North American continent is linked in large part with a reduction in the biodiversity and 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.

Throughout the world, invasive species seriously affect forest ecosystems to the detriment of biological diversity, forest health, forest productivity, soil and water quality, and socioeconomic values (Chornesky et al. 2005). In the United States, researchers estimate that the roughly 360 non-native insect species that have invaded 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. A 2002 bark beetle infestation affecting many Arizona and New Mexico forests 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).

The 2002 bark beetle infestation produced serious effects within the Tonto National Forest. Beetle activity was recorded on over 161,180 acres of Tonto pine forest land, and piñon mortality in the forest from the beetles covered 23,895 acres (USFS 2004d). Infestations of non-endemic weeds have also become an increasing concern in the area containing Prescott, Tonto, and Coconino National Forests. According to the USFS (2005d), 187,500 acres in the three forests suffer from invasive weeds, such as dalmation toadflax (*Linaria genistifolia*), which pose a substantial threat to native plant and animal populations. Recent decisions include projects intended to reduce the infestation of various invasive weeds through 14,000 acres of manual removal, 18,000 acres of mechanical removal, 14,000 acres of cultural removal and revegetation, 16,000 acres of biological removal, and 57,000 acres of herbicidal

treatments with limited spray zones established within a mile of communities, recreation and scenic sights, and trailheads.

Invasive grass species have also impacted both desert and grassland ecosystems in Arizona. In western deserts, 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 southern 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).

Unmanaged Recreation

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 Tonto alone, there are between 5.1-6.3 million visits each year to the national forest itself and between 84,000-134,000 wilderness visits, making the TNF one of the more visited forests in the state and establishing tourism as one of the single most vital economic factors to the communities surrounding the forest (Kocis et al. 2003b).

In Arizona, access to recreational activities on federal- and state-protected land is important and valuable to the general public. 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. Whether fishing, off-roading, boating, hunting, visiting archeological sites, mountain biking, or 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, 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 the respondents even felt that off-road vehicles should have access to forests with only limited restrictions (USFS 1999a). In 1996, almost half of all hunters used public lands, and one-third of their hunting days occurred entirely or in part on public lands (Flather, Brady, and Knowles 1999). In addition, activities such as rock climbing have greatly increased in popularity although their inherent risk has caused officials to consider special use fees to cover added ranger responsibilities surrounding climbing-related injuries (Cordell et al. 1999).

The explosive growth of recreational use presents challenges to managers even as the public receives increasing benefits from its forests and grasslands. At the national level, the Forest Service 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 off-highway vehicles (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 which are the foremost reasons for forest usage (Peart 1995, Knopf 1987).

Given the rapid growth of Arizona's population, overcrowding may eventually be an increasing challenge for the TNF although, at present, it does not seem to be an issue. According to NVUM data, more than 52% of visitors interviewed stated that there appeared to be hardly anyone else present during wilderness visits and only 18% of those interviewed considered overcrowding on developed overnight sites to be a problem in the Tonto, one of the best proportions for Arizona's national forests (Kocis et al. 2003b).

A related issue that has drawn some national 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 97% of the wilderness visitors to the TNF 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. 2003b).

9.2 Land and water resources

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. We have 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).

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[11] 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

Evidence suggests that Tonto National Forest has experienced considerable environmental alteration from historical grazing habits. In 1926, Fred Croxen, then a senior forest manager, related the story of Reverend Fuller, who came to the Tonto Basin in the late 1870s. The reverend described a land filled with "Red Topped grass" that he claimed "grew to a height of about sixteen inches." As Coxen noted in his speech, "There is none of this grass to be found now" (Coxen 1926). Investigating historical grassland ecosystems, researchers have studied the area surrounding Dutchwoman Butte, an area of land which, due to its relatively rough terrain and lack of accessibility, is considered to be in much the same state as it would have been before the arrival of Europeans. Examination done on the plains has shown that the fauna and grasses present in this area are strikingly different from other areas in Tonto with similar soil composition. In contrast to nearby, grazed areas, which are dominated by a 16% canopy of curly mesquite and whose only grass is *sideoats grama*, Dutchwoman Butte has twelve species, and a 40% canopy, of grasses (Ambos, Robertson, and Douglas 2000).

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 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

[11] An AUM, or Animal Unit Month, is equal to one cow with calf or five sheep feeding for one month.

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). In the Tonto in particular, excessive grazing has been identified as a major cause of increased fire frequency (Huggard 2001, Carter 2003). 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

In Arizona, the practice of allocating public lands for various beneficiaries 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).

Watershed integrity is of specific importance for Tonto National Forest inasmuch as the area was made a federal protectorate in order to preserve its watersheds. There are numerous dams and man-made lakes

across the forest and the annual rainfall exceeds sixteen inches. Although the forest ranks second in water production overall, it is by far the most important forest in terms of water storage. Its numerous dams—including the Roosevelt, Saguaro, Apache, Canyon, and Horseshoe—provide essential facilities for water reclamation as well as provide preventative protection against floods. With much of this water providing the residents of Phoenix, the state's largest city, the health and welfare of Tonto's watersheds remains an important priority for the forest and the surrounding communities (Baker et. al. 1998).

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 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. Two of the watersheds closest to the Tonto, the Verde and Salt River Systems, were up to 90% and 95% of capacity respectively at the time of this assessment. 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). Statewide, other longstanding water protection initiatives are suffering setbacks. 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).

Watershed pollution also remains a concern in the region. In 1993, Pinto Creek suffered environmental damage from a breach in containment at a tailing waste levee. Acid drainage and other chemical byproducts of the mining industry also pose dangers to recreational and fishing activities on public lands (Peart 1995).

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."

9.3 Forest access and travel

Earlier chapters discussed forest access and travel, focusing on the transportation characteristics of communities surrounding the Tonto National Forest. 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 non-native species. The TNF includes approximately 170,000 acres of inventoried roadless areas (USFS 2001c).

In 2001, the FS 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 5th, 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 (OHV) access

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 $1.8 billion[12] in 2002 in Maricopa, Pinal, Yavapai, and Gila Counties, representing $97.8 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 TNF 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

[12] 75% of this amount comes as a result of Maricopa County

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 TNF 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 Tonto National Forest 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 significant increase in population over the past two decades. Without question, the dramatic growth of the Phoenix Metropolitan Area has had a tremendous impact not only on this forest, but on the state of Arizona as a whole. According to the 2000 Census, the Phoenix–Mesa Metropolitan Area was the fourteenth largest, and the eighth fastest growing metro area in the United States. Over the last fifty years, the amount of land, water, and infrastructure devoted to supporting this growth has had a tremendous impact on the economic development of Maricopa County and the state as a whole. Over the next fifty years, as previously rural areas of Arizona become increasingly urban, the demand for natural and physical resources needed to sustain population growth and economic development will surely influence the future management alternatives of the TNF.

Data also show that overall population within the four counties surrounding the TNF increased by over one hundred percent between 1980 and 2000. Within this overall increase, growth in the retirement-age population and an upsurge in individuals of multiple race and Hispanic origin were particularly strong. Along with increases in population, the area witnessed a substantial growth in total housing, housing density and homes intended for seasonal use. 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 TNF and surrounding communities.

The economy of central Arizona is also likely to have a substantial impact on future planning and management on the TNF. Data suggest that economic growth in the region has been relatively strong when compared to state averages over the past several years. This is highlighted in part by considerable increases in total full- and part-time employment as well as per capita and household income. Meanwhile, recent indicators of dependence on natural resources have shown mixed results. Between 1990 and 2000, gains in income from tourism and wood products were offset by losses in income from special forest products. Although activities such as mining and ranching 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 TNF'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 TNF. 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 TNF 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 the national forests. This trend is supported by national surveys showing continued declines in timber harvesting and recent data on the Tonto National Forest which demonstrate similar declines in extractive use of forest lands. These same reports point toward a substantial increase in recreational uses of national forests in general and the TNF 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 TNF 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 TNF has designated dozens of wilderness areas, trailheads, camping and picnic areas, along with other cultural and recreation sites within forest boundaries. Forest archeologists and recreation staff have also made considerable progress in identifying a number of areas throughout central Arizona that are considered special by Native American tribes, descendents of early settlers, and wilderness enthusiasts. In the future, the TNF should continue to seek input from these and other groups in identifying special places and planning for their protection.

Regional trends and Forest Service planning regulations have influenced the relationships between the TNF and surrounding communities. In particular, the protection of wildlife, prevention of forest fire, and the sustainable management of area watersheds 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 TNF management objectives.

Finally, data suggest that a number of natural resource issues will continue to influence future management alternatives of the Tonto National Forest. 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.

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

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

* 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 Tonto National Forest

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	1,383.852	13,669.385	255.555	155.897	46.876	33.653	491.981
19	21 Mining	1,096.174	6,035.368	216.032	25.184	225.354	48.012	514.582
30	22 Utilities	3,543.073	7,650.407	691.804	50.887	1,195.638	382.510	2,320.838
33	23 Construction	22,162.874	185,890.652	6,893.726	1,638.630	983.429	112.984	9,628.768
46	31-33 Manufacturing	32,149.854	144,985.806	8,638.221	456.676	3,197.206	262.438	12,554.540
390	42 Wholesale Trade	12,514.288	85,561.797	4,804.475	211.791	1,963.400	2,080.631	9,060.296
391	48-49 Transportation & Warehousing	8,164.116	73,249.730	3,068.994	267.151	480.946	234.362	4,051.453
401	44-45 Retail trade	14,744.823	237,425.708	6,014.209	716.780	2,190.822	2,141.752	11,063.563
413	51 Information	7,667.531	43,237.966	2,022.537	246.917	1,545.896	416.107	4,231.457
425	52 Finance & insurance	19,324.016	129,919.327	5,638.308	491.161	4,090.959	540.043	10,760.471
431	53 Real estate & rental	20,924.417	107,633.552	1,551.852	1,658.513	9,358.765	1,892.611	14,461.741
437	54 Professional- scientific & tech svcs	11,600.290	137,511.436	5,527.455	1,698.170	1,262.482	142.428	8,630.535
451	55 Management of companies	2,508.673	18,575.695	1,156.356	20.018	517.982	27.443	1,721.799
452	56 Administrative & waste services	8,560.811	184,840.828	4,457.190	411.132	596.636	132.325	5,597.283
461	61 Educational svcs	1,272.768	24,966.982	644.766	21.128	81.500	19.751	767.146
464	62 Health & social services	12,619.787	162,198.503	6,167.445	695.694	831.817	96.426	7,791.383
475	71 Arts- entertainment & recreation	2,253.890	41,819.745	868.771	213.878	170.224	154.540	1,407.413
479	72 Accommodation & food services	6,829.475	154,706.634	2,525.649	156.665	552.856	370.969	3,606.139
482	81 Other services	6,736.065	141,999.153	2,833.786	380.444	157.372	73.925	3,445.527
495	92 Government & non NAICs	24,890.297	236,683.454	10,257.434	0.000	10,125.038	1,201.366	21,583.837
	Totals	220,947.076	2,138,562.129	74,234.565	9,516.716	39,575.196	10,364.276	133,690.754

*Millions of dollars