Socio-Economic Assessment for the Kaibab National Forest

Prepared for the Southwest Region
USDA Forest Service

The University of Arizona
School of Natural Resources

2005

Socioeconomic Assessment of the Kaibab National Forest

Prepared for:

The Kaibab National Forest
800 South Sixth Street
Williams, AZ 86046
and
USDA Forest Service Region 3
(Southwestern Region)
333 Broadway SE
Albuquerque, NM 87102

Submitted by:

Arizona National Forests Socioeconomic Assessment Team
The University of Arizona
School of Natural Resources
312 BioSciences East
P.O. Box 210043
Tucson, AZ 85721-0043

Acknowledgements

The completion of this socioeconomic assessment would not have been possible without consistent cooperation between the University of Arizona and the Southwestern Region of the United States Forest Service. We would like to thank the following individuals for the time and effort they contributed to the development of this study. Reuben Weisz was an important resource in the Regional Office, offering critical guidance during the formative stages of the assessment. Bruce Higgins was a valuable source of information on the Kaibab National Forest. Craig Wissler, Mickey Reed, and Alona Bachi of the Advanced Resource Technology Group in the College of Agriculture at the University of Arizona provided land ownership and land use data as well as each of the GIS components of this assessment. Susan Winter of the Planning Analysis Group in the Rocky Mountain Research Station provided the IMPLAN data for assessment of natural resource dependent economic activities.

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.
Members include the following individuals:

J.E. “Ed” de Steiguer, Ph.D.	Principal Investigator
Tom Spangler	Project Manager
Sara Jensen	Research Specialist/Writer
Ian MacDonald	Writer / Editor
J.R. Owens	Data Analyst
Denise Fisher	Research Specialist
Cori Carveth	Research Specialist
Julie Michael	Research Specialist

Abstract

This report presents a socioeconomic assessment of the five-county area surrounding the Kaibab 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. In addition to revealing 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.

TABLE OF CONTENTS

Acknowledgements i
Abstract ii
List of Tables v
List of Figures vi
Acronyms vii
Executive Summary ix

1. Introduction 1
   1.1 Statement of purpose 1
   1.2 Assessment methodology and topics 1
   1.3 Report organization 2
2. Demographic Patterns and Trends 3
   2.1 Historical context and social characteristics 3
   2.2 Population, age structure, net migration, and tourism 7
   2.3 Racial/ethnic composition and educational attainment 14
   2.4 Housing characteristics and population projections 17
   2.5 Key issues for forest planning and management 19
3. Economic Characteristics and Vitality 21
   3.1 Historical context and regional economic conditions 21
   3.2 Employment and income within key industries 22
   3.3 Forest- and natural-resource dependent economic activities 36
   3.4 Government earnings from federal-lands related payments 38
   3.5 Key issues for forest planning and management 41
4. Access and Travel Patterns 43
   4.1 Historical context and current access issues 43
   4.2 Predominant transportation modes and seasonal flow patterns 44
   4.3 Regional transportation plans and roadway improvements 49
   4.4 Internal modes, barriers and access issues 52
   4.5 Key issues for forest planning and management 53
5. Land Use 55
   5.1 Historical context and land use patterns 55
   5.2 Land ownership and land use 56
   5.3 County land use plans and local policy environment 62
   5.4 Changes in land use affecting Kaibab National Forest 70
   5.5 Key issues for forest planning and management 71
6. Forest Users and Uses 74
   6.1 Historical context and user groups 74
   6.2 Extractive uses and users 75
   6.3 Non-extractive uses and users 75
   6.4 Special users and uses 79
   6.5 Key issues for forest planning and management 81
7. Designated Areas and Special Places 84
   7.1 Historical context and methods of designation 84
   7.2 Designated areas 85
   7.3 Special places 88
   7.4 Scenery management 88
   7.5 Key issues for forest planning and management 89
8. Community Relationships 92
   8.1 Historical context and methods of designation 92
   8.2 Community profiles and involvement with natural resources 93
   8.3 Communities of interest and forest partnerships 97
   8.4 Historically underserved communities and environmental justice 102
   8.5 Community-forest interaction 106
   8.6 Key issues for forest planning and management 109

9. Key Resource Management Topics 112
9.1 Forest health.....112
9.2 Land and water resources.....118
9.3 Forest access and travel 123
10. Summary of Key Findings and Recommendations.....125
11. Works Cited.....127

Appendix A. Industry Sectors for IMPLAN Data Analysis 143
Appendix B. Indirect Economic Effects of Forest-Related Products in the Kaibab National Forest.....145

List of Tables

Table 1. Total Area, Total Population, Population Density, and Forest Service Acreage by County and Place 8
Table 2. Decennial County, Place, and State Populations, 1980-2000 and % Change 9
Table 3. Urban and Rural County Populations, 1980-2000 and % Change 10
Table 4. Age Structure of County, Place, and State Populations (under 18 and 65+), 1990-2000 and % Change 11
Table 5. Net Migration by County, 1990-2000 and % Change 13
Table 6. Racial/Ethnic Composition of County and State Populations, 1990-2000 and % Change 15
Table 7. Racial/Ethnic Composition of County and State Populations by Percentage, 1990-2000 and Change 16
Table 8. Educational Attainment for County and State Populations 25-Yrs. Old and Over 17
Table 9. County, Place, and State Housing Characteristics, 1990-2000 and % Change 18
Table 10. County and State Population Projections, 2010-2030 and % Change 19
Table 11. Employment by Industry, County and State, 1990-2000 and % Change 24
Table 12. County and State Employment by Industry Percentages, 1990-2000 and % Change 26
Table 13. Major Employers by County, 2004 30
Table 14. Dominant Occupations of State and County Populations, 2000 31
Table 15. Average Annual Unemployment Rates by County, State, Place, and U.S., 1980-2004 32
Table 16. Per Capita and Family Income by County and State 33
Table 17. Household Income Distribution by County, 2000 34
Table 18. Total Labor Income from Forest Resources by County and State, 1990-2000 and % Change 37
Table 19. Tourism Employment by County and State, 1990-2000 and % Change 38
Table 20. Payment in Lieu of Taxes (PILT) Entitlement Acreage by County and Agency, FY 2004 39
Table 21. County PILT Payments, 2000-2004 40
Table 22. Forest Receipts by County, 1986-1999 (Amounts in 1,000s) 40
Table 23. U.S., State, and Indian Routes by County 46
Table 24. Daily Vehicle-Miles of Travel (VMT) by County, 1990-2000 and % Change 47
Table 25. Daily and Monthly Traffic Variation by Cluster Area, 2003 49
Table 26. ADOT Current 5-Year Transportation Facilities Construction Program, Kaibab National Forest 50
Table 27. Land Ownership by County, 2005 58
Table 28. Land Cover by County and Assessment Area, 1990 60
Table 29. Description of ROS Classifications 77
Table 30. Ten Most Popular Recreation Activities, NSRE 2000-2001 78
Table 31. Participation in General Outdoor Activities, NSRE 2000-2001 78
Table 32. Designated Areas on the Kaibab National Forest 85
Table 33. Weblinks to Community Profiles for Counties and Municipalities in the Area of Assessment 93
Table 34. Acreage of Arizona National Forests in Federal Congressional Districts 94
Table 35. Natural-Resources Related Keyword Search of Six Arizona Newspapers 96
Table 36. Selected Public Issues for the Kaibab National Forest 97
Table 37. Communities of Interest for the Kaibab National Forest 98
Table 38. Tribal Consultation Responsibilities for the Kaibab National Forest 98
Table 39. United States Forest Service, Southwest Region Partners 100
Table 40. Partnerships for the Kaibab National Forest 101
Table 41. Minority- and Women-owned Businesses by County, 2002 103
Table 42. Plant Community Types and Principle Plant Species in the KNF 113

List of Figures

Figure 1. Map of Forest Boundaries and Counties in Area of Assessment 5
Figure 2. Proximity of Population – Municipalities within 100-Mile Radius 6
Figure 3. Five-County Assessment Area Population Change, 1900-2000.....9
Figure 4. Five-County Assessment Area Urban/Rural Composition, 1980-2000.....10
Figure 5. Percent Change under-18 and 65+ Populations by County, 1990-2000.....12
Figure 6. Map of Arizona Tourism Regions.....14
Figure 7. Five-County Assessment Area Racial/Ethnic Composition, 1980-2000.....16
Figure 8. Percent Change in Total and Seasonal Housing Units by County, 1990-2000 19
Figure 9. Percent Change in Industry by County and State, 1990-2000.....28
Figure 10. Unemployment Rates by County and State, 1980-2004.....35
Figure 11. Annual Percent Change in Per Capita Income by County, 1980-2000.....35
Figure 12. Percent of Families in Poverty by County, 1990-2000.....36
Figure 13. Forest Receipts by County, 1986-1999 41
Figure 14. Road Network within the Area of Assessment.....45
Figure 15. Traffic Pattern Cluster Areas.....48
Figure 16. Land Ownership within Area of Assessment 57
Figure 17. Percent Ownership of Major Land Owners in Five-County Area of Assessment.....57
Figure 18. Land Cover within the Area of Assessment 59
Figure 19. Visitor Recreation Days as Compared to Timber Extraction, 1950-1997 82
Figure 20. Social Networks in Natural Resource Management.....108
Figure 21. Partial Social Network for the Kaibab National Forest.....109

Acronyms

AADT	Average Annual Daily Traffic
ADOC	Arizona Department of Commerce
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
ASNF	Apache-Sitgreaves National Forests
ATR	Automatic Traffic Recorder
AUM	Animal Unit Month
AZOT	Arizona Office of Tourism
AZSLD	Arizona State Land Department
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
CDP	Census Designated Places
CFLHD	Central Federal Lands Highway Division
CIP	Capital Improvement Plan
CLIMAS	Climate Assessment for the Southwest
CNF	Coronado National Forest
CYMPO	Central Yavapai Municipal Planning Organization
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
FHWA	United States Department of Transportation Federal Highway Administration
FMPO	Flagstaff Metropolitan Planning Organization
FS	Forest Service
FSH	Forest Service Handbook
GCIA	Grand Canyon Improvement Association
GIS	Geographic Information System
IMI	Inventory and Monitoring Institute
IRA	Inventoried Roadless Areas
ITS	Intelligent Traffic Systems
KNF	Kaibab National Forest
MCD	Minor Civil Division
MIG	Minnesota IMPLAN Group
NACOG	Northern Arizona Council of Government
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NIFC	National Interagency Fire Center
NRIS	Natural Resource Information System
NSRE	National Survey on Recreation and the Environment
NVUM	National Visitor Use Monitoring
OHV	Off-Highway Vehicle
PAG	Planning Analysis Group
PILT	Payments in Lieu of Taxes
PNF	Prescott National Forest
PPI	Per Capita Personal Income
PRIA	Public Rangelands Improvement Act
RAP	Roads Analysis Process
RARE	Roadless Area Review and Evaluation
ROS	Recreation Opportunity Spectrum

Acronyms

SOPA	Schedule of Proposed Action
TDR	Transfer of Development Rights
TEIM	Tourism Economic Impact Model
USFS	United States Forest Service
VMT	Vehicle Miles Traveled
WACOG	Western Arizona Council of Governments
WAPA	Western Area Power Authority
WMA	Waste Management of Arizona

Executive Summary

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

A multi-county area of assessment provides a framework for the compiling of social and economic data for this report. The boundaries of the Kaibab National Forest abut the state of Utah and extend into three counties in northern 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. The following section highlights collected information pertaining to each of these seven topics.

Demographic Patterns and Trends

Total population

Three of the five counties within the area of assessment experienced dramatic population growth between 1980 and 2000. The highest rates of increase were seen in Mohave, Washington and Yavapai Counties (247%, 178% and 146% respectively). Population growth within each of these counties far exceeded the rate of increase in overall population for their respective states over the same period. Population growth between 1980 and 2000 was considerably less in Coconino and Kane Counties (55% and 50% respectively). Among individual cities, Prescott Valley, Camp Verde, St. George, Lake Havasu City, and Kingman experienced the greatest increases in total population between 1980 and 2000.

Population age

The increase in individuals age 65 and over was greater than those 18 and under for three of the five counties within the area of assessment. The exceptions were Mohave and Yavapai Counties where the increase in both age groups exceeded those at the state level between 1990 and 2000. The greatest disparity between the growth of the 65-and-over and under-18 populations was reported in Coconino County. The cities of Prescott Valley, Cottonwood, St. George, and Lake Havasu City reported the most significant increases in 65-and-over populations among selected cities within the area of assessment.

Racial/ethnic composition

Washington and Mohave Counties reported dramatic increases in population of individuals of multiple race and Hispanic origin between 1990 and 2000, clearly outpacing increases in the same categories at the state level over the same period. Despite substantial increases in individuals of multiple-race and Hispanic ethnicity, whites remain the predominant racial group in each county within the area of assessment. As of 2000, Coconino County was the most racially diverse within the area of assessment due to its considerable Native American population.

Housing

Increases in total housing and housing density were greatest in Washington County between 1990 and 2000, mirroring similar growth in its overall population. Housing increases were also substantial in Mohave and Yavapai Counties over the same period. Each of these three counties also saw a significant increase in seasonal housing over the ten-year period. By comparison, Coconino and Kane Counties reported much more moderate increases in housing between 1990 and 2000.

Economic Characteristics and Vitality

Employment

Economic growth for the area of assessment was significant between 1990 and 2000. Washington and Yavapai Counties reported the strongest gains in total full- and part-time employment with especially strong increases in the construction, finance, and real estate sectors. Despite moderate gains in total and full-time employment, Coconino, Mohave, and Kane Counties maintained average rates of unemployment that were greater than those for their respective states or the United States as a whole between 1980 and 2004.

Occupational structure

The occupational structures within three of the five counties within the area of assessment closely resemble those for the states of Arizona and Utah overall. In these areas, management, professional, and related occupations is the dominant occupational category, followed by sales and office occupations as well as service occupations. The exceptions are Mohave and Washington Counties where sales and office occupations are the most common. For 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 occupational categories.

Income

As a whole, the area of assessment witnessed relatively strong gains in income between 1990 and 2000. Despite these gains, however, each of the counties within the area of assessment maintained levels of per capita and family income that were below average for their respective states as of 2000. Kane County saw the greatest increases in per capita and median family income as well as the largest decreases in individual and family poverty between 1990 and 2000. Although Coconino and Washington Counties saw substantial declines in individual and family poverty, both maintained rates of poverty that were greater than average for their respective states as of 2000.

Natural-resource dependent economic activity

Changes in income from natural resources were particularly dramatic in Coconino and Kane Counties between 1990 and 2000. Data for the both counties show a precipitous decline in income from wood products and processing and a substantial increase in income from special forest products and processing over the period. Kane and Washington Counties reported especially strong increases in tourism employment between 1990 and 2000. Mohave County reported the slightest increase in tourism employment over the same period.

Access and Travel Patterns

Existing federal and state road networks

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 states of Arizona and Utah, 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 was greatest in Yavapai County between 1990 and 2000—an expected result of population increases over the same period. Peak traffic flow for the area of assessment occurs between the months of June and August, and traffic is lowest from November to February. With respect to internal modes of travel, the greatest increases were reported for off-highway vehicles.

Planned improvements

The Arizona Department of Transportation currently has few plans for road improvements in proximity to the Kaibab National Forest over the next five years. Although county governments throughout the area of assessment envision improvements to arterial road networks, implementation of such plans is dependent on the pace of population growth and the level of transportation infrastructure funding. There are currently no plans to expand the existing network of internal roads in the Kaibab National Forest.

Barriers to access

On external road networks, the greatest barrier to access is likely poor road maintenance resulting from constrained county transportation budgets. Currently, there are few barriers to access within the Kaibab National Forest. The potential exists however, for future access issues resulting from the proximity of forest roads and trails to private property. Information obtained from forest personnel suggests that private land owners throughout the state of Arizona have increasingly sought to limit passage through their property for the purpose of accessing public 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 Native American and Forest Service land. Coconino County has the greatest amount of Native American lands whereas Gila County has far and away the greatest amount of land controlled by the Forest Service. Yavapai County reported the greatest amounts of private and State Trust land, while Gila County reported the smallest amount of land in both these categories.

Land coverage and land use

Shrub and brush rangeland is the predominant land cover in four of the five counties within the area of assessment for the Kaibab National Forest. The lone exception is Coconino County where evergreen forest is the most common type of land cover. Within the area of assessment, Yavapai County reported the highest percentage of residential and industrial land cover while Coconino County reported the greatest amount of commercial and services 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 ranching in rural areas to denser concentrations of residential, industrial, and commercial uses in and around urban centers. Preservation of open space is a particularly important land use issue given both the public's desire to maintain the "rural character" of county lands and the need to accommodate rapidly growing populations and municipalities. The provision of adequate, affordable infrastructure and sufficient water supplies is also a growing concern for planners, residents, and land managers throughout the region.

Forest Users and Uses

Extractive uses

Historically, extractive uses have played a major role in public land management throughout the area of assessment. National studies show, however, that land uses such as livestock grazing, timber cutting, and mining are being slowly succeeded in policy and management by an emphasis on non-extractive uses. These national trends are supported by information which suggests a similar decline in timber harvesting and livestock grazing on lands managed by the Kaibab National Forest.

Non-extractive uses

Although recreation use has increased steadily since the establishment of the National Forest Service, the increase in recreation over the past few decades has been particularly dramatic. According to National Visitor Use Monitoring data, the Kaibab National Forest received approximately 560,000 visits during fiscal year 2000—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 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 Kaibab National Forest including Native American tribes, OHV users, wildlife users, and wilderness users. The management and accommodation of these and other special user groups have involved increasing administrative and political implications in recent years.

Designated Areas and Special Places

Natural, recreational, and interpretive resources

The Kaibab National Forest encompasses considerable natural, recreational, cultural, and interpretive resources including nearly 150 trailheads, camping and picnic sites, fishing, and scenic areas. Although special places are inherently difficult to identify and categorize, the Kaibab National Forest is home to a

range of individual places considered special by various user groups. Most importantly, land managed by the KNF includes a number of cultural sites and special places for the various Native American tribes in the region

Issues surrounding identification of special places as 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 Kaibab 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 general interest in the use and management of forest resources with particular attention paid to recreational uses such as hunting and fishing as well as management of wildlife and regional water sources.

Communities of interest and historically underserved communities

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

Given rates of population growth and urban expansion in northern Arizona and southern Utah, the Kaibab 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 an impact on the forest given the presence of State Trust land within the area of assessment. Likewise, the role of managing regional watersheds places the Kaibab National Forest at the center of contentious debates over water provision, particularly in light of the ongoing regional drought.

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

1.2 Assessment methodology and topics

This assessment of the social and economic environment surrounding the KNF 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 KNF, this includes Coconino, Mohave, and Yavapai Counties in Arizona as well as Kane and Washington Counties in Utah. Where appropriate, social and economic trends for the area of assessment are compared to those for the states of Arizona and Utah. 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 Kaibab 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 KNF 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 Kaibab NF and discusses their importance to forest management. Chapter 8 assesses relationships between the KNF 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 five counties within the area of assessment for Kaibab National Forest (KNF). Data on selected cities within the area of assessment are included in order to illustrate important factors contributing to demographic change for specific populations. Demographic data for both Arizona and Utah are also addressed as a basis for a comparison of trends among the bordering states. 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 Washington, Mohave, and Yavapai Counties have all undergone considerable growth over the last twenty years, exceeding statewide population growth rates for the same period. Similarly, each of these counties experienced significant increases in their populations of individuals under 18 as well as individuals 65 and over between 1990 and 2000. Most of the urban areas within the region can be characterized as small towns with Flagstaff the only city reporting more than 50,000 residents as of 2000. The last twenty years have also seen significant shifts from a largely rural regional population to one that is predominantly urban. Here again, Washington, Mohave, and Yavapai Counties experienced relatively sharp increases in total housing units as well as housing for seasonal use. Each of the counties became more racially and ethnically diverse between 1990 and 2000 although, with the exception of Coconino County, they remained considerably less diverse than overall state populations.

2.1 Historical context and social characteristics

It is estimated that human activity within the area surrounding the KNF dates back to 8,000 B.C.E. although overall human use in the area was low. Trade routes were developed early across the Kaibab, linking trails that extended from the Rio Grande to the Pacific Ocean (Putt 1995). Early settlement within the area was limited by available surface water; a short growing season; and thin, rocky soils which were ill-suited for agricultural purposes.

Three Native American tribes—the Havasupai, the Hualapai, and the Yavapai—made use of the land for hunting, gathering, and planting limited crops. Early variations of these tribes have been linked to the area as early as 650 C.E. (Martin 1985). Hopi and Zuni tribes also ventured into the Kaibab area from the east to collect medicinal plants, piñon nuts and fuel woods (Putt 1995). Several natural landmarks, including Bill Williams Mountain, Kendrick Mountain, Sitgreaves Mountain, and Red Butte, were considered sacred by earlier Native American Inhabitants.

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).

Early exploration of the Kaibab area was initiated in the mid 1540s to search for gold and silver deposits. The Spaniards conducted multiple expeditions through the area over the course of 250 years, and although they gained much knowledge of the area and its resources, they lacked the necessary money and immigrant population to settle and develop the area.

The United States claimed control of the region in the mid 1800s, and the livestock industry found the area most beneficial. The tall, rich grasses in the Kaibab Forest area attracted sheep and cattle farmers. By 1890, John Wesley Powell had submitted a report on the Rocky Mountain Forest region to Congress, stating that the forests within the territory were in a serious state of decline, posing both an economic and environmental threat for the country. After the passing of the General Provision Act of 1891, President Benjamin Harrison signed a proclamation which established the Grand Canyon Forest Reserve. By 1908, shortly after the administration of the forest reserves was transformed from the Department of the Interior to the Department of Agriculture, this area became known as the Kaibab National Forest. In 1934, the Kaibab National Forest was combined with the Tusayan National Forest to make the Kaibab National Forest as we know it today.

The KNF is part of the largest contiguous ponderosa pine forest in the United States. The word Kaibab is a Shivwits Indian word for the region which translates to "lying down mountain." The original inhabitants of the Colorado Plateau believed that the region's gently rolling plateaus and volcanic peaks resembled mountains lying on their sides (Tucker and Fitzpatrick 1972). Located in north-central Arizona and bordering the north and south rims of the Grand Canyon, the 1.6 million acres of the KNF provide a striking contrast to the deserts in western and southern Arizona. Topography in the forest consists of rolling hills and several volcanic peaks, most notably Bill Williams Mountain, Sitgreaves Mountain, and Kendrick Mountain, the latter, at 10,418 feet, being the tallest peak in the state. Annual precipitation in the Kaibab Forest area varies at around twelve to twenty inches and occurs predominantly in the form of snow during the winter months (Lowe 1972).

The demographic history of the area surrounding the KNF, 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, Coconino County has itself grown at an average of just above 3% per year over the past fifty years, and over the past century, the counties surrounding the KNF have grown from a total of 29,000 residents to over 535,000 (U.S. Census Bureau 2005, Forstall 1995, Morton 2003). The state of Utah has increased in size from 276,000 residents to over 2.2 million. 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 in the two states surrounding the KNF. 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. Utah has fared even worse in terms of its state racial diversity. In 1940, African Americans represented a mere 0.22% of the population, and that amount rose

but a fraction over the following sixty years to 0.79% in 2000. The Native American population has doubled, but this represents only an increase from 0.65% to 1.33% of the population. Residents of Hispanic origins, however, have increased by the largest amount of any racial category in Utah over the period, rising from 0.46% of the population in 1940 to over 9% in 2000 (U.S. Census Bureau 2005). [1]

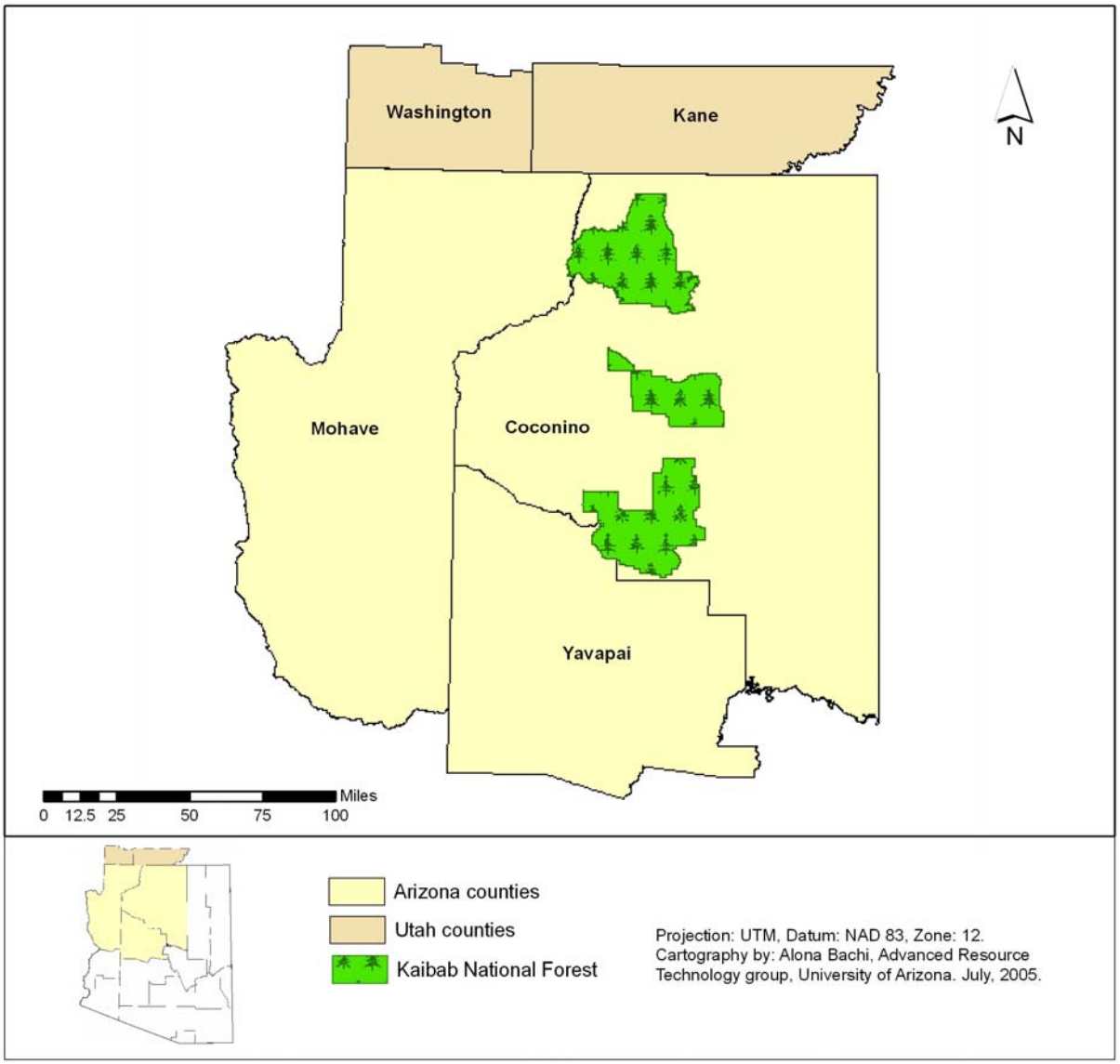


Figure 1. Map of Forest Boundaries and Counties in Area of Assessment

[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 (Tables 17 and 59) and are juxtaposed against the Census 2000 findings.

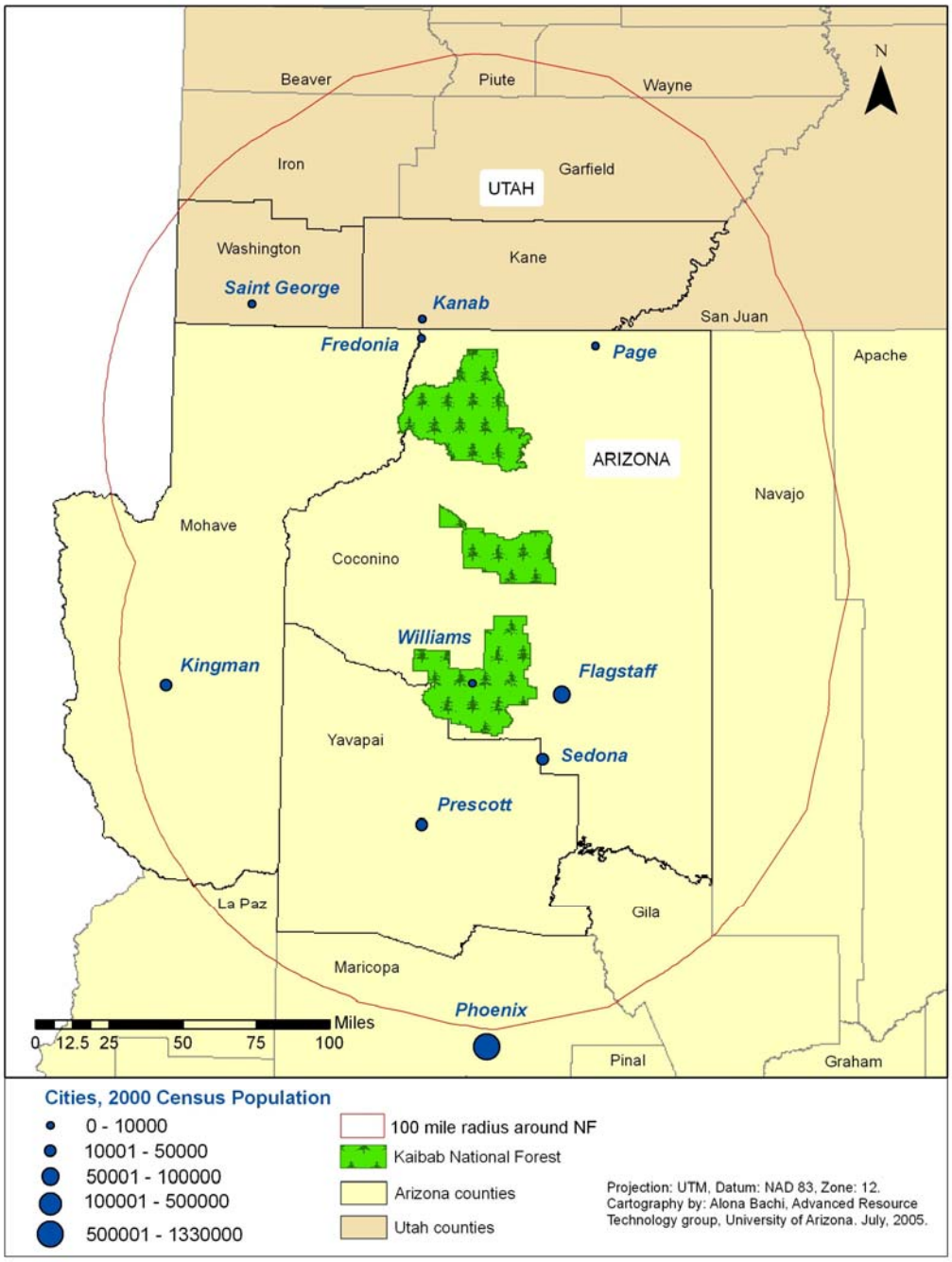


Figure 2. Proximity of Population – Municipalities within 100-Mile Radius

2.2 Population, age structure, net migration, and tourism

Information concerning total land area, U.S. Forest Service acreage, total population, and population density for each of the five counties is presented in Table 1. Data show that Coconino County has both the largest total area and the greatest amount of Forest Service land with well over 3 million acres. Populations range from 167,517 individuals in Yavapai County to 6,046 in Kane County, Utah. Kane County is also the most sparsely populated with 1.51 individuals per square mile while neighboring Washington County, Utah is more densely populated with 20.97 individuals per square mile. Of the selected cities within the area of assessment, Flagstaff is the most populous, followed by St. George, Lake Havasu City, and Prescott.

County and state population changes between 1980 and 2000 are presented in Table 2. Data show that population growth in Washington County over the past two decades has significantly outpaced that of the other counties in the area of assessment as well as exceeding state averages for both Utah and Arizona. The populations of both Yavapai and Mohave Counties also increased considerably, although at a more conservative pace, between 1990 and 2000. Both Coconino and Kane Counties grew at a slower rate than the average within their respective states. Several cities within the area of assessment mirrored strong population growth rates at the county level. Camp Verde, Prescott Valley, Sedona, and St. George experienced particularly large population increases between 1980 and 1990. Between 1990 and 2000, Prescott Valley, Lake Havasu City, Chino Valley, and Page sustained population growth rates in excess of county growth rates over the same period.

Table 3 presents urban and rural population data and percent change by county from the three most recent censuses. Data confirm an overall trend towards urbanization throughout the region over the last two decades. Yavapai and Kane Counties, in particular, underwent significant shifts from predominantly rural areas to largely urban areas between 1980 and 1990. The dramatic shift in Kane County is likely due in part to its limited population and 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 at that time by Kanab, the small town that accounted for over half of the county's total population of 6,046 in 2000. 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 smaller towns and suburbs. This shift likely explains much of the total population growth for Kane County between 1980 and 1990, leading to a somewhat skewed picture of the shift between urban and rural populations. Census data show that between 1990 and 2000, Kane County achieved a roughly even split between very small urban and rural populations. Of all five counties in the area of assessment, Washington County, Utah is the most urban with over 80% of residents living in urban areas as of 2000.

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
Coconino County	18,661	116,320	6.23	3,275,320
Flagstaff	63.6	52,894	831.67	n/a
Sedona	18.6	10,192	547.96	n/a
Page	16.6	6,809	410.18	n/a
Williams	43.5	2,842	65.33	n/a
Fredonia	7.4	1,036	140.00	n/a
Mohave County	13,312	155,032	11.64	1,704,652
Lake Havasu City	43	41,938	975.30	n/a
Bullhead City	45.2	33,769	747.10	n/a
Kingman	30.0	20,069	668.97	n/a
New Kingman/ Butler	14.6	14,810	1,014.38	n/a
Colorado City	10.5	3,334	317.52	n/a
Yavapai County	8,128	167,517	20.6	5,487
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	857.9	n/a
Chino Valley	18.6	7,835	421.24	n/a
Kane County, UT	3,992	6,046	1.51	6,046
Kanab	14.0	3,564	254.57	n/a
Washington County, UT	2,427	90,354	20.97	90,354
St. George	64.4	49,663	771.16	n/a

* Cottonwood - Verde Village is an unincorporated Census Designated Place (CDP)

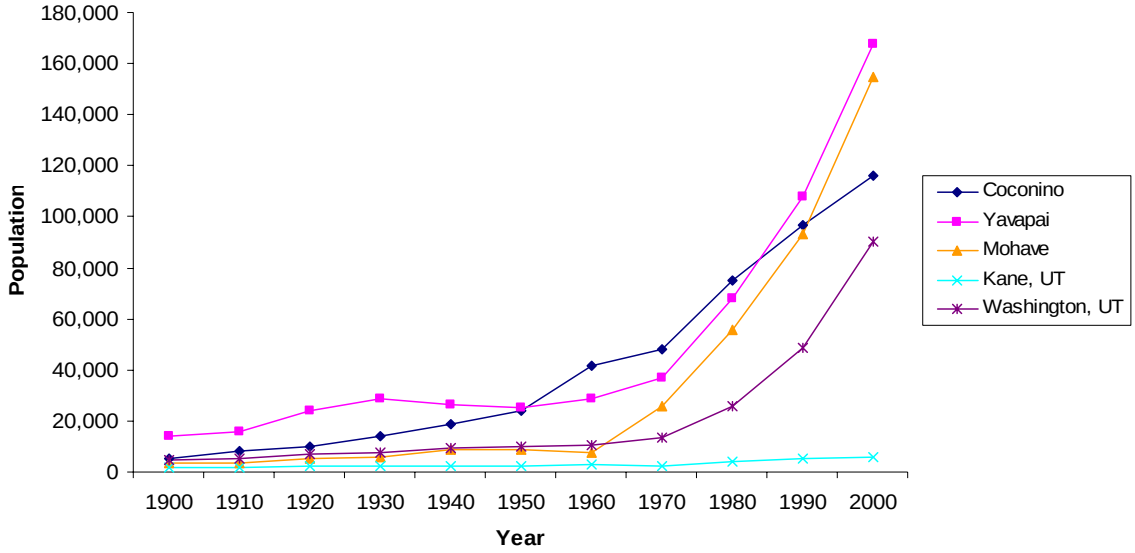
Source: NRIS - Human Dimensions

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	2000	1980-1990 % Change	1990-2000 % Change
Coconino County	75,008	96,591	116,320	28.77%	20.43%
Flagstaff	34,743	45,857	52,894	31.99%	15.35%
Sedona	2,266	6,598	6,809	191.17%	3.20%
Page	4,907	7,645	10,192	55.80%	33.32%
Williams	5,368	2,461	2,842	-54.15%	15.48%
Fredonia	1,040	1,197	1,036	15.10%	-13.45%
Mohave County	55,865	93,497	155,032	67.36%	65.81%
Lake Havasu City	15,909	24,363	41,938	53.14%	72.14%
Bullhead City	n/a	n/a	33,769	n/a	n/a
Kingman	9,257	12,722	20,069	37.43%	57.75%
New Kingman/ Butler	n/a	11,627	14,810	n/a	27.38%
Colorado City	n/a	2,355	3,334	n/a	41.57%
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%
Kane County, UT	4,024	5,169	6,046	28.45%	16.97%
Kanab	2,148	3,289	3,564	53.12%	8.36%
Washington County, UT	26,065	48,560	90,354	86.30%	86.07%
St. George	11,350	28,502	49,663	151.12%	74.24%
Arizona	2,718,215	3,665,228	5,130,632	34.84%	39.98%
Utah	1,461,037	1,722,850	2,233,169	17.92%	29.62%

Source: NRIS - Human Dimensions



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

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

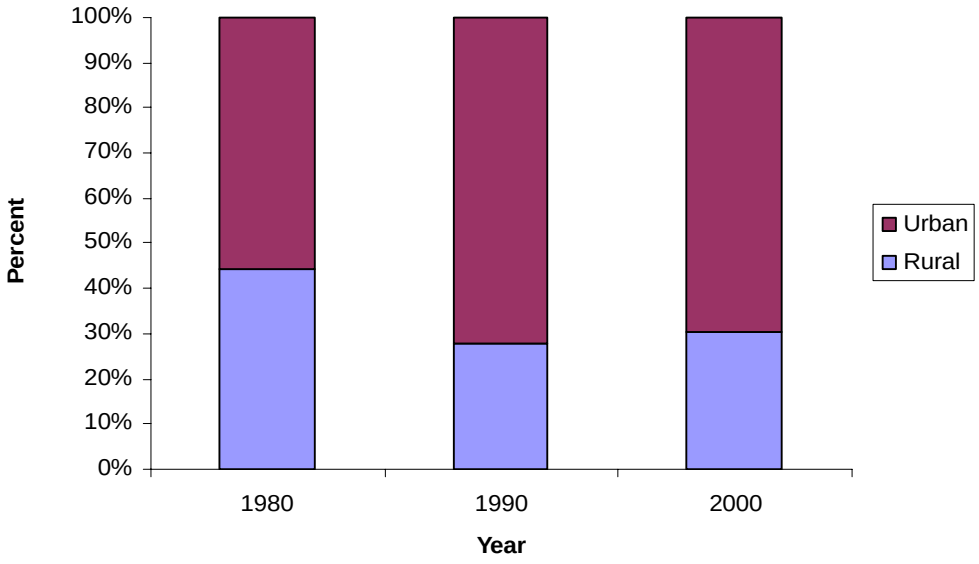
Table 3. Urban and Rural County Populations, 1980-2000 and % Change

County		1980* Population	1980* % of Total	1980* % Change	1990 Population	1990 % of Total	1990 % Change	2000 Population	2000 % of Total	2000 % Change
Coconino	Urban	46,473	61.96%	n/a	63,988	66.25%	37.69%	74,462	64.01%	16.37%
	Rural	28,535	38.04%	n/a	32,603	33.75%	14.26%	41,858	35.99%	28.39%
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%
Mohave	Urban	35,530	63.60%	n/a	79,957	85.52%	125.04%	117,132	75.55%	46.49%
	Rural	20,335	36.40%	n/a	13,540	14.48%	-33.42%	37,900	24.45%	179.91%
Kane (UT)	Urban	0	0.00%	n/a	3,148	60.90%	n/a	2,782	46.01%	-11.63%
	Rural	4,024	100.00%	n/a	2,021	39.10%	-49.78%	3,264	53.99%	61.50%
Washington (UT)	Urban	14,442	55.41%	n/a	35,898	73.93%	148.57%	72,550	80.30%	102.10%
	Rural	11,623	44.59%	n/a	12,662	26.07%	8.94%	17,804	19.70%	40.61%

*Does not account for farming populations

N.B.: % Total is the percentage of total population. % Change is the percentage of change from prior census year

Source: NRIS - Human Dimensions



Source: NRIS - Human Dimensions

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

The age structure of populations for the counties and states is presented in Table 4. Data show significant increases in the under-18 populations of Yavapai, Mohave, and Washington Counties, each of which far surpassed the rate of growth for the same cohort within their respective states as a whole. Kane County actually experienced a decline in its under-18 population between 1990 and 2000 and was the only county in the region which did not experience significant growth in the population of individuals 65 and over. Washington and Mohave Counties saw the greatest increase in the 65-and-over population with gains of 70.64% and 62.88% respectively. Of the selected cities within the area of assessment, Prescott Valley and Lake Havasu City saw substantial growth in their under-18 populations between 1990 and 2000. They

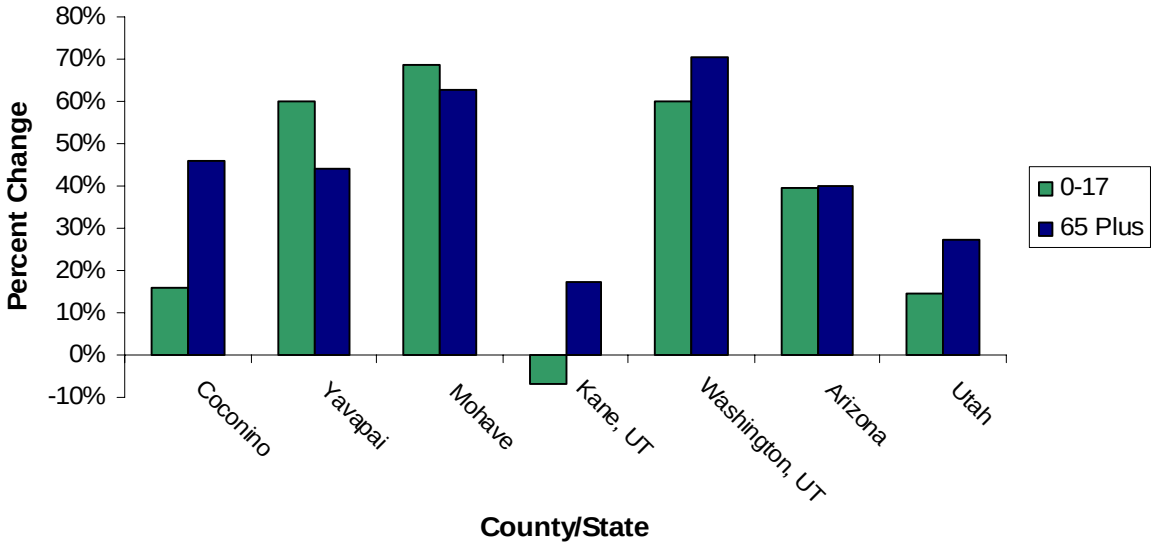
were joined by Kingman, Cottonwood, and St. George in experiencing similar increases in the 65-and-over population during the same period.

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**
Coconino County	29,624	33,425	12.83%	5,585	8,143	45.80%
Flagstaff	11,321	12,834	13.36%	1,988	2,826	42.15%
Sedona	2,559	2,178	-14.89%	351	432	23.08%
Page	1,098	1,401	27.60%	2,456	2,605	6.07%
Williams	743	847	14.00%	323	316	-2.17%
Fredonia	470	335	-28.72%	72	115	59.72%
Mohave County	21,282	35,860	68.50%	19,479	31,728	62.88%
Lake Havasu City	4,705	8,151	73.24%	5,812	10,695	84.02%
Bullhead City	n/a	7,594	n/a	n/a	6,479	n/a
Kingman	3,402	5,021	47.59%	2,205	3,571	61.95%
New Kingman/ Butler	2,812	3,806	35.35%	2,606	2,846	9.21%
Colorado City	1,571	2,014	28.20%	21	56	166.67%
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%
Kane County, UT	1,908	1,777	-6.87%	1,251	1,467	17.27%
Kanab	1,226	1,031	-15.91%	507	698	37.67%
Washington County, UT	17,610	28,190	60.08%	13,336	22,756	70.64%
St. George	9,290	14,091	51.68%	5,160	9,566	85.39%
Arizona	978,783	1,366,947	39.66%	477,200	667,839	39.95%
Utah	627,928	718,698	14.46%	149,692	190,222	27.08%

* Verde Village includes Cottonwood CDP

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 Washington and Yavapai Counties has been especially strong, fueled by in-migration of individuals previously living outside the county. Conversely, net migration to Kane County was relatively low between 1990 and 2000. Washington County reports a relatively large increase in the numbers of immigrants from outside the state of Utah, particularly those from the northwestern and southern regions of the United States. Washington, Yavapai, and Mohave Counties also reported significant increases in the number of individuals migrating from “elsewhere” (different countries) over the period.

Historically, the Arizona Office of Tourism (AZOT) has reported visitor statistics by designated tourist region rather than by county. Currently, AZOT collects visitation and economic impact data for seven distinct tourism regions within the state (Figure 6). The area of assessment of Kaibab National Forest is located within the region referred to as the “Canyon Country” Region. The 2003 Profile for the Canyon Country Region reported 3.3 million domestic overnight leisure visitors, representing an 11.5% increase over the 2.96 million domestic overnight leisure visitors reported a decade earlier. This placed the Canyon Country as the third most visited region in the state behind the Valley of the Sun and the Old West tourism regions in terms of the number of domestic overnight visitors. Approximately 82% of Canyon Country visitors came to the area for leisure while the remaining 18% were visiting on business (AZOT 2004a).

In 2002, 28.4% of domestic visitors to the Canyon Country came from within Arizona while 22.1% were visitors from California. New Mexico, Colorado, Texas, and Utah also contributed significant numbers of tourists. AZOT data confirm that Canyon Country is a predominantly outdoor-based activity destination with 62% of visitors engaging in both nature and sight-seeing activities. The attraction of the Grand Canyon is clearly demonstrated by the fact that 54% of the FY2003 tourists in Canyon Country reported visiting National and/or State Parks. The park is easily the top natural tourist attraction in the state with 4.1 million visits reported in 2003. The flow of visitors is greatest during spring and summer with a full 70% of 2002 visits taking place between the months of April and September (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. as a whole 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).

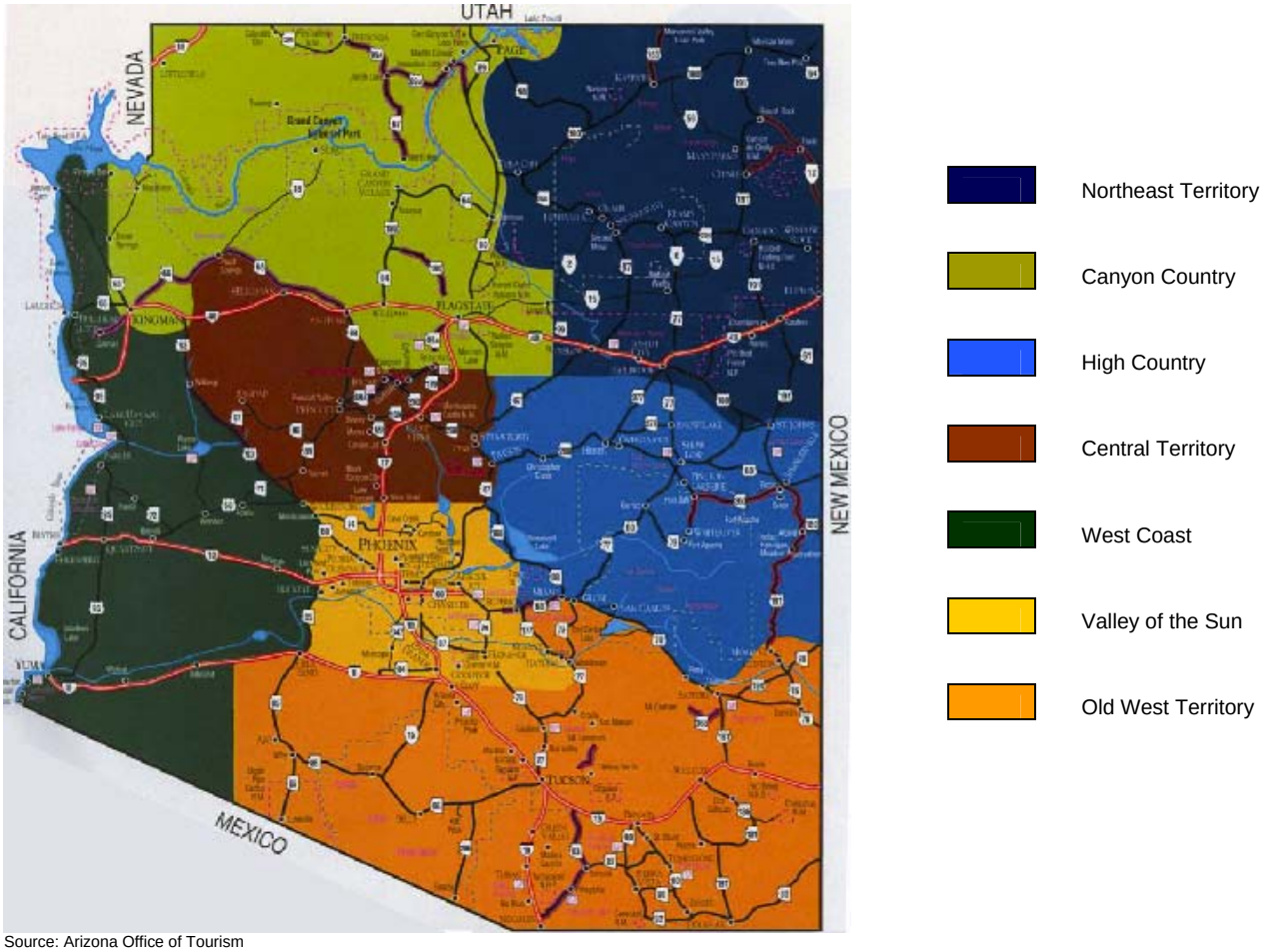
Table 5. Net Migration by County, 1990-2000 and % Change

	Coconino County			Mohave County			Yavapai County		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Total*	88,003	107,775	22.47%	87,327	145,803	66.96%	101,667	158,931	56.33%
Same House	36,558	49,841	36.33%	33,433	67,332	101.39%	42,240	70,108	65.98%
Different House	51,445	57,934	12.61%	53,894	78,471	45.60%	59,427	88,823	49.47%
In United States	50,117	56,247	12.23%	53,185	76,439	43.72%	58,759	86,079	46.50%
Same County	21,006	24,801	18.07%	18,154	31,065	71.12%	21,154	34,448	62.84%
Different County	29,111	31,446	8.02%	35,031	45,374	29.53%	37,605	51,631	37.30%
Same State	13,634	14,870	9.07%	4,502	6,082	35.10%	14,513	20,461	40.98%
Different State	15,477	16,576	7.10%	30,529	39,292	28.70%	23,092	31,170	34.98%
Northwest	927	1,658	78.86%	1,149	1,651	43.69%	1,522	2,997	96.91%
Midwest	2,373	3,055	28.74%	4,279	5,511	28.79%	4,374	6,359	45.38%
South	2,755	2,856	3.67%	2,357	2,997	27.15%	3,422	4,419	29.14%
West	9,422	9,007	-4.40%	22,744	29,133	28.09%	13,774	17,395	26.29%
In Puerto Rico	0	7	n/a	0	0	n/a	21	12	-42.86%
Elsewhere	1,307	1,680	28.54%	692	2,032	193.64%	637	2,732	328.89%

	Kane County, UT			Washington County, UT			Arizona		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Total*	4,714	5,636	19.56%	43,970	82,121	86.77%	3,374,806	4,752,724	40.83%
Same House	2,345	3,237	38.04%	19,058	34,909	83.17%	1,454,319	2,103,907	44.67%
Different House	2,369	2,399	1.27%	24,912	47,212	89.52%	1,920,487	2,648,817	37.92%
In United States	2,336	2,341	0.21%	24,689	45,927	86.02%	1,840,216	2,465,345	33.97%
Same County	1,096	646	-41.06%	8,665	19,271	122.40%	1,026,332	1,456,345	41.90%
Different County	1,240	1,695	36.69%	16,024	26,656	66.35%	813,884	1,009,490	24.03%
Same State	323	667	106.50%	8,468	12,880	52.10%	164,063	213,070	29.87%
Different State	917	1,028	12.10%	7,556	13,776	82.32%	649,821	796,420	22.56%
Northwest	10	44	340.00%	79	702	788.61%	63,950	84,288	31.80%
Midwest	70	31	-55.71%	716	1,225	71.09%	179,202	190,720	6.43%
South	18	58	222.22%	669	1,717	156.65%	118,041	140,608	19.12%
West	819	895	9.28%	6,092	10,132	66.32%	288,628	380,804	31.94%
In Puerto Rico	0	0	n/a	8	0	-100.00%	665	1,745	162.41%
Elsewhere	33	58	75.76%	215	1,285	497.67%	78,618	181,237	130.53%

	Utah		
	1990	2000	% Change
Total*	1,553,351	2,023,875	30.29%
Same House	818,356	998,458	22.01%
Different House	734,995	1,025,417	39.51%
In United States	709,378	960,754	35.44%
Same County	409,847	538,410	31.37%
Different County	299,531	422,344	41.00%
Same State	122,460	180,155	47.11%
Different State	177,071	242,189	36.78%
Northwest	8,641	13,498	56.21%
Midwest	20,788	25,944	24.80%
South	28,371	41,848	47.50%
West	119,271	160,899	34.90%
In Puerto Rico	340	452	32.94%
Elsewhere	25,041	64,211	156.42%

* 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



Source: Arizona Office of Tourism

Figure 6. Map of Arizona Tourism Regions

2.3 Racial/ethnic composition and educational attainment

Tables 6 and 7 present collected data on the racial and ethnic composition of the population in the five counties as well as the states of Arizona and Utah. 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 may indicate the possibility of an increase in individuals who identify themselves as being both of multiple racial backgrounds and of Hispanic origin. Notably, the decade between 1990 and 2000 saw significant increases in individuals of multiple-race and Hispanic ethnicity for each of the five

counties, mirroring the same trends for the states of Arizona and Utah. Table 6 also shows that growth in multiple-race and Hispanic populations between 1990 and 2000 greatly exceeded the overall population growth rates for each of the five counties and both states. However, despite dramatic increases in both multiple-race and Hispanic populations in Mohave, Kane, and Washington Counties, Table 7 shows that these groups remained minimally represented in comparison to state averages.

Educational attainment for those populations 25 years of age and older is shown for each of the five counties in Table 8. Coconino and Yavapai Counties were near or above state averages in their percentage of high school and college graduates. In contrast, Mohave County fell below the Arizona state average with less than 10% of the 25-and-over population having graduated from college. In keeping with Utah's relatively high educational attainment, both Kane and Washington Counties exhibited high rates of high school and college graduates.

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

	Coconino County			Yavapai County			Mohave County		
Race/Ethnicity	**1990**	**2000**	**% Change**	**1990**	**2000**	**% Change**	**1990**	**2000**	**% Change**
American Indian or Alaska Native	28,270	33,161	17.30%	1,764	2,686	52.27%	2,139	3,733	74.52%
Asian or Pacific Islander	724	1,018	40.61%	492	861	75.00%	668	1,205	80.39%
African American or Black	1,255	1,215	-3.19%	244	655	168.44%	136	833	512.50%
Multiple Races	4,086	7,545	84.65%	2,053	9,254	350.75%	1,466	9,496	547.75%
White	62,256	73,381	17.87%	103,161	153,933	49.22%	89,088	139,616	56.72%
Hispanic	9,768	12,727	30.29%	6,854	16,376	138.93%	4,637	17,182	270.54%
	Kane County, UT			**Washington County, UT**			**Arizona**		
	1990	**2000**	**% Change**	**1990**	**2000**	**% Change**	**1990**	**2000**	**% Change**
American Indian or Alaska Native	39	94	141.03%	742	1,328	78.98%	204,589	255,879	25.07%
Asian or Pacific Islander	82	16	-80.49%	312	789	152.88%	54,127	98,969	82.85%
African American or Black	10	2	-80.00%	129	186	44.19%	110,062	158,873	44.35%
Multiple Races	10	130	1,200.00%	220	3,508	1,494.55%	328,768	743,300	126.09%
White	5,028	5,804	15.43%	47,157	84,543	79.28%	2,967,682	3,873,611	30.53%
Hispanic	77	140	81.82%	855	4,727	452.87%	680,628	1,295,617	90.36%
	Utah								
	1990	**2000**	**% Change**						
American Indian or Alaska Native	24,371	29,684	21.80%						
Asian or Pacific Islander	33,000	52,253	58.34%						
African American or Black	11,079	17,657	59.37%						
Multiple Races	36,974	140,600	280.27%						
White	1,617,426	1,992,975	23.22%						
Hispanic	83,097	201,559	142.56%						

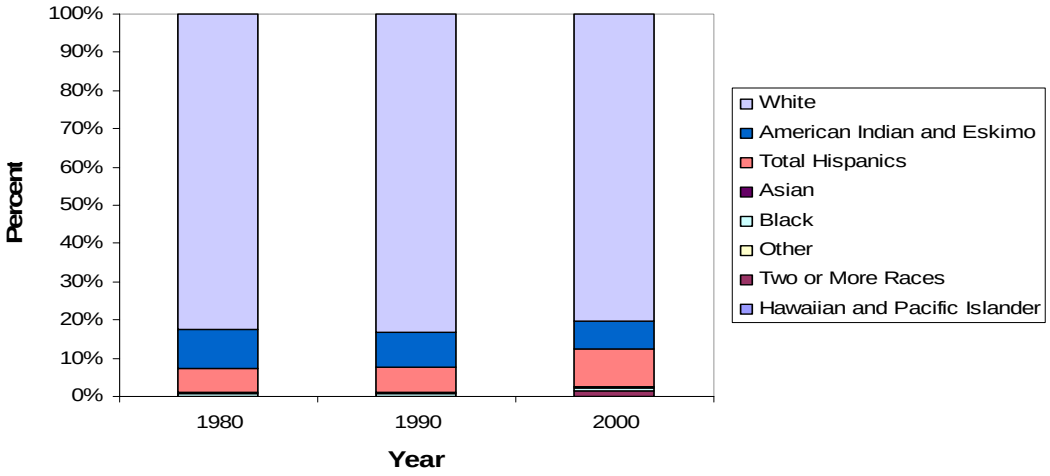
Source: NRIS - Human Dimensions

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

	Coconino County			Yavapai County			Mohave County		
Race/Ethnicity	**1990**	**2000**	**Change**	**1990**	**2000**	**Change**	**1990**	**2000**	**Change**
American Indian or Alaska Native	29.27%	28.51%	-0.76%	1.64%	1.60%	-0.03%	2.29%	2.41%	0.12%
Asian or Pacific Islander	0.75%	0.88%	0.13%	0.46%	0.51%	0.06%	0.71%	0.78%	0.06%
African American or Black	1.30%	1.04%	-0.25%	0.23%	0.39%	0.16%	0.15%	0.54%	0.39%
Multiple Races	4.23%	6.49%	2.26%	1.91%	5.52%	3.62%	1.57%	6.13%	4.56%
White	64.45%	63.09%	-1.37%	95.77%	91.89%	-3.88%	95.28%	90.06%	-5.23%
Percent Non-white	35.55%	36.91%	1.37%	4.23%	8.11%	3.88%	4.72%	9.94%	5.23%
Hispanic	10.11%	10.94%	0.83%	6.36%	9.78%	3.41%	4.96%	11.08%	6.12%
	Kane County, UT			**Washington County, UT**			**Arizona**		
	1990	**2000**	**Change**	**1990**	**2000**	**Change**	**1990**	**2000**	**Change**
American Indian or Alaska Native	0.75%	1.55%	0.80%	1.53%	1.47%	-0.06%	5.58%	4.99%	-0.59%
Asian or Pacific Islander	1.59%	0.26%	-1.32%	0.64%	0.87%	0.23%	1.48%	1.93%	0.45%
African American or Black	0.19%	0.03%	-0.16%	0.27%	0.21%	-0.06%	3.00%	3.10%	0.09%
Multiple Races	0.19%	2.15%	1.96%	0.45%	3.88%	3.43%	8.97%	14.49%	5.52%
White	97.27%	96.00%	-1.27%	97.11%	93.57%	-3.54%	80.97%	75.50%	-5.47%
Percent Non-white	2.73%	4.00%	1.27%	2.89%	6.43%	3.54%	19.03%	24.50%	5.47%
Hispanic	1.49%	2.32%	0.83%	1.76%	5.23%	3.47%	18.57%	25.25%	6.68%
	Utah								
	1990	**2000**	**Change**						
American Indian or Alaska Native	1.41%	1.33%	-0.09%						
Asian or Pacific Islander	1.92%	2.34%	0.42%						
African American or Black	0.64%	0.79%	0.15%						
Multiple Races	2.15%	6.30%	4.15%						
White	93.88%	89.24%	-4.64%						
Percent Non-white	6.12%	10.76%	4.64%						
Hispanic	4.82%	9.03%	4.20%						

Source: NRIS - Human Dimensions

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



Source: NRIS - Human Dimensions

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

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

	Coconino County		Yavapai County		Mohave County		Kane County, UT	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Population 25 years and over	65,976	100%	120,223	100%	109,347	100%	3,842	100.0%
Less than 9th grade	4,596	6.97%	5,547	4.61%	5,420	5.00%	85	2.2%
9th to 12th grade, no diploma	6,108	9.26%	12,829	10.67%	19,176	17.50%	437	11.4%
High school graduate (includes equivalency)	14,279	21.64%	33,877	28.18%	38,127	34.90%	1,008	26.2%
Some college, no degree	12,159	18.43%	23,660	19.68%	29,644	27.10%	1,240	32.3%
Associate degree	3,891	5.90%	7,940	6.60%	6,125	5.60%	261	6.8%
Bachelor's degree	12,316	18.67%	15,685	13.05%	6,949	6.40%	536	14.0%
Graduate or professional degree	1,090	1.65%	2,021	1.68%	3,906	3.60%	275	7.2%
Percent high school graduate or higher	(x)	83.80%	(x)	84.70%	(x)	77.50%	(x)	86.4%
Percent bachelor's degree or higher	(x)	29.90%	(x)	21.10%	(x)	9.90%	(x)	21.1%

	Washington County, UT		Arizona		Utah	
	Number	Percent	Number	Percent	Number	Percent
Population 25 years and over	51,842	100.0%	3,256,184	100%	1,197,892	100%
Less than 9th grade	1,447	2.8%	254,696	7.82%	38,426	3.20%
9th to 12th grade, no diploma	4,995	9.6%	364,851	11.20%	108,585	9.10%
High school graduate (includes equivalency)	13,847	26.7%	791,904	24.32%	294,426	24.60%
Some college, no degree	16,540	31.9%	859,165	26.39%	348,680	29.10%
Associate degree	4,145	8.0%	219,356	6.74%	94,812	7.90%
Bachelor's degree	7,222	13.9%	493,419	15.15%	213,959	17.90%
Graduate or professional degree	3,646	7.0%	272,793	8.38%	99,004	8.30%
Percent high school graduate or higher	(x)	87.6%	(x)	81.00%	(x)	87.70%
Percent bachelor's degree or higher	(x)	21.0%	(x)	23.50%	(x)	26.10%

Source: U.S. Census Bureau, Census 2000 Summary File

http://www.census.gov/census2000/states/az.html

2.4 Housing characteristics and population projections

Changes in housing characteristics between 1990 and 2000 are shown for both counties and states in Table 9. Total housing units range from a high of 54,805 in Yavapai County to a low of 3,237 in Kane County. Growth in total housing and seasonal housing units between 1990 and 2000 was particularly strong in Mohave and Washington Counties. Likewise, these two counties saw the largest increases in housing density over the same time period. As of 2000, housing density ranged from a high of fifteen houses per square mile in Washington County to a low of less than one house per square mile in neighboring Kane County. Interestingly, Washington and Kane Counties showed the largest increases in median home value over the period with gains of 78.54% and 65.97% respectively. Of the cities included in the assessment, Prescott Valley and Lake Havasu City saw the largest increases in total housing units between 1990 and 2000. Lake Havasu City and St. George also experienced relatively large increases in seasonal housing units over the same period. Median home values in Flagstaff, Chino Valley, Prescott, and Camp Verde increased substantially over the ten-year period.

Table 10 suggests that population growth at the county and state level is expected to continue although at somewhat lower rates than were experienced over the last two decades (Table 2). A potential exception to this trend is seen in Kane County, in which population growth is expected to accelerate over and above

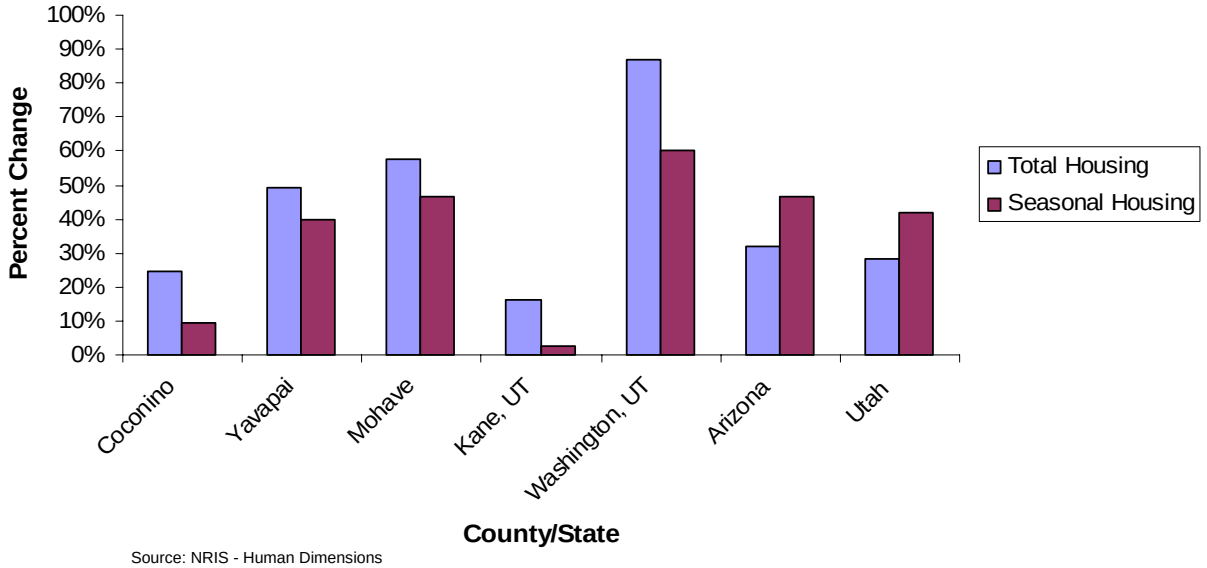
the last two decades' rates, promising to outpace statewide population growth through 2030. While the population growth rates of both Mohave and Washington Counties are projected to decline significantly from previous highs, they will remain well above state averages through 2020. Coconino County is expected to see accelerated population growth between 2000 and 2010 before declining significantly over the following two 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
Coconino County	42,914	53,443	24.54%	8,361	9,155	9.50%	2.30	2.87	24.55%	$82,600	$142,500	72.52%
Flagstaff	16,313	21,430	31.37%	925	977	5.62%	258	337	30.62%	$90,300	$161,000	78.29%
Sedona	2,307	2,606	12.96%	33	76	130.30%	139	157	12.95%	$91,700	$138,600	51.15%
Page	4,658	5,709	22.56%	430	446	3.72%	237	307	29.54%	$159,600	$253,700	58.96%
Williams	1,118	1,224	9.48%	40	52	30.00%	39	28	-28.21%	$64,800	$100,300	54.78%
Fredonia	464	428	-7.76%	7	18	157.14%	91	58	-36.26%	$54,300	$77,900	43.46%
Mohave County	50,822	80,062	57.53%	6,798	9,956	46.45%	4.00	6.00	50.00%	$74,900	$95,300	27.24%
Lake Havasu City	12,845	22,991	78.99%	1,891	3,971	109.99%	298.0	534.0	79.19%	$82,100	$98,500	19.98%
Bullhead City	n/a	18,410	n/a	n/a	2,448	n/a	n/a	407.0	n/a	n/a	$102,500	n/a
Kingman	5,473	8,564	56.48%	85	63	-25.88%	263.0	286.0	8.75%	$63,900	$87,500	36.93%
New Kingman/ Butler	5,148	6,671	29.58%	80	81	1.25%	356.0	456.0	28.09%	$53,900	$71,800	33.21%
Colorado City	307	474	54.40%	0	2	n/a	29.0	45.0	55.17%	$24,900	$99,200	298.39%
Yavapai County	54,805	81,730	49.13%	4,325	6,048	39.84%	7.0	10.0	42.86%	$85,300	$138,000	61.78%
Prescott	13,393	17,431	30.15%	787	1,026	30.37%	414.0	470.0	13.53%	$93,400	$162,700	74.20%
Prescott Valley	3,913	9,481	142.29%	134	162	20.90%	237.0	299.0	26.16%	$64,500	$108,100	67.60%
Verde Village*	3,200	4,327	35.22%	84	43	-48.81%	376.0	493.0	31.12%	$78,000	$114,900	47.31%
Sedona	4,658	5,709	22.56%	430	446	3.72%	237.0	307.0	29.54%	$159,600	$253,700	58.96%
Camp Verde	2,839	3,988	40.47%	179	136	-24.02%	67.0	94.0	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%	116.0	175.0	50.86%	$76,400	$135,500	77.36%
Kane County, UT	3,237	3,767	16.37%	1,227	1,256	2.36%	0.8	0.9	16.38%	$62,600	$103,900	65.97%
Kanab	1,258	1,483	17.89%	20	64	220.00%	91.0	106.0	16.48%	$64,500	$106,100	64.50%
Washington County, UT	19,523	36,478	86.85%	2,727	4,364	60.03%	8.0	15.0	86.89%	$78,300	$139,800	78.54%
St. George	11,766	21,083	79.19%	1,287	2,505	94.64%	205.0	327.0	59.51%	$84,800	$143,200	68.87%
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%
Utah	598,388	768,594	28.44%	20,888	29,685	42.12%	7.00	9.00	28.57%	$68,700	$146,100	112.66%

* 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
Coconino County	116,320	147,352	26.68%	169,343	14.92%	189,868	12.12%
Yavapai County	167,517	198,052	18.23%	240849	21.61%	278,426	15.60%
Mohave County	155,032	194,403	25.40%	236,396	21.60%	270,785	14.55%
Kane County (UT)	6,046	8,272	36.82%	11,077	33.91%	13,628	23.03%
Washington County (UT)	90,354	131,880	45.96%	177,354	34.48%	218,840	23.39%
Arizona	5,130,632	6,145,108	19.77%	7,363,604	19.83%	8,621,114	17.08%
Utah	2,233,169	2,787,670	24.83%	3,371,071	20.93%	3,772,042	11.89%

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

Source: http://www.governor.utah.gov/Projections/EDPT3.xls

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.

Although population growth in the communities surrounding the KNF has been somewhat slower than in other parts of the state, significant changes in the human populations surrounding the forest are likely to affect not only the quantity of goods and services demanded from public lands but also significantly influence the character, or quality, of those goods and services. Research shows that areas with an

abundance of natural resource-based amenities (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 small, rural communities. In particular, migrants are increasingly attracted to smaller communities with relatively affordable housing, low crime rates, and cultural traditions associated with small, rural towns throughout the mountain west (Booth 2002, McCool and Kruger 2003, Bodio 1997). These demographic shifts are borne out by collected data for Kaibab NF which show substantial increases in population and housing in both Washington 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 rural areas through greater employment opportunities and an expanding tax base, it can also challenge the capacity of rural communities and public land managers to provide for the wide array of services. This is particularly true in areas where potential conflicts in value systems between established community interests and recently arrived immigrants can create friction over natural resource management. For example, the growth in populations seeking natural amenities from forest lands may pit them against traditional commodity interests. Likewise, the dramatic growth in multiple race and Hispanic populations (sometimes referred to as “hidden populations”) may force different demands for public services and may influence the interaction with natural resources in fundamentally different ways than has been the historic norm for the resident population (McCool and Kruger 2003).

Together, these shifts in the demographic makeup of communities surrounding the KNF 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, immigrant populations may lack a thorough understanding of underlying community values while at the same time acting on a thorough understanding of planning regulations and methods of influencing political processes (McCool and Kruger 2003, Booth 2002, Wilkinson 1992).

3. Economic Characteristics and Vitality

In this section, historic and current economic conditions within the five counties surrounding the Kaibab National Forest (KNF) are examined. One 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 associations between forest management alternatives and economic changes 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 KNF has experienced significant economic growth over the past two decades. Washington and Yavapai Counties have been centers of much of this growth with substantial gains in total part-and full-time employment, particularly in the construction, finance, and real estate sectors. In general, employment grew much more slowly in Coconino and Mohave Counties despite specific gains in the agricultural services, wholesale trade, and finance and real estate sectors. In terms of occupational structure, the region's closely resembled those of the states of Arizona and Utah overall with management, professional, and related occupations maintaining primary importance over sales and office as well as service occupations. Despite significant increases in per capita and family income and decreasing rates of poverty, data show that the region remains economically challenged when compared to statewide figures over the same period. Within the area of assessment, Yavapai County appears to be the exception with rates of unemployment and poverty below those for the state of Arizona overall. Mohave and Washington Counties reported particularly strong gains in total labor income from wood products and processing along with decreases in income from special forest products and processing. Increases in income from special forest products and processing were greatest in Kane and Coconino Counties between 1990 and 2000. On the whole, the area of assessment saw significant increases in tourism employment over the same period. In terms of federal-lands related revenue, Mohave County has consistently been the largest recipient of PILT payments over the last several years whereas Coconino 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 KNF has undergone dramatic changes over the past century. Originally a territory isolated on the borders of a cohering nation, Arizona and Utah, and the West in general, are 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] suggesting that Arizona's economy remains fixated on a limited number of economic outlets such as agriculture and tourism (Sheridan 1995, Canamex 2001, ADOC 2002a). By contrast, Utah, as of 2001, ranked 13th in the country in state economic diversity with an IDI rating of .74 (Office of the Governor of Utah 2001).

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%

[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.

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 and between 9-12% in Utah (U.S. Census Bureau 2005, ADOC 2002a).

Over the past thirty to thirty-five years, the primary locus of economical advancement has shifted. Mining, which represented 3% of the Arizona's per capita income in the late 1960s, had dropped to a 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 KNF are, collectively, some of the more economically challenged compared to those surrounding the other forests in the state but exhibit a far stronger rate of economic growth. The 2002 PPI of the five U.S. counties abutting forest land was $21,993[3], representing a 16.4% differential from the state average at that time, a 5% drop from 1969. Compared to the national averages, the PPI of the counties containing the Kaibab NF represents 71.4% of the national total, down nearly 9% over the past thirty years. Yet, despite the larger setbacks, the thirty-year average rate of income growth in this region is a brisk 11.1%, well above the averages for Arizona (10.1%) and Utah (9%) (BEA 2002). This suggests that although Arizona's growth continues to be strong, it nonetheless remains behind the country as a whole in individual economic status.

3.2 Employment and income 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 the relatively strong growth of Kane, Washington, and Yavapai Counties, particularly when compared to regional and state averages. Washington County experienced the strongest economic growth in the region with a 121.87% increase in total full- and part-time employment between 1990 and 2000. This substantial increase in employment for Washington County was buoyed by strong gains in wage and salary employment as well as proprietor's employment. In northern Arizona, Coconino County saw a substantial increase in proprietor's employment during the same period. Washington County clearly experienced the most dramatic increases in employment, outpacing growth at the state level in virtually every industrial sector. The greatest increases in Washington County were seen in the agricultural services and the forest, construction, and finance/real estate sectors. In Arizona, Yavapai led other counties in the region with substantial job gains in wholesale trade, construction, finance/real estate, and services. Coconino County also saw increases in employment in the wholesale trade and finance/real estate sectors, but these gains were partially offset by job losses in farming and manufacturing. Mohave County also lost farming jobs but experienced incremental employment increases in both mining and wholesale trade. In Kane County, Utah, the decade between 1990 and 2000 saw relatively strong increases in both private and non-farm employment with some of the greatest growth coming in government and government enterprises as a result of federal, civilian employment.

[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.

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 declines in proprietor's employment in four of the five counties, each maintained a higher percentage of proprietor's employment than that of its respective state. Kane County, Utah was the only county that maintained a significant percentage of farming jobs despite a decrease in the sector's importance for overall employment. Each of the five counties exceeded state averages for percentage of employment in retail trade while Coconino and Kane Counties maintained a relatively high percentage of jobs in the government and government enterprises sector.

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

	Coconino County			Mohave County			Yavapai County			Kane County, UT		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Employment by place of work												
Total full-time and part-time employment	48,977	70,286	43.51%	37,255	54,637	46.66%	42,555	70,286	65.17%	2,388	3,744	56.78%
By type												
Wage and salary employment	41,079	55,639	35.44%	28,298	43,017	52.01%	29,717	51,881	74.58%	1,720	2,714	57.79%
Proprietors employment	7,898	14,647	85.45%	8,957	11,620	29.73%	12,838	18,405	43.36%	668	1,030	54.19%
Farm proprietors employment	276	204	-26.09%	226	247	9.29%	509	527	3.54%	140	163	16.43%
Non-farm proprietors employment	7,622	14,443	89.49%	8,731	11,373	30.26%	12,329	17,878	45.01%	528	867	64.20%
By industry												
Farm employment	313	254	-18.85%	342	327	-4.39%	598	752	25.75%	163	175	7.36%
Non-farm employment	48,664	70,032	43.91%	36,913	54,310	47.13%	41,957	69,534	65.73%	2,225	3,569	60.40%
Private employment	36,864	54,305	47.31%	32,380	46,839	44.65%	35,585	59,510	67.23%	1,731	2,862	65.34%
Ag. services, forestry, fishing and other	(D)	510	n/a	378	628	66.14%	531	1,017	91.53%	17	(D)	n/a
Mining	(D)	159	n/a	101	145	43.56%	1,107	1,184	6.96%	(D)	(L)	n/a
Construction	2,363	4,014	69.87%	4,189	5,412	29.20%	3,877	7,302	88.34%	79	(D)	n/a
Manufacturing	3,562	2,985	-16.20%	2,771	3,506	26.52%	2,847	4,189	47.14%	103	(D)	n/a
Transportation and public utilities	1,979	1,957	-1.11%	1,553	2,434	56.73%	1,454	1,866	28.34%	88	105	19.32%
Wholesale trade	801	1,378	72.03%	863	1,468	70.10%	895	2,031	126.93%	31	42	35.48%
Retail trade	10,862	15,266	40.55%	9,030	13,072	44.76%	9,168	13,592	48.25%	605	787	30.08%
Finance, insurance, and real estate	2,052	4,674	127.78%	3,321	4,335	30.53%	3,431	6,216	81.17%	(D)	268	n/a
Services	14,837	23,362	57.46%	10,174	15,839	55.68%	12,275	22,113	80.15%	676	1,009	49.26%
Government and government enterprises	11,800	15,727	33.28%	4,533	7,471	64.81%	6,372	10,024	57.31%	494	707	43.12%
Federal, civilian	3,054	3,322	8.78%	366	546	49.18%	1,076	1,198	11.34%	55	109	98.18%
Military	378	283	-25.13%	357	360	0.84%	414	394	-4.83%	40	31	-22.50%
State and local	8,368	12,122	44.86%	3,810	6,565	72.31%	4,882	8,432	72.72%	399	567	42.11%
State government	3,560	(D)	n/a	324	(D)	n/a	652	(D)	n/a	57	59	3.51%
Local government	4,808	(D)	n/a	3,486	(D)	n/a	4,230	(D)	n/a	342	508	48.54%

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

	Washington County, UT			Arizona			Utah		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Employment by place of work									
Total full-time and part-time employment	21,432	47,552	121.87%	1,909,879	2,819,302	47.62%	944,329	1,387,847	46.97%
By type									
Wage and salary employment	15,903	35,549	123.54%	1,607,628	2,355,299	46.51%	778,155	1,134,757	45.83%
Proprietors employment	5,529	12,003	117.09%	302,251	464,003	53.52%	166,174	253,090	52.30%
Farm proprietors employment	412	502	21.84%	8,027	7,572	-5.67%	13,771	15,748	14.36%
Non-farm proprietors employment	5,117	11,501	124.76%	294,224	456,431	55.13%	152,403	237,342	55.73%
By industry									
Farm employment	462	542	17.32%	19,297	19,842	2.82%	19,148	20,380	6.43%
Non-farm employment	20,970	47,010	124.18%	1,890,582	2,799,460	48.07%	925,181	1,367,467	47.81%
Private employment	18,126	41,930	131.33%	1,583,146	2,410,566	52.26%	754,468	1,163,728	54.24%
Ag. services, forestry, fishing and other	229	584	155.02%	27,817	46,873	68.50%	6,093	11,960	96.29%
Mining	130	215	65.38%	15,475	12,607	-18.53%	9,587	9,293	-3.07%
Construction	1,742	5,415	210.85%	108,918	200,373	83.97%	43,407	93,991	116.53%
Manufacturing	1,708	2,650	55.15%	194,529	225,767	16.06%	111,846	136,857	22.36%
Transportation and public utilities	1,011	2,054	103.17%	84,360	124,954	48.12%	46,493	67,540	45.27%
Wholesale trade	552	1,168	111.59%	82,812	122,582	48.02%	42,938	57,241	33.31%
Retail trade	4,768	11,008	130.87%	344,297	484,207	40.64%	157,440	233,707	48.44%
Finance, insurance, and real estate	1,771	5,107	188.37%	170,005	281,675	65.69%	69,241	132,075	90.75%
Services	6,215	13,729	120.90%	544,933	911,528	67.27%	267,423	421,064	57.45%
Government and government enterprises	2,844	5,080	78.62%	307,436	388,894	26.50%	170,713	203,739	19.35%
Federal, civilian	284	504	77.46%	45,843	48,135	5.00%	39,894	32,488	-18.56%
Military	385	468	21.56%	38,197	33,258	-12.93%	19,399	16,255	-16.21%
State and local	2,175	4,108	88.87%	223,396	307,501	37.65%	111,420	154,996	39.11%
State government	438	739	68.72%	61,595	81,026	31.55%	44,018	61,687	40.14%
Local government	1,737	3,369	93.96%	161,801	226,475	39.97%	67,402	93,309	38.44%

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

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

Source: Bureau of Economic Analysis

http://www.bea.doc.gov/bea/regional/reis/action.cfm

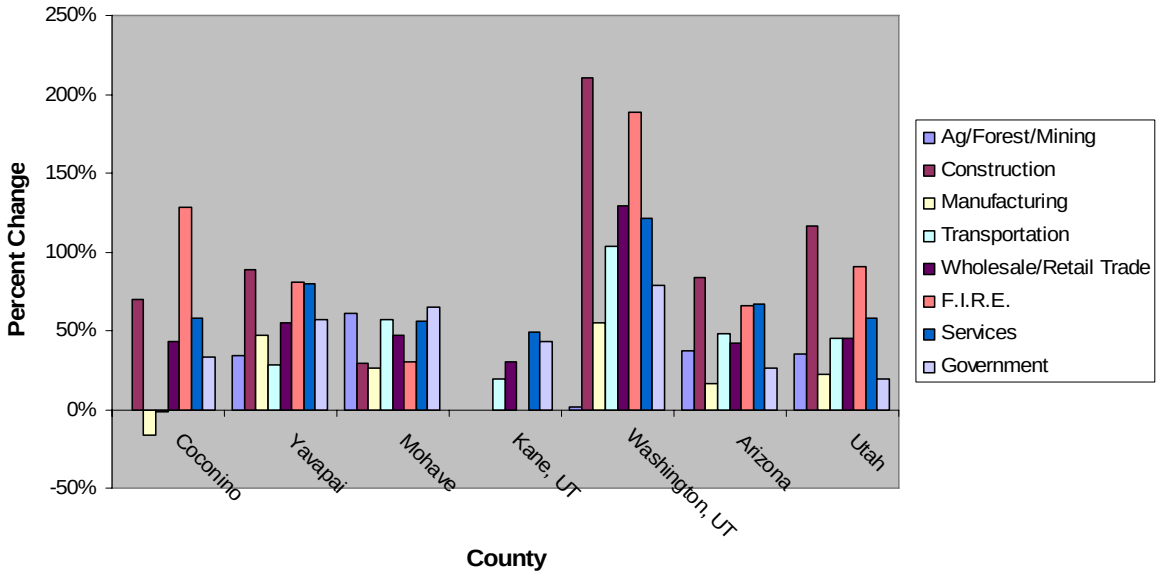
Table 12. County and State Employment by Industry Percentages, 1990-2000 and % Change

	Coconino County			Mohave County			Yavapai County			Kane County, UT		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Employment by place of work												
Total full-time and part-time employment	100.00%	100.00%	0.00%	100.00%	100.00%	0.00%	100.00%	100.00%	0.00%	100.00%	100.00%	0.00%
By type												
Wage and salary employment	83.87%	79.16%	-5.62%	75.96%	78.73%	3.65%	69.83%	73.81%	5.70%	72.03%	72.49%	0.64%
Proprietors employment	16.13%	20.84%	29.23%	24.04%	21.27%	-11.54%	30.17%	26.19%	-13.20%	27.97%	27.51%	-1.65%
Farm proprietors employment	0.56%	0.29%	-48.50%	0.61%	0.45%	-25.48%	1.20%	0.75%	-37.31%	5.86%	4.35%	-25.74%
Non-farm proprietors employment	15.56%	20.55%	32.04%	23.44%	20.82%	-11.18%	28.97%	25.44%	-12.20%	22.11%	23.16%	4.73%
By industry					0.00%							
Farm employment	0.64%	0.36%	-43.45%	0.92%	0.60%	-34.80%	1.41%	1.07%	-23.86%	6.83%	4.67%	-31.52%
Non-farm employment	99.36%	99.64%	0.28%	99.08%	99.40%	0.32%	98.59%	98.93%	0.34%	93.17%	95.33%	2.31%
Private employment	75.27%	77.26%	2.65%	86.91%	85.73%	-1.37%	83.62%	84.67%	1.25%	72.49%	76.44%	5.46%
Ag. services, forestry, fishing and other	n/a	0.73%	n/a	1.01%	1.15%	13.28%	1.25%	1.45%	15.96%	0.71%	n/a	n/a
Mining	n/a	0.23%	n/a	0.27%	0.27%	-2.11%	2.60%	1.68%	-35.24%	n/a	n/a	n/a
Construction	4.82%	5.71%	18.37%	11.24%	9.91%	-11.91%	9.11%	10.39%	14.03%	3.31%	n/a	n/a
Manufacturing	7.27%	4.25%	-41.61%	7.44%	6.42%	-13.73%	6.69%	5.96%	-10.91%	4.31%	n/a	n/a
Transportation and public utilities	4.04%	2.78%	-31.09%	4.17%	4.45%	6.87%	3.42%	2.65%	-22.30%	3.69%	2.80%	-23.90%
Wholesale trade	1.64%	1.96%	19.88%	2.32%	2.69%	15.99%	2.10%	2.89%	37.39%	1.30%	1.12%	-13.59%
Retail trade	22.18%	21.72%	-2.06%	24.24%	23.93%	-1.29%	21.54%	19.34%	-10.24%	25.34%	21.02%	-17.03%
Finance, insurance, and real estate	4.19%	6.65%	58.72%	8.91%	7.93%	-10.99%	8.06%	8.84%	9.69%	n/a	7.16%	n/a
Services	30.29%	33.24%	9.72%	27.31%	28.99%	6.15%	28.85%	31.46%	9.07%	28.31%	26.95%	-4.80%
Government and government enterprises	24.09%	22.38%	-7.13%	12.17%	13.67%	12.38%	14.97%	14.26%	-4.75%	20.69%	18.88%	-8.72%
Federal, civilian	6.24%	4.73%	-24.20%	0.98%	1.00%	1.72%	2.53%	1.70%	-32.59%	2.30%	2.91%	26.40%
Military	0.77%	0.40%	-47.83%	0.96%	0.66%	-31.24%	0.97%	0.56%	-42.38%	1.68%	0.83%	-50.57%
State and local	17.09%	17.25%	0.94%	10.23%	12.02%	17.49%	11.47%	12.00%	4.57%	16.71%	15.14%	-9.36%
State government	7.27%	n/a	n/a	0.87%	n/a	n/a	1.53%	n/a	n/a	2.39%	1.58%	-33.98%
Local government	9.82%	n/a	n/a	9.36%	n/a	n/a	9.94%	n/a	n/a	14.32%	13.57%	-5.26%

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

	Washington County, UT			Arizona			Utah		
	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	74.20%	74.76%	0.75%	84.17%	83.54%	-0.75%	82.40%	81.76%	-0.78%
Proprietors employment	25.80%	25.24%	-2.16%	15.83%	16.46%	4.00%	17.60%	18.24%	3.63%
Farm proprietors employment	1.92%	1.06%	-45.08%	0.42%	0.27%	-36.10%	1.46%	1.13%	-22.19%
Non-farm proprietors employment	23.88%	24.19%	1.30%	15.41%	16.19%	5.09%	16.14%	17.10%	5.97%
By industry									
Farm employment	2.16%	1.14%	-47.12%	1.01%	0.70%	-30.34%	2.03%	1.47%	-27.58%
Non-farm employment	97.84%	98.86%	1.04%	98.99%	99.30%	0.31%	97.97%	98.53%	0.57%
Private employment	84.57%	88.18%	4.26%	82.89%	85.50%	3.15%	79.89%	83.85%	4.95%
Ag. services, forestry, fishing and other	1.07%	1.23%	14.94%	1.46%	1.66%	14.15%	0.65%	0.86%	33.56%
Mining	0.61%	0.45%	-25.46%	0.81%	0.45%	-44.81%	1.02%	0.67%	-34.04%
Construction	8.13%	11.39%	40.10%	5.70%	7.11%	24.62%	4.60%	6.77%	47.34%
Manufacturing	7.97%	5.57%	-30.07%	10.19%	8.01%	-21.38%	11.84%	9.86%	-16.74%
Transportation and public utilities	4.72%	4.32%	-8.43%	4.42%	4.43%	0.34%	4.92%	4.87%	-1.15%
Wholesale trade	2.58%	2.46%	-4.63%	4.34%	4.35%	0.28%	4.55%	4.12%	-9.29%
Retail trade	22.25%	23.15%	4.06%	18.03%	17.17%	-4.73%	16.67%	16.84%	1.00%
Finance, insurance, and real estate	8.26%	10.74%	29.97%	8.90%	9.99%	12.24%	7.33%	9.52%	29.79%
Services	29.00%	28.87%	-0.44%	28.53%	32.33%	13.32%	28.32%	30.34%	7.13%
Government and government enterprises	13.27%	10.68%	-19.49%	16.10%	13.79%	-14.31%	18.08%	14.68%	-18.79%
Federal, civilian	1.33%	1.06%	-20.02%	2.40%	1.71%	-28.87%	4.22%	2.34%	-44.59%
Military	1.80%	0.98%	-45.21%	2.00%	1.18%	-41.02%	2.05%	1.17%	-42.98%
State and local	10.15%	8.64%	-14.87%	11.70%	10.91%	-6.75%	11.80%	11.17%	-5.35%
State government	2.04%	1.55%	-23.96%	3.23%	2.87%	-10.89%	4.66%	4.44%	-4.64%
Local government	8.10%	7.08%	-12.58%	8.47%	8.03%	-5.18%	7.14%	6.72%	-5.80%

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 Arizona Department of Commerce 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 four of the five counties within the area of assessment maintain occupational structures very similar to those of the states of Arizona and Utah as a whole. "Management, professional, and related occupations" is the dominant occupational category for both states, followed by sales and office occupations and, finally, by service occupations. Management/professional and sales/office are the two most common occupational areas in Coconino, Yavapai, Kane, and Washington Counties. The exception is Mohave County, where sales/office occupations were most dominant followed by service occupations. For both the states of Arizona and Utah as well as 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 counties, the states of Arizona and Utah, and the United States as well as decennial unemployment for selected cities within the area of assessment. During the period, average unemployment ranged from a high of 7.2% in Coconino County to a low of 3.8% in Washington County. In fact, both Yavapai and Washington Counties reported average unemployment rates that were well below those of their respective states 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 covered.

Per capita and median family incomes, as well as rates of individual and family poverty, are provided in Table 16. Data demonstrate increases in per capita and median family income that were near or above increases at the state level for four of the five counties within the area of assessment. Despite these increases, however, per capita and median family income remained lower than the state averages in each of the counties as of 2000. A similar trend is evident in individual and family poverty between 1990 and 2000. Kane, Coconino, and Yavapai Counties each saw substantial declines in individual and family poverty that were greater than the reductions in poverty at the state level over the ten-year period. Kane County reported dramatic cuts in the percentages of individual and family poverty (-51.53% and -58.65% respectively). Nonetheless, Coconino and Washington Counties remain economically challenged with

incomes below and rates of poverty well above those for the state of Arizona and Utah respectively. Among individual cities within the area of assessment, Williams reported negative trends in both per capita and median family income between 1990 and 2000. Both Williams and Page saw significant increases in individual and family poverty over the same ten-year period. The city of Kanab mirrored the trend for Kane County as a whole, reporting substantial cuts in both individual and family poverty over the ten-year period.

Household income distribution for each county is presented in Table 17. The economic status of households in Mohave County appears to be the most limited with 18.7% of households earning less than $15,000 per year. Mohave County also reported the lowest median household income at $31,521. Median household income was highest in Coconino County at $38,256. Coconino County was also the most affluent of the five counties with 8.5% of households earning $100,000 or more as of 2000.

Table 13. Major Employers by County, 2004

Coconino County	Mohave County	Yavapai County
ARA Leisure Services, Page	American Woodmark Corporation, Kingman	Ace hardware, Prescott Valley
City of Flagstaff	Cyprus Climax Metals Co., Kingman	APS, Prescott
Coconino Community College, Flagstaff	Ford Proving Grounds, Yucca	The Arbors, Camp Verde
Coconino County, Flagstaff	General Cable, Kingman	Atria & Kachina Point Assisted Living Retirement, Sedona
Flagstaff Unified School District, Flagstaff	Goodyear, Kingman	Camp Verde Public Schools, Camp Verde
Flagstaff Medical Center, Flagstaff	Guardian Fiber Glass, Kingman	Caradon Better Bilt, Prescott Valley
Grand Canyon Railways, Williams	Havasu Regional Hospital, Lake Havasu City	Chino Valley Unified Schools District # 51
Kaibab National Forest, Williams	Home Depot, Bullhead City, Lake Havasu	Cliff Castle Casino
National Park Service, Page	IWX Motor Freight, Kingman	City of Cottonwood
Navajo Generating Station, Page	Kingman Regional Medical Center, Kingman	Cottonwood/Oak Creek School
Navajo Government Executive Branch, Navajo Nation	Laidlaw Corp., Kingman	Cyprus Bagdad Copper Corporation, Bagdad
Navajo Tribal Utility Authority, Navajo Nation	Mohave Community College	Double Tree Sedona Resort, Sedona
Northern Arizona University, Flagstaff	McKee Foods, Kingman	Embry-Riddle Aeronautical University
Pittsburg & Midway Coal Mining Co., Navajo Nation	Lake Havasu City	Enchantment Resort, Sedona
Nestle Purina Petcare, Flagstaff	Mohave County , Kingman	Humboldt Unified School District
Samaritan Family Health Center, Grand Canyon	Praxair Inc., Kingman	Exsil Inc.
Tooh-Dineh Industries, Leupp	Silver Ridge Village, Bullhead City	Los Abrigados Resort, Sedona
Tuba City Indian Medical Center	Smith's Food and Drug Centers, Kingman	Mingus Union High School District
Tuba City Unified School District #15	Sterlite Corporation	Phelps and Sons Trusses, Cottonwood
Walgreens Distribution	True Serv	Phoenix Cement Company, Clarkdale
Wal-Mart, Flagstaff and Page	Wal-Mart, Bullhead City/Lake Havasu City	City of Prescott
Window Rock Unified School District	West Coast Netting, Kingman	Prescott Resort
SCA Tissue, Flagstaff	Western Arizona Regional, Bullhead City	Prescott Unified School District
W.L. Gore and Associates, Inc., Flagstaff		Price Costco Store, Prescott
		Ruger Investment Castings, Prescott
		Safeway, Chino Valley
		Sedona/Oak Creek Unified School District
		Sturm Ruger & Company, Prescott
		Target Store, Prescott
		Town of Prescott Valley
		U.S. Forest Service
		Veterans Admin. Medical Center, Prescott
		Verde Valley Medical Center, Cottonwood
		Wal-Mart, Cottonwood and Prescott
		West Yavapai Guidance Clinic, Prescott
		Wulfsberg Electronics, Prescott
		Yavapai Community College
		Yavapai County
		Yavapai Gaming Agency
		Yavapai Regional Medical Center, Prescott

Kane County , UT	Washington County , UT
Aramark Sports and Entertainment, Lake Powell Resorts/Marina	Washington School District
Stampin Up	Dixie Regional Medical Center
Thunderbird Restaurant and Motel	Wal-Mart
Kane County	Dixie College
Kane County School District	City of St. George
Federal Government	Federal Government
State of Utah	Washington County
City of Kanab	Andrus Trucking
Best Friends Animal Sanctuary	SkyWest Airlines
Kane County Hospital	Lin's Supermarket
Honey IGA Supercenter	Sunroc Corporation
Glazier's Food Town	McDonald's
	Albertson's
	Boulevard Furniture

Source: Arizona Department of Commerce - Community Profiles

http://www.azcommerce.com/Communities/community_profiles.asp
http://governor.utah.gov/dea/WrittenProfiles.PDF

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

County/State	Number	Percent
Coconino County		
Management, professional, and related occupations	19,309	38.4%
Sales and office occupations	14,240	25.7%
Service occupations	10,610	19.1%
Construction, extraction, and maintenance occupations	5,548	10.0%
Production, transportation, and material moving occupations	5,529	10.0%
Mohave County		
Sales and office occupations	16,892	27.9%
Service occupations	15,237	25.2%
Management, professional, and related occupations	12,366	20.4%
Construction, extraction, and maintenance occupations	7,989	13.2%
Production, transportation, and material moving occupations	7,772	12.8%
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%
Kane County ,UT		
Management, professional, and related occupations	779	29.2%
Sales and office occupations	651	24.4%
Service occupations	480	18.0%
Construction, extraction, and maintenance occupations	409	15.3%
Production, transportation, and material moving occupations	315	11.8%
Washington County, UT		
Sales and office occupations	9,799	27.5%
Management, professional, and related occupations	9,575	26.9%
Service occupations	6,517	18.3%
Construction, extraction, and maintenance occupations	4,914	13.8%
Production, transportation, and material moving occupations	4,693	13.2%
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%
Utah		
Management, professional, and related occupations	339,310	32.5%
Sales and office occupations	301,566	28.9%
Service occupations	145,862	14.0%
Production, transportation, and material moving occupations	141,334	13.5%
Construction, extraction, and maintenance occupations	110,873	10.6%

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
Coconino County	7.7%	7.8%	9.2%	7.8%	8.7%	8.4%	7.3%	6.7%	5.8%	5.4%	5.9%	6.4%	6.1%	7.2%
Flagstaff	7.0%	6.1%	7.3%	6.1%	6.9%	6.6%	5.8%	5.3%	4.6%	4.3%	4.6%	5.1%	4.8%	5.7%
Sedona	5.3%	2.1%	2.5%	2.1%	2.4%	2.3%	2.0%	1.8%	1.6%	1.5%	1.6%	1.8%	1.6%	2.2%
Page	4.8%	6.1%	7.3%	6.1%	6.9%	6.6%	5.8%	5.3%	4.6%	4.2%	4.6%	5.0%	4.8%	5.5%
Williams	n/a	3.7%	4.4%	3.6%	4.1%	4.0%	3.4%	3.2%	2.7%	2.5%	2.7%	3.0%	2.9%	3.4%
Fredonia	n/a	7.2%	8.6%	7.2%	8.1%	7.8%	6.8%	6.3%	5.3%	5.0%	5.4%	5.9%	5.7%	6.6%
Mohave County	6.6%	5.0%	8.7%	6.7%	7.2%	5.3%	4.3%	4.6%	4.2%	4.5%	5.6%	4.9%	3.9%	5.5%
Lake Havasu City	5.6%	2.7%	4.7%	3.6%	3.9%	2.8%	2.3%	2.5%	2.2%	2.4%	3.0%	2.6%	2.0%	3.1%
Bullhead City	7.1%	5.6%	9.6%	7.5%	8.0%	5.9%	4.8%	5.2%	4.7%	5.0%	6.2%	5.4%	4.3%	6.1%
Kingman	6.4%	3.4%	5.8%	4.5%	4.8%	3.5%	2.9%	3.1%	2.8%	3.0%	3.7%	3.2%	2.6%	3.8%
New Kingman	n/a	7.2%	12.2%	9.5%	10.2%	7.6%	6.2%	6.6%	6.1%	6.5%	7.9%	6.9%	5.5%	7.7%
Colorado City	n/a	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
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%
Kane County, UT	7.1%	6.9%	7.5%	8.7%	7.5%	4.8%	3.9%	3.9%	3.1%	3.5%	4.2%	4.6%	5.0%	5.4%
Kanab**	n/a	6.8%	n/a	n/a	n/a	n/a	n/a	n/a	4.3%	n/a	n/a	n/a	n/a	5.6%
Washington County, UT	5.1%	4.8%	2.4%	3.3%	3.6%	3.3%	3.8%	3.6%	3.2%	3.8%	4.5%	4.4%	3.9%	3.8%
St. George	4.2%	4.2%	3.2%	3.6%	3.9%	3.6%	4.1%	4.0%	3.5%	4.1%	4.9%	4.8%	4.2%	4.0%
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%
Utah	6.3%	4.3%	3.7%	3.6%	3.5%	3.1%	3.8%	3.7%	3.2%	4.4%	6.1%	5.6%	4.4%	4.3%
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

**Bureau of Labor Statistics publishes annual unemployment figures only for cities with populations greater than 25,000 individuals

Source: Arizona Department of Commerce, Arizona Workforce Informer

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

Utah Economic Data Viewer:

http://jobs.utah.gov/jsp/wi/utalmis/almisLaborforce/areaMap.jsp#

U.S. Department of Labor, Bureau of Labor Statistics

http://www.bls.gov/lau/home.htm#data

Table 16. Per Capita and Family Income by County and State

County/Place	Per Capita Income 1990	Per Capita Income 2000*	Per Capita Income % Change	Median Family Income 1990	Median Family Income 2000*	Median Family Income % Change	% Individuals in Poverty 1990	% Individuals in Poverty 2000	% Individuals in Poverty % Change	% Families in Poverty 1990	% Families in Poverty 2000	% Families in Poverty % Change
Coconino County	$10,580	$13,004	22.91%	$30,648	$34,805	13.56%	23.1%	18.2%	-21.21%	16.9%	13.1%	-22.49%
Flagstaff	$11,517	$14,140	22.78%	$34,952	$36,743	5.12%	17.2%	17.4%	1.16%	10.4%	10.6%	1.92%
Sedona	$19,893	$23,786	19.57%	$35,559	$39,954	12.36%	8.9%	9.7%	8.99%	6.3%	4.7%	-25.40%
Page	$12,352	$14,181	14.81%	$42,068	$41,216	-2.02%	9.2%	13.9%	51.09%	8.5%	12.8%	50.59%
Williams	$10,121	$10,098	-0.23%	$26,524	$23,454	-11.57%	11.7%	15.0%	28.21%	8.0%	12.3%	53.75%
Fredonia	$8,185	$12,309	50.38%	$27,065	$29,638	9.51%	13.5%	12.8%	-5.19%	11.1%	9.9%	-10.81%
Mohave County	$11,933	$12,737	6.74%	$27,010	$27,550	2.00%	14.2%	13.9%	-2.1%	8.7%	9.8%	12.6%
Lake Havasu City	$14,418	$15,480	7.37%	$31,639	$31,406	-0.74%	8.1%	9.5%	17.28%	5.1%	6.6%	29.41%
Bullhead City	n/a	$12,329	n/a	n/a	$25,731	n/a	n/a	15.1%	n/a	n/a	11.3%	n/a
Kingman	$12,721	$13,036	2.47%	$31,458	$31,356	-0.32%	9.4%	11.6%	23.40%	5.5%	8.2%	49.09%
New Kingman	$9,469	$10,618	12.13%	$21,861	$23,652	8.19%	15.0%	18.2%	21.33%	11.5%	13.3%	15.65%
Colorado City	$2,319	$4,016	73.18%	$15,179	$24,540	61.67%	68.4%	31.9%	-53.36%	61.0%	29.0%	-52.46%
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%
Kane County, UT	$8,721	$11,726	34.46%	$24,904	$30,372	21.96%	16.30%	7.90%	-51.53%	13.30%	5.50%	-58.65%
Kanab	$8,956	$12,237	36.63%	$26,862	$30,939	15.18%	13.0%	5.6%	-56.92%	11.3%	4.0%	-64.60%
Washington County, UT	$9,450	$12,043	27.44%	$27,690	$31,749	14.66%	13.3%	11.2%	-15.79%	9.2%	7.7%	-16.30%
St. George	$10,520	$17,022	61.81%	$29,802	$41,788	40.22%	12.7%	11.6%	-8.66%	7.9%	7.4%	-6.33%
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%
Utah	$11,029	$13,797	25.10%	$33,246	$38,712	16.44%	11.40%	9.40%	-17.54%	8.60%	6.50%	-24.42%

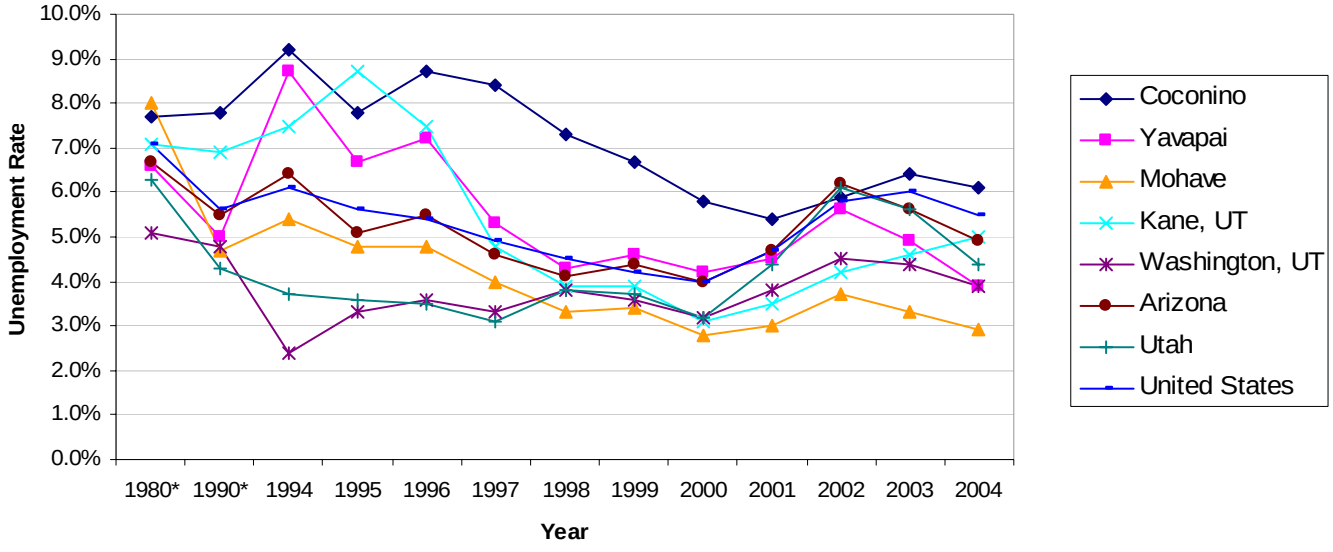
*2000 Income data adjusted to reflect 1990 constant dollars by applying deflation factor calculated by Consumer Price Index

Source: NRIS - Human Dimensions

Table 17. Household Income Distribution by County, 2000

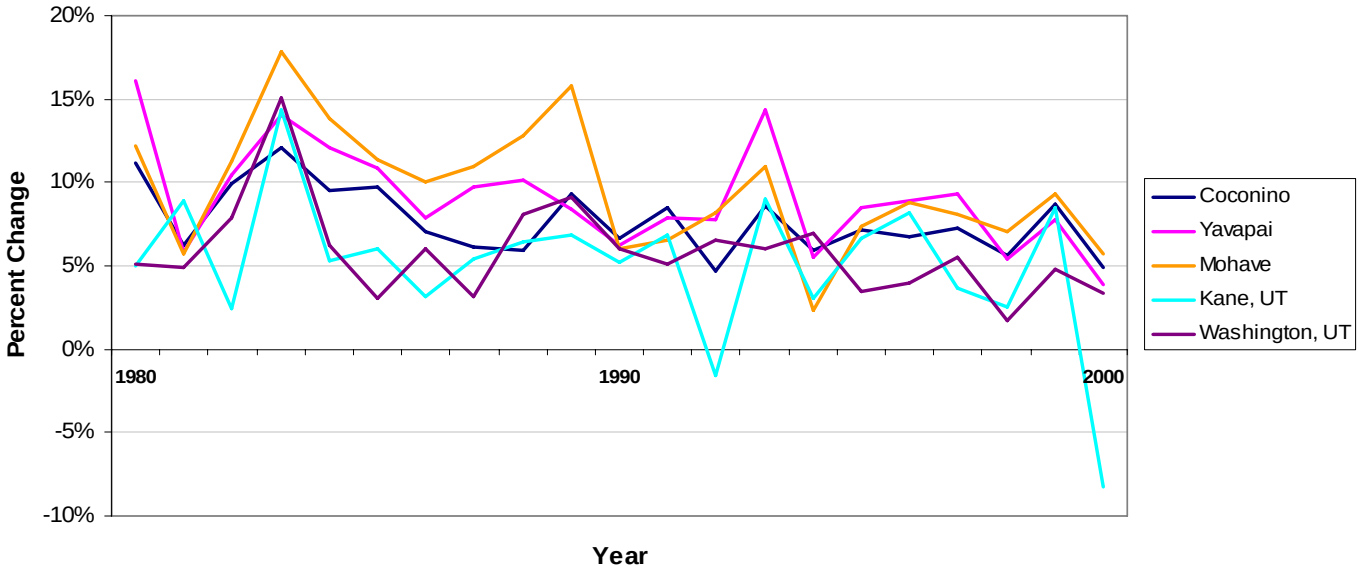
	Coconino County		Mohave County		Yavapai County		Kane County, UT		Washington County, UT	
Household Income	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Less than $10,000	4,285	10.60%	6,123	9.80%	6,298	9.00%	187	8.40%	2,001	6.70%
$10,000 to $14,999	2,838	7.00%	5,617	8.90%	5,692	8.10%	138	6.20%	1,966	6.60%
$15,000 to $24,999	5,670	14.00%	12,343	19.70%	12,019	17.20%	421	18.80%	4,850	16.20%
$25,000 to $34,999	5,542	13.70%	10,695	17.00%	11,115	15.90%	394	17.60%	4,902	16.40%
$35,000 to $49,999	7,018	17.40%	11,612	18.50%	13,098	18.70%	484	21.60%	6,297	21.00%
$50,000 to $74,999	7,661	19.00%	9,529	15.20%	11,709	16.70%	404	18.10%	5,785	19.30%
$75,000 to $99,999	3,950	9.80%	3,906	6.20%	4,924	7.00%	135	6.00%	2,112	7.00%
$100,000 to $149,999	2,349	5.80%	1,962	3.10%	3,285	4.70%	56	2.50%	1,413	4.70%
$150,000 to $199,999	555	1.40%	388	0.60%	762	1.10%	7	0.30%	305	1.00%
$200,000 or more	518	1.30%	621	1.00%	1,167	1.70%	10	0.40%	339	1.10%
Median household income ($)	$38,256	(x)	$31,521	(x)	$34,901	(x)	$34,247	(X)	$37,212	(X)

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



Source: Arizona Department of Commerce, Arizona Workforce Informer

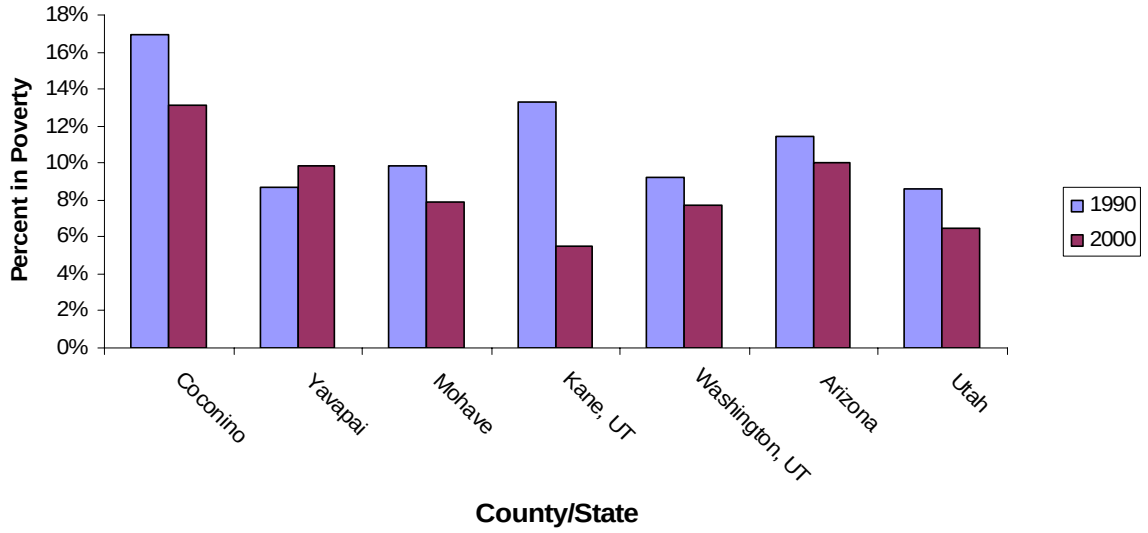
Figure 10. Unemployment Rates by County and State, 1980-2004



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

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 divergent trends among the five counties during the ten-year period. Mohave and Washington Counties both reported dramatic increases in total labor income from wood processing and products between 1990 and 2000 (461% and 156% respectively) while Coconino and Kane Counties reported substantial decreases in the same category as a result of lost income from millwork, paper mills, logging, and

sawmills. The gains in Mohave and Washington Counties were largely the result of increases in income from millwork, wood and kitchen cabinets, structural wood members, and wood household furniture. Meanwhile, Kane and Coconino Counties both saw dramatic growth in total labor income from special forest products and processing (3,993% and 1,755% respectively) resulting from increases in agriculture, forestry, and fishery services. However, for the entire area of assessment, these gains were offset by income losses in the same category for the other three counties over the decade.

Information on tourism employment for all five 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, the analysis of tourism employment is based on percentages derived from the Travel Industry Association of America's Tourism Economic Impact Model (TEIM). This is the same model used in the Arizona Tourism Statistical Report issued by AZOT. Table 19 suggests that the strongest gains in tourism employment between 1990 and 2000 occurred in Kane, Washington, and Yavapai Counties. Kane County reported particularly strong gains in employment in lodging and amusement, contributing to an overall increase in tourism employment that far exceeded that of neighboring counties and the states of Arizona and Utah. Washington and Yavapai Counties also saw increases in tourism employment between 1990 and 2000 that were significantly greater than average for their respective states.

Table 18. Total Labor Income from Forest Resources by County and State, 1990-2000 and % Change

County / State	Income from Wood Products and Processing			Income From Special Forest Products and Processing		
	1990	2000	%Change	1990	2000	%Change
Coconino County	$30,558,827	$3,773,588	-87.65%	$78,834	$1,462,923	1,755.70%
Mohave County	$3,001,246	$16,838,392	461.05%	$711,194	$263,278	-62.98%
Yavapai County	$4,044,339	$5,661,275	39.98%	$2,229,247	$975,281	-56.25%
Kane County , UT	$590,510	$165,501	-71.97%	$25,926	$1,061,369	3,993.87%
Washington County, UT	$3,783,682	$9,689,287	156.08%	$594,512	$142,004	-76.11%
Assessment Area Total	**$41,980,594**	**$36,130,043**	**-13.94%**	**$3,641,704**	**$3,906,854**	**7.28%**
Arizona	$263,558,989	$369,474,539	40.19%	$175,994,087	$137,825,248	-21.69%
Utah	$156,598,593	$248,444,947	58.65%	$8,134,462	$8,811,387	8.32%

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

Source: IMPLAN 2000 data

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

	Coconino County			Mohave County		
Industry Sector	**1990**	**2000**	**%Change**	**1990**	**2000**	**%Change**
Retail	562	896	59.47%	590	830	40.74%
Restaurant/Bar	1,054	1,451	37.69%	612	968	58.16%
Lodging	3,812	4,831	26.73%	1,876	1,344	-28.35%
Amusement	60	121	101.21%	41	50	22.54%
Total	**5,488**	**7,299**	**33.00%**	**3,119**	**3,193**	**2.36%**

	Yavapai County			Kane County, UT		
Industry Sector	**1990**	**2000**	**%Change**	**1990**	**2000**	**%Change**
Retail	514	828	60.96%	32	39	22.80%
Restaurant/Bar	747	1,241	66.24%	63	96	53.17%
Lodging	839	2,157	157.09%	7	214	3,118.59%
Amusement	26	112	324.04%	1	23	2,407.86%
Total	**2,126**	**4,338**	**104.02%**	**102**	**371**	**265.10%**

	Washington County, UT			Arizona		
Industry Sector	**1990**	**2000**	**%Change**	**1990**	**2000**	**%Change**
Retail	304	756	148.72%	21,655	30,376	40.28%
Restaurant/Bar	337	699	107.50%	26,393	38,395	45.47%
Lodging	817	1,656	102.75%	47,848	56,848	18.81%
Amusement	16	25	54.84%	1,442	3,462	140.05%
Total	**1,474**	**3,137**	**112.78%**	**97,338**	**129,081**	**32.61%**

	Utah		
Industry Sector	**1990**	**2000**	**%Change**
Retail	10,145	15,575	49.54%
Restaurant/Bar	10,728	16,341	52.32%
Lodging	13,690	21,542	57.35%
Amusement	653	1,544	136.33%
Total	**35,486**	**55,002**	**54.99%**

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 is 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. Mohave County holds by far the most entitlement acreage with over 6 million acres, only 5,487 of which are Forest Service lands. Coconino County holds the largest amount of FS lands entitled to PILT with over 3.2 million acres. Actual PILT payments for each county are presented in Table 21. Consistent with its abundance of entitlement acreage, Mohave County has consistently been the largest recipient of PILT payments, averaging $1.56 million over the last four years. Both Yavapai and Washington Counties averaged $1.3 million in annual PILT payments over the same period. Kane County reported the lowest average annual PILT payments at $431,395 between 2000 and 2004.

Annual forest receipts for the years 1986-1999 are presented for each county in Table 22. Coconino County reported by far the greatest amount in forest receipts with an annual average of over $2.4 million. In contrast, Mohave County reported the lowest amount in annual forest receipts with an average of $3,400 over the same period.

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
Coconino County	605,440	3,269,240	24,083	826,877	0	0	0	0	4,725,640
Mohave County	4,753,216	5,487	0	1,310,237	320	0	10,005	0	6,079,265
Yavapai County	606,237	1,967,402	12,319	727	0	0	0	0	2,586,685
Kane County, UT	1,589,997	121,204	131,132	459,558	0	0	0	0	2,301,891
Washington County , UT	634,343	393,358	0	120,872	0	0	0	0	1,148,573
TOTAL	8,189,233	5,756,691	167,534	2,718,271	320	0	10,005	0	16,842,054

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
Coconino County	$820,879	$1,260,220	$1,329,731	$858,124	$896,233	$1,033,037
Mohave County	$1,052,149	$1,509,613	$1,584,701	$1,818,201	$1,869,675	$1,566,868
Yavapai County	$973,796	$1,417,178	$1,473,737	$1,359,624	$1,280,574	$1,300,982
Kane County, UT	$292,000	$420,052	$432,522	$499,106	$513,297	$431,395
Washington County , UT	$885,447	$1,270,856	$1,324,136	$1,516,570	$1,556,724	$1,310,747
TOTAL	$4,024,271	$5,877,919	$6,144,827	$6,051,625	$6,116,503	$5,643,029

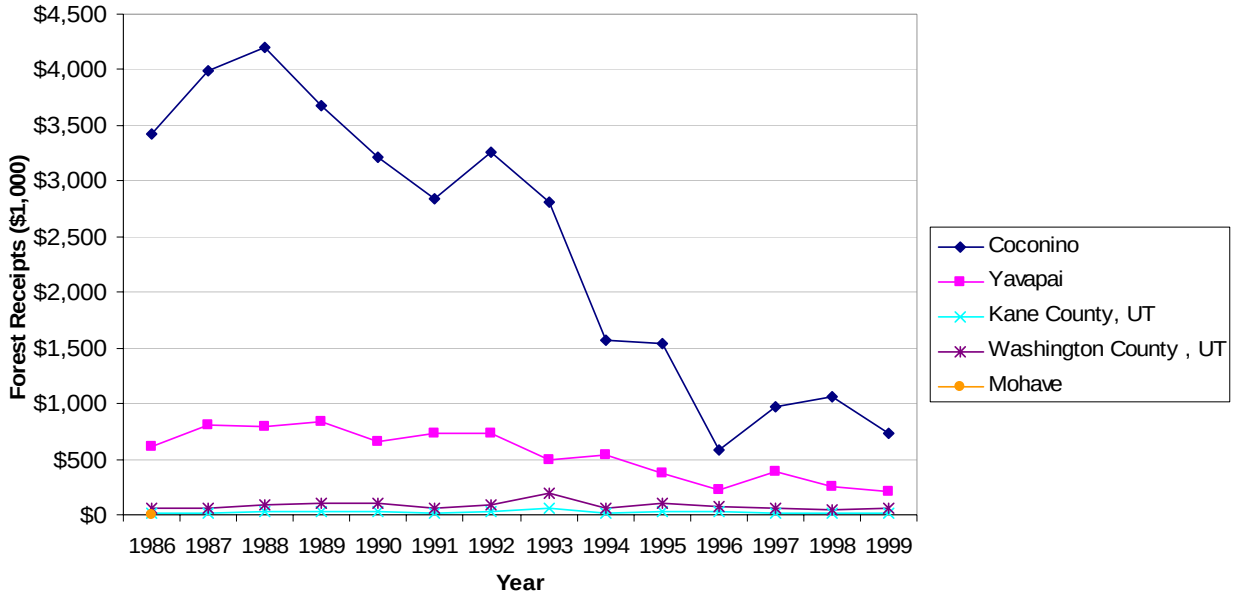
Source: U.S. Department of the Interior, Bureau of Land Management
http://www.blm.gov/pilt/search.html

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

County	1986	1987	1988	1989	1990	1991	1992	1993
Coconino County	$3,418.8	$3,991.3	$4,208.3	$3,671.3	$3,218.2	$2,839.2	$3,256.8	$2,817.3
Mohave County	$5.9	$5.4	$5.8	$4.1	$4.7	$2.6	$3.8	$4.3
Yavapai County	$610.9	$806.9	$787.5	$837.5	$664.5	$729.2	$732.2	$498.8
Kane County, UT	$17.5	$19.9	$26.7	$32.6	$31.6	$20.6	$28.0	$63.4
Washington County , UT	$55.4	$63.0	$84.8	$103.6	$100.5	$65.5	$88.8	$201.4

	1994	1995	1996	1997	1998	1999	Average
Coconino County	$1,566.2	$1,534.2	$584.4	$969.9	$1,058.5	$735.3	$2,419.3
Mohave County	$1.0	$2.7	$0.8	$2.0	$2.3	$1.6	$3.4
Yavapai County	$538.7	$378.7	$219.4	$382.3	$249.5	$210.8	$546.2
Kane County, UT	$20.2	$32.4	$25.8	$17.7	$14.4	$17.7	$26.3
Washington County , UT	$64.2	$102.9	$81.9	$56.2	$45.6	$56.2	$83.6

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

Again, these changes are emblematic of those seen in recent decades throughout the Mountain West and signal important demographic and economic trends that are likely to shape the region's future development. As evinced by the relatively strong population and economic growth centered in Washington, Kane, and Yavapai Counties over the past decade, the area surrounding the KNF has seen the expansion of certain populations and industries that are increasingly important to the local economy. In particular, the increase in retirement-aged population and increase in seasonal housing units, when combined with increases in the service/professional, wholesale trade, manufacturing, and construction industries, mirror a common trend in rural western economies (Booth 2002).

These trends support the notion that growth in many western communities is increasingly supported by individuals and households with the wherewithal to support non-extractive economies. Although the data show that per capita and median household incomes grew somewhat faster than state averages between

1990 and 2000, overall income levels remain below average for Arizona and Utah within each of the counties in the area of assessment. This trend takes on increasing relevance when combined with observed demographic trends showing an influx of retirement-age residents and seasonal homeowners. Several researchers have noted that while labor income is growing in the rural Mountain West, it is growing more slowly than transfer (social security, pensions, retirement) and dividend income. In other words, the growth of rural communities is being fueled, at least in part, by income that is not tied to local employment (Booth 2002, Rasker 2000).

The relative expansion of the service and professional industries is also facilitated by advances in 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 KNF demonstrate the reciprocal cause-and-effect relationships between economic and demographic trends. Although economic growth in many western communities may be fueled by households with relatively “footloose” income, potentially negative consequences include an increased demand for construction, schools, health care, and other services as well as undesirable side effects such as pollution, urban sprawl, and congestion (Rasker 2000, Case and Alward 1997).

4. Access and Travel Patterns

This section examines the historic and current factors affecting access patterns and transportation infrastructure within the five counties surrounding the Kaibab National Forest (KNF). The information gathered is intended to assess 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, 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 KNF cite the difficulty of transportation planning in the region given its vast geographic scale, population growth and 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 Yavapai, Coconino, and Mohave Counties saw relatively large increases in VMT between 1990 and 2000, mirroring the region's relatively strong population growth over the same period. Research shows that there are relatively few significant improvements currently scheduled for the region's transportation network and that seasonal traffic flows coincide with weather conditions which influence patterns of visitors from outside the region.

4.1 Historical context and current access issues

Transportation infrastructure throughout the state of Arizona was initially developed to serve the needs of a predominantly rural population while supporting expansion of the state's largely agricultural economy. State, county, and city comprehensive plans reviewed for this assessment specifically mention economic influences such as logging, ranching, mining, and tourism as having played a role in developing the region's circulation system (Coconino County 2003, Mohave County 1995, ADOT 2004a).

Today, many regions of the state, including the area surrounding Kaibab National Forest, 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 challenging given the geographic scale of the area, the presence of private lands and development within the national forest boundaries, and the competing needs of rural and urban county residents. Each of 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 (Coconino County 2003, Yavapai County 2003, Mohave County 1995).

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

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

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

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

4.2 Predominant transportation modes and seasonal flow patterns

A map of the roadway network within the area of assessment is presented in Figure 14. Interstates, U.S. and State highways, and Indian Routes within the area of assessment are presented in Table 23. The information shows that the area clearly has a considerable transportation network with a predominant number of State highways. Figure 14 shows that the area clearly has a substantial amount of roads with a particularly dense road network adjacent to more urban areas. Additionally, most of the major roadways follow a north-south orientation, the lone exception being Interstate 40 which is oriented east to west.

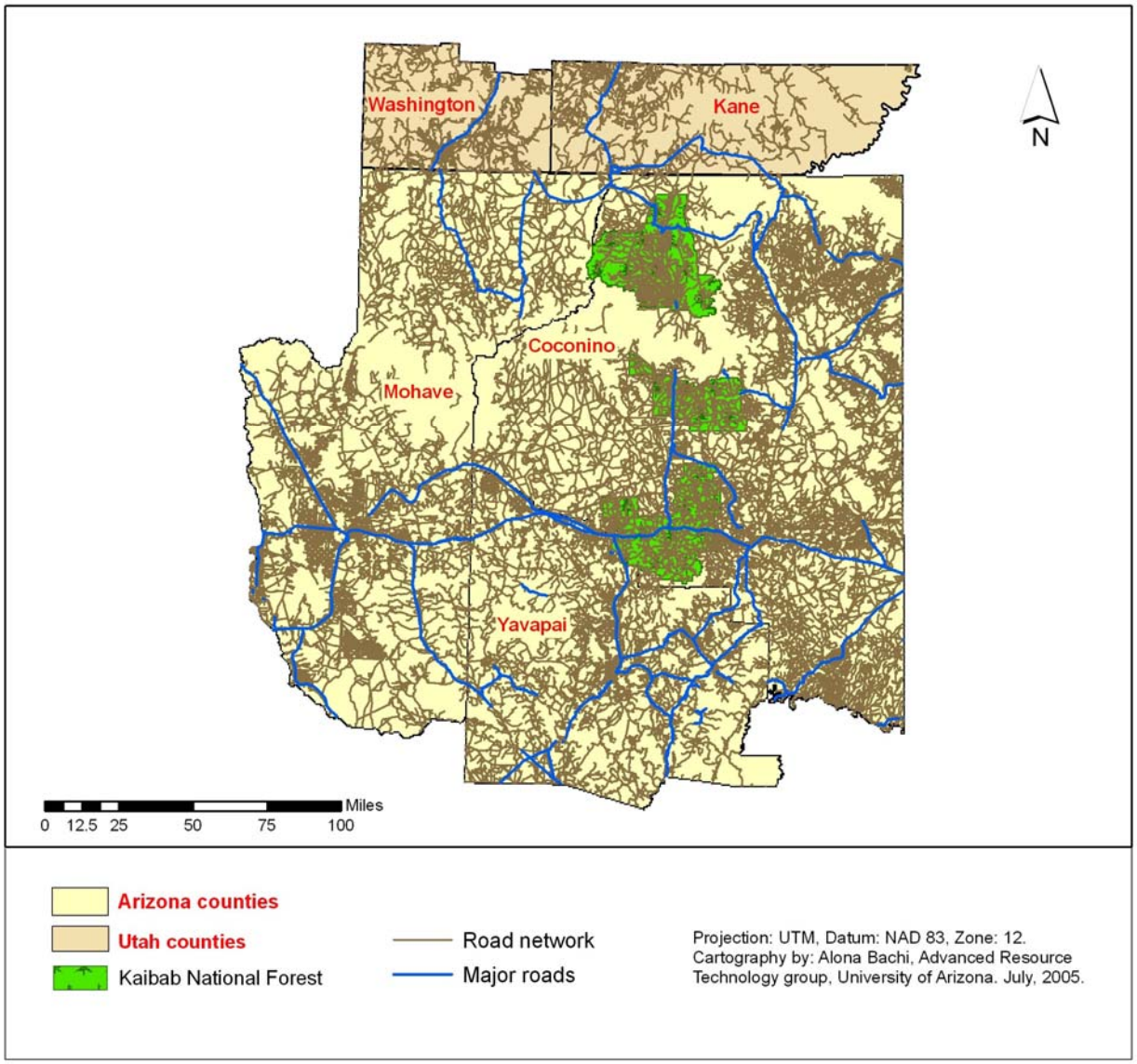


Figure 14. Road Network within the Area of Assessment

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

	Interstates / U.S. Highways	State Highways	Indian Routes
Coconino County			
	Interstate 40	State Highway 64	Indian Route 2
	Interstate 17	State Highway 66	Indian Route 15
	U.S. 89	State Highway 67	Indian Route 18
	U.S. 160	State Highway 87	
	U.S. 180	State Highway 89	
		State Highway 89A	
		State Highway 98	
		State Highway 99	
		State Highway 260	
		State Highway 264	
Mohave County			
	Interstate 40	State Highway 66	
	Interstate 15	State Highway 68	
	U.S. 93	State Highway 95	
		State Highway 389	
Yavapai County			
	Interstate 17	State Highway 69	
	Interstate 40	State Highway 71	
	U.S. 93	State Highway 89A	
		State Highway 96	
		State Highway 97	
		State Highway 169	
		State Highway 260	
Kane County, UT			
	U.S. 89	State Highway U 20	
	Interstate 15	State Highway U 146	
Washington County, UT			
	Interstate 15		
	U.S. 89		

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. For example, over ninety percent of daily person trips in the Flagstaff area currently take place in private motor vehicles. This means that less than ten percent of intercity mobility is accomplished via public transit, walking and bicycling. Given the expense of developing infrastructure for alternative modes of transportation and patterns of development throughout rural areas of the state, the predominance of motorized vehicles is likely to continue for the foreseeable future. Nonetheless, counties and cities throughout the region express a desire to reduce dependency on automobiles by supporting alternative modes—transit, walking, bicycling—thereby

reducing the demand for expanded roadways (Coconino County 2003, Yavapai County 2003, FMPO 2001, Mohave County 1995).

The Arizona highway system consists of over 58,000 miles of roadway, of which two percent are interstates, three percent are U.S. routes, and nearly six percent are state routes. Although only 12% of the total highway network is composed of state facilities, over 57% of the daily VMT occurs on these roads. The Interstate System carries 28% of all daily VMT (ADOT 2004c). Much of the Arizona state highway system passes through lands owned by federal agencies and federally recognized tribes. Federal agencies and federally recognized tribes own 70% of the land in Arizona. Federal lands agencies, including the USFS, the BLM, and others, own 42% of the land in Arizona, with over 2,000 miles of state highway passing through these lands. Arizona's twenty-one federally recognized tribal nations own 28% of Arizona land. An additional 1,200 miles of state highway pass through these lands, with over one-half of these road-miles located 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 Yavapai County over the ten-year period. Similar, though less substantial, increases were seen for traffic counts on all roads within the county over the same period. In light of the significant increases in population and housing in Yavapai County between 1990 and 2000, the increase in travel on non-state roads likely points to significant increases in travel on expanded city, county, and private road networks. Coconino County also experienced increases in VMT on non-state roads that were much higher than those for the state over the same period. Data also show that the areas of assessment in the state of Utah reported considerably lower daily VMT counts between 1990 and 2000. The lone exception to this trend is a significant increase in travel on non-state roads in Washington County during the period.

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**
Coconino County	4,783	6,796	42.09%	3,646	5,211	42.92%	1,137	1,585	39.40%
Mohave County	4,799	6,770	41.07%	3,071	5,022	63.53%	1,728	1,748	1.16%
Yavapai County	3,439	6,803	97.82%	3,182	4,776	50.09%	257	2,027	688.72%
Kane County*	294	338	14.97%	254	287	12.99%	40	51	27.50%
Washington County*	1,842	2,465	33.82%	1,210	1,589	31.32%	632	876	38.61%
Arizona	97,139	134,345	38.30%	40,252	66,671	65.63%	56,887	67,674	18.96%
Utah*	51,467	61,648	19.78%	37,102	42,927	15.70%	14,365	18,721	30.32%

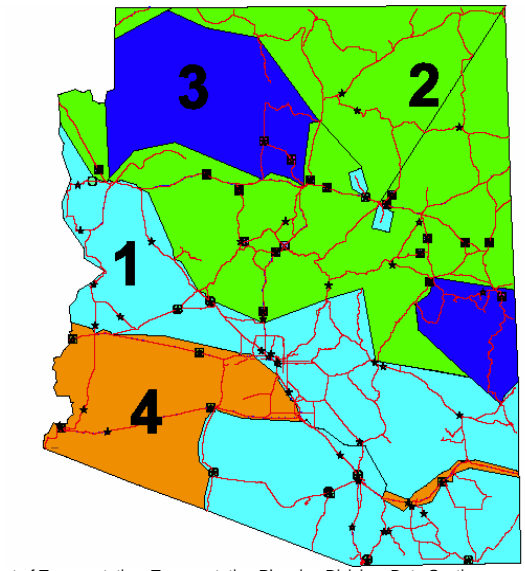
*Earliest available traffic data for Utah is from 1994

Sources: Arizona Department of Transportation, Transportation Planning Division

Utah Highway Performance Monitoring System (HPMS) and Traffic on Utah Highways

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

Table 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 Annual Average Daily Traffic (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 KNF.

Planned improvements to the state highway system surrounding Kaibab NF are presented in Table 26. Currently, the ADOT Transportation Planning Department reports only a single project affecting Kaibab National Forest as part of its Five-Year Construction Program.

Table 26. ADOT Current 5-Year Transportation Facilities Construction Program, Kaibab National Forest

Year	Route	Milepost	County	Funding Source	Location	Length (miles)	Type Of Work	Cost ($1000)
2005	64	215	Coconino	National Highway System	MP 215 - MP 225	10	Construct Passing Lane	$1,650

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 KNF, the Northern Arizona Council of Government (NACOG), the Flagstaff Municipal Planning Organization (FMPO), the Western Arizona Council of Governments (WACOG), 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 (Coconino County 2003, Yavapai County 2003, Mohave County 1995, Washington County 1994). 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. Transportation planning documents for Kane County, Utah were not available at the time of this assessment.

Coconino County

Similar to other comprehensive plans, the circulation element of the *Coconino County Comprehensive Plan* claims that limited funding requires a continuing emphasis on maintaining existing systems rather than pursuing new roadway construction and other improvements. As with other elements in the comprehensive plan, the circulation framework for the county is grounded within an overall conservation framework. The plan explicitly states that circulation throughout the county will be planned in order to limit fragmentation or damage to habitat, disruption of wildlife movement, and introduction of pollutants or invasive species as a result of road construction (Coconino County 2003).

Two major highways serve crucial circulation roles for Coconino County—Interstate 17, which heads south to Phoenix, and Interstate 40, the only east-west roadway extending across the county. U.S. highways in Coconino County primarily serve north-south traffic. Coconino County is responsible for maintaining the roads it owns as well as those managed through cooperative agreements with ADOT, the Forest Service, and the Navajo Nation. The most pressing access issues occur on private, unpaved roads throughout the county. The county encourages the formation of improvement districts in order to ensure maintenance of private roads in previously developed areas. The Public Works Department is responsible for all roadway improvements. Projects are evaluated according to safety and efficiency and are

prioritized in the county's Capital Improvement Plan (CIP). The most recently available CIP describes no major roadway improvements affecting forest access in Coconino County (Coconino County 2003).

Yavapai County

As with Coconino 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/north-easterly through the county, State Route 89 and Interstate 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 proposed, large residential developments in Chino Valley and north of the Paulden community are expected to have significant impacts on SR 89 North and will necessitate 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. With 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).

Mohave County

The transportation element of the *Mohave County General Plan* describes the overall transportation goals and policies of the county without a great deal of information regarding planned improvements to the current road network. The most recent revision of the plan, for which no date is given, does explain that rapid growth has increased traffic congestion along State Highways 68 and 95. While ADOT has begun upgrading State Highway 68 through the Golden Valley area, State Highway 95 continues to experience congestion through Bullhead City and South Mohave Valley. Bullhead City has built a loop road that bypasses the most congested roadway through the City, but the general plan states that this will not remedy the traffic problems south of Bullhead City (Mohave County 1995).

Perhaps the most significant development affecting transportation in Mohave County is the development of the Hoover Dam Bypass Project. United States Highway 93 (U.S. 93) has been designated a North American Free Trade Agreement (NAFTA) route. Due to the congestion caused by switchbacks in the current route, as well as restricted vehicle access to the Hoover Dam crossing, several federal and state partners have proposed the development of a 3.5 mile bypass corridor. As currently designed, the route will begin approximately at milepost 2.2 in Clark County, Nevada and cross the Colorado River approximately 1,500 feet downstream of the Hoover Dam terminating in Mohave County, Arizona near milepost 1.7 on U.S. 93. Major stakeholders on the Project Management Team currently include the Federal Highway Administration (FHWA), the States of Arizona and Nevada, the Bureau of Reclamation (BOR), the Western Area Power Authority (WAPA), the National Park Service (NPS), and the Central Federal Lands Highway Division (CFLHD) which will act in the lead management role for all elements of project procurement, design, and construction (Hoover Dam 2005).

Washington County, Utah

The circulation element of the *Washington County General Plan* does not provide mileage or engineering standards of individual road classes, but rather describes their general purpose and the county's long-term goals for their maintenance and improvement. The plan states that the freeway system within the county is completed and no expansions are anticipated in the near future. New freeway interchanges in the north Washington City area and south of Bloomington are among the improvements that may be required by the continued growth of established communities.

The plan calls for as much controlled access to major highways as possible. Where this is not possible, or is impractical due to rural patterns of development, the plan calls for the construction of collector roads as a means of limiting access and providing for efficient circulation in the event of future urban development. Finally, the standard of improvement of collector roads and local streets in unincorporated areas of the county should be compatible with development standards in adjacent communities in order to encourage and facilitate annexation by incorporated cities (Washington County 1994).

4.4 Internal modes, barriers and access issues

At present, there are few, if any, prominent barriers to access within the Kaibab National Forest. While forest planners have identified the potential for future issues involving private property owners and access rights, few such issues currently exist for the KNF. The potential of compromised access is most likely to develop in the Williams district given the scarcity of private property in north Kaibab. Planners also cited the potential for conflict between various user groups (OHV, equestrian, hikers, mountain bikers) if current recreation trends continue. Currently, however, neither of these factors is perceived as a conflict or barrier to access (Higgins, pers. comm.).

Access and travel patterns within the KNF are likely to be influenced by two current analytical processes. A proposed amendment to the five-forest off-highway vehicle environmental impact statement (OHV EIS) would prohibit all OHV travel between established routes. Currently, the Kaibab NF is also involved in a roads analysis process (RAP) for Level 1 and Level 2 forest roads. Level 1 roads represent existing primitive roads that could be closed with little or no impact on forest access. Level 2 roads are open to high-clearance vehicles only. The RAP, currently ongoing in the Tusayan district, involves the public in determining which roads are most used and needed as well as which roads may be recommended for closure. Available information suggests that the RAP will lead to a net decrease in the number and density of roads within the forest as a result of both closures and limited new construction to improve access. Both the proposed OHV amendment and the RAP are aimed at managing forest routes in a way that ensures access and prevents undue damage to forest land (Higgins, pers. comm.).

Regarding seasonal flows, the Kaibab National Forest experienced a significant increase in travel coinciding with the summer flow of visitors to the Grand Canyon. Planners noted that the forest also experiences a significant increase in travel during the fall hunting season.

Currently, there are no explicit differences in the general access afforded to various user groups on the Kaibab NF. Businesses, individuals, or groups intending to use KNF lands for a variety of special purposes ranging from commercial recreation to infrastructure must apply for a Special Use Authorization.

4.5 Key issues for forest planning and management

The Forest Service has long been aware of the considerable impact internal roads have on forest management. Increasingly, however, the short- and long-term effects of such roads have become highly controversial given the wider public's concern for roadless areas and the perceived detrimental affects on wilderness due to resource extraction. Previous research on the impact of roads in forested environments tended to focus on broadly defined positive and negative impacts of road networks. Positive impacts are generally considered to include improved access to forest areas for the purpose of timber harvesting and the collection of special forest products, livestock grazing, mining, fire control, research and monitoring, access to private inholdings, and the cultural value of the roads themselves. Potentially negative impacts of forest roads include adverse effects on hydrology and geomorphic features; habitat fragmentation; predation; roadkill; invasion by exotic species; degraded water quality and chemical contamination; degraded aquatic habitat; use conflicts; destructive human actions such as fire ignition, trash dumping, 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 within the national forests. For example, the fact that the FS is required by law to permit access to private inholdings is likely to become increasingly important to the KNF.

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

This assessment, however, is primarily concerned with the socioeconomic status and trends among communities outside of the forest, many of which are likely to directly affect future forest management alternatives. The quantity and quality of road networks to and from the KNF are no exception. A recent report to the United States Congress noted that while the condition of our national interstate highway system has improved considerably over the last fifty years, traffic congestion has also increased. Daily VMT—the principle measure of traffic density—increased 31% on the national highway system between 1990 and 2000. By comparison, the state of Arizona reported a 38% increase in VMT over the same period. Three counties within the area of assessment for the KNF reported even greater increases, the highest of which was in Yavapai County (97.82%). Although information on VMT within the state of Utah is available only since 1994, data suggest that traffic increases have been considerably less than those in Arizona and the Untied States as a whole. 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 FHWA expects to see significant increases in both passenger and freight traffic on the interstate highway system between 2001 and 2010 (17% and 28% respectively) (Siggerud 2002). Given population projections for counties within the area of assessment, the KNF is likely to be affected by increased traffic flow, congestion, and longer commute times.

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

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

Collected land use and ownership data reveal that the area of assessment for the KNF contains a considerable amount of Native American, private, and Forest Service (FS) land, all of which stand to have a considerable impact on future forest planning. Yavapai County is particularly notable for its 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. The proximity of private parcels and forest lands has also contributed to a number of significant land exchanges involving the KNF over the last several years.

5.1 Historical context and land use patterns

Since the federal government first began designating public trust land in the late nineteenth century, the amount of national forest land in Arizona has remained remarkably steady. The concept of shared land 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 this use of the lands since the institution of federally protected domain in the region. Public domain territory stood at 75% in Arizona in 1891, and by 1977, that number remained at over 70%. The National Forest System itself accounts for about 15% of the land in Arizona. This small segment of the state's land accounts for a substantial portion of Arizona's natural resources, containing 40% of the watersheds and nearly 60% of the timber. For this reason, maintaining the integrity of the forest boundaries and co-opting land to form contiguous borders has historically been an essential objective of the USFS. Recently, one of the rising primary resources of the national forests has come in the form of recreational use. Of course, 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 Kaibab National Forest is discussed in more detail in Section 2.1.

The majority of National Forest land is grassland, with only 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). The controversy has hit home in the KNF recently with logging on the East Rim. Proponents claim that the logging activity falls under the tree thinning clause in the Healthy Forests Act meant to reduce wildfire threat. Environmentalists argue that, even if the nearest community were not forty-eight miles away, the loggers have little use for the kind of small-diameter shrub most dangerous in wildfire spread and, instead, are targeting hundreds of large-diameter trees. Regardless of the motives behind logging and fire suppression ventures in the national

forests, the GAO has reported that they remain a financial burden, draining $2.7 billion from other federal programs (Eilperin 2004, GAO 2004b).

Although the total amount of federal land in the area has remained consistent, the specific lands contained within the national forests have occasionally been juggled about. FS and BLM lands can be traded or sold under a process that has been in place for over fifty years. These exchanges can attempt to redirect growth away from areas deemed environmentally sensitive and attempt to keep it near communities with compatible infrastructures. The process begins when private interests wish to acquire federal lands. Following an environmental assessment, trades may be made at fair market value. Trades like the conveyance of administrative sites on 800 acres of the Coconino, Tonto, Prescott, and Kaibab forests in 1998 and the exchange of 272 acres of KNF land in Tusayan in 1999 pass by with little public comment, but other land swaps, like the Verde River Basin trade due to be debated in Congress this year (S. 161/H.R. 410), have seen high levels of public and legal resistance.

5.2 Land ownership and land use

There are over 29.9 million acres of land in the five-county area of assessment for KNF. Within this expanse, there are distinct patterns of land ownership and use, each of which carries important implications for current and future forest management. Figures 16 and 17 provide information on land ownership for the entire area of assessment while Table 27 provides more detailed land ownership data on a county-by-county basis. Figure 16 displays a relatively large amount of Forest Service land in close proximity to private land as well as considerable Native American holdings within the area of assessment. Data in Figure 17 suggest that, as a whole, the area of assessment for the KNF closely resembles overall ownership patterns for the state of Arizona. For example, approximately 16% of the land within the area of assessment is under private ownership while 10% is State Trust land. Both of these factors exercise a great deal of influence on regional development patterns, a point discussed later in this section (AZSLD 2004).

The more detailed data provided in Table 27 indicate important differences in ownership among the five individual counties within the area of assessment. Yavapai County is notable for its relatively substantial amount of private and State Trust land. Coconino County contains the highest percentage of Native American land (38.13%) while Yavapai County reports the greatest amount of land held by the FS (38.17%). Kane County contains relatively limited amounts of private (10.29%) and State Trust land (3.86%) compared to neighboring counties.

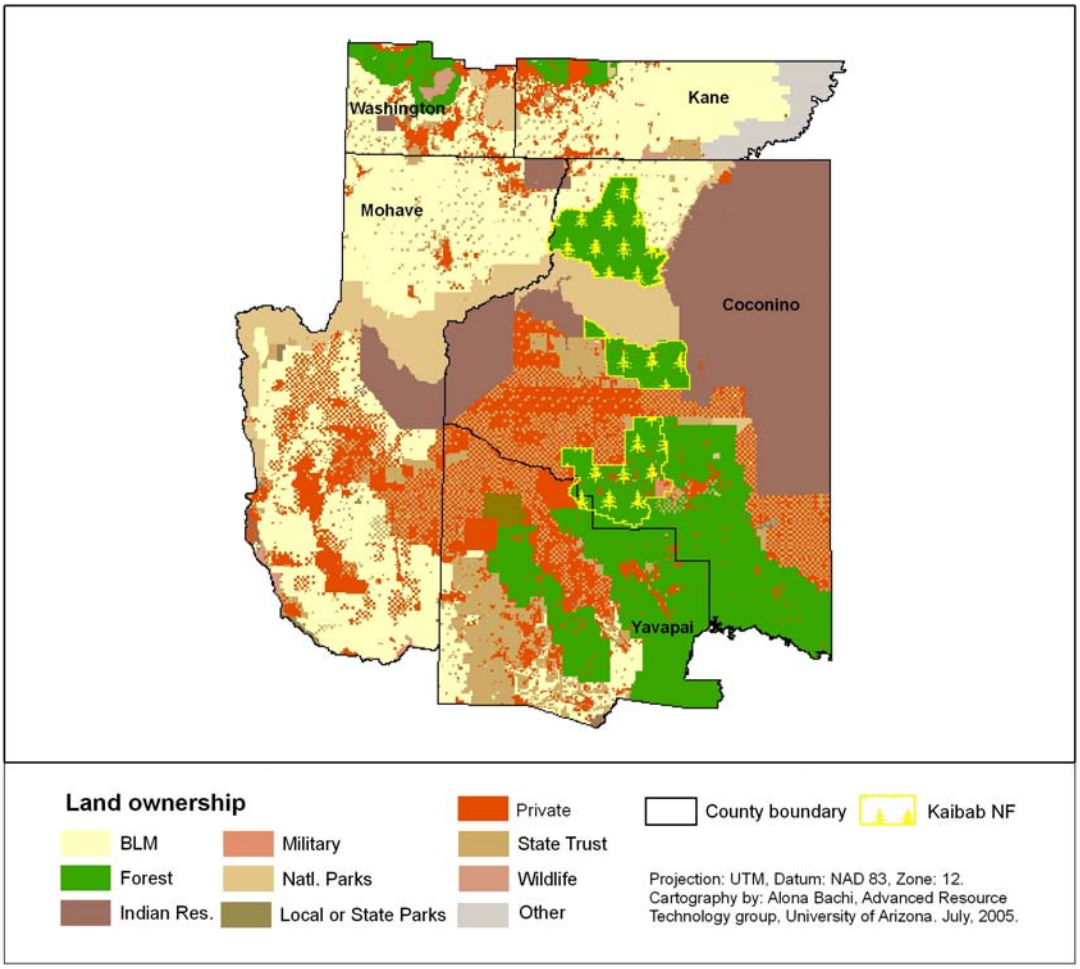
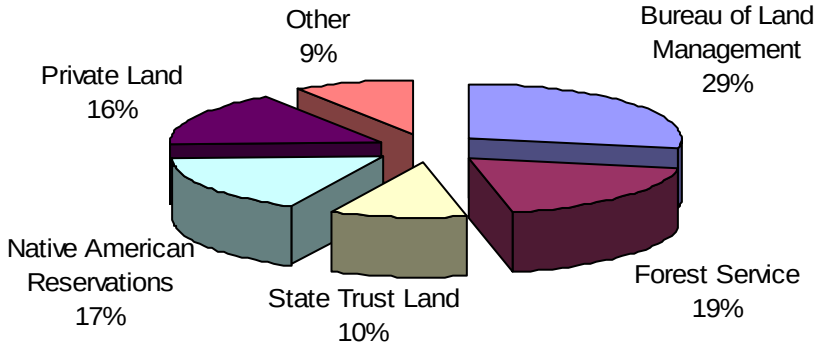


Figure 16. Land Ownership within Area of Assessment



Source: Arizona State Land Department

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

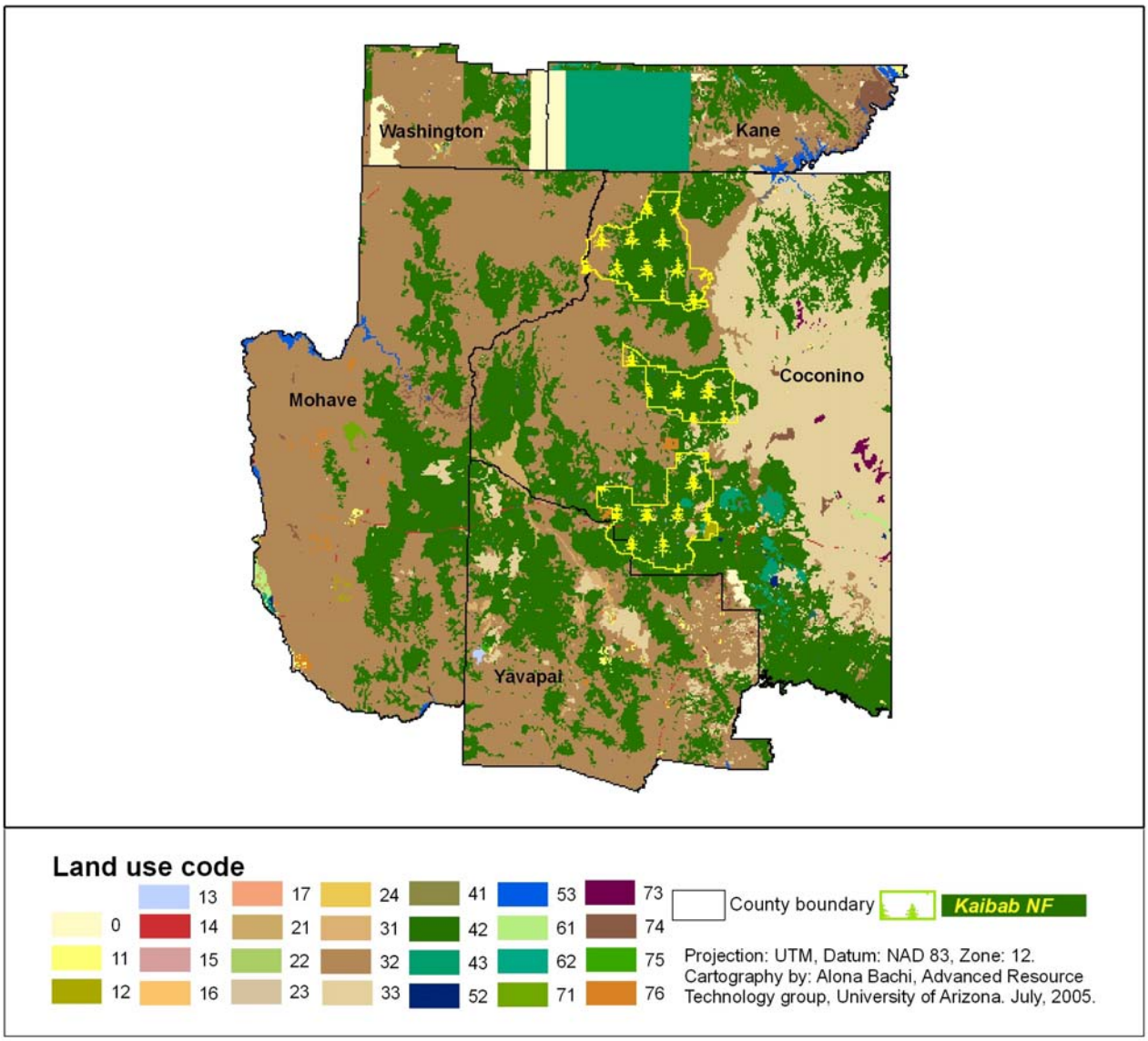
Table 27. Land Ownership by County, 2005

Land Ownership	Acres	Percent
Coconino County		
Apache-Sitgreaves NF	288,821.10	2.42%
BLM	605,491.35	5.08%
Coconino N.F.	1,399,784.27	11.73%
Game and Fish	10,073.02	0.08%
Glen Canyon N.R.A.	40,657.72	0.34%
Grand Canyon N.P.	681,829.36	5.72%
Havasupai Indian Res.	171,918.92	1.44%
Hopi Indian Res.	493,566.28	4.14%
Hualapai Indian Res.	579,476.99	4.86%
Indian Allotments	4,625.05	0.04%
Kaibab Indian Res.	13,170.00	0.11%
Kaibab N.F.	1,510,895.79	12.66%
Marble Canyon N.M.	14,600.29	0.12%
Navajo Army Depot	25,752.93	0.22%
Navajo Indian Res.	3,166,147.29	26.54%
Navajo N.M.	39.18	0.00%
Navajo-Hopi Joint Use	123,966.85	1.04%
Prescott N.F.	43,592.26	0.37%
Private Land	1,587,305.56	13.31%
State Trust Land	1,125,427.03	9.43%
Sunset Crater N.M.	3,035.99	0.03%
Walnut Canyon N.M.	3,049.74	0.03%
Wupatki N.M.	36,478.85	0.31%
TOTAL	11,929,705.82	100.00%
Yavapai County		
BLM	605,411.62	11.64%
Bureau of Reclamation	8,682.85	0.17%
Coconino N.F.	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 N.F.	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 N.F.	1,211,345.57	23.30%
Private Land	1,324,643.23	25.47%
State Trust Land	1,265,474.56	24.34%
Tonto N.F.	321,677.16	6.19%
Tuzigoot N.M.	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%

Land Ownership	Acres	Percent
Mohave County		
BLM	4,777,546.23	55.38%
Bureau of Reclamation	12,679.83	0.15%
Fort-Mohave Indian Res.	23,568.52	0.27%
Game and Fish	1,185.74	0.01%
Grand Canyon N.P.	495,680.96	5.75%
Havasu N.W.R.	36,097.96	0.42%
Hualapai Indian Res.	444,705.94	5.15%
Indian Allotments	637.85	0.01%
Kaibab Indian Res.	107,084.46	1.24%
Kaibab N.F.	4,694.66	0.05%
Lake Mead N.R.A.	675,014.46	7.82%
Military Res.	9,967.71	0.12%
Parks and Recreation	4,722.79	0.05%
Pipe Springs N.M.	39.44	0.00%
Private Land	1,467,782.61	17.01%
State Trust Land	565,970.53	6.56%
TOTAL	8,627,379.69	100.00%
Kane County, UT		
BLM	1,635,361	62.25%
Forest Service	123,044	4.68%
National Parks, Monuments	18,313	0.70%
National Rec. Area	381,635	14.53%
Private	270,264	10.29%
State Park Rec. Area	1,746	0.07%
State Trust	101,382	3.86%
State Wildlife Reserves	266	0.01%
USFS & BLM Wilderness	21,427	0.82%
Water	73,479	2.80%
Water Intermittent	332	0.01%
TOTAL	2,627,249	100.00%
Washington County, UT		
BLM	630,461	40.52%
Forest Service	344,482	22.14%
National Parks, Monuments	132,032	8.49%
Private	275,597	17.71%
State Park Rec. Area	7,918	0.51%
State Trust	81,685	5.25%
State Wildlife Reserves	836	0.05%
Tribal	27,905	1.79%
USFS & BLM Wilderness	53,188	3.42%
Water	1,807	0.12%
TOTAL	1,555,911	100.00%

Sources: Arizona Land Resource Information Service
Utah Trust Lands Administration

Figure 18 depicts land cover within the entire area of assessment while Table 28 provides detailed data on land cover within each of the five 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. Yavapai County reported the greatest amount of residential and industrial cover (.54% and .20% respectively), and Coconino County had the greatest amount of land dedicated to commercial and services uses. Shrub and brush rangeland was the predominant land cover in four of the five counties within the area of assessment, the lone exception being Coconino County, where evergreen forest was most common.



*The apparent G.I.S. data anomalies in Kane and Washington Counties (LULC 43 and 0, Mixed Forest Land and Other) 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

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

Land Use Code	Coverage Type	Coconino County		Mohave County		Yavapai County	
		Acres	Percent	Acres	Percent	Acres	Percent
0	Unknown / Background	2,6569	0.22%	2,144	0.02%	2,549	0.05%
11	Residential	1,3388	0.11%	12,635	0.15%	28,107	0.54%
12	Commercial and services	20,442	0.17%	12,679	0.15%	3,431	0.07%
13	Industrial	2,572	0.02%	368	0.00%	10,397	0.20%
14	Transportation, communication, utilities	14,942	0.13%	10,211	0.12%	13,348	0.26%
16	Mixed urban or built-up land	4,100	0.03%	1,380	0.02%	1,610	0.03%
17	Other urban or built-up land	1,442	0.01%	1,511	0.02%	851	0.02%
21	Cropland and pasture	130,213	1.09%	15,601	0.18%	94,142	1.81%
22	Orchards, groves, vineyards, nurseries and ornamental horticultural areas	0	0.00%	51	0.00%	86	0.00%
23	Confined feeding operations	79	0.00%	32	0.00%	90	0.00%
24	Other agricultural land	335	0.00%	170	0.00%	1,412	0.03%
31	Herbaceous rangeland	9,559	0.08%	2,963	0.03%	54,394	1.05%
32	Shrub and brush rangeland	2,384,941	19.99%	6,094,445	70.64%	2,563,774	49.30%
33	Mixed rangeland	3,831,908	32.12%	40,858	0.47%	343,004	6.60%
41	Deciduous forest land	740	0.01%	0	0.00%	315	0.01%
42	Evergreen forest land	5,152,147	43.19%	2,183,171	25.31%	2,033,524	39.11%
43	Mixed forest land	147,202	1.23%	0	0.00%	1,214	0.02%
51	Streams and canals	1,252	0.01%	1,996	0.02%	0	0.00%
52	Lakes	11,380	0.10%	3,573	0.04%	216	0.00%
53	Reservoirs	17,868	0.15%	84,217	0.98%	4,441	0.09%
61	Forested wetland	17,097	0.14%	27,563	0.32%	0	0.00%
62	Non-forested wetland	602	0.01%	6,633	0.08%	0	0.00%
71	Dry salt flats	0	0.00%	22,556	0.26%	0	0.00%
72	Beaches	0	0.00%	121	0.00%	0	0.00%
73	Sandy areas not beaches	55,941	0.47%	5,666	0.07%	1,585	0.03%
74	Bare exposed rock	56,324	0.47%	42,039	0.49%	13,536	0.26%
75	Strip mines, quarries, gravel pits	6,094	0.05%	3,412	0.04%	13,387	0.26%
76	Transitional areas	21,834	0.18%	51,387	0.60%	14,571	0.28%
77	Mixed Barren Land	364	0.00%	0	0.00%	0	0.00%
85	Mixed tundra	369	0.00%	0	0.00%	0	0.00%
	Total	**11,929,706**	**100.00%**	**8,627,380**	**100.00%**	**5,199,986**	**100.00%**

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

Land Use code	Coverage Type	Kane County, UT		Washington County, UT		Assessment Area	
		Acres	Percent	Acres	Percent	Acres	Percent
0	Unknown / Background	1,091,946	41.56%	208,556	13.40%	1,331,765	4.45%
11	Residential	6,663	0.25%	2,647	0.17%	63,440	0.21%
12	Commercial and services	88	0.00%	213	0.01%	36,853	0.12%
13	Industrial	0	0.00%	0	0.00%	13,337	0.04%
14	Transportation, communication, utilities	19	0.00%	1,448	0.09%	39,968	0.13%
16	Mixed urban or built-up land	0	0.00%	453	0.03%	7,543	0.03%
17	Other urban or built-up land	7	0.00%	369	0.02%	4,180	0.01%
21	Cropland and pasture	1,076	0.04%	29,566	1.90%	270,599	0.90%
22	Orchards, groves, vineyards, nurseries and ornamental horticultural areas	0	0.00%	60	0.00%	197	0.00%
23	Confined feeding operations	0	0.00%	40	0.00%	241	0.00%
24	Other agricultural land	0	0.00%	35	0.00%	1,951	0.01%
31	Herbaceous rangeland	700	0.03%	681	0.04%	68,296	0.23%
32	Shrub and brush rangeland	795,892	30.29%	929,221	59.72%	12,768,274	42.65%
33	Mixed rangeland	93,747	3.57%	14,475	0.93%	4,323,993	14.44%
41	Deciduous forest land	4,461	0.17%	1,780	0.11%	7,296	0.02%
42	Evergreen forest land	467,551	17.80%	354,231	22.77%	10,190,624	34.04%
43	Mixed forest land	16,138	0.61%	4,628	0.30%	169,182	0.57%
51	Streams and canals	0	0.00%	0	0.00%	3,248	0.01%
52	Lakes	411	0.02%	0	0.00%	15,580	0.05%
53	Reservoirs	67,614	2.57%	375	0.02%	174,515	0.58%
61	Forested wetland	0	0.00%	1,751	0.11%	46,411	0.16%
62	Non-forested wetland	350	0.01%	558	0.04%	8,144	0.03%
71	Dry salt flats	0	0.00%	0	0.00%	22,556	0.08%
72	Beaches	0	0.00%	0	0.00%	121	0.00%
73	Sandy areas not beaches	0	0.00%	1,104	0.07%	64,297	0.21%
74	Bare exposed rock	80,074	3.05%	3,469	0.22%	195,442	0.65%
75	Strip mines, quarries, gravel pits	84	0.00%	0	0.00%	22,977	0.08%
76	Transitional areas	426	0.02%	252	0.02%	88,469	0.30%
77	Mixed Barren Land	0	0.00%	0	0.00%	364	0.00%
85	Mixed tundra	0	0.00%	0	0.00%	369	0.00%
	Total	**2,627,249**	**100.00%**	**1,555,911**	**100.00%**	**29,940,231**	**100.00%**

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

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

Source: U.S. Geological Survey, 1990

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 a region, the patterns of development, desired conditions, and current county land use policies. It must be noted, however, that county governments hold no legal authority over independent jurisdictions such as federal and state lands, incorporated cities and towns, or Native American tribal reservations. 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, descriptive analysis of land use patterns and desired conditions, others present more detailed, prescriptive policies and guidelines for county land use. As such, information from the various comprehensive plans is discussed in terms of its potential for influencing land use patterns adjacent to the national forest.

Coconino County Comprehensive Plan

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

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

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

Water for residential use is either unavailable or difficult to obtain in unincorporated areas of Coconino County. The plan claims that groundwater depth typically exceeds 1,000 feet prompting residents to depend on shared wells, small public water supply systems, or the hauling of water from municipal standpipes. While the county does have the authority to require developers to reveal sources of water for planned subdivisions, it does not have the legal authority to evaluate the impact of proposed wells on neighboring water sources or the environment. The plan also alludes to the planning challenges posed by the reverence for the "rural" character of the county held by many residents in unincorporated areas. It explicitly states that the ultimate success of the conservation framework will depend on planners' success in redefining "rural character" from that of two- to five-acre lots with no protected open space to land use patterns that incorporate smaller individual lots and large areas of conserved open space (Coconino County 2003).

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

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

- Residential land use

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

The pace of residential development and the scarcity of available land have made the affordability of housing a growing issue in Coconino County. The Coconino County Comprehensive Plan asserts that median home prices in the county doubled between 1987 and 2000. Given a median household income of $38,256 in 2000, over one-half of residents in the Flagstaff area could not afford a median-priced home. In unincorporated areas of the county, higher development costs and land prices are due in part to large lot zoning and the fact that more accessible lands with existing infrastructure have already been developed. Attempts by the county to address the issue of housing affordability have included the amendment of the county subdivision ordinance to simplify the subdivision process, the encouragement of higher densities, the clustering of subdivisions, and the selection of locations for manufactured homes. A related trend in residential housing involves the proliferation of seasonal homes in Coconino County. Census data reveal that in 2000, 17% of all homes in Coconino County were used for seasonal occupancy. At issue is the fact that the costs to the county of providing second-home communities with services such as police protection, solid waste disposal, road maintenance, and snow removal typically exceed tax revenues from seasonal populations (Coconino County 2003).

Residential development in unincorporated Coconino County is also complicated by the common use of lot splits. State law allows owners to divide land into parcels of thirty-six acres or more with no county oversight. Similarly, subsequent owners can split property up to five ways without subdivision review until the resulting parcels reach the minimum zoned size. The *Coconino County Comprehensive Plan*

claims that, as of 2002, these types of developments contained approximately 3,200 forty-acre lots that covered 200 square miles (8%) of private land in the county.

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

- Commercial and industrial land use

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

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

Yavapai County General Plan

Like that of Coconino County, the *Yavapai County 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% lives 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.

As is the case in Coconino County, 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.

Mohave County General Plan

The land use element of the *Mohave County General Plan* is based on an analysis of land use patterns that revealed high rates of population growth in South Mohave Valley, Golden Valley, and the areas immediately surrounding Bullhead City, Kingman, and Lake Havasu City. The plan states that four-fifths of the land in the county is owned by federal, state, or local governments, but that due to the vast size of the county, this extensive amount of public lands is not considered a constraint to growth, except where public ownership of alternating sections increases development costs. The primary constraint to future growth is the limited availability of adequate public facilities (particularly water and sewer) (Mohave County 1995).

The plan identifies four distinct planning area types, allowing for an array of land use planning policies dependent on growth characteristics. Most of the land in Mohave County falls under the "Rural Development Area" (RDA) category. Most parcels in this area are at least five acres in size, many of which are much larger and owned by federal, state, or Native American governments.

"Suburban Development Areas" (SDAs) are intended for lower density residential neighborhoods with lot changes ranging from one to five acres in size. SDAs in Mohave County include the North Kingman area, South Kingman area, parts of Golden Valley, south Mohave Valley, areas north and east of Lake Havasu City, areas west of White Hills, and areas adjacent to Highway 93 and Interstate 40.

"Urban Development Areas" (UDAs) are intended to provide for more intense residential and non-residential development. Residential diversities in these areas range from two to five dwellings per acre although high-density developments of up to twenty-five units per acre may be permitted. UDAs in Mohave County include Hualapai Ranch, South Kingman/McConnico, parts of Golden Valley, parts of South Mohave Valley, areas east of Bullhead City, areas north of Lake Havasu City, Valle Vista, North Kingman/Butler, and areas west of White Hills.

"Outlying Communities" include both rural and urban land uses and support both residential and non-residential development. "Outlying Communities" in Mohave County include Meadview, Littlefield, Chloride, Dolan Springs, Peach Springs, Truxton, Yucca, Wikieup, Topock, Oatman, Hualapai Mountain subdivision, Peacock, Hackberry, Cedar Hills, Pinion Pines White Hills, Golden Shores, Scenic, Mocassin, Centennial, and Arvada.

- Residential land use

The *Mohave County General Plan* identifies six residential land use categories. The "Rural Residential" (RR) category applies to most land within RDAs. The two suburban residential land use categories—Suburban Estates (SE) and Suburban Residential (SR)—allow low housing densities but typically require higher levels of infrastructure and service than rural areas. Three categories apply to urban residential development. They are "Low Density Residential" (LR), "Medium Density Residential" (MR) and "High Density Residential" (HR). All urban residential development requires lot sizes of less than one acre as well as urban services including paved roads, centralized water, sewers, etc. The general plan permits residential densities ranging from one dwelling unit on parcels of five or more acres within the RR category to a maximum of twenty-five dwelling units per acre within the HR category (Mohave County 1995).

- Non-residential land use

The general plan also identifies six categories of non-residential land use categories. The "Neighborhood Commercial" (NC) category allows uses that meet the needs of residents in adjacent neighborhoods, including small scale service and retail and small office buildings. "General Commercial" (GC) uses

include retail, service, and offices that serve the entire community or region. Examples include major retail centers, fast food restaurants, service stations, and multi-story office buildings. The "Commercial Recreation" (CR) category provides for a various privately owned or leased facilities where the primary activities are recreational and occur outside of buildings. Uses in this category include golf courses, equestrian centers, and recreational vehicle parks and campgrounds. The "Rural Industrial" (RI) category provides for industrial activities in rural areas while the "Light Industrial" (LI) is intended uses such as warehousing, wholesale sales, distribution, and light manufacturing. "Heavy Industrial" (HI) land uses include heavy manufacturing and construction yards. Such uses may have safety, nuisance, or environmental effects which require them to be located away from residential areas and near major transportation facilities such as rail lines, airports, or freeways. Finally, the "Airport Industrial" (AI) category provides for industrial development compatible with adjacent airport use such as manufacturing, transport service providers, wholesalers, and warehouse facilities (Mohave County 1995).

Washington County General Plan

The plan explains that the earliest efforts at land use planning in Washington County began with the first Mormon pioneer settlers, beginning at Harmony Fort in 1852. Settlers were sent to the area by Brigham Young with the mission of growing cotton for the newly established territory of Utah. The first experimental crop was planted in the Santa Clara Valley in 1855, and two years later, the town of Washington was established. The town of St. George, the present county seat, was named after George A. Smith, a prominent early leader of the Church of Latter Day Saints (Washington County 1994).

The economy of Washington County has long been supported by the tourist industry and, to a lesser extent, by farming, livestock raising, construction, education, medicine, and retirement living. The county is also home to limited mining activity. The plan describes the region including southwestern Utah, northern Arizona, and southeastern Nevada as one, "on the threshold of phenomenal growth." This demographic increase has taken place in a region notable for major recreation destinations such as Zion National Park, Bryce Canyon National Park, the Grand Canyon, Lake Mead, and Glen Canyon National Recreation Area. According to the General Plan, Washington County is ranked second among counties in the state of Utah in terms of tourist dollars spent.

In addition, the plan identifies the mild climate, rural landscape, and LDS community as important factors for the recent growth in retirement age population, many of whom are affluent and in search of an amenity-rich environment for seasonal homes. The plan claims that Washington County is the fastest growing county in the state, accounting for eighty to ninety percent of all growth south of Utah County. In light of each of these factors, the *Washington County General Plan* calls for effective long-term planning for the provision of schools, fire and police protection, commercial and industrial growth, sanitation, and water provision (Washington County 1994).

Nearly eighty percent of the entire land base in Washington County is publicly owned and managed. For this reason, the plan stresses the importance of business activities on public lands and identifies the protection of property rights, the facilitation of a free market economy, and the establishment of a process to insure self-determination by local residents as the primary responsibilities of the county government. The plan goes on to describe a lack of effective communication and coordination between the county government and federal agencies as a critical factor in many of the current land use concerns held by local groups and individuals (Washington County 1994).

With respect to the county's natural resources, the plan states that public lands should be managed for multiple uses to allow for full use of prior existing water rights on the Virgin River and its tributaries, including Beaver Dam. It also states that land value appraisals should, "reflect the highest and best use of the land without regard to sensitive or threatened and endangered species" (Washington County 1994). The plan asserts that public lands should be open for the sale of mineral rights except for designated

wilderness areas. It then goes on to state that "inventory designation and interim protection of wilderness areas has been a disruptive, divisive and non-productive element in the county" and that "additional inventories or protective management of wilderness, primitive or wild and scenic rivers are not necessary and should not be made" (Washington County 1994).

- Residential land use

The plan alludes to rapidly expanding residential development in both rural and urban areas of Washington County. A number of new developments not contiguous with existing municipalities have been established in recent years, including Winchester Hills, Diamond Valley, and Apple Valley. The plan states a strong preference for residential growth through a "natural pattern" of expansion of existing urban areas, thereby reducing the costs related to providing schools, libraries, parks, highways, police and fire protection, sewage and garbage collection, and all other facilities. In the event that new residential development is proposed in proximity to incorporated communities, the county should insist that every effort is made by the community to annex the area rather than allowing development on unincorporated county land (Washington County 1994).

- Commercial and industrial land use

The *Washington County General Plan* identifies two categories of commercial development in Washington County: shopping centers and highway service centers. The county discourages the development of "strip" commercial development due to its detrimental effect on property values and the existing quality of the built environment. Highway service commercial development will be supported only in areas where there is a four-way flow of traffic as well as adequate access and egress from the roadway.

The plan encourages industrial development only in areas where the industry has access to adequate labor, utility services, and transportation infrastructure. The plan includes an exception to these guidelines for mining and mineral development, stating that such industries are tied to the land and provisions should be made to ensure that utility needs and labor requirements for these interests are met (Washington County 1994).

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 for urban development. While residents and planners prefer to maintain a rural character throughout unincorporated county lands, rapidly increasing populations and expanding city boundaries represent some of challenges for doing so.

Preservation of open space is a particularly important land use issue among planners and property owners within the area of assessment. Adequate open space is seen as a critical step toward protecting important watersheds, preventing fragmentation of wildlife habitat, and creating buffers between low-density rural development and higher-density uses within incorporated cities. Policies aimed at preserving open space have been mentioned in each of the county comprehensive plans. These methods include the encouragement of "clustered development," the purchase of development rights, and the dedication of land such as conservation easements. Although no such measures have been adopted, the Flagstaff Area Regional Land Use and Transportation Plan mentions the possibility of adopting rural and urban growth boundaries, outside of which future development would be discouraged or prohibited (Coconino County 2003, Yavapai County 2003, Mohave County 1995).

In addition 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, it maximizes the efficiency of infrastructure and minimizes traffic congestion, thereby lowering the overall cost development. Policies aimed at encouraging infill include the provision of density transfers and zoning changes that allow for mixed uses in low-density areas (Coconino County 2003, Yavapai County 2003, FMPO 2001).

Another factor certain to influence the pattern of future development is the relative scarcity of private land within the area surrounding KNF. In an effort to capitalize on the current land market and accommodate the need for residential and commercial development resulting from population growth, large property owners commonly engage in the practice 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 avoiding the costs 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 (Coconino County 2003, Yavapai County 2003, Mohave County 1995). Proponents of development also advocate the consolidation and conversion of the current patchwork of trust lands currently managed by the AZSLD. They argue that the exchange and/or sale of these trust lands will alleviate land scarcity, provide much needed funds for the state educational system, and allow for protection of environmentally sensitive landscapes. A further discussion of the impact of State Trust Lands on Arizona's national forests is presented in the next section (Coconino County 2003, 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 AMAs to identify a 100-year assured water supply, participate in banking water, expand use of effluent water, and convert homes and building to low-water-use fixtures. Currently, the Prescott Active Management Area in central Yavapai County is the only one within the area of assessment and measures 485 square miles (ADWR 2005). Additionally, the 1998 Growing Smarter legislation passed by the state congress requires the inclusion of a Water Resources element in the comprehensive plans of all counties with a 2000 population of 125,000 or greater. The current versions of the Yavapai and Coconino County comprehensive plans both contain Water Resources elements which support making water availability a key consideration for all major developments and subdivision applications filed in conjunction with a rezoning for higher density. Policies for effectively managing future development with respect to projected water supplies include county support for the formation of water districts, incentives for low-water plumbing devices, drought-tolerant landscaping, and the identification and reuse of non-potable sources such as gray water (Coconino County 2003, Yavapai County 2003).

Finally, the proximity of many rural communities to large parcels of public land have prompted calls for greater collaboration on land use planning between county and municipal governments and their federal and state counterparts. In addition to the aforementioned issues, county residents are particularly interested in coordinating efforts on land acquisition and exchange as well as fire management and forest restoration (Coconino County 2003, Yavapai County 2003, Mohave County 1995, Washington County 1994).

5.4 Changes in land use affecting Kaibab National Forest

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

- Northern Arizona Land Exchange (2005)

On March 16, 2005, Arizona Senators John McCain and Jon Kyl introduced Senate bill S. 161, entitled the Northern Arizona Land Exchange and Verde River Basin Partnership Act. On the same date, the Deputy Chief of the National Forest System offered testimony before the Subcommittee on Forests and Forest Health on H.R. 410, the House version of the legislative bill. The proposed legislation is intended to provide for the exchange of 20,800 acres of land currently held by the Prescott, Kaibab, and Coconino National Forests for 35,000 acres owned and managed by Yavapai Ranch Limited Partnership and the Northern Yavapai, L.L.C. The proposed action would facilitate consolidation of approximately 15,000 acres of "checkerboard" parcels within the Prescott NF while conveying conservation and development rights to Yavapai Ranch Limited Partnership and the cities of Williams, Flagstaff, Clarkdale, and Camp Verde. Six summer church camps would also obtain purchase rights for land they currently occupy under the proposed exchange. The proposed exchange is one of the largest exchanges of federal and private land in Arizona history and has garnered both considerable support and opposition from local governments, advocacy groups, and citizens. Proponents of the exchange claim that it provides for more effective administration of FS lands and delivers direct benefits to municipalities in the implementation of economic, growth management, and open space plans. Opposition to the exchange is largely based on the fact that the legislative process involved does not require the environmental assessments, public participation, or disclosure procedures involved in typical land exchanges. Additionally, many local critics are opposed to the retention of all water rights on exchanged parcels by the Yavapai Ranch Limited Partnership. They believe that retention of such rights is an extraordinary and irresponsible concession by the FS in light of Yavapai Ranch's development plans and the area's scarce water supply. Both S. 161 and H.R. 410 have been introduced in committee and are awaiting further action on the floor of U.S. Senate and the House of Representatives (Holtrop 2005, Olsen 2003, Rey 2003, Yavapai Ranch 2003).

- 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 (KNF 2005).

- Gray Wolf Land Exchange (2005)

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

- Canyon Forest Village Land Exchange (1999)

Long before this proposed land exchange, the KNF had begun considering alternatives for expansion of the community of Tusayan in order to meet the needs of a growing number of visitors to the Grand Canyon National Park. Initially proposed in 1994, the development entitled Canyon Forest Village (CFV) was to involve the transfer of significant private inholdings in the KNF in exchange for federal forest land on which a tourist-oriented "gateway" community could be established. Canyon Forest Village II (CFVII) Corporation, a subsidiary of Grand Canyon Exchange Limited Partnership was responsible for submitting the proposed exchange. Proponents included the Grand Canyon Trust, the Environmental Defense Fund, the Natural Resources Defense Council, the Wilderness Society, and the National Parks Conservation Association. After five years of alternative development and refinement—a process that involved extensive public input and negotiation—the Regional Forester for the Southwestern Region of the Forest Service recommended the adoption of Alternative H in her Record of Decision for the Final Environmental Impact Statement for Tusayan Growth. This alternative called for the exchange of 272 acres of forest land along Arizona Highway 64 between Tusayan and the Park entrance for twelve private inholdings in the KNF, totaling 2,118 acres. The selected alternative was intended to provide land for the CFVII Corporation to construct community facilities, a transit center for Park visitors and employees, a community park, employee housing, 1,270 rooms for visitor lodging, and 270,000 square feet of retail and restaurant space. Alternative H also proposed to import all necessary water from the Colorado River via rail lines and underground piplelines as well as implement certain requirements regarding resource conservation, sustainable building practices, and a building design code. Staunch opposition to the proposal was voiced by a group of land and business owners in Tusayan organized under the name of the Grand Canyon Improvement Association (GCIA). This group joined in opposition to CFV on the grounds that the development would detract from established businesses in communities such as Tusayan, Williams, and Flagstaff that had previously served as "gateways" to the Grand Canyon. Subsequently, a Coconino County referendum on zoning approval for CFV was defeated by a 2-1 margin in November 2000. Additionally, the Southwest Office of the Sierra Club and the Center for Biological Diversity filed a lawsuit against the KNF and CFV stating that the EIS did not adequately address all of the proposal's environmental impacts, particularly with respect to water provision. The court ruling agreed, asserting that the decision by the Forest Service to support the plan was "clearly erroneous" leading to an appeal filed in the Ninth Circuit by CFVII. On December 27, 2002, the Court dismissed the appeal, allowing the lower court decision to stand, thereby eliminating the proposal from further consideration (USFS 1999c, Colorado College 2003, Sierra Club 2003).

5.5 Key issues for forest planning and management

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

Few, if any, of the topics included in this assessment have as direct an impact on forest management as land use planning. Although land ownership and use remained remarkably stable in the century following the founding of the Arizona Territory in 1863, recent shifts in the state's population and economic base have brought about dramatic trends in land use that are likely to influence forest management for decades to come.

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

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

The area surrounding the KNF exemplifies many of the trends and controversial issues involving the economic stability and effective management of public lands. Within the area of assessment, 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 best to manage the competing priorities of resource conservation and economic development. As seen in the county comprehensive plans reviewed for this assessment, planners are struggling to cope with growing demands for housing and recreation while ensuring preservation of a shrinking natural resource base that contributes to Arizona's highly valued "rural character."

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

In order to facilitate resolution of current and future land use issues, the KNF 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 Kaibab National Forest (KNF) 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, 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 KNF 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 OHVs. These and other socioeconomic factors discussed in this section present significant challenges for multiple-use management of the KNF.

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 statutes—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 Kaibab National Forest 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 uses and users

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). 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. The Kaibab National Forest issued thirty grazing permits in 2000, down from thirty-six in 1990 (Higgins, pers. comm.).

The FS 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).

The Kaibab National Forest issues permits for the harvest and sale of sawtimber, pulpwood, and commercial fuelwood. Between 1990 and 2000, Kaibab reported a drastic decrease in sawtimber permits (from over 57,000 to under 5,000 mbf), a decrease in commercial fuelwood permits (from 2,518 to 1,676 cords), and a large increase in pulpwood permits (from 30 to 4,770 cords). The forest also reports the sale of permits for non-commercial fuelwood gathering. 1,843 fuelwood permits were issued in 2000, down from more than 7,000 in 1990.

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 then stake a claim, which allows full access to mineral development and can, in turn, be patented to claim full title to the deposit. Small fees are generally required to stake, maintain, and patent a claim (Humphries and Vincent 2004). Nationally, mineral and energy production, from gravel to gold to carbon dioxide, totaled about $2 billion in fiscal year 2003 (USFS 2005i). In 2002, Region 3 issued $557,042 in sale permits and $1,773,756 in free use permits for mineral extraction (Jevons, pers. comm.). In 2002, the Kaibab forest issued slightly more than $250,000 in mineral permits for about 100,000 tons of landscape rock, dimension stone, cinders, and sand and gravel.

Forests also commonly allow communities and other entities to use public lands for infrastructure, including power lines, rights of way, telecommunications, and the like.

6.3 Non-extractive uses and users

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).

[4] Data given are the most recent available.

However, unmanaged recreation has also been identified by the Forest Service as one of four "key threats" to the nation's forests and grasslands. As participation in outdoor recreation increases, the 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 (region 3) received 19.5 million visits[5] (USFS 2001e).

Arizona in particular (but also the West and the nation in general) has experienced significant demographic changes in recent years, and these demographic trends have likewise influenced recreation trends. In Arizona, where more than 42% of the land base is managed by federal agencies for public use, the population has increased about tenfold since 1940 to more than 5 million people in 2000. The state had the second largest growth rate in the nation in the 1990s (Arizona State Parks 2003). Perhaps even more importantly, the proportion of Arizona residents living in urban areas has increased dramatically, so that more than 88% 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 1.6 million acres of the Kaibab NF received about 560,000 visits during fiscal year 2000. A majority of visitors to KNF are male (83%). Visitors are predominately white (88.3%). Spanish, Hispanic, or Latino visitors make up approximately 4.1% of total visits while Asian users account for about 1.4% of visits. About 18.6% of users are under the age of 16 while relatively few visitors are between 16 and 30 or over 70-years old. An estimated 67.1% of visitors are between the ages of 31 and 70. Approximately 13% of visitors were from a foreign country. This number is much higher than in other Arizona national forests and is likely a result of Kaibab's proximity to the Grand Canyon. The most frequently reported zip codes suggest that most domestic visitors live in the Flagstaff area or, to a much lesser extent, in the Phoenix metro area (Kocis et al. 2001a).

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.

[5] 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.

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

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

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

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

Source: Cordell et. al. 2004

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

Locally, recreation in the Kaibab National Forest is likely influenced by its proximity to the Grand Canyon. The forest borders both the north and south rims of the Grand Canyon and includes dispersed and developed camping sites, fishing, hiking trails, historic sites, and wilderness areas. The Kaibab Plateau–North Rim Parkway, one of only two National Scenic Byways in Region 3, offers visitors a superb scenic drive and opportunities to view wildlife, including the Northern goshawk and the California condor.

The most popular activities for visitors to the Kaibab were viewing natural features (64% participation), viewing wildlife (60%), general relaxing (47%), hiking or walking (44%), and picnicking and camping at developed sites (26% each). Driving for pleasure, visiting nature centers and nature trails, and visiting resorts and cabins were also very popular. The Kaibab differs from most other Arizona forests in that activities such as camping (both on developed and primitive sites), hiking, hunting, and horseback riding are much more popular while recreation centered around motorized vehicles is less popular (Kocis et al. 2001a).

6.4 Special users and uses

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

Tribes

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

Tribes' use of 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, according to the study, devoted limited funding and staffing to managing OHV use and 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).

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). 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 KNF, wildlife viewing is a more common activity than either fishing or hunting. National Visitor Use Monitoring (NVUM) data from 2002 show that 60% of the visitors interviewed participated in some sort of wildlife viewing activity. Only 15%, however, described it as their primary activity.[7] Approximately 14% of interviewed visitors hunted (with nearly all of those describing it as their primary activity), and only 5% fished. The Kaibab includes the nation's only designated game preserve.

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 off-highway vehicles), and the decision to designate a roadless area as wilderness can be controversial. However, many forest users value the solitude and isolation, closeness to nature, and self-reliance experienced in wilderness areas. Activities available in wilderness or primitive areas attract millions of visitors nationally. For example, an estimated 34.1 million Americans participated in primitive camping in 2000-2001 while participation in backpacking and mountain climbing drew an estimated 22.8 million and 12.9 million visitors respectively (Cordell et al. 2004).

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

The Kaibab NF includes four designated wilderness areas and 35,000 acres of inventoried roadless areas (USFS 2001c). Users of designated wilderness areas in the KNF are predominantly male (83%), white (86.9%), and from the Flagstaff and Phoenix areas. A relatively large proportion of wilderness visitors (over 10%) identify themselves as American Indians or Alaska Natives. Likewise, while nearly all wilderness visitors are between the ages of 31 and 60, over a third are between 51-60 years old. NVUM data suggest that roughly 6,545 wilderness visits were made during fiscal year 2000 although the error rate on this data is very high (+/- 41.49%) because of the relatively low number of visitors interviewed (Kocis et al. 2001a).

Special use permits

While research is rarely considered by the public to be a major use of federal lands, the Kaibab forest, like most forests, issues special use permits for research purposes. Research on flora, fauna, water quality, seismic activity, weather, and wildland fire effects is conducted on the national forests by universities, private institutions, and other federal, state, and local agencies. A variety of special use permits are issued for different forest uses by the public.

6.5 Key issues for forest planning and management

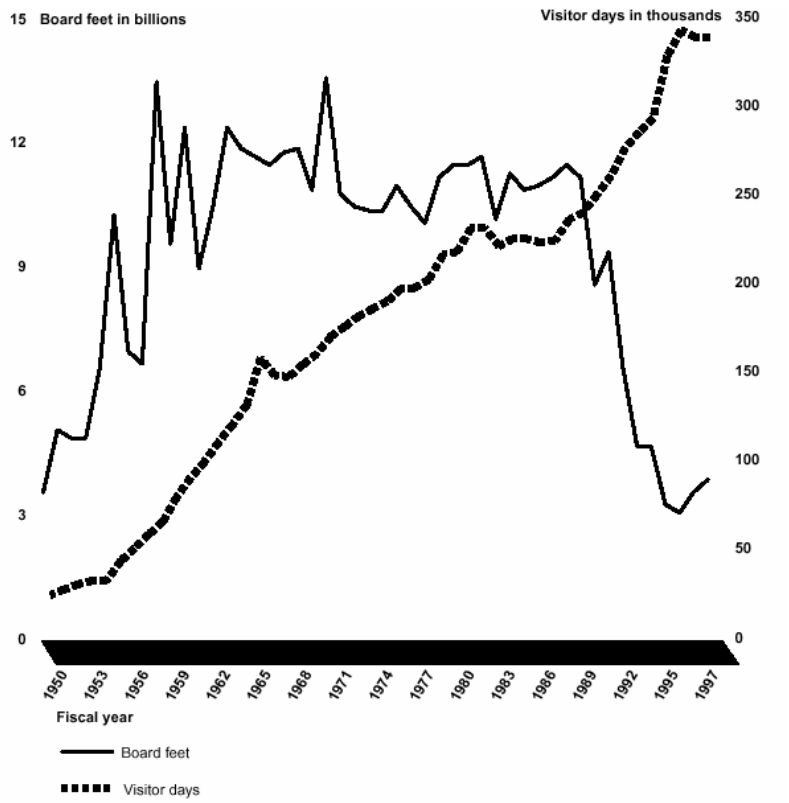
Extractive and non-extractive uses of national forests are often seen as competing with one another, and balancing the uses of different user groups can be challenging. Livestock grazing is no exception. Overgrazing, especially on arid lands, can seriously damage ecosystems. Soil erosion, watershed destruction, 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 FS authorized grazing levels higher than the land could support on 19% of allotments (GAO 1988). Disagreements among citizen groups over the appropriate fee system for public-lands grazing, the refusal of some operators to pay grazing fees, the retirement of allotments, and calls for government buy-outs of permits are all key issues for both ranchers and other user groups (c.f. Section 9.2) (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).

Meanwhile, as the western United States becomes increasingly urbanized, national forests are experiencing an increasing demand for recreational uses and, in many cases, decreasing support and demand for extractive uses. While these trends generally have not caused a clear rise in environmental or pro-conservation politics and policy, the forces of supply and demand are changing the face of the

national forests (Davis 2001). The following figure, provided by the USDA Forest Service to the General Accounting Office, clearly illustrates these changes (GAO 1999a).



Source: General Accounting Office (GAO) 1999a

Figure 19. Visitor Recreation Days as Compared to Timber Extraction, 1950-1997

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 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, 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 Kaibab National Forest (KNF) which have been designated for public uses such as camping and picnicking, wilderness, undeveloped and interpretive sites, fishing areas, scenic drives and vistas, 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 KNF. 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 KNF contains considerable recreational, interpretive, and cultural resources. Forest GIS Staff provided designation types and specific site names for nearly 150 designated areas within the KNF, including wilderness areas, trailheads, campgrounds and picnic areas. Additionally, the mountain ranges, plateaus, and water sources in an around the Grand Canyon area are home to a number of cultural sites and special places for the various Native American tribes in the region.

7.1 Historical context and methods of designation

This section describes the places in and around the KNF which have been either 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.

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

The method used to identify the more elusive second category (i.e., undesignated special places) was to contact the Forest Archeologist. This individual was asked to name and describe, to the best her ability, the key special places in the forest. Also, she was asked to identify the key user publics and, finally, specify the main management issues associated with these special places.

The following subsections of this chapter are Designated Areas, Special Places, Key Issues for Forest Planning and Management, and, lastly, Literature Cited.

7.2 Designated areas

Table 32 contains the designated areas from various data bases for the KNF.

Table 32. Designated Areas on the Kaibab National Forest

Designated Area Type	Name	Source
Wilderness	Kanab Creek Wilderness Area	GIS
Wilderness	Saddle Mountain Wilderness Area	GIS
Geologic-Botanical Area	Frank's Lake	GIS
Wilderness	Kendrick Wilderness Area	GIS
Special Use Permit	Elephant Rocks Golf Course	GIS
Dept. of Defense (Arizona National Guard)	Camp Navajo	GIS
Research Natural Area	Garland Prairie	GIS
Botanical Area	Arizona Bugbane	GIS
Special Use Permit	Bill Williams Ski Area	GIS
Wilderness	Sycamore Canyon Wilderness Area	GIS
Campground	White Horse Lake	Infra
Campground	Kaibab Lake	Infra
Campground	Cataract Lake	Infra
Campground	Dogtown Lake	Infra
Campground	DeMotte	Infra
Campground	Jacob Lake	Infra
Campground	Indian Hollow	Infra
Campground	Ten-X	Infra
Fishing Site	Kaibab Lake Fishing Site	Infra
Fishing Site	Cataract Lake Fishing Site	Infra
Fishing Site	White Horse Lake Fishing Site	Infra
Fishing Site	JD Dam Lake	Infra
Fishing Site	Perkins Tank	Infra
Fishing Site	Elk Tank	Infra
Fishing Site	Little Hell's Canyon Lake	Infra
Fishing Site	Dogtown Lake Fishing Site	Infra
Fishing Site	Russel Tank Fishing Site	Infra
Group Campground	Kaibab Lake Group Site	Infra
Group Campground	Dogtown Lake Group Site	Infra
Group Campground	Jacob Lake Group Site	Infra
Group Campground	Ten-X Group Site	Infra
Historic Cabin	Old Vaughn Place (Snake Gulch)	Infra
Historic Cabin	Three Lakes Cabin	Infra
Historic Cabin	Jump Up Point	Infra
Historic Cabin	Spring Valley Cabin	Infra
Historic Marker	Ryan Site	Infra
Historic Marker	Brow Monument	Infra
Hotel/Lodge/Resort Privately Owned	Kaibab Lodge	Infra
Hotel/Lodge/Resort Privately Owned	Jacob Lake Inn	Infra
Hotel/Lodge/Resort Privately Owned	North Rim Country Store	Infra
Interpretive Site	Williams Visitor Information Center	Infra

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

Designated Area Type	Name	Source
Interpretive Site	Kaibab Lake Amphitheatre	Infra
Interpretive Site	Kaibab Plateau Visitor Info. Center	Infra
Interpretive Site	Ponderosa Trail	Infra
Interpretive Site	Parks Rest Area Nature Trail	Infra
Interpretive Site	Laws Spring Interpretive Site	Infra
Interpretive Site	Key Hole Sink Interpretive Site	Infra
Interpretive Site	Parks Route 66 Interpretive Site	Infra
Interpretive Site	Brannigan Pk. Rte. 66 Interp. Site	Infra
Interpretive Site	Pitman Valley Rte. 66 Interp. Site	Infra
Interpretive Site	Dogtown Lake Amphitheatre	Infra
Interpretive Site	Jacob Lake Ranger Station	Infra
Interpretive Site	Jacob Lake Amphitheatre	Infra
Interpretive Site	DeMotte Amphitheatre	Infra
Interpretive Site	Hull Cabin	Infra
Interpretive Site	Granview Lookout Tower	Infra
Interpretive Site	Ten-X Amphitheatre	Infra
Undeveloped Observation Site	Bill Williams Mtn. Lookout Tower	Infra
Undeveloped Observation Site	Big Springs Lookout Tower	Infra
Undeveloped Observation Site	Sycamore Point	Infra
Undeveloped Observation Site	Locust Point	Infra
Undeveloped Observation Site	LeFevre Overlook	Infra
Undeveloped Observation Site	North Timp Point	Infra
Undeveloped Observation Site	Fence Point	Infra
Undeveloped Observation Site	Timp Point	Infra
Undeveloped Observation Site	Parissawampitts Point	Infra
Picnic Site	Kaibab Lake Picnic Ground	Infra
Picnic Site	Garland Priarie Vista	Infra
Picnic Site	Dogtown Lake Picnic Ground	Infra
Picnic Site	Jacob Lake Picnic Ground	Infra
Playground Park Specialized Sport Site	Elephant Rocks Golf Course	Infra
Playground Park Specialized Sport Site	Williams Shooting Range	Infra
Playground Park Specialized Sport Site	Apache Stables	Infra
Playground Park Specialized Sport Site	Allen's Trail Rides	Infra
Ski Area Alpine	Bill Williams Ski Area	Infra
Ski Area Nordic	Spring Valley Ski Trailhead	Infra
Snow Play	Oak Hill Snowplay Area	Infra
Trailhead	Tusayan Bike	Infra
Trailhead	Red Butte	Infra
Undeveloped Interpretive Site	Moqui Stage Station	Infra
Undeveloped Interpretive Site	Lower Wright Place	Infra
Undeveloped Interpretive Site	Upper Wright Place	Infra
Undeveloped Observation Site	Crazy Jug Point	Infra
Undeveloped Observation Site	Jump Up Point	Infra
Undeveloped Observation Site	Marble View	Infra
Undeveloped Observation Site	Sowat’s Point	Infra
Undeveloped Observation Site	House Rock Wildlife Area	Infra
Undeveloped Observation Site	Mingus Mountain Vista	Infra

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

Designated Area Type	Name	Source
Undeveloped Observation Site	House Rock Valley View	Infra
Undeveloped Trailhead	Bixler Saddle	Infra
Undeveloped Trailhead	City of Williams Link	Infra
Undeveloped Trailhead	White Horse Lake Trailhead	Infra
Undeveloped Trailhead	Sunflower Flat Mountain Bike	Infra
Undeveloped Trailhead	Sycamore Point Mountain Bike	Infra
Undeveloped Trailhead	Coxcomb Mountain Bike	Infra
Undeveloped Trailhead	Grandview Ski	Infra
Undeveloped Trailhead	NPS-Tusayan Ski	Infra
Undeveloped Trailhead	Ten-X Nature Trail	Infra
Wildlife Viewing Site	Coleman Lake	Infra
Trailhead	Benham	Infra
Trailhead	Ashfork Hill	Infra
Trailhead	Bandit	Infra
Trailhead	Bill Williams Mountain	Infra
Trailhead	Davenport	Infra
Trailhead	Devil Dog	Infra
Trailhead	Stage Station Loop	Infra
Trailhead	CCC Camp Interpretive	Infra
Trailhead	Buckskinner Park	Infra
Trailhead	KA Hill	Infra
Trailhead	Sycamore Vista	Infra
Trailhead	Summit Mountain	Infra
Trailhead	Scholz Lake	Infra
Trailhead	Kendrick Mountain	Infra
Trailhead	Pomeroy Tank	Infra
Trailhead	Sycamore Falls	Infra
Trailhead	Bull Basin	Infra
Trailhead	Dow Spring	Infra
Trailhead	Garland Prairie	Infra
Trailhead	Pumpkin	Infra
Trailhead	Deadhorse	Infra
Trailhead	Arizona Trail (205/89A)	Infra
Trailhead	Arizona Trail (205/67)	Infra
Trailhead	Arizona Trail (610/GCNP)	Infra
Trailhead	East Rim View Point	Infra
Trailhead	Snake Gulch-Kanab Creek	Infra
Trailhead	Lookout #120	Infra
Trailhead	Lookout #121	Infra
Trailhead	Lookout #122	Infra
National Scenic Byway	Kaibab Plateau-North Rim	Plan
Undeveloped Area	White Horse Lake Area	NAU
Undeveloped Area	Seiver Tank	NAU
Undeveloped Area	Bill Williams Mountain	NAU
Undeveloped Area	Sitgreaves Mountain	NAU
Undeveloped Area	Sycamore Rim	NAU
Undeveloped Area	Three Sisters Mountains	NAU

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

Designated Area Type	Name	Source
Undeveloped Area	Lonesome Pocket	NAU
County Road	Perkinsville Road	NAU
Undeveloped Area	Ruin Mountain	NAU
Forest Service Road	Twin Springs Road	NAU
Undeveloped Area	Barney Flats	NAU
Trail	Beale Road-Government Prairie	NAU
Undeveloped Area	Behind Hat Ranch	NAU
Undeveloped Area	Dogtown Wash	NAU
Undeveloped Area	Hearst Mountain	NAU
Undeveloped Area	Near Grand Canyon	NAU
Undeveloped Area	North Kaibab	NAU
Undeveloped Area	Northwest of Parks	NAU
Undeveloped Area	Pine Flat	NAU

Source: C. Minor. Landscape Architect. Kaibab NF.

7.3 Special places

The following information on Special Places was provided by John Hanson, Forest Archaeologist at KNF (and has been edited for clarity):

> I have asked the Kaibab National Forest (KNF) tribal partners about the issue of Special Places and can give the following information, which is general in nature and scope. The KNF staff is not at liberty to discuss this information in greater detail at this time. Most of the KNF's known special places are major landscape features. They are held and considered special by one or more of the consulting tribes, including the Hopi, Navajo Western Agency, Havasupai, Kaibab Paiutes, Hualapai, and Yavapai-Prescott. These special places include: Bill Williams Mountain, just south of Williams (Hopi, Navajo and many others); Bear Springs, east of Bill Williams Mountain (Hopi); Buck Mountain (Hopi); Kendrick Mountain (Hopi); Red Butte (Havasupai and Hopi); Kanab Creek drainage and tributaries (Kaibab Paiutes); all Grand Canyon Springs, associated with the Redwall-Muav aquifer (Havasupai); Snake Gulch (Kaibab Paiute and Hopi); Rain Tank Wash and environs (Havasupai); and the Kaibab Plateau (Kaibab Paiutes).

The KNF remains in constant and close contact with tribal neighbors and has consultation Memoranda of Understanding with the Hopi, Kaibab Paiute, and Havasupai. In the management practices, Hanson notes that the KNF staff is particularly sensitive to those special places of which they are aware and makes it a practice not to undertake project actions without extensive tribal consultations. These often, according to Hanson, include face-to-face meetings in the field. One can imagine that this is highly sensitive information. More specific information must come from tribal contacts.

7.4 Scenery management

Landscape Aesthetics: A Handbook for Scenery Management prepared by the USDA Forest Service (1995) provides a system for the management of forested landscapes such as those associated with designated areas and special places. This handbook deals with the character and nature of landscapes, the

integrity of natural scenes, how to obtain information from constituent publics regarding scenic preferences, determination of landscape visibility, and application of the Scenery Management System. The appendices contain information about the history of the scenery management issue in the U.S. Forest Service. The scenery management issue, according *Landscape Aesthetics*, 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, particularly on recreationists.

7.5 Key issues for forest planning and management

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 significantly important to visitors of our national forests. However, it is special areas that the Forest Service recognizes for their "unique or special characteristics" (USFS 2005o) 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 Forest Service maps. But as will be shown, the distinction between those designated areas and special places, which is the subject of this study, 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.

Special places exist because humans form emotion-laden attachments to places 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 peoples' 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 today, in this age of the homogenization of culture, 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 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 if they are 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 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 if only to that person. The following are some hypothetical examples in which the stimuli affecting the sensory experience at the place considered special are actually located miles away:

- An artist's sunny picnic and sketching spot includes a view of a particular mountain but is, in fact, quite a distance from that mountain. Although the setting alone might seem to be the special place, some of its value is inexorably tied to the vantage point and the desired view of the mountain. Thus the whole view-shed becomes part of the special place.

- A couple considers a forest meadow camping spot to be a special place not only for its beauty but also for the peace and quiet it affords. Because of its location, the breeze rustles the trees just enough to create a tranquil sound. Gas drilling is then permitted several miles from this place. The gentle breeze now carries the constant dull pulsing of the pumps. The special aspects of this place are not confined to the point where the meadow is noted on their map but also include the auditory qualities of the location. Consequently this special place is greatly impacted by a larger area of noise-generating activities and land management decision.

Thus, management of forests for the traditional extractive resources and motorized vehicle use of some may impact forest places that are considered special to others. These potential impacts can generate conflict and 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 townhall 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 the interests. Some findings have suggested that the traditional public meeting may serve to exclude some interested groups or individuals and to encourage a 'majority (or loudest) rules' mentality (Brandenburg and Carroll 1995; Brandenburg, Carroll, and Blatner 1995). The potential loss of social capital within the community when voicing a dissenting opinion in a public meeting may outweigh one's strong special place connection: "an individual may not share his or her emotive personal values regarding the place in a public or group setting because of the pressures of the primary social groups' common values" (Brandenburg and Carroll 1995). Thus a mixture of town hall meetings, surveys, and open-ended individual interviews and conversations may provide a more balanced and clearer picture of special places in the forest (Brandenburg and Carroll 1995; Brandenburg, Carroll, and Blatner 1995).

Although the concept of special places has existed in social science literature for decades, the idea of incorporating it into forest management plans is a relatively new one. 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" (Cheng, Kruger, and Daniels 2003). Another study suggested that attention to stakeholders'

place value concerns could help avoid “continued acrimonious debate” (Brandenburg, Carroll, and Blatner 1995).

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). Often, decision makers are lacking 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 Forest Service 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, the researchers advised 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 when planning. Increased and continued interactions between forest managers and the visitor public are interpreted as a sign of respect for the 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 the forest resource. 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 Forest Service 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 forest edges, and more. For example, Kaibab forest planner, Bruce Higgins, mentioned that many of the in-holdings in the Williams district are being developed, and this is the type of trend that researchers believe will exacerbate the ecological issue of edge effects between developed and natural areas (McCool 2003).

8. Community Relationships

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

Information gathered on the nature of the relationships between the KNF 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 KNF 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 an array of publics and mandated that the USFS actively involve them in their management decisions. In addition to these and other statute laws, there are other written authorities which 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 KNF. 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 Kaibab. 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

Coconino County	**http://www.azcommerce.com/doclib/COMMUNE/Coconino%20County.pdf**
Flagstaff	http://www.azcommerce.com/doclib/COMMUNE/flagstaff.pdf
Sedona	http://www.azcommerce.com/doclib/COMMUNE/sedona-oak%20creek%20canyon.pdf
Page	http://www.azcommerce.com/doclib/commune/page.pdf
Williams	http://www.azcommerce.com/doclib/commune/williams.pdf
Fredonia	http://www.azcommerce.com/doclib/COMMUNE/fredonia.pdf
Mohave County	**http://www.azcommerce.com/doclib/COMMUNE/Mohave%20County.pdf**
Lake Havasu City	http://www.azcommerce.com/doclib/COMMUNE/lake%20havasu%20city.pdf
Bullhead City	http://www.azcommerce.com/doclib/COMMUNE/bullhead%20city.pdf
Kingman	http://www.azcommerce.com/doclib/commune/kingman.pdf
New Kingman	http://www.city-data.com/city/New-Kingman-Butler-Arizona.html
Colorado City	http://www.azcommerce.com/doclib/COMMUNE/colorado%20city.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
Kane County, UT	**http://www.kaneutah.com/**
Kanab	http://www.kaneutah.com/kanab.htm
Washington County, UT	**http://www.washco.state.ut.us/**
St. George	http://www.washco.state.ut.us/index.php?page=cities

Source: Arizona Department of Commerce

http://www.kaneutah.com/

http://www.washco.state.ut.us/

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 Kaibab NF 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 KNF 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 Arizona national forests, the keyword search included terms such as "forest," "conservation," "wildlife," and "endangered" species. The results of this keyword search are presented in Table 35. *The Grand Canyon News* (Williams) is the newspaper most proximate to the KNF 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 KNF 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 KNF's nearest paper, *The Grand Canyon News,* is one of Arizona's important papers in terms of natural resource news coverage. Furthermore, the search indicated that the KNF itself was the subject of 722 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 Articles
Issues Searched:	1999-April 2005	1999-April 2005	**2000-April 2005**	2000-April 2005	2003-April 2005	1999-April 2005	Found	Found
Key Word Searched:								
Forest	8,066	319	**732**	399	367	3,414	13,297	13.2%
Natural Resources	690	79	**29**	23	16	688	1,525	1.5%
Conservation	732	133	**109**	7	62	732	1,775	1.8%
Water	0	1,382	**741**	244	728	10,960	14,055	14.0%
Lake	7,313	788	**294**	294	178	2,708	11,575	11.5%
River	5,033	625	**370**	131	279	n/a	6,438	6.4%
Stream	1,602	169	**24**	36	67	n/a	1,898	1.9%
Recreation	3,224	2,334	**483**	314	211	1,969	8,535	8.5%
Fish	4,708	5,028	**131**	248	285	2,646	13,046	13.0%
Native fish	98	2	**15**	15	3	135	268	0.3%
Sportfish	22	0	**0**	0	2	1	25	0.0%
Fishing	480	502	**55**	434	147	1,035	2,653	2.6%
Forest Fire	247	15	**28**	3	16	2,491	2,800	2.8%
Mining	165	282	**25**	9	43	1,504	2,028	2.0%
Endangered species	544	18	**23**	2	14	638	1,239	1.2%
Wildlife	2,747	167	**185**	135	120	2,824	6,178	6.1%
Native Wildlife	22	4	**5**	0	0	24	55	0.1%
Bird Watching	17	26	**1**	30	1	153	228	0.2%
Hunting	3,231	514	**56**	253	63	1,114	5,231	5.2%
Range	0	1,194	**56**	67	146	1,062	2,525	2.5%
Grazing	865	41	**40**	11	19	402	1,378	1.4%
The National Forests:								
Coconino National Forest	1,046	15	**15**	3	0	22	1,101	1.1%
Coronado National Forest	120	9	**2**	20	0	755	906	0.9%
Apache-Sitgreaves 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 Grand Canyon News* were also examined to determine the types of natural resource topics that were of interest to the public in the region surrounding the KNF. Selected topics and their dates of publication in *The Grand Canyon News* are provided in Table 36 below:

Table 36. Selected Public Issues for the Kaibab National Forest

Topic	Date
1. USFS Centennial celebration scheduled on North Kaibab Ranger District	June 2005
2. Residents meet with agencies to discuss law enforcement issues	June 2005
3. Topeka prescribed fire is scheduled to take place on the South Rim	June 2005
4. Condors thrive at the Canyon	May 2005
5. Grand Canyon most popular tourist spot	May 2005
6. Snow delays opening on the north rim	May 2005

Source: The Grand Canyon News

8.3 Communities of interest and forest partnerships

The KNF 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 purposes 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 KNF. An especially noteworthy community of interest to the KNF is the Native American tribes. The tribal contact list for the KNF is found in Table 38. There are nine tribes for which the KNF has consultation responsibilities.

Table 37. Communities of Interest for the Kaibab National Forest

Governmental	Special Advocacy Groups	Business
Mayor's Office – City of Williams	Grand Canyon Historical Society	Williams Chamber of Commerce
Williams Police Department	Grand Canyon Rotary	Grand Canyon Chamber of Commerce
Coconino County Board of Supervisors	Grand Canyon Trust	Grand Canyon Railway
Coconino County Parks and Recreation	Arizona Wilderness Coalition	
Arizona State Land Department	Wildlife Society – Arizona chapter	**Media**
Arizona Department of Transportation	Arizona Wildlife Federation	Williams News
Arizona State Parks	Forest Guardians	
Grand Canyon National Park	Center for Biological Diversity	**Educational**
U.S. Congressional delegation	Northern Arizona Audubon Society	N.A.U. – Ecological Restoration Institute
Arizona Governor's office	Sierra Club, Grand Canyon Chapter	
Arizona Congressional delegation	Southwest Forest Alliance	
	Arboretum of Flagstaff	
	The Nature Conservancy	
	Northern Arizona Flycasters	
	Public Lands Interpretive Association	
	Arizona Antelope Foundation	
	Rocky Mountain Elk Foundation	
	Wildlife Society – Arizona Chapter	

Source: B. Higgins, Planner, Kaibab NF

Table 38. Tribal Consultation Responsibilities for the Kaibab National Forest

Arizona Indian Tribe
Havasupai Tribe
Hopi Tribe
Hualapai Tribe
Kaibab Paiute Tribe
Navajo Nation
San Juan Southern Paiute 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. Due to 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 KNF is involved in multiple partnerships that contribute to forest health and fire management, the construction of community infrastructure, and economic involvement with natural resources. 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 Region 3 (Southwest) 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: 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/. Table 40 presents a list of the partnerships between the KNF and external groups.

Table 39. United States Forest Service, Southwest Region Partners

Conservation Organizations	
Ducks Unlimited	http://www.ducks.org/
Environmental Systems Research Institute (ESRI)	http://www.conservationgis.org/
Federation of Flyfishers	http://www.fedflyfishers.org/
Mule Deer Foundation	http://www.muledeer.org/
National Wild Turkey Federation (NWTF)	http://www.nwtf.org/
Quail Unlimited	http://www.qu.org/
Rocky Mountain Elk Foundation	http://www.rmef.org/
Trout Unlimited	http://www.tu.org
Wildlife Management Institute	http://www.wildlifemanagementinstitute.org/
Arizona Conservation Partners	
Arizona Department of Game and Fish	http://www.gf.state.az.us/
Arizona Wildlife Foundation	http://www.azwildlife.org/
Sonoran Institute	http://www.sonoran.org/
New Mexico Conservation Partners	
New Mexico Department of Game and Fish	http://www.wildlife.state.nm.us/
New Mexico Wildlife Federation	http://leopold.nmsu.edu/nmwf/
Audubon Society – New Mexico State Office	http://www.audubon.org/chapter/nm/nm/rdac/index.html
New Mexico Museum of Natural History	http://museums.state.nm.us/nmmnh/nmmnh.html
Youth Conservation 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/

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

National Interpretive Recreation	
Public Lands Information Center	http://www.publiclands.org/home.php?SID=
Association of Partners for Public Lands	http://www.appl.org/
Tread Lightly	http://www.treadlightly.org/
National Outdoor Leadership School	http://www.nols.edu/
Leave No Trace	http://www.lnt.org/
Arizona Interpretive Recreation	
Arizona Trail Association	http://www.aztrail.org/
Arizona State Association of 4-Wheel Drive Clubs	http://asa4wdc.org/
New Mexico Interpretive Recreation	
New Mexico Environmental Education Association	http://www.eeanm.org/
Back Country Horsemen – New Mexico	http://www.bchnm.org/
New Mexico Council of Guides and Outfitters	http://nmoutfitters.org/
New Mexico Volunteers for the Outdoors	http://www.nmvfo.org/
Arizona Environmental Organizations	
Sierra Club – Arizona Chapter	http://www.sierraclub.org/az/
New Mexico Environmental Organizations	
New Mexico Wilderness Alliance	http://www.nmwild.org/
Sierra Club – New Mexico Chapter	http://www.sierraclub.org/nm/

Source: USDA Forest Service, Southwest Region – Partnerships

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

Table 40. Partnerships for the Kaibab National Forest

Cooperator Name	Project Title
Arizona Department of Public Safety	N/A
Arizona Game and Fish Department	Dogtown Lake Recreational Area
Arizona Game and Fish Department	Fence Modifications
Arizona Game and Fish Department	Water Catchment Improvements
Arizona Game and Fish Department	Grassland Maintenance Project
Arizona Game and Fish Department	Three Lakes Habitat Protection
Arizona Game and Fish Department	Grassland Restoration Projects
Arizona Game and Fish Department	Grassland Restoration Planning
Arizona Game and Fish Department	Deer Tag Sales
Arizona Public Service Company	NEPA Analysis
Arizona Strip Field Office – BLM	Colorado Plateau Fire Management
Black Mesa Pipeline, Inc.	NEPA Analysis
Bryce Canyon National Park	Colorado Plateau Fire Management
Bureau of Indian Affairs	Western Region Office
Cedar City Field Office – BLM	Colorado Plateau Fire Management
City of Williams	Dog Town Boating Facility

Table 40 (cont.). Partnerships for the Kaibab National Forest

Cooperator Name	Project Title
City of Williams	City of Williams Visitor Center
Coconino County	Youth Conservation Corps
Coconino County	Navajo Trail Rehabilitation
Coconino County Sheriff's Department	Cooperative Law Enforcement
Coconino County Sheriff's Department	Search and Rescue Operations
Dine Power Authority	NEPA
Dixie National Forest	Colorado Plateau Fire Management
Glen Canyon National Recreation Area	Colorado Plateau Fire Management
Havasupai Tribe	Havasupai Tribe
Hopi Cultural Preservation Office	Hopi Tribe
Merritt Lumber Company	N/A
Public Lands Interpretive Association	N/A
Rocky Mountain Elk Foundation	Water Tank Improvements
Rocky Mountain Elk Foundation	Archaeological Survey
Rocky Mountain Elk Foundation	Grassland Maintenance Project
Rocky Mountain Elk Foundation	Water Catchment Projects
Rocky Mountain Elk Foundation	NEPA – Tusayan Pipeline Project
Southern Paiute BIA	Colorado Plateau Fire Management
University of Arizona	U of A Cooperative Extension
USDI, National Park Service	Kaibab Fire Station Position
USDI, National Park Service	Fire Planning and Management Activities
USDI, National Park Service	Grand Canyon National Park
Williams – Grand Canyon CC	Chamber of Commerce
Williams Police Department	Cooperative Law Enforcement
Zion National Park	Colorado Plateau Fire Management

Source: Kaibab NF, Grants and Agreements

8.4 Historically underserved communities and environmental justice

This section deals with special communities located near the KNF 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 KNF 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). Native Americans are a significant minority population in the area of assessment; however, individuals of multiple race and/or Hispanic origin grew at a much faster rate between 1990 and 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. The percentage of Native Americans is particularly noteworthy in Coconino County at 28.51% of the total population as of 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 KNF to consider. Table 41 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 41. 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
Coconino	17,940	2,456	-	1,046	341	927	5,339
Mohave	19,378	1,363	-	254	216	951	5,499
Yavapai	31,225	2,030	-	218	-	1,579	8,439

Sources: Arizona Dept. of Commerce, 2002

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 in the following general areas (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 the 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 U.S. states, the District of Columbia, and Puerto Rico for the purpose of building local capacity to manage their natural resources.

Human Resource Programs

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

Southwestern Strategy

In November of 1997, the Secretaries of Agriculture and the Interior issued a directive to their agency leaderships to develop a collaborative approach to resolving the quality of life, natural resource, and cultural resource issues in Arizona and New Mexico. The result was the Southwest Strategy, which

addresses community development and natural resources conservation and management within the jurisdictions of the involved federal agencies.

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

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

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

- To incorporate environmental justice considerations into the USDA's programs and activities and to address environmental justice across mission areas;
- To identify, prevent, and/or mitigate disproportionately high or adverse human health and environmental effects of USDA programs and activities on minority and low-income populations;
- To provide the opportunity for minority and low-income populations to participate in planning, analysis, and decision making that affects 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 multiple conflicting uses.

The FS 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). Many social researchers suggest that the qualities of relationships and the strategies used by actors should be of more concern than a visual or mathematical representation of networks.

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

Provan and Milward (2001) outline three broad groups of "network constituents," or stakeholders: principals, agents, and clients. Principals are individuals or groups which "monitor and fund the network and its activities." Agents "work in the network both as administrators and service-level professionals," and clients "actually receive the services provided by the network." However, as Provan and Milward also note, actors can and often do fulfill multiple roles, acting, for example, as a client at one geographical or political level and as an administrator at a different level. Figure 20 illustrates the interactions of these groups in the context of natural resource management. Different stakeholders interact with one another and with the resource being managed.

According to this view, a national forest is managed, not simply by a USDA chain of command, but by a network that includes a wide variety of stakeholders. The resource itself forms the "center" of the network, and these stakeholders both affect the management of the resource and are in turn affected by its management direction. In a very real sense, non-USDA actors such as county officials, the U.S. Border Patrol, and even media and citizen groups participate in forest management. Figure 21 provides examples of principals, agents, and clients involved in the management of KNF (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 Kaibab. However, this typology is neither unambiguous nor static. For example, forest-level administrators can function as principals, agents, or clients, depending on the

situation and geographic scale. They monitor and administrate the network, but they also receive services provided by other stakeholders, such as recreation users and those with special permits. Local residents are generally seen as clients of the forest, but some residents also actively participate in network monitoring to ensure that they receive the services they expect. Environmental groups, while perhaps most often seen as clients, can also play an important role in monitoring management and even directly helping manage the forests. While none of these designations is set in stone, this framework provides a unique perspective on the linkages among and the roles of different stakeholders (or network members) in managing the forest.

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

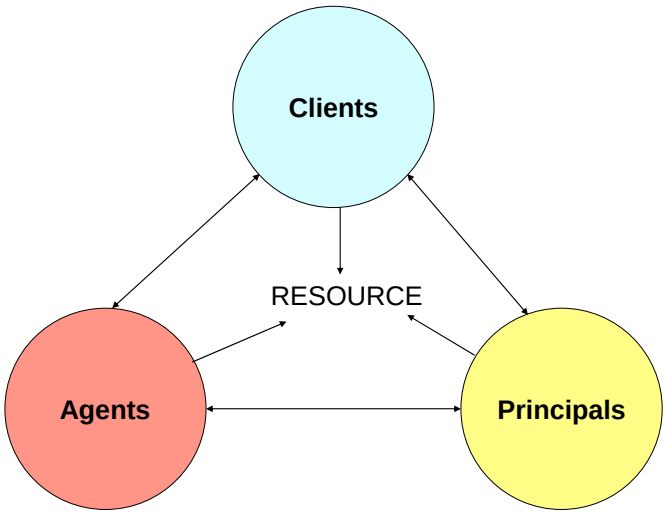


Figure 20. Social Networks in Natural Resource Management

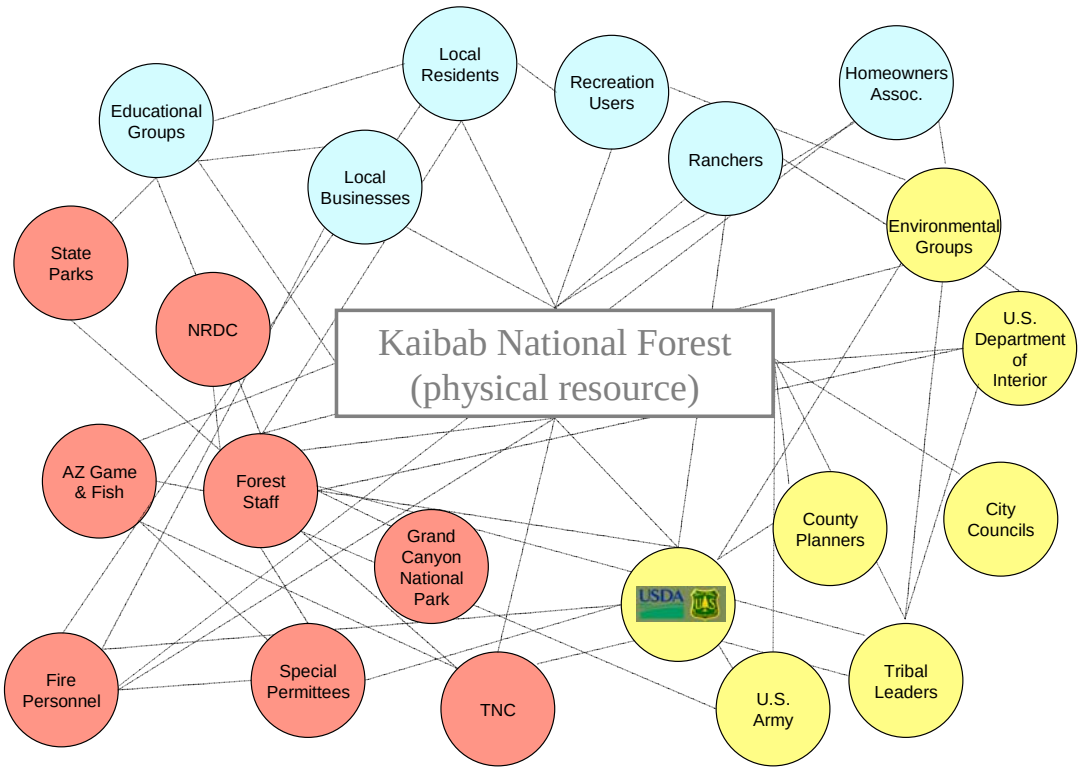


Figure 21. Partial Social Network for the Kaibab National Forest

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 one 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 KNF and various groups, individuals, and organizations is found in ongoing debates over the preservation of open space, the administration of recreation and grazing fees, the protection of water resources and wildlife, and the security of forest lands and communities along the international border.

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

The study focuses on five principal recommendations for enhancing the effectiveness and sustainability of community relations that may also prove useful to Arizona's national forests. They include 1) development of a concept and definition of community relations relevant to the national forest, 2) development of an understanding of the possible benefits of a positive community relations program, 3) development of a common agency image of what a positive community relations program might resemble, 4) development of some essential principles of an effective community relations program, and 5) development of a list of potential community relations questions and issues to be dealt with by the community relations plan (McMillan 1999).

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

- *Leadership*—improvements in community relations require leadership at the forest level.
- *Local Ownership*—community relations strategies work best when they are owned and designed by the local community, the groups in that community, and the institutions that serve that community.
- *Administrative Support*—community relations needs to be supported by appropriate forest administrators.
- *Planning*—in seeking to ensure positive conditions for community relations, planning is the key.
- *Positive Framework*—community relationships seek to provide a positive framework and infrastructure for dealing with community-related problems.

- *Integration*—community relationships work better when they are integrated into existing forest processes and procedures rather than regarded as add-ons that can be addressed outside the framework of those processes and procedures.
- *Holistic Approach*—effective community relations strategies frequently need to be multi-pronged and very frequently require the collaboration of a number of organizations, groups, and agencies in order to work effectively.
- *Informed Decision Making*—information from the community is vital in informing community relations, as is information from other sources (including research literature), from other organizations who have tried community relations projects, and from people with knowledge and expertise in the field.
- *Inclusion of Diversity*—community relations values and respects diversity and works to include all cultural and linguistic backgrounds into the social, cultural, and economic life of the community as well as into the decision-making mechanisms of the community.
- *Ongoing Effort*—recognize that improved community relations is an ongoing 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 Kaibab 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 brief overviews of several topics that are highly relevant to current and future forest management. The issues addressed in this section have been discussed throughout the assessment; however, this section offers a more detailed analysis of their potential impact on the socioeconomic environment surrounding the Kaibab National Forest (KNF). 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, it represents an issue of common concern to national forests and communities throughout the state. Where relevant, issues have been separated to identify their impact on the local, state, and national level.

9.1 Forest health

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

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

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

Fire and Fuels

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

In the area of what is now Arizona, prior to Euro-American settlement in the 1800s, tree densities in ponderosa pine forests were maintained by two natural processes: competitive exclusion of tree seedlings by understory grasses and low intensity surface fires (Belsky and Blumenthal 1997). Large ponderosa pine trees (more than eighteen-inches in diameter) historically dominated the high-elevation forests. Historically, fires burned throughout the ponderosa pine ecosystems every two to ten years at low elevations and less frequently, and with more intensity, at higher elevations (Swetnam and Baisan 1996). Fire frequency began to decrease with the settlement of Euro-Americans and the removal of herbaceous

undergrowth by grazing livestock. Nevertheless, the last few fire seasons have provided several examples illustrating the costs, financial and otherwise, associated with the large wildland fires which continue to break out in Arizona. The Rodeo-Chediski fire of 2002, for instance, spread across over 450,000 acres of land, including over 170,000 acres of the Tonto and Apache-Sitgreaves National Forests. The costs associated with this fire surpassed $40 million (USFS 2003d).

On the local level, the KNF, like any dryland forest or grassland, is itself no stranger to wildfires. Due in part to precipitation, an elevation change of almost 5,000 feet, and unique soil types, the KNF supports a rich variety of flora and fauna and, thus, fire regimes. Vegetation within the forest varies by elevation and exposure.

Table 42. Plant Community Types and Principle Plant Species in the KNF

Alpine forest	Ponderosa-pine forest	Piñon-juniper woodland	Mountain grassland
	Ponderosa pine	Colorado piñon	Mountain Timothy
	Gambles oak	Utah juniper	Arizona fescue
	Douglas fir	One-seed juniper	Mountain muhly
	sagebrush	cliffrose	Pine dropseed
			Black dropseed
			Needlegrass
			Mountain Brome
			Arizona wheatgrass
			Kentucky bluegrass

Source: Lowe 1964

The four predominant plant communities within the forest are alpine forest, ponderosa pine forest, piñon-juniper woodland, and mountain grassland (Lowe 1972). The ponderosa pine forests are typically homogeneous stands of ponderosa pine (*Pinus ponderosa*). Piñon-juniper woodland, one of the simplest plant communities in the state, covers an extensive area below the ponderosa pine forest and is typically observed at elevations of 5,500 to 7,000 feet. The mountain grassland occurs in very small unique areas, which are the natural openings on canyon bottoms or on ridge tops within the coniferous forests. These grassland areas are not suitable for tree growth due to unique soil types which have a high rate of moisture evaporation.

In 1998, the Williams Ranger District of the Kaibab NF began planning a ponderosa pine forest health restoration demonstration area that intended to apply thinning and prescribed fire treatments to these forests in order to restore more natural processes in the ponderosa pine ecosystem. The 1000-acre demonstration area is located east of Williams (USFS 2005m). In addition to the effects of fire on the pines, the study also addresses the effect of prescribed fire on fifty-four species of cavity-nesting birds endemic to the area (USFS 2004k).

The KNF suffered significant damage from infestations of western pine beetles in 2002-2003, registering piñon-juniper mortality on almost 160,000 acres and ponderosa pine damage on over 65,000 acres (USFS 2004d). Ongoing experiments in the forest are exploring the connection between bark beetle infestation and wildfire frequency and behavior.

Historical accounts of the Kaibab Forest often describe it as, “much more open and park-like than it is today,” with forest overstories composed of widely spaced trees growing in both even-aged and uneven-aged stands and understories made up of grasses, forbs, and low shrubs (Cooper 1960, Belsky and Blumenthal 1997). Today old-growth ponderosa pine forests are rare, and many large ponderosa pines have been removed by intensive logging (Noss, LaRoe, and Scott 1995). Through a combination of

grazing, logging, and fire suppression, the density of ponderosa pines within the KNF has risen from an estimated fifty-six trees per acre in 1881 to approximately 851 trees per acre in 1990 (GAO 1999c).

Elsewhere, increases in tree density like these have led to well-documented negative effects, including decreases in understory herbaceous cover and diversity, major changes in hydrological processes, decreased resistance to disease and insect infestation, and an alteration of fire regimes (Covington and Moore 1994, Allen et al. 2002, Belsky and Blumenthal1997, Laughlin et al. 2004). Large, stand-replacing fires are increasing in number, size, and severity and now threaten many of the remaining ponderosa pine forests in the region (Allen et al. 2002). The effects of such severe fires in local forests and elsewhere have included short-term amplification of erosion and flooding (Allen at al. 2002).

The White House's initiative calls for aggressive thinning projects in Arizona and places much of the blame for the recent Rodeo-Chediski fire and other regional fires on overly dense forests and "nuisance" litigation (Office of the President 2002). Nationally, some researchers echo this claim, blaming 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). On the local level, other citizen groups argue against what they consider a preoccupation with fuel-reduction projects at the expense of other protection efforts, such as a recent postponement of a project to protect Anderson Mesa (Eilperin 2004). Litigation has undeniably delayed, prevented, or changed some fuel-reduction projects. In the Kaibab area, for example, The Grand Canyon Partnership Assessment Project, which was scuttled by litigation in 2001, was replaced by smaller projects. However, several studies at the national and local scale have shown that the impact and scope of litigation on national forest logging plans has been substantially overstated (Cortner et al. 2003, Carter 2003).

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

Generally, wildland fire behavior is determined by several factors, including climate and weather conditions and the type, distribution, and abundance of fuels. Because other elements are difficult or impossible for managers to control, management efforts generally focus on changing the likelihood of ignition and the behavior of fires by modifying fuels. For a fire to ignite and burn, fine fuels must be abundant, and fuel moisture must be low (Wright and Bailey 1982, Wink and Wright 1973). However, the chemical and structural properties of fuels also greatly influence a fire's behavior. Particularly abundant or combustible fuels result in fires that are more intense and are more likely to show extreme behaviors, such as spotting firewhirls; crowning; and long, fast runs (Pyne 1997). Intense fires can threaten species and landscapes that are better adapted to slow-burning, low-intensity fires, such as some ponderosa pine forests, and extreme fire behavior can make cultural resources and developed areas more difficult to protect. Heavy surface fuels, such as thick needle layers, can result in long-burning, low-intensity fires while dry grasses are consumed very quickly. Understory shrubs and small trees can act as ladders, carrying surface fires into the crowns of trees (Graham, McCaffrey, and Jain 2004). The most common strategies for managing wildland fire are mechanical treatments[8], controlled fire treatments (used here to include both prescribed and natural-ignition "wildland fire use" fires), and direct suppression of fires.

Managers often also attempt to control human-caused ignitions. As of September 2004, more than 3,260 large, non-prescribed fires had been reported in Arizona and New Mexico. Humans caused 1,308 of these, affecting more than 62,000 aces (CLIMAS 2004, Sept.). Increases in human-ignited fires are likely due at

[8] 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.

least in part to the increased population of the counties surrounding the national forests (discussed further later in this section). With increased population come increases 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.

The focus of fire policy in Arizona 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, increasing soil erosion and disturbing wildlife, and can actually increase the likelihood of another fire (USFS 2003d, USFS 1999a).

Invasive species

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

Nationwide, invasive species affect forest ecosystems to the detriment of biological diversity, forest health, forest productivity, soil and water quality, and socioeconomic values (Chornesky et al. 2005). Researchers estimate that the roughly 360 non-native insect species that have invaded U.S. forests cost about $2.1 billion per year in the loss of forest products alone. A similar amount is lost to non-native plant pathogens (Pimentel, Zuniga, and Morrison 2005).

In the Southwest regional scale, the 2002 bark beetle infestation in Arizona and New Mexico caused significant damage. The infestation was likely the result of a combination of factors, including drought and high tree density. This outbreak killed millions of Ponderosa pine and piñon trees, and mortality, which reached up to 90% at a few localized sites, was highly visible in some areas. 2003 brought an increase in juniper and Arizona cypress mortality, which was also partially attributed to bark beetle infestations (USFS 2004o). Statewide, the round-headed pine beetle actually decreased its impact area from 11,120 acres in 2002 to 4,530 acres in 2003. Almost all of the 2003 round-headed pine beetle damage occurred within the Coronado National Forest. Within the KNF, primary damage to the tree

population was caused by Ips beetle activity, which affected more than 64,000 acres of ponderosa pine and over 158,000 acres of piñon.

In the Southwest Region, 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). In the region just south of the Kaibab, invasive grass species have become a substantial problem. According to the USFS (2005d), 187,500 acres in the Prescott, Tonto, and Coconino forests suffer from invasive weeds, such as Dalmatian toadflax (*Linaria genistifolia*), which poses a substantial threat to native plant and animal populations Recent decisions include projects intended to reduce the infestation of various species of 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 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:

- Prevent harmful new introductions by identifying and impeding pathways for invasive species introduction and spread,
- Detect and eradicate of invaders that elude prevention, and
- Engage in 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).

Increased Recreation at National Forests

In its Agricultural Fact Book, the USDA identifies the Forest Service as supplying more recreational activities than any other federal program. 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. By twenty years ago, however, visitor days had increased to nearly fifteen 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 skiing opportunities (USDA 2002). In 1996, almost half of all hunters used public lands and one-third of hunting days occurred entirely or in part on public lands (Flather, Brady, and Knowles 1999). In addition, activities such as rock climbing have greatly increased in popularity although the inherent risks have caused park officials to consider special use fees to cover added ranger responsibilities surrounding climbing-related injuries (Cordell et al. 1999). In the KNF alone, there are between 400,000-700,000 visits each year, including 3,800-9,000 wilderness visits (Kocis et al. 2001a), making tourism (whether to the Kaibab, or, more commonly, to Grand Canyon National Park) one of the single most vital economic factors to the communities surrounding the forest.

In Arizona, access to recreational activities on federal- and state-protected land in Arizona is important and valuable. Over the past half-century, the demand for such outdoor experiences has grown tremendously nationwide. This change can be attributed to several trends, including an increase in leisure time and discretionary income and a greater appreciation for nature in response to growing urbanization (Clawson 1985). About 45% of registered Arizona voters frequently or occasionally go hiking while 40% go picnicking or animal watching. 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).

Several factors have influenced the rise of tourism in the Kaibab area since the inception of the forest. Along with national increases in tourism and outdoor recreation, proximity of the Kaibab to Grand

Canyon National Park is likely a major factor. Few people visited the area for recreation prior to the 1900s due to the rough travel and primitive accommodations. Tourism increased dramatically around the turn of the century with the development of the Grand Canyon Railway in 1901. This railway allowed tourists to travel to the area more quickly and in relative comfort. By the 1920s, sightseers were taking trips to the area to view the Grand Canyon in rapidly increasing numbers (Putt 1995). Many forest rangers were aware of the tourism in the area and committed themselves to public safety and convenience, installing interpretive signs and building trails and scenic roads. However, the problem of inadequate recreational areas persisted, and forest roadsides were frequently lined with campers. The most popular roadside sites deteriorated from overuse and were often lined with trash. This prompted Forest Service officials to develop centralized camping sites with trashcans at the sites (Putt 1995). By the 1930s, the number of visitors to the area had doubled and forest officials were developing many new recreational opportunities for visitors including reservoirs for canoeing and fishing (Baker et al. 1988).

Today, within the KNF, there are nine developed campgrounds. Despite the fact that water is not abundant within the forest, several man-made lakes near Williams provide water-related recreation as well as irrigation and drinking water to the area. Dogtown Lake is the largest reservoir in the area and Cataract Lake (a preferred area for bird watching) is the smallest. Fishing is currently permitted at all of the lakes within the forest boundaries, and campgrounds are available on each shore.

Given the rapid increases in Arizona's population, overcrowding may eventually be a growing challenge for the Kaibab NF; however, according to NVUM data, overcrowding does not seem to be a major issue for the KNF at present. Nearly 53% of the wilderness visitors interviewed in the 2003 NVUM survey stated that there seemed to be "hardly anyone else" present, and only 35% of visitors using developed overnight sites thought that overcrowding was "more of a problem than not," all of which reflects considerable progress from the early recreation history in the forest (Kocis et al. 2001a).

Nationally, a related issue that has drawn some attention recently is the use of recreation fees for public lands. Some users feel that such fees amount to double taxation, adding costs on top of the money donated in taxes, and that these fees discourage lower-income individuals from accessing the park. These arguments echo the ideas of Frederick Law Olmstead, the designer 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 87% of the wilderness visitors to the KNF 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. 2001a).

9.2 Land and water resources

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

Arizona is among the fastest growing states. The 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). Also, older Americans, an increasing part of the population (one in eight people in the U.S. is now over 65 as opposed to one in twenty-five 100 years ago), are moving to the warmer climates of the south and west (Alig et al. 2003). 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. Previous descriptions in this assessment have shown how, as a result of these developments, 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).

Sheep and cattle grazing in the Kaibab area can be traced back to the establishment of the Beale Road wagon trail, completed in 1959 under the supervision of Lieutenant E.F. Beale. Ranchers used the Beale Road frequently during the early 1860s to drive their herds between New Mexico and California. Most areas that supported grass and sedge production were stocked with cattle and sheep (Belsky and Blumenthal 1997). Drought conditions in west Texas made Kaibab's grass-covered hillsides, "a natural attraction for ranchers" (Fuchs 1952). Ranchers could legally graze their herds on any land outside of Indian reservations without any hindrance from the government. As in much of the Southwest, overstocking became a serious problem in the Kaibab area in the 1880s and 1890s, and sheep and cattle began consuming more grass than the forest could produce each year (Putt 1995). By the turn of the 20th century, livestock were having visible negative effects on grasslands and forests. Grazing by the domestic livestock removed grasses that had historically helped maintain cool ground fires and, as a consequence, the open "park-like" forests that were present prior to settlement became dense stands. Grazing further influenced the area by reducing fire frequencies, compacting soils, reducing water infiltration rates, and increasing erosion (Beymer and Klopatek 1992).

The establishment of forest reserves in Arizona during the late 1800s appeared to threaten ranching in the state. A report submitted by Gifford Pinchot in 1900, however, changed the fate of grazing rights on federal lands. In his report, Pinchot stated that livestock grazing was compatible with the major objectives for establishing forest reserves and was essential to the economy of the region. Based on Pinchot's findings, the government began implementing the use of fees for grazing of private livestock on public land as early as 1901 (Putt 1995). As a consequence, when the Forest Service was established in 1905, they inherited the problems caused by decades of overgrazing. For this reason, a main focus of the Forest Service during the early years of operation was to work with ranchers to control existing herds and reduce any conflicts on the land. By the 1920s, however, continued damage by livestock was interfering with the range improvement programs initiated by the FS. As early as 1910, studies of range conditions were being conducted which indicated that overgrazing was seriously impacting the growth of ponderosa pine

(Putt 1995). Such conditions forced the Forest Service to impose a strict range improvement program in 1925, sharply reducing the number of livestock grazing permits issued within the Kaibab forest.

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

The PRIA began the fee formula for the FS and the BLM on an experimental basis, but following continuing presidential and congressional support, it has remained the standard. Grazing fees have become controversial in part because the fee has increased only marginally from its inception and has not kept pace with the market rates. In 2002, for example, the grazing fee remained $1.35 per AUM[9] 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 FS recently spent nearly $250,000 to establish and maintain cattle fences and borders for land that generates only $7,000 per year in grazing revenue as part of an attempt to protect Apache Trout and other threatened fish in livestock-impacted watersheds (Wolff 1999). Many groups also argue that livestock ranching interferes with other uses of the national forests

The National Forest System contains much of the summer range and a portion of the year-round grazing in the area, and as such, regional administrators help determine the success of southwestern livestock 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). Some argue that a balanced relationship between livestock grazers, environmentalists, and the Forest Service is important, even critical, given the continuing decline of grassland ecosystems, even critical (Baker et al. 1988).

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

State Trust land reform

The practice of allocating public lands for various beneficiaries in Arizona dates back to the founding of the territory in 1863. The current system of managing these lands, referred to as State Trust lands, was

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

established with the Arizona State Land Department 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 manages 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 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 AZSLD 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 (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).

Regionally, below-average precipitation over the past several years has once again brought water to the forefront of natural resource management concerns. According to the U.S. Geological Survey, the period following 1999 is the driest in the hundred years that the Colorado River has been monitored. That river supplies 25 million people in seven states with water (USGS 2004, CRWUA 2005, Pontius 1997). In Arizona in particular, low rainfall has led to periodic drops in water levels in nearly all the primary reservoirs. 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 surrounding the greater Kaibab area show the discrepancies within the state. The Verde River System was up to 99% of capacity by May of 2005 although it had returned to 90% by June, while the Lake Powell reservoir further north remained at between 35-43% of capacity, well below its average. 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-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).

Although the Kaibab Forest stays relatively cool and receives a large amount of precipitation, surface water is uncommon because of the porous nature of the Kaibab limestone which caps much of the plateau. The lack of obvious surface water has led some to refer to it as "the green desert" (Martin 1985). The majority of the forest soils are shallow and susceptible to erosion. Since reliable water sources are scarce in the area, water has been a controlling factor in the establishment of transportation routes and settlement (Putt 1995). While the government has contracted research organizations to investigate the possibilities of developing a water pipe across the Coconino Plateau which would transport water from Lake Powell and the Grand Canyon Dam as far south as Phoenix, these plans have not translated into any large-scale action to date (Heffernon and Muro 2001).

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 Kaibab 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 nonnative species. The KNF includes approximately 53,000 acres of inventoried roadless areas (IRAs) (USFS 2001c).

In 2001, the Forest Service published a final rule that prohibited several activities in 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 the surrounding communities. According to Silberman (2003), OHV users spent a combined $580.3 million in 2002 in Coconino, Yavapai, and Mohave Counties alone, representing $28.9 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 KNF and four other Arizona national forests initiated a five-forest amendment for OHV travel. Still in the early stages at the time of this assessment, the Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests adopted a Draft Environmental Impact Statement (DEIS) that proposes limitations and/or restrictions on cross-country travel by OHV users on lands managed by the five forests. Several issues need to be resolved before these amendments can be adopted into existing forest plans, among them the feasibility of enforcing new OHV restrictions and the right of entry for individuals into certain areas for the purposes of cultural practices, fuelwood gathering, or retrieval of big game (USFS 2003a, USFS 2003c, Arizona State Parks 2004). Only the Coronado NF is not a party to the proposed amendment, having previously established forest rules regarding cross-country travel. Contrary to existing regulations in the KNF 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 Kaibab National Forest (KNF) have undergone substantial social and economic changes over the past 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. Data show that overall population within the five counties surrounding the KNF increased by 134% percent between 1980 and 2000 with the strongest growth occurring in Washington, Mohave, and Yavapai Counties. 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 housing, including 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 KNF and surrounding communities.

The economies of northern Arizona and southern Utah are also likely to have a substantial impact on future planning and management of the KNF. Data suggest that economic growth in the region has been relatively strong, supported in part by strong gains in total part- and full-time employment in Washington and Yavapai Counties. The most significant economic gains between 1990 and 2000 were reported for the construction, wholesale trade, and finance and real estate sectors. Despite significant increases in per capita and family income and decreasing rates of poverty, data show that each of the counties within the area of assessment remain economically limited when compared to statewide figures over the same period. Meanwhile, recent indicators of dependence on natural resources have shown mixed results. As a whole, the area of assessment experienced a decline in income from wood products and processing and a relatively slight increase in income from special forest products and processing between 1990 and 2000. Over the same period, four of the five counties within the area of assessment reported strong gains in tourism employment. Although activities such as ranching and timber harvesting continue to play an important role in rural areas, recent years have seen a continued shift away from extractive industries and toward a regional economy that is increasingly dependent on the construction, real estate, and service sectors supporting growing urban populations. When combined with ongoing demographic changes, such factors are likely to have a direct impact on the KNF'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 KNF. 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 KNF has an opportunity to play an important role in the resolution of current and future transportation and land use issues by promoting sustainable regional planning policies, informing local stakeholders of the environmental and economic impacts of transportation and land use alternatives, and effectively involving surrounding communities in forest planning and management.

Concurrent with trends in the regional economy, there has been a measurable shift away from extractive uses of national forests. This trend is supported by national surveys showing continued declines in timber harvesting as well as recent data on KNF that suggest a ninety percent decrease in sawtimber permits on

forest lands between 1990 and 2000. These same reports point toward a substantial increase in recreational uses of national forests in general and the KNF 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 KNF 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 KNF has designated nearly 150 natural, cultural, and recreation sites within forest boundaries. Forest archeologists and recreation staff have also cooperated with leaders of regional Native American tribes to identify and protect sites throughout northern Arizona that are considered special for their cultural and spiritual values. Recent events such as the proposed expansion of the Arizona Snowbowl and proposed developments near the Grand Canyon have highlighted the importance of "special places" as a key factor in forest planning and community relations. In the future, the KNF should continue to seek public input in identifying special places and planning for their protection.

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

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

11. Works Cited

Adams-Russell Consulting. 2004. Social assessment: Clearwater National Forest and Nez Perce National Forest. Placerville, CA. 218p.

Alig, R.J., and B.J. Butler. 2004. Area changes for forest cover types in the United States, 1952 to 1997, with projections to 2050. Gen. Tech. Rep. PNW-GTR-613. Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. 106p. http://www.treesearch.fs.fed.us/pubs/viewpub.jsp?index=7303

Alig, R.J., A.J. Plantinga, S. Ahn, and J.D. Kline. 2003. Land use changes involving forestry in the United States: 1952 to 1997, with projections to 2050. Gen. Tech. Rep. PNW-GTR-587. Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. 92p. http://216.48.37.142/pubs/viewpub.jsp?index=5596

Allen, C.D, M. Savage, D.A. Falk, K.F. Suckling, T.W. Swetnam, T. Schulke, P.B. Stacey, P. Morgan, M. Hoffman, and J.T. Klingel. 2002. Ecological restoration of southwestern ponderosa pine ecosystems: A broad perspective. Ecological Applications. 12(5):1418-1433. http://www.swfa.org/doc%20files/Allen_SWRestoration.pdf

Allen, L.S. 1989. Roots of the Arizona livestock industry. Rangelands. 11:9-13.

Arizona Department of Commerce (ADOC). 2002a. Arizona's economic future. Prepared by Economy.com. 92p. http://www.maricopa.edu/workforce/pdfs/AZEconFuture.pdf

Arizona Department of Commerce (ADOC). 2005. Community/County Profiles. Arizona Dept. of Commerce Website. http://www.azcommerce.com/Communities/community_profiles.asp

Arizona Department of Transportation (ADOT). 2004a. MoveAZ long range transportation plan. Appendix B: Issues Papers. Prepared by Cambridge Systematics, Inc. http://www.moveaz.org/Documents/MoveAZ_AppB.pdf

Arizona Department of Transportation (ADOT). 2004b. MoveAZ long range transportation plan. Synthesis of Issues Papers. http://www.moveaz.org/Documents/issuepapersynth.pdf

Arizona Department of Transportation (ADOT). 2004c. MoveAZ long range transportation plan. http://www.moveaz.org/Documents/MoveAZ_Chap1-9.pdf

Arizona Office of Tourism (AZOT). 2004a. Arizona Tourism Statistical Report, 2003. 47p. http://www.azot.com/research/data/2003%20Statistical%20Report.pdf

Arizona Office of Tourism (AZOT). 2004b. AZ Regional Profiles. http://www.azot.gov/research/researchdocs.asp?catid=48

Arizona State Land Department (AZSLD). 2004. Arizona State Land Department annual report: 2003-2004. http://www.land.state.az.us/report/report_full.pdf

Arizona State Land Department (AZSLD). 2005. http://www.land.state.az.us/index.html

Arizona State Parks. 2003. Arizona Statewide Comprehensive Outdoor Recreation Plan. Partnerships

Division, Arizona State Parks and Land and Water Conservation Fund. 114p. http://www.pr.state.az.us/partnerships/planning/scorp03.html.

Arizona State Parks. 2004. Arizona trails 2005: State motorized and non-motorized trail plan. 110p. http://www.pr.state.az.us/partnerships/trails/statetrails.html

Arizona Town Hall. 1999. Uniting a diverse Arizona. Report on the Seventy-Fifth Arizona Town Hall. www.aztownhall.org/75report.doc

Baden, J.A. and D. Snow (eds.). 1997. The Next West: Public Lands, Community and Economy in the American West. Gallatin Institute. Island Press, Washington DC. 272p.

Baldwin, P. 2004. The National Forest System Roadless Areas Initiative. Rep. RL30647. Congressional Research Service, Library of Congress. 27p. http://www.ncseonline.org/NLE/CRS/abstract.cfm?NLEid=16808

Baker, R.D., R.S. Maxwell, V.H. Treat, and H.C. Dethloff. 1988. Timeless Heritage: A History of the Forest Service in the Southwest. FS-409. USDA Forest Service. College Station, TX: Intaglio, Inc. 208p. http://www.fs.fed.us/r3/about/history/timeless/index.shtml

Becerra, H., and D. Pierson. 2005. April showers may bring scorcher. Los Angeles Times. 21 May.

Belsky, J., and D.M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the Interior West. Conservation Biology. 11:315-327.

Belsky, J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. Journal of Soil and Water Conservation. 54:419-431. http://www.onda.org/library/papers/BelskyGrazing.pdf

Beymer, R.J., and J.M. Klopatek. 1992. Effects of grazing on cryptogamic crusts in pinyon-juniper woodlands in Grand Canyon National Park. American Midland Naturalist. 127:139-148.

Bluewater Network. 1999. Off-the-Track: America's national parks under siege. 41p. http://bluewaternetwork.org/reports/rep_pl_offroad_offtrack.pdf

Bodemann, Y.M. 1988. Relations of production and class rule: The hidden basis of patron-clientage, pp. 198-220. *In:* B. Wellman and S.D. Berkowitz (eds.), Social Structures: A Network Approach. Cambridge University Press, Cambridge. 508p.

Bodio, S. 1997. Struck with consequence, pp. 15-24. *In:* J.A. Baden and D. Snow (eds.), The Next West: Public Lands, Community and Economy in the American West. Gallatin Institute. Island Press, Washington D.C. 272p.

Booth, D.E. 2002. Searching for Paradise: Economic Development and Environmental Change in the Mountain West. Rowman & Littlefield Publishers, Inc., Lanham, Maryland. 288p.

Brandenburg, A.M., and M.S. Carroll. 1995. Your place or mine?: The effect of place creation on environmental values and landscape meanings. Society and Natural Resources. 8:381-398.

Brandenburg, A.M., M.S. Carroll, and K.A. Blatner. 1995. Towards successful forest planning through locally based qualitative sociology. Western Journal of Applied Forestry. 10(3):95-100.

Brandes, U., P. Kenis, J. Raab, V. Schneider, and D. Wagner. 1999. Explorations into the visualization of policy networks. Journal of Theoretical Politics. 11(1):75-106. http://jtp.sagepub.com/cgi/reprint/11/1/75

Breiger, R.L. 1988. The duality of persons and groups, pp. 83-98. *In:* B. Wellman and S.D. Berkowitz (eds.), Social Structures: A Network Approach. Cambridge University Press, Cambridge. 508p.

Brown, T.C. 1999. Past and future freshwater use in the United States: A technical document supporting the 2000 USDA Forest Service RPA Assessment. Gen. Tech. Rep. RMRS-GTR-39. Fort Collins, CO: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 47p. http://www.fs.fed.us/rm/pubs/rmrs_gtr039.html

Bullard, R.D. 1993. Race and environmental justice in the United States. Yale Journal of International Law. 18:319-336.

Bureau of Economic Analysis (BEA). 2002. Local area personal income. U.S. Dept. of Commerce. http://www.bea.gov/bea/regional/reis/

Canamex Corridor Coalition. 2001. Task I: Existing infrastructure—Economic conditions and programs/ transportation infrastructure/ telecommunications infrastructure. ADOT Contr. No. AD000088001. Prepared by Economics Research Associates. 82p.

Carter, R. 2003. Climate, forest management, stoke western wildfires. End in sight. CLIMAS. 4p. http://www.ispe.arizona.edu/climas/forecasts/articles/wildfire_April2003.pdf

Case, P., and G. Alward. 1997. Patterns of demographic, economic and value change in the western United States: Implications for water use and management. Report to the Western Water Policy Review Advisory Commission. U.S. Dept. of Agriculture, Forest Service. 70p. http://www.fs.fed.us/institute/news_info/wwprc_1.html

Cheng, A.S., L.E. Kruger, and S.E. Daniels. 2003. "Place" as an integrating concept in natural resource politics: Propositions for a social science research agenda. Society and Natural Resources. 16:87-104.

Chornesky, E.A., A.M. Bartuska, G.H. Aplet, K.O. Britton, J. Cummings-Carlson, F.W. Davis, J. Eskow, D.R. Gordon, K.W. Gottschalk, R.A. Haack, A.J. Hansen, R.N. Mack, F.J. Rahel, M. Shannon, L.A. Wainger, and T.B. Wigley. 2005. Science priorities for reducing the threat of invasive species to sustainable forestry. BioScience. 55(4):335-348. http://docserver.ingentaconnect.com/deliver/cw/aibs/00063568/v55n4/s10/p335.pdf?fmt=dirpdf&tt=479&cl=22&ini=connect&bini=&wis=connect&ac=0&acs=4703,291891,57006404,30000342&kn=1&expires=1117753790&checksum=0065CC4DCC2E1A61161D75295214D652&cookie=1329481216

Clawson, M. 1985. Trends in the use of public recreation areas, pp. 1-12. *In*: Proceedings, 1985 National Outdoor Recreation Trends Symposium II; 24-27 Feb. Myrtle Beach: Clemson, SC: Department of Parks, Recreation and Tourism Management.

Climate Assessment for the Southwest (CLIMAS). 2004-2005. Monthly Southwest Climate Outlook. http://www.ispe.arizona.edu/climas/forecasts/archive.html

Clinton, W.J. 1994. Federal action to address environmental justice in minority populations and low-income populations. Executive Order 12898. White House, Washington, DC. 11 Feb. www.fs.fed.us/land/envjust.html

Coalition for Sonoran Desert Protection. 2001. Livestock grazing and the Sonoran Desert Conservation Plan. 45p. http://www.biologicaldiversity.org/swcbd/programs/grazing/SDCP-Report.pdf

Coconino County. 2003. Coconino County Comprehensive Plan: A Conservation-Based Planning Partnership. Coconino County, AZ. 122p. http://co.coconino.az.us/files/pdfs/commdev/Complete_Plan.pdf

Cody, B.A. 2001. Grazing fees: An overview. CRS Congressional Report, 96-450 ENR. National Council for Science and the Environment. http://www.ncseonline.org/NLE/CRSreports/Agriculture/ag-5.cfm

Colorado College. 2003. Charting the Colorado Plateau Revisited: Regional Management Issues – Canyon Forest Village. http://www.coloradocollege.edu/Dept/EC/Faculty/Hecox/CPwebpage/issuespageGCdevelopment.htm

Colorado River Water Users Association (CRWUA). Overview. 2005. CRWUA Website. http://www.crwua.org/colorado_river/overview.htm

Cooper, C.F. 1960. Changes in vegetation, structure, and growth of southwestern pine forests since white settlement. Ecological Monographs. 30: 129-164. http://www.esajournals.org/esaonline/?request=get-abstract&issn=0012-9615&volume=030&issue=02&page=0129

Cordell, H.K., C.J. Betz, G.T. Green, S. Mou, V.R. Leeworthy, P.C. Wiley, J.J. Barry, and D. Hellerstein. 2004. Outdoor Recreation for 21st Century America. Venture Publishing, Inc, State College, PA. 316p.

Cordell, H.K., B.L., McDonald, R.J. Teasley, J.C. Bergstrom, J. Martin, J. Bason, and V.R. Leeworthy. 1999. Outdoor recreation participation trends, pp. 219-321. *In:* H.K. Cordell et al., Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends. Sagamore Publishing, Champaign, IL. 449 p. http://www.srs.fs.usda.gov/pubs/viewpub.jsp?index=767

Cordell, H.K, J. Teasley, and G. Super. 1997. Outdoor recreation in the United States: Results from the National Survey on Recreation and the Environment (All Forest Service Regions). Prepared by the Outdoor Recreation and Wilderness Assessment Group. Dept. of Agriculture and Applied Economics, University of Georgia. 209p. http://www.srs.fs.usda.gov/trends/fsoutrec.html http://www.srs.fs.usda.gov/trends/fsoutrec.html

Coronado National Forest (CNF). 2003b. Coronado National Forest Fire Management Plan. U.S. Dept. of Agriculture, Forest Service. 164p. http://www.fs.fed.us/r3/coronado/forest/projects/fire_mgt/wfa/documents/fmp/fmp.pdf

Cortner, H.J., M. Gretchen, R. Teich, and J. Vaughn. 2003. Analyzing USDA Forest Service appeals: Phase 1, the database. Ecological Restoration Institute. Northern Arizona University. 58p. http://www.nativeforest.org/pdf/FS-appeals-database.pdf

Covington, W. W., and M. M. Moore. 1994. Southwestern ponderosa pine forest structure: Changes since

Euro-American settlement. Journal of Forestry. 92:39–47.

D'Antonio, C.A., and P.J. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics. 23:63-87. arjournals.annualreviews.org/doi/pdf/10.1146/annurev.es.23.110192.000431

Davis, C. 2001. Introduction: The context of public lands policy change, pp. 1-8. *In*: C. Davis (ed.), Western Public Lands and Environmental Politics (2nd Ed.). Westview Press, Boulder, CO. 240p.

Davis, T. 2004. Leader of group seeking state land changes resigns. Arizona Daily Star. 2 Oct.

Dreesen, D., J. Harrington, T. Subirge, P. Stewart, and G. Fenchel. 2002. Riparian restoration in the southwest—species selection, propagation, planting methods, and case studies. Gen. Tech. Rep. RMRS-P-24. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 370p. http://plantmaterials.nrcs.usda.gov/pubs/nmpmcsy03852.pdf

Duffus, J. 1992. Federal lands – Reasons for and effects of inadequate public access. Briefing Report to the Chairman, Subcommittee on National Parks and Public Lands, Committee on Interior and Insular Affairs, House of Representatives. U.S. General Accounting Office. http://archive.gao.gov/d32t10/146394.pdf

Ecological Restoration Institute. 2005. Strategic plan. Northern Arizona University. 13p. http://www.eri.nau.edu/forms/files/strategicplan2003.pdf

Eilperin, J. 2004. National forests fall victim to firefighting: Plan to protect residences costs trees, money. Washington Post. 29 Jun. http://www.washingtonpost.com/wp-dyn/articles/A13324-2004Jun28.html

Esparza, A.X., and J.I. Carruthers. 2000. Land use planning and exurbanization in the rural Mountain West: Evidence from Arizona. Journal of Planning Education and Research. 20:23-36. http://jpe.sagepub.com/cgi/reprint/20/1/23

Fedkiw, J. 1998. Managing Multiple Uses on National Forests, 1905-1995: A 90-year Learning Experience and It Isn't Finished Yet. FS-628. U.S. Dept. of Agriculture, Forest Service. 284p. http://www.fs.fed.us/research/publications/Managing_Multiple_Uses.htm

Flagstaff Metropolitan Planning Organization (FMPO). 2001. Flagstaff area regional land use and transportation plan. Flagstaff, AZ. 203p. http://www.flagstaff.az.gov/documents%5CCommunity%20Development%5CRegional%20Plan/Web%20plan.pdf

Flather, C.H., S.J. Brady, and M.S. Knowles. 1999. Wildlife resource trends in the United States: A technical document supporting the 2000 RPA Assessment. Gen. Tech. Rep. RMRS-GTR-33. Fort Collins, CO: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 79p. http://www.fs.fed.us/rm/pubs/rmrs_gtr33.html

Forstall, R.L. 1995. Arizona: Population of counties by decennial census—1900 to 1990. U.S. Bureau of the Census, Population Division. http://www.census.gov/population/cencounts/az190090.txt

Freilich, J.E., J.M. Emlen, J.J. Duda, D.C. Freeman, and P.J. Cafaro. 2003. Ecological effects of ranching: A

six-point critique. BioScience. 53(8): 759-765. http://www.alamedacreek.org/Educational%20Resources/Livestock%20grazing%20resources/Ecological%20Effects%20of%20Ranching%20--%20A%206%20point%20critique.pdf

Frentz, I. C., S. Burns, D.E. Voth, and C. Sperry. 1999. Rural development and community-based forest planning and management: A new, collaborative paradigm—Executive summary. Fayetteville, Arkansas: University of Arkansas. http://ocs.fortlewis.edu/Stewardship/Pubns/execsummary.pdf

Fuchs. J. R. 1952. A history of Williams, Arizona, 1876-1951. M.A. Thesis. The University of Arizona. Tucson, Arizona.

Galaskiewicz, J., and S. Wasserman. 1994. Introduction: Advances in the social and behavioral sciences from social network analysis, pp. xi-xvii. *In:* S. Wasserman and J. Galaskiewicz (eds.), Advances in Social Network Analysis. Sage Publications, Thousand Oaks. 300p.

Garson, G.D. 2005. Sociometry and Network Analysis, online notes. *In*: G.D. Garson, PA 765 Statnotes: An Online Textbook. North Carolina State University, Raleigh, NC. http://www2.chass.ncsu.edu/garson/pa765/sociometery.

General Accounting Office (GAO). 1987. National forests: Timber utilization policy needs to be reexamined. GAO/RCED 88-31. Report to the Chief, Forest Service, U.S. Dept. of Agriculture. 10p. http://archive.gao.gov/d29t5/134436.pdf

General Accounting Office (GAO). 1988. Rangeland management: More emphasis needed on declining and overstocked grazing allotments. GAO/RCED 88-80. Report to Congressional Requesters. 71p. http://archive.gao.gov/t2pbat17/136027.pdf

General Accounting Office (GAO). 1989. Federal land management: The Mining Law of 1872 needs revision. GAO/RCED 89-72. Report to the Chairman, Subcommittee on Mining and Natural Resources, Committee on Interior and Insular Affairs, House of Representatives. 47p. http://archive.gao.gov/d15t6/138159.pdf

General Accounting Office (GAO). 1991. Forest Service: Difficult choices face the future of the recreation program. GAO/RCED 91-115. Report to the Chairman, Subcommittee on National Parks and Public Lands, Committee on Interior and Insular Affairs, House of Representatives. 28p. http://archive.gao.gov/t2pbat8/143648.pdf

General Accounting Office (GAO). 1995. Federal lands: Information on the use and impact of off highway vehicles. GAO/RCED 95-209. Report to Bruce F. Vento, House of Representatives. 77p. http://www.gao.gov/archive/1995/rc95209.pdf

General Accounting Office (GAO). 1996. U.S. Forest Service: Fees for recreation special-use permits do not reflect fair market value. GAO/RCED 97-16. Report to the Chairman, Subcommittee on Oversight of Government Management and the District of Columbia, Committee on Governmental Affairs, U.S. Senate. 27p. http://www.gao.gov/archive/1997/rc97016.pdf

General Accounting Office (GAO). 1998. Recreation fees: Demonstration fee successful in raising revenues but could be improved. GAO/RCED 99-7. Report to Congressional Requesters. 116p. http://www.gao.gov/archive/1999/rc99007.pdf

General Accounting Office (GAO). 1999a. Forest Service priorities: Evolving mission favors resource

protection over production. GAO/RCED 99-166. Report to Chairman, Subcommittee on Forests and Public Land Management, Committee on Energy and Natural Resources, U.S. Senate. 16p. http://www.gao.gov/archive/1999/rc99166.pdf

General Accounting Office (GAO). 1999b. Forest Service: Amount of timber offered, sold, and harvested, and timber sales outlays, fiscal years 1992 through 1997. GAO/RCED 99-174. Report to Chairman, Subcommittee on Department Operations, Oversight, Nutrition, and Forestry, Committee on Agriculture, House of Representatives. 78p. http://www.gao.gov/archive/1999/rc99174.pdf

General Accounting Office (GAO). 2001a. Financial management: Annual costs of Forest Service's timber sales program are not determinable. GAO 01-1101R. Memo to Cynthia McKinney and George Miller, House of Representatives. 7p. http://www.gao.gov/new.items/d011101r.pdf

General Accounting Office (GAO). 2001b. Recreation fees: Management improvements can help the demonstration program enhance visitor services. GAO 02-10. Report to the Ranking Minority Member, Subcommittee on National Parks, Historic Preservation, and Recreation, Committee on Energy and Natural Resources, U.S. Senate. 37p. http://www.gao.gov/new.items/d0210.pdf

General Accounting Office (GAO). 2004b. Wildfire suppression: Funding transfers cause project cancellations and delays, strained relationships, and management disruptions. GAO 04-612. Report to Congressional Requesters. 63p. http://www.gao.gov/new.items/d04612.pdf

Gorte, R.W. 2004. Below-cost timber sales: An overview. CRS Report RL32485. Congressional Research Service, Library of Congress. 11p. http://www.ncseonline.org/NLE/CRSreports/04Jul/RL32485.pdf

Graham, R.T., S. McCaffrey, and T.B. Jain (tech. eds.). 2004. Science basis for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Rep. RMRS-GTR-120. Fort Collins, CO: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 43p. http://www.fs.fed.us/rm/pubs/rmrs_gtr120.html

Grewell, B.J. 2004. Recreation fees: Four philosophical questions. PERC Policy Series. PS-31. 32p. http://www.perc.org/publications/policyseries/rec_fees.php?s=2

Gucinski, H., M.J. Furniss, R.R. Ziemer, and M.H. Brookes (eds.). 2001. Forest roads: A synthesis of scientific information. Gen. Tech. Rep. PNW-GTR-509. U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. 103p. http://www.fs.fed.us/pnw/pubs/gtr509.pdf

Hanneman, R.A. 1999. Introduction to Social Network Methods (online text). Analytic Technologies. 149p. http://www.analytictech.com/networks.pdf

Haynes, R.W. (Tech. Coord.). 2003a. An analysis of the timber situation in the United States: 1952 to 2050. Gen. Tech. Rep. PNW-GTR-560. Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. 254p. http://www.treesearch.fs.fed.us/pubs/viewpub.jsp?index=5284

Heffernon, R., and M. Muro. 2001. Growth on the Coconino Plateau: Potential impacts of a water pipeline for the region. Morrison Institute for Public Policy. Arizona State University. 68p. http://www.asu.edu/copp/morrison/coconino.htm

Higgins, B. 2005. Personal Communication. Forest Supervisor, Kaibab National Forest.

Hobbs, F., and N. Stoops. 2002. Demographic trends in the 20th Century. U.S. Census Bureau. Census 2000 Special Reports, Series CENSR-4. U.S. Government Printing Office, Washington, DC. 228p. http://www.census.gov/prod/2002pubs/censr-4.pdf

Holtrop, J. 2005. Statement before the Subcommittee on Forests and Forest Health Committee on Resources. U.S. House of Representatives. Hearing concerning H.R. 410 – Northern Arizona Land Exchange and Verde River Basin Partnership Act of 2005. 16 May. http://www.fs.fed.us/congress/109/house/legislative/holtrop/031605.html

Hoover Dam Bypass Project. 2005. Hoover Dam Bypass US 93. http://www.hooverdambypass.org/default.htm

Huggard, C.J. 2001. Introduction. *In:* C.J. Huggard, and A.R. Gomez (Eds.), Forests Under Fire: A Century of Ecosystem Mismanagement in the Southwest. University of Arizona Press, Tucson. 307p. http://www.uapress.arizona.edu/samples/sam1375.htm

Humphries, M., and C.H. Vincent. 2004. Mining on federal lands. CRS Issue Brief for Congress. IB89130. National Library for the Environment. Resources, Science, and Industry Division. http://www.ncseonline.org/NLE/CRSreports/Mining/mine1.cfm?&CFID=8492224&CFTOKEN=29386060#_1_1

Jevons, D. 2005. Personal Communication. Acting Forest Planner. Apache-Sitgreaves National Forests.

Johnson, H. 2005. $1.5 mil house destroyed in blaze; cause is sought. The Arizona Republic. 6 May. http://www.azcentral.com/arizonarepublic/local/articles/0506nefire06.html

Johnson, T.G. (Ed.). 2000. United States timber industry—An assessment of timber product output and use, 1996. Gen Tech. Rep. SRS-45. Asheville, NC: U.S. Dept. of Agriculture, Forest Service, Southern Research Station. 145p. http://www.srs.fs.usda.gov/pubs/viewpub.jsp?index=2829

Kaibab National Forest (KNF). 2005. Schedule of Proposed Action (SOPA) 01/01/2005 to 03/31/2005, Kaibab National Forest. http://www.fs.fed.us/r3/kai/projects/nepa/sopa.pdf

Kocis, S.M., D.B.K. English, S.J. Zarnoch, R. Arnold, and L. Warren. 2001a. National Visitor Use Monitoring Results. USDA Forest Service Region 3. Kaibab National Forest. http://www.fs.fed.us/recreation/programs/nvum/reports/year1/R3_Kaibab_final.htm

Kruger, L.E. 1996. Understanding Place as a Cultural System: Implications of Theory and Method. Ph.D. Dissertation. University of Washington, Seattle, WA. 180 p.

Laughlin D.C., J.D. Bakker, M.T. Stoddard, M.L. Daniels, J.D. Springer, C.N. Gildar, A. M. Green, and W.W. Covington. 2004. Toward reference conditions: Wildfire effects on flora in an old-growth ponderosa pine forest. Forest Ecology and Management. 199:137-152.

Leefers, L., K. Potter-Witter, and M. McDonough. 2003. Social and economic assessment of the Michigan National Forests. Department of Forestry, Michigan State University. 254p.

Lowe, C. H. 1972. Arizona's natural environment. The University of Arizona, Tucson.

Madrid, B. 2004. Personal communication. Fire Management Office, Gila National Forest Wilderness District, USDA Forest Service. 17 Sep.

Martin, J.F. 1985. The prehistory and ethnohistory of havasupai-hualapai relations. Ethnohistory. 32: 135-153.

McCool, S.F. 2003. From scholarship to stewardship: Opportunities and challenges in wilderness research, education, and management, pp. 218-224. *In*: Forest Service Proceedings. RMRS-P-27. U.S. Dept. of Agriculture. http://www.fs.fed.us/rm/pubs/rmrs_p027/rmrs_p027_218_224.pdf

McCool, S.F. 2001. Quaking aspen and the human experience: Dimensions, issues, and challenges, pp. 147-160. *In*: Sustaining aspen in western landscapes: Symposium Proceedings. RMRS-P-18. Grand Junction, CO: U.S. Department of Agriculture, Rocky Mountain Research Station, Forest Service Proceedings. 13-15 Jun. http://www.fs.fed.us/rm/pubs/rmrs_p018/rmrs_p018_147_162.pdf

McCool, S.F., and L.E. Kruger. 2003. Human migration and natural resources: Implications for land managers and challenges for researchers. Gen. Tech. Rep. PNW-GTR-580. Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. 19p. http://www.fs.fed.us/pnw/pubs/gtr580.pdf

McHugh, K.E., and R.C. Mings. 1996. The circle of migration: Attachment to place in aging. Annals of the Association of American Geographers. 86(3):530-550. http://www.jstor.org/view/00045608/di010520/01p0038p/0?currentResult=00045608%2bdi010520%2b01p0038p%2b2%2cC8060C&searchUrl=http%3A%2F%2Fwww.jstor.org%2Fsearch%2FResults%3FQuery%3DCoronado%2BNational%2BForest%2Bborder%2Bissues%26hp%3D25%26so%3Dnull%26si%3D1%26mo%3Dbs

McMillan, W. 1999. The community relations manual: A guide for local government. Department of the Premier and Cabinet. Office of Ethnic and Multicultural Affairs. Queensland, Australia. 90p. http://www.premiers.qld.gov.au/library/office/Community_Relations_Manual.doc

Meahl, J. 2005. More wildfires likely as restrictions in effect. Eloy News. 19 May. http://www.zwire.com/site/news.cfm?newsid=14555409&BRD=1817&PAG=461&dept_id=222071&rfi=8

Merrill, B.D. 1998. Arizona's support balance: Attitudes toward rural communities and environmental values. Arizona State University, Walter Cronkite School. Prepared for the Eastern Arizona Counties Organization. 24p.

Mills, J.R., and X. Zhou. 2003. Projecting national forest inventories for the 2000 RPA timber assessment. Gen. Tech. Rep. PNW-GTR-568. Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. 58p. http://www.fs.fed.us/pnw/pubs/gtr568.pdf

Mitchell, J.E. 2000. Rangeland resource trends in the United States: A technical document supporting the 2000 USDA Forest Service RPA Assessment. Gen. Tech. Rep. RMRS-GTR-68. Fort Collins, CO: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 84p. http://www.fs.fed.us/rm/pubs/rmrs_gtr68.html

Mitchell, M.Y., J.E. Force, M.S. Carroll, and W.J. McLaughlin. 1993. Forest places of the heart: Incorporating special places into public management. Journal of Forestry. 91(4):32-37.

Mohave County. 1995. Mohave County General Plan. Mohave County, AZ. 195p. http://www.co.mohave.az.us/depts/pnz/forms/Mohave_County_General_Plan.pdf

Morehouse, B.J. 2001. Climate, forest fires, and recreation: Insights from the U.S. Southwest. University of Arizona, Institute for the Study of Planet Earth, pp. 195-226. *In*: A. Matzarakis and C.R. de Freitas (eds.), Proceedings of the First International Workshop on Climate, Tourism, and Recreation. International Society of Biometeorology. Report of a Workshop Held at Porto Carras, Neos Marmaras, Halkidiki, Greece, 5-10 Oct. 265p.

Morton, P. 2003. Economic profiles for Arizona counties: Coconino County. Wilderness Society. 9p. http://www.wilderness.org/Library/Documents/upload/Coconino-County-Economic-Profile-AZ.pdf

National Agricultural Statistics Service (NASS). 2003. U.S. Dept. of Agriculture, Economics and Statistics System. Albert R. Mann Library, Cornell University. http://jan.mannlib.cornell.edu/reports/nassr/price/pap-bb/2003/agpr0103.txt

National Forest Foundation (NFF), and United States Forest Service (USFS). 2005. Partnership Guide: The Power of People Working Together. National Partnership Office. 104p. http://www.partnershipresourcecenter.org/resources/partnership-guide/

National Interagency Fire Center (NIFC). 2003. Interagency strategy for the implementation of federal wildland fire policy. U.S. Dept. of Agriculture, U.S. Dept. of the Interior. National Fire and Aviation Executive Board. Federal Fire Policy Directives Task Group. 62p. http://www.nifc.gov/fire_policy/pdf/strategy.pdf

National Interagency Fire Center (NIFC). 2005. Wildland Fire Statistics. Boise, ID: U.S. Dept. of Agriculture, U.S. Dept. of the Interior. National Fire and Aviation Executive Board. Federal Fire Policy Directives Task Group. http://www.nifc.gov/stats/wildlandfirestats.html

Nintzel, J. 2005. Broken trust – Saving some patches of our vanishing desert depends on state land reform. Just don't expect to see that happen anytime soon. Tucson Weekly. 3 Mar. http://www.tucsonweekly.com/gbase/currents/Content?oid=oid:66288

Northern Economics. 2002. Social assessment of the Beaverhead-Deerlodge National Forest: A report to the Beaverhead-Deerlodge National Forest. Northern Economics Inc., Anchorage, AK. 425p.

Noss, R. F., E. T. LaRoe, III, and J. M. Scott. 1995. Endangered ecosystems of the United States: A preliminary assessment of loss and degradation. National Biological Service Biological Report 28. U.S. Dept. of the Interior, Washington, DC. http://biology.usgs.gov/pubs/ecosys.htm

Office of the Governor of Utah. 2001. Excerpts from the 2001 Economic Report to the Governor. State of Utah. http://governor.utah.gov/dea/ERG/ERG2001/Excerpts6.PDF

Office of the President. 2002. Healthy forests: An initiative for wildfire prevention and stronger communities. Washington, DC. 21p. http://www.whitehouse.gov/infocus/healthyforests/Healthy_Forests_v2.pdf

Olsen, K. 2003. Secret Land Swaps Taxpayers Help Finance. Alicia Patterson Foundation Reporter. 21(1). http://www.aliciapatterson.org/APF2101/Olsen/Olsen.html

Omi, P.N., and E.J. Martinson. 2002. Effect of fuels treatment on wildfire severity. Final report to the Joint Fire Science Program Governing Board. Fort Collins, CO: Western Forest Fire Research Center.

Otterstrom, S., and J.M. Shumway. 2003. Deserts and oases: The continuing concentration of population in the American Mountain West. Journal of Rural Studies. Forthcoming. http://www.geog.byu.edu/shumway/pubs/Rural%20Studies%20article.pdf

Partnership for Community Development. 2000. The Arizona Factbook of Ethnic Minorities. College of Human Services, Arizona State University West. 57p. http://www.west.asu.edu/chs/partdev/Ethnic/Ethnic.pdf

Peart, D. (Dir.). 1995. Arizona Comparative Environmental Risk Project (ACERP). Arizona State University, Earthvision. http://earthvision.asu.edu/acerp/

Pimentel, D., R. Zuniga, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecological Economics. 52:273-288. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-4F4H9SX-3&_coverDate=02%2F15%2F2005&_alid=262573837&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5995&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=62eb55db6ee665a5355632ea17eb34b9

Pontius, D. 1997. Colorado River Basin study. Report to the Western Water Policy Review Advisory Commission. SWCA Environmental Consultants, Tucson, AZ. 126p. https://repository.unm.edu/handle/1928/368

Prescott National Forest (PNF). 2004. Gray Wolf Land Exchange Project Proposal and Alternatives. U.S. Dept. of Agriculture, Forest Service. 20p. http://www.fs.fed.us/r3/prescott/projects/pdf/gray-wolf-land-exchange.pdf

Provan, K.G., and H.B. Milward. Do networks really work? A framework for evaluating public-sector organizational networks. Public Administration Review. 61(4):414-423. http://www.ingentaconnect.com/content/bpl/puar/2001/00000061/00000004/art00005

Putt, P.J. 1995. South Kaibab National Forest: A historical overview to 1940. M.A. Thesis. Northern Arizona University.

Pyne, S.J. 1997. Fire in America: A Cultural History of Wildland and Rural Fire. University of Washington Press, Seattle, WA. 654 pp.

Rasker, R. 2000. Your next job will be in services—Should you be worried? Chronicle of Community. 3(2):38-42.

Rey, M. 2003. Statement before the Subcommittee on Public Land and Forests Committee on Energy and Natural Resources, United States Senate. Hearing on S. 849 “Northern Arizona National Forest Land Exchange Act of 2003.” 11 Sep. http://www.fs.fed.us/congress/108/senate/legislative/rey/091103.html

Richard, T., and S. Burns. 1998. Beyond “scoping”: Citizens and San Juan National Forest managers, learning together. Journal of Forestry. 96(4):39-43.

Riske, P. 2005. Talk of trust land reform resurfaces – Flake says open space is “deal-breaker.” Arizona Capitol Times. 18 Mar.

RoperASW. 2004. Outdoor recreation in America 2003: Recreation’s benefits to society challenged by trends. Recreation Roundtable. 22p. www.funoutdoors.com/files/ROPER%20REPORT%202004_0.pdf

Roth, M. 2005. Personal Communication. Acting Recreation Program Leader. Coronado National Forest, Santa Catalina Ranger District.

Ruyle, G. B., R. Tronstad, D. W. Hadley, P. Heilman, and D. A. King. 2000. Aspects of cattle ranching in Arizona, pp. 379-417. *In:* R. Jemison, C. Raish, and D. Finch, Ecological, Cultural, and Socioeconomic Aspects of Livestock Management in the Southwest. Elsevier Science Press. 612p.

Schuster, E.G., and M.A. Krebs. 2003. Forest Service programs, authorities, and relationships: A technical document supporting the 2000 USDA Forest Service RPA Assessment. Gen. Tech. Rep. RMRS-GTR-112. Fort Collins, CO: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 88p. http://www.fs.fed.us/rm/pubs/rmrs_gtr112.html

Segee, B**.** and M.Taylor. 2002. Prelude to catastrophe: recent and historic land management within the Rodeo-Chediski fire area. Center for Biological Diversity, Sierra Club, Southwest Alliance. http://www.biologicaldiversity.org/swcbd/Programs/fire/r-c_report.pdf

Sheridan, T.E. 1995. Arizona: A History. University of Arizona Press, Tucson. 434p.

Sherwood, R. 2005. State trust land reform falls apart. The Arizona Republic. 22 Feb. http://www.azcentral.com/specials/special12/articles/0222trustland.html

Sherwood, R., and S. McKinnon. 2005. Trust-land reform may go to voters. The Arizona Republic. 9 Mar.

Sierra Club. 2003. Sierra Club and Center for Biological Diversity Win Grand Canyon Protection: Developer's Appeal on Canyon Forest Village Dismissed. Sierra Club, Arizona’s Grand Canyon Chapter. News Release. 6 Jan. http://arizona.sierraclub.org/pr_and_alerts/pr_and_alerts_2003/alert_01_06-03.asp

Siggerud, K. 2002. Highway infrastructure – Physical conditions of the Interstate Highway System have improved, but congestion and other pressures continue. Statement by the Acting Director of Physical Infrastructure Issues, U.S. General Accounting Office. 19p. http://www.gao.gov/new.items/d021128t.pdf

Silberman, J. 2003. The economic importance of off-highway vehicle recreation: Economic data on off highway recreation for the state of Arizona and for each Arizona county. Arizona State University West. 90p. http://www.gf.state.az.us/pdfs/w_c/OHV%20Report.pdf

Stevenson, W.B., and D. Greenberg. 2000. Agency and social networks: Strategies of action in a social structure of position, opposition, and opportunity. Administrative Science Quarterly. 45:651-678. http://www.jstor.org/view/00018392/di015548/01p0021f/0

Stokowski, P.A., and C.B. LaPointe. 2000. Environmental and social effects of ATVs and ORVs: An annotated bibliography and research assessment. University of Vermont School of Natural Resources. 31p. http://forestwatch.org/orv/VT_ATV_Study.pdf

Stuebner, S. 1998. Private rights vs. public lands: Thousands of inholdings create conflict inside federal lands. High County News. 30(3). http://www.hcn.org/servlets/hcn.PrintableArticle?article_id=3946

Swetnam, T. W., and C. H. Baisan. 1996. Historical fire regime patterns in the southwestern United States since AD 1700, pp. 11–32. *In*: C. D. Allen (tech ed.), Fire effects in southwestern forests, proceedings of the second La Mesa Fire symposium. Gen. Tech. Rep. RM-GTR-286. Los Alamos, NM.

Sztompka, P. 1993. The Sociology of Social Change. Blackwell Publishers, Oxford. 369p.

Toupal, R.S. 2003. Cultural landscapes as a methodology for understanding natural resource management impacts in the western United States. Conservation Ecology. 7(1). http://www.ecologyandsociety.org/vol7/iss1/art12/main.html

Tucker, E.A., and G. Fitzpatrick. 1972. Men Who Matched the Mountains: The Forest Service in the Southwest. U.S. Dept. of Agriculture, Forest Service, Southwestern Region, Albuquerque, NM. 293p.

United States Census Bureau. 2005. United States Census, 2000. U.S. Dept. of Commerce. http://www.census.gov/

United States Department of Agriculture (USDA). 1997. Departmental Regulation on Environmental Justice. Dept. Reg. No. 5600-002 National Resource Conservation Center. Washington, DC. http://www.nrcs.usda.gov/technical/ECS/environment/envjust.html

United States Department of Agriculture (USDA). 2002. Agricultural Fact Book, 2001-2002. Office of Communication. 174p. http://www.usda.gov/factbook/

United States Fish and Wildlife Service (USFWS). 2001. National Survey of Fishing, Hunting, and Wildlife Associated Recreation. In conjunction with U.S. Department of the Interior (DOI), U.S. Department of Commerce, U.S. Census Bureau. http://www.census.gov/prod/2002pubs/FHW01.pdf

United States Forest Service (USFS). 1982. ROS Users Guide (FSM 2311). Recreation, Heritage, and Wilderness Resources. Washington, DC. 38p.

United States Forest Service (USFS). 1983. Facts about the National Forest System in the Southwest. Albuquerque, NM: U.S. Dept. of Agriculture, Southwestern Region.

United States Forest Service (USFS). 1993. The Principal Laws Relating to Forest Service Activities. U.S. Government Printing Office. Washington, DC. 1,163p.

United States Forest Service (USFS). 1995. Landscape aesthetics: A handbook for scenery management. Agriculture Handbook 701. 264p.

United States Forest Service (USFS). 1999a. Heber-Overgaard Interface Analysis. U.S Dept. of Agriculture, Apache Sitgreaves National Forests, Chevelon-Heber Ranger District. CEEM V Team. 80p.

United States Forest Service (USFS). 1999c. Record of Decision, Final Environmental Impact Statement for Tusayan Growth. Kaibab National Forest. http://www.fs.fed.us/r3/kai/business/teis_record.pdf

United States Forest Service (USFS). 2000a. RPA Assessment of Forest and Rangelands. FS-687. Washington, DC. 78p. http://www.fs.fed.us/pl/rpa/rpaasses.pdf

United States Forest Service (USFS). 2000b. Interim strategic public outreach plan. FS-665. U.S. Dept. of Agriculture. 51p. http://www.fs.fed.us/cr/national_programs/correspondence/spop/fsspop.pdf

United States Forest Service (USFS). 2001b. Santa Rita Experimental Forest. Rocky Mountain Research Station. http://www.fs.fed.us/rm/main/expfor/santarita.html

United States Forest Service (USFS). 2001c. Roadless Area Conservation. U.S. Dept. of Agriculture. http://roadless.fs.fed.us/

United States Forest Service (USFS). 2001e. The Built Environment Image Guide. FS-710. U.S. Dept. of Agriculture. 275p. http://www.fs.fed.us/recreation/programs/beig/

United States Forest Service (USFS). 2002a. Environmental assessment: East Clear Creek watershed health project. Coconino County, AZ: U.S. Dept. of Agriculture, Coconino National Forest, Mogollon Rim Ranger Station. 114p. http://www.fs.fed.us/r3/coconino/nepa/east_clearcreek_ea.pdf

United States Forest Service (USFS). 2003a. Coconino National Forest Off-Highway Vehicle Proposed Forest Plan Amendment. U.S. Dept. of Agriculture, Southwestern Region. 6p. http://www.fs.fed.us/r3/ohv/deis/cocamend.pdf

United States Forest Service (USFS). 2003c. Draft environmental impact statement for cross country travel by off-highway vehicles: Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests, Arizona. U.S. Dept. of Agriculture, Southwestern Region. 201p. http://www.fs.fed.us/r3/ohv/deis/xcountry-deis.pdf

United States Forest Service (USFS). 2003d. Draft environmental impact statement for the Rodeo Chediski Fire Salvage Project: Apache-Sitgreaves and Tonto National Forests. U.S. Dept. of Agriculture, Southwestern Region. 363p.

United States Forest Service (USFS). 2003f. Understanding community-forest relations. Gen. Tech. Rep. PNW-GTR-566. Portland, Oregon: U.S. Dept. of Agriculture, Pacific Northwest Research Station. 162p. http://www.fs.fed.us/pnw/pubs/gtr566.pdf

United States Forest Service (USFS). 2004d. Forest insect and disease conditions in the Southwestern Region, 2003. R3-04-02. Southwestern Region, Forestry and Forest Health. 34p. http://www.fs.fed.us/r3/publications/documents/fidc2003.pdf

United States Forest Service (USFS). 2004g. 36 CFR Part 294 Special Areas; State Petitions for Inventoried Roadless Area Management. U.S. Dept. of Agriculture. Federal Register. 69:42636-42641.

United States Forest Service (USFS). 2004j. Travel management: Designated routes and areas for motor vehicle use (proposed rule). Federal Register. 69(135):42381-42395.

United States Forest Service (USFS). 2004k. Annual monitoring report for implementing the Kaibab National Forest land management plan, Fiscal Year 2003. U.S. Dept. of Agriculture, Southwest Region. 17p. http://www.fs.fed.us/r3/kai/management/efoia/documents/2004_monitoring_report.pdf

United States Forest Service (USFS). 2004n. Fact sheet: Loss of open space. U.S. Dept. of Agriculture. 1p. http://www.fs.fed.us/projects/four-threats/documents/lossofopenspace-fs.pdf

United States Forest Service (USFS). 2004o. Fact sheet on Arizona bark beetle epidemics. U.S. Dept. of Agriculture, Southwest Region. 2p. http://www.fs.fed.us/r3/resources/health/documents/az_2004_beetle.pdf

United States Forest Service (USFS). 2005c. National Forest System land management planning: Final rule. 36 CFR Part 219. Federal Register. 70(3):1023-1034.

United States Forest Service (USFS). 2005d. Record of decision: Final environmental impact statement for integrated treatment of noxious or invasive weeds: Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona. U.S. Dept. of Agriculture, Southwest Region. 14p. http://www.fs.fed.us/r3/kai/projects/nox_weeds/pds/feis-chapters.pdf

United States Forest Service (USFS). 2005f. Loss and fragmentation of open space. Forest Service Policy Position Paper. 5p. http://www.fs.fed.us/publications/policy-analysis/loss-of-open-space-position-paper.pdf

United States Forest Service (USFS). 2005g. Sold and harvest reports for all convertible products. U.S. Dept. of Agriculture, Forest Management. http://www.fs.fed.us/forestmanagement/reports/sold-harvest/index.shtml

United States Forest Service (USFS). 2005i. NFS mineral production summary, fiscal year 2003. U.S. Dept. of Agriculture, Forest Management http://www.fs.fed.us/geology/mgm_locatable.html

United States Forest Service (USFS). 2005j. Four threats—quick facts—unmanaged recreation. U.S. Dept. of Agriculture, Forest Service Website. http://www.fs.fed.us/projects/four-threats/facts/unmanaged-recreation.shtml

United States Forest Service (USFS). 2005m. Kaibab National Forest Official Website. U.S. Dept. of Agriculture. http://www.fs.fed.us/r3/kai/

United States Forest Service (USFS). 2005n. Mission, motto, vision, and guiding principles. U.S. Dept. of Agriculture, Forest Service Website. http://www.fs.fed.us/aboutus/mission.shtml

United States Forest Service (USFS). 2005o. National Forest System Land Management Planning (Final Rule). U.S. Dept. of Agriculture. Federal Register. 70(3):1023-1061. http://www.nplnews.com/library/forestplanning/2004rule.htm

United States Forest Service (USFS). 2005q. Forest health protection. Forest Service Website. http://www.fs.fed.us/foresthealth

United States Geological Survey (USGS). 2004. Climatic fluctuations, drought, and flow in the Colorado River Basin (v. 2). USGS Fact Sheet 2004-3062. U.S. Dept. of the Interior. 4p. http://water.usgs.gov/pubs/fs/2004/3062/pdf/fs2004-3062_version2.pdf

Vincent, C.H. 2004. Grazing fees: An overview and current issues. CRS Report RS-21232. Congressional Research Service, Library of Congress. 6p. http://www.ncseonline.org/NLE/CRS/abstract.cfm?NLEid=60589

Vitousek, P.M., H.A. Mooney, J. Lubchenco, and J.M. Melillo. 1997. Human domination of Earth's ecosystems. Science. 277:494-499. http://www.rachel.org/library/getfile.cfm?ID=200

Washington County. 1994. Washington County General Plan. 25p.

Wilkinson, C.F. 1992. Crossing the Next Meridian: Land, Water and the Future of the West. Island Press, Washington, DC. 389p.

Williams, D.R., and M.E. Patterson. 1996. Environmental meaning and ecosystem management: Perspectives from environmental psychology and human geography. Society and Natural Resources. 9:507-521.

Williams, D.R., and S.I. Stewart. 1998. Sense of place: An elusive concept that is finding a home in ecosystem management. Journal of Forestry. 96(5):18-23.

Wink, R.L., and H.A. Wright. 1973. Effects of fire on an Ashe juniper community. Journal of Range Management. 12:153-167.

Wolff, P. 1999. The taxpayer's guide to subsidized ranching in the Southwest. Center for Biological Diversity, Tucson, AZ. 24p. http://www.biologicaldiversity.org/swcbd/programs/grazing/tax.pdf

Wondolleck, J.M., and S.L. Yaffee. 2000. Making Collaboration Work: Lessons from Innovation in Natural Resource Management. Island Press, Washington, D.C. 277p.

Wright, H.A., and A.W. Bailey. 1982. Fire Ecology: United States and Southern Canada. John Wiley & Sons, New York. 501p.

Yavapai County. 2003. Yavapai County General Plan. Dava Associates Inc. 80p. http://www.co.yavapai.az.us/departments/Dev/unitspc/ordregs/genplan/2003gp.pdf

Yavapai Ranch. 2003. Valuable Yavapai Ranch lands to be entrusted to Forest Service management. Yavapai Ranch Land Exchange Website. http://www.yavapairanch.com/

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 Kaibab National Forest

Output, Value Added and Employment

July 26, 2005

Base Year: 2002

Copyright MIG 2005

	Industry	Industry Output*	Employment	Employee Compensation*	Proprietor Income*	Other Property Income*	Indirect Business Tax*	Total Value Added*
1	11 Ag, Forestry, Fish & Hunting	230.600	2,235.375	15.833	5.137	15.900	6.520	43.390
19	21 Mining	172.418	1,404.143	52.761	-9.431	39.485	7.320	90.135
30	22 Utilities	202.274	718.374	40.040	3.561	60.178	19.090	122.868
33	23 Construction	2,634.775	25,593.155	694.942	188.214	94.962	11.618	989.736
46	31-33 Manufacturing	1,973.479	11,319.464	433.326	42.200	214.726	14.581	704.833
390	42 Wholesale Trade	459.634	4,579.295	173.356	10.531	72.285	76.601	332.773
391	48-49 Transportation & Warehousing	881.053	7,494.879	293.531	40.504	61.145	26.401	421.582
401	44-45 Retail trade	1,782.286	33,349.889	701.171	109.194	268.206	262.330	1,340.901
413	51 Information	450.487	2,978.384	93.431	12.600	73.770	15.569	195.369
425	52 Finance & insurance	637.100	5,006.611	152.326	21.934	162.090	13.215	349.566
431	53 Real estate & rental	820.562	9,368.800	78.688	75.869	308.281	76.498	539.336
437	54 Professional- scientific & tech svcs	541.361	7,896.817	184.640	147.434	53.954	6.844	392.871
451	55 Management of companies	37.940	437.241	15.677	0.724	7.335	0.389	24.124
452	56 Administrative & waste services	398.085	8,568.749	145.054	31.076	35.971	8.101	220.202
461	61 Educational svcs	111.677	2,919.097	60.158	-0.494	1.997	0.740	62.400
464	62 Health & social services	1,674.821	24,568.317	773.300	102.106	98.098	12.629	986.133
475	71 Arts- entertainment & recreation	245.661	4,799.122	72.321	16.235	20.855	13.596	123.006
479	72 Accommodation & food services	1,043.385	26,494.988	352.332	22.458	98.773	60.014	533.577
482	81 Other services	725.485	15,169.352	255.355	65.672	14.490	9.554	345.071
495	92 Government & non NAICs	3,062.439	33,130.598	1,450.911	0.000	1,096.817	140.940	2,688.669
	Totals	18,085.522	228,032.651	6,039.154	885.525	2,799.317	782.549	10,506.544

*Millions of dollars