4. Access and Travel Patterns

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

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

4.1 Historical context and current access issues

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

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

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

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

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

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

4.2 Predominant transportation modes and seasonal flow patterns

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

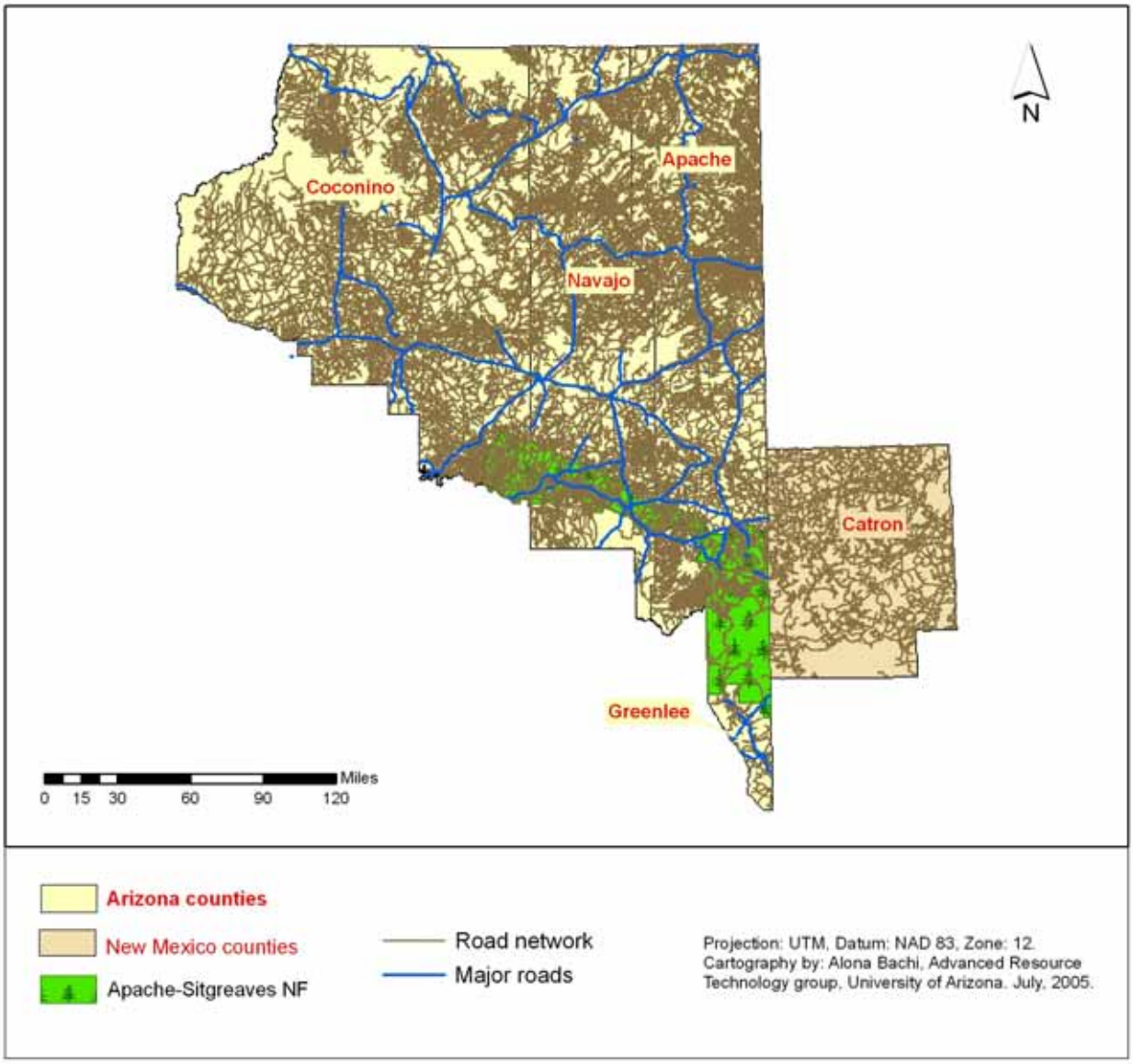


Figure 14. Road Network within the Area of Assessment

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

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

Source: Arizona Department of Commerce: County Profiles

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

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

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

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

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

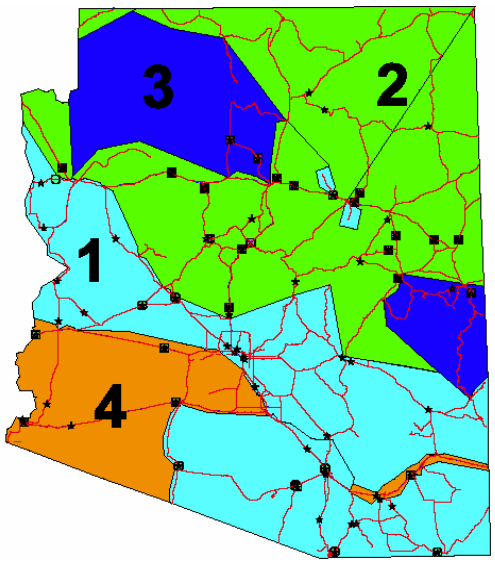
Source: Arizona Department of Transportation, Transportation Planning Division

HPMS Data for the Calendar years 1990 and 2000

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

Seasonal Flow Patterns

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



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

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

Table 25. Daily and Monthly Traffic Variation by Cluster Area, 2003

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

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

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

4.3 Regional transportation plans and roadway improvements

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

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

Table 26. OT Current 5-Year Transportation Facilities Construction Program, Apache-Sitgreaves NF

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

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

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

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

Apache County

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

Coconino County

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

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

Navajo County

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

Fort Apache Indian Reservation (White Mountain Apache Tribe)

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

Other Regional Transportation Planning Authorities

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

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

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

4.4 Internal modes, barriers, and access issues

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

Under revision at the time of this assessment, the five-forest DEIS raises several important issues involving barriers to access and modes of travel within each of the forests. Primary issues include the ability to effectively and efficiently enforce proposed travel restrictions as well as the ability of diverse user groups to access recreational sites and resources such as fuelwood and big game. This effort to regulate cross-country OHV travel is further complicated by the need to adequately assess existing roads and trails and the logistics of implementing OHV restrictions given a planning process addressing ten to fifteen specific sites. How such decisions will affect existing permits and leases and whether the "one-size-fits-all" plan can adequately address OHV issues for a five-forest area are issues still under consideration (Schendel, pers. comm.).

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

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

4.5 Key issues for forest planning and management

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

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

This assessment, however, is primarily concerned with the socioeconomic status and trends among communities outside of the forest, many of which are likely to directly affect future forest management alternatives. The quantity and quality of road networks to and from the ASNF are no exception. A recent report to the United States Congress noted that while the condition of our national interstate highway system has improved considerably over the last fifty years, traffic congestion has also increased. Daily

VMT—the principle measure of traffic density—increased 31% on the national highway system between 1990 and 2000. By comparison, the state of Arizona reported a 38% increase in VMT over the same period. Within the area of assessment for the ASNF, only Coconino County exceeded the state increase with a reported gain of 42.09% in VMT between 1990 and 2000. The same study also found that while "the density of traffic on urban interstate highways is higher than on rural interstates, traffic on rural interstate highways is increasing at a faster rate than on any other class of road." Additionally, the Federal Highway Administration (FHWA) expects to see significant increases in both passenger and freight traffic on the interstate highway system between 2001 and 2010 (17% and 28% respectively) (Siggerud 2002). Given population projections for counties within the area of assessment, the ASNF is likely to be affected by increased traffic flow, congestion, and longer commute times.

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

5. Land Use

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

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

5.1 Historical context and land use patterns

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

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

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

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

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

5.2 Land ownership and land use

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

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

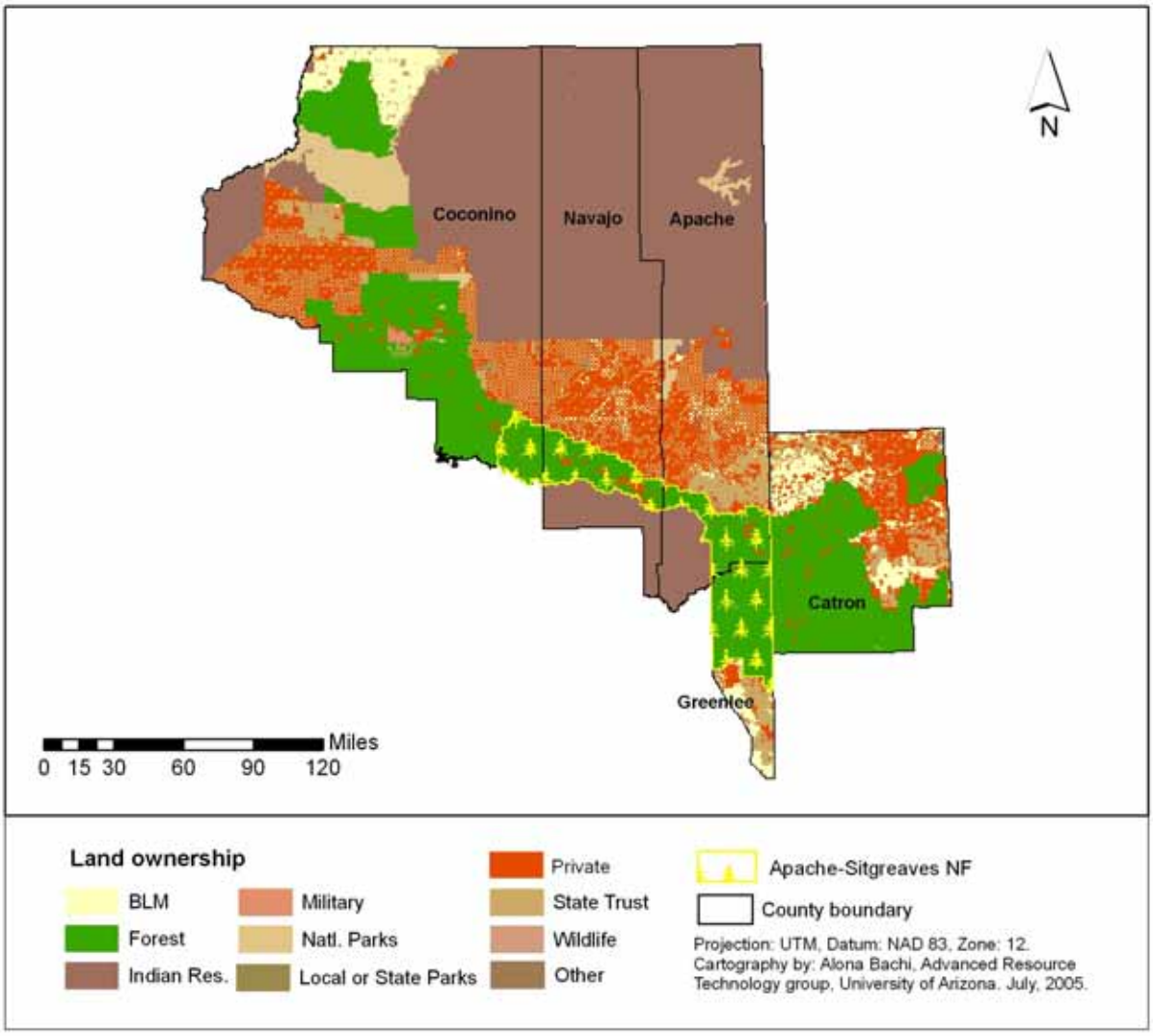
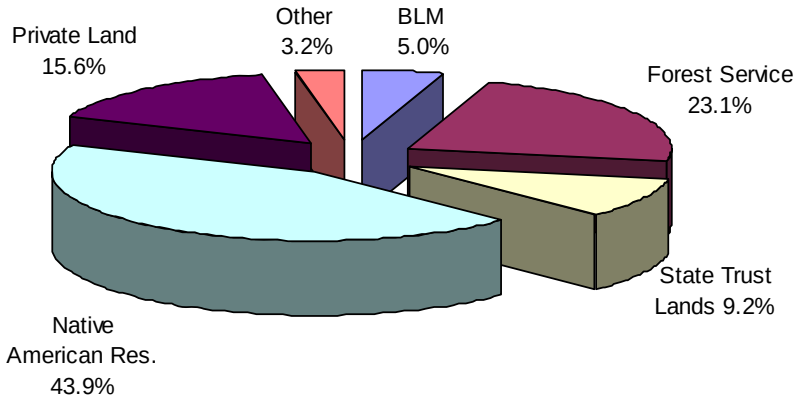


Figure 16. Land Ownership within Area of Assessment



Source: Arizona State Land Department

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

Table 27. Land Ownership by County, 2005

Land Ownership	Acres	Percent
Apache County		
Apache-Sitgreaves NF	491,363.65	6.85%
Bureau of Land Mgmt.	109,972.01	1.53%
Canyon De Chelly NM	92,308.90	1.29%
County Land	1,317.99	0.02%
Game and Fish	6,377.76	0.09%
Hubble Post NHS	160.01	0.00%
Indian Allotments	29,317.21	0.41%
Navajo Indian Res.	4,187,029.04	58.33%
Navajo Reservation	73,330.99	1.02%
Petrified Forest NP	71,618.83	1.00%
Private Land	940,773.51	13.11%
State Trust Land	668,900.61	9.32%
White Mountain Apache Indian Res.	500,480.73	6.97%
Zuni Indian Res.	5,231.20	0.07%
TOTAL	7,178,182.44	100.00%
Coconino County		
Apache-Sitgreaves NF	288,821.10	2.42%
Bureau of Land Mgmt.	605,491.35	5.08%
Coconino NF	1,399,784.27	11.73%
Game and Fish	10,073.02	0.08%
Glen Canyon NRA	40,657.72	0.34%
Grand Canyon NP	681,829.36	5.72%
Havasupai Indian Res.	171,918.92	1.44%
Hopi Indian Res.	493,566.28	4.14%
Hualapai Indian Res.	579,476.99	4.86%
Indian Allotments	4,625.05	0.04%
Kaibab Indian Res.	13,170.00	0.11%
Kaibab NF	1,510,895.79	12.66%
Marble Canyon NM	14,600.29	0.12%
Navajo Army Depot	25,752.93	0.22%
Navajo Indian Res.	3,166,147.29	26.54%
Navajo NM	39.18	0.00%
Navajo-Hopi Joint Use	123,966.85	1.04%
Prescott NF	43,592.26	0.37%
Private Land	1,587,305.56	13.31%
State Trust Land	1,125,427.03	9.43%
Sunset Crater NM	3,035.99	0.03%
Walnut Canyon NM	3,049.74	0.03%
Wupatki NM	36,478.85	0.31%
TOTAL	11,929,705.82	100.00%
Greenlee County		
Apache-Sitgreaves NF	746,981.54	63.55%
Bureau of Land Mgmt.	160,090.68	13.62%
Private Land	95,715.64	8.14%
State Trust Land	172,590.22	14.68%
TOTAL	1,175,378.08	100.00%
Navajo County		
Apache-Sitgreaves NF	488,315.54	7.67%
Bureau of Land Mgmt.	92,960.86	1.46%
County Land	668.23	0.01%
Game and Fish	1,897.45	0.03%
Hopi Indian Res.	1,061,734.31	16.68%
Indian Allotments	44,624.93	0.70%
Navajo Indian Res.	1,723,965.18	27.08%
Navajo NM	312.08	0.00%
Navajo-Hopi Joint Use	761,145.21	11.95%
Petrified Forest NP	22,367.89	0.35%
Private Land	1,141,423.36	17.93%
State Trust Land	372,146.88	5.84%
White Mountain Apache Indian Res.	655,552.30	10.30%
TOTAL	6,367,114.22	100.00%
Catron County		
Bureau of Land Management	581,435	13.17%
USDA Forest Service	2,217,036	50.23%
State land	533,037	12.08%
Private land	1,070,477	24.25%
Indian reservations	11,302	0.26%
Other federal land	533	0.0%
TOTAL	4,413,820	100.00%

Source: Arizona Land Resource Information System

Catron county, New Mexico – Assessor's Office

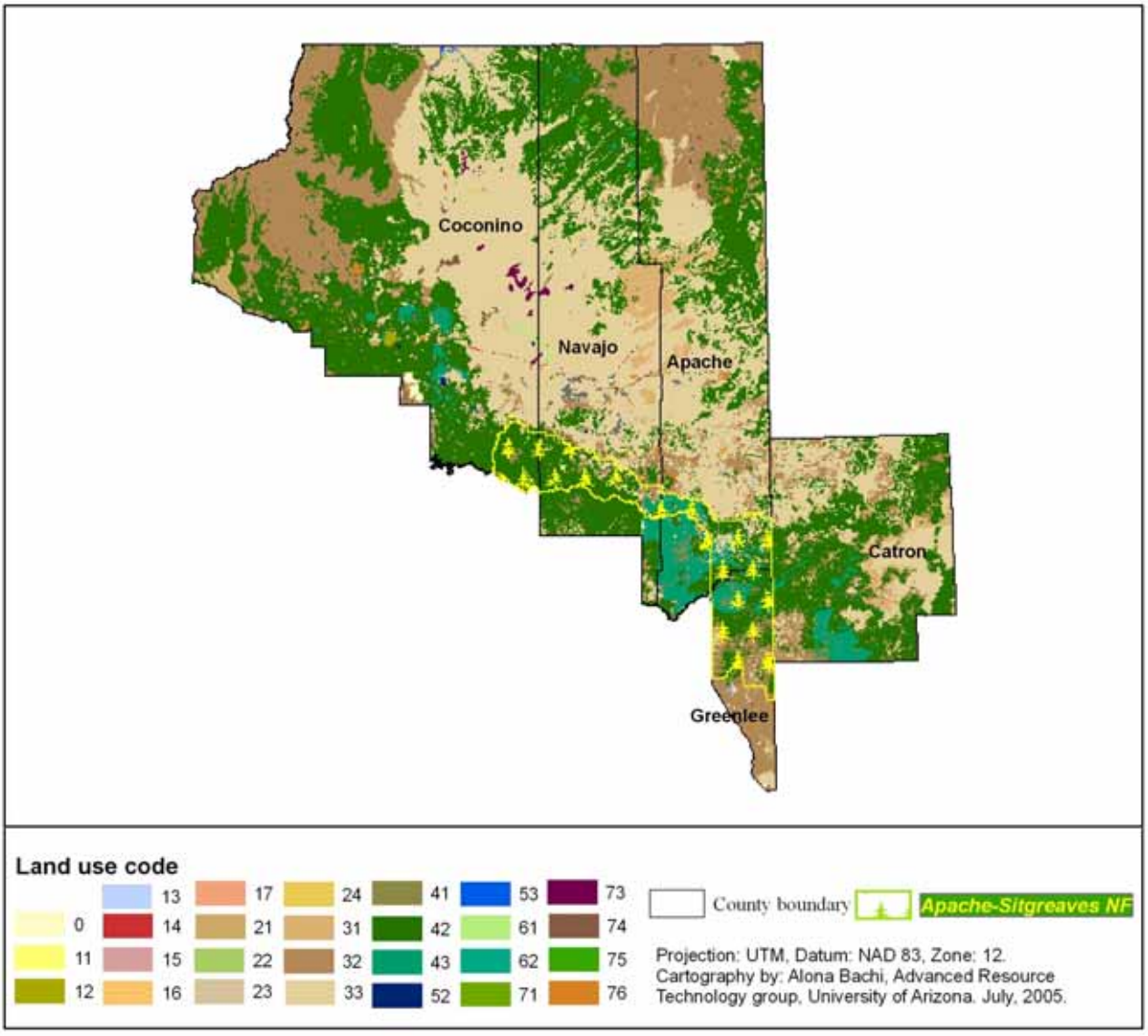


Figure 18. Land Cover within the Area of Assessment

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

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

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

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

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

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

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

5.3 County land use plans and local policy environment

For the purpose of this assessment, county comprehensive plans have been used as a primary source of information on the history of land use within the region, the patterns of development, desired conditions, and current county land use policies. It must be noted, however, that county governments hold no legal authority over independent jurisdictions such as federal and state lands, incorporated cities and towns, or Native American tribal reservations[1]. 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

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

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

Apache County Comprehensive Master Plan

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

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

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

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

The land use element of the Apache County Comprehensive Master Plan establishes seven character areas and one overlay zone that correspond to existing and potential zoning districts. The purpose of the character areas is to protect the existing community character while maximizing balanced economic development. The character areas differ in density and land use intensity depending on the surrounding

land cover characteristics, access to transportation corridors, and traditional uses such as ranching and agriculture. A brief description of the various character areas follows:

- Rural Ranch

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

- Range Land

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

- Community Village

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

- Rural Edge

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

- Highway Service

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

- Recreation

The Recreation character area provides for limited growth in support of vacation and recreation-oriented uses on properties adjacent to or surrounded by national forest land. National forest land transferred to private ownership in the future will be designated within this character area. Appropriate uses include guest lodges, resorts, hotels, bed and breakfasts, restaurants, second homes, and other tourist-oriented commercial and residential uses. Development within this area has minimum foliage requirements (eight

native trees per acre), must maintain natural meadows, and must be "fire-wise." Residential densities greater than one dwelling unit per ten acres and all commercial uses require paved access from the highway. Logging, mining and mineral extraction are allowed subject to the approval of the Board of Supervisors.

- Environmentally Sensitive Development Area (ESDA)

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

- Petrified Forest National Park Overlay (PFNPO)

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

Catron County Comprehensive Land Use and Policy Plan

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

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

coordination on the development of federal and state land use policies that are responsive to the public interest (Catron County 1992).

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

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

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

Coconino County Comprehensive Plan

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

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

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

issues of drainage, utilities, and other infrastructure, often resulting in uncoordinated wildcat development in unincorporated areas (Coconino County 2003).

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

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

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

- Residential land use

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

The pace of residential development and the scarcity of available land have made the affordability of housing a growing issue in Coconino County. The *Coconino County Comprehensive Plan* asserts that median home prices in the county doubled between 1987 and 2000. Given a median household income of $38,256 in 2000, over one-half of residents in the Flagstaff area could not afford a median-priced home.

In unincorporated areas of the county, higher development costs and land prices are due in part to large lot zoning and the fact that more accessible lands with existing infrastructure have already been developed. Attempts by the county to address the issue of housing affordability have included the amendment of the county subdivision ordinance to simplify the subdivision process, the encouragement of higher densities, the clustering of subdivisions, and the selection of locations for manufactured homes. A related trend in residential housing involves the proliferation of seasonal homes in Coconino County. Census data reveal that in 2000, 17% of all homes in Coconino County were used for seasonal occupancy. At issue is the fact that the costs to the county of providing second-home communities with services, such as police protection, solid waste disposal, road maintenance, and snow removal, typically exceed tax revenues from seasonal populations (Coconino County 2003).

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

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

- Commercial and industrial land use

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

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

Navajo County Comprehensive Plan

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

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

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

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

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

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

Finally, the Navajo County Comprehensive Plan makes specific mention of the land use implications surrounding the Rodeo-Chediski Fire. Between June 18 and July 7, 2002, the fire burned 467,099 acres, establishing it as the largest fire in Arizona history. It affected 167,215 acres on the Sitgreaves National Forest, 10,667 acres on the Tonto National Forest, and 289,217 aces on the White Mountain Apache

Reservation. In light of destroyed homes, charred forest cover, and lost tourism potential, the fire has prompted Navajo County to renew its focus on long-term forest health as critical to future growth and development (Navajo County 2004).

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

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

- Sierra Blanca Land Exchange (2005)

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

- Black River Land Exchange (2005)

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

- Camp Tatiyee Land Exchange (2005)

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

- Tonto Apache Land Exchange (2005)

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

- Cote Land Exchange (2005)

According to the most recent ASNF Schedule of Proposed Action, this land exchange involves parcels in all districts of CNF and portions of the ASNF. The SOPA explains that the land acquisition involves parcels in Cochise, Graham, Pima, and Santa Cruz Counties. As of May 15, 2004, the Sonoita Valley Planning Partnership raised concerns that the exchange would sever the last remaining corridor between FS lands and the Las Cienagas National Conservation Area. The current SOPA for the CNF (April 1 – June 30, 2005) describes the Cote Land Exchange as being "on hold" (ASNF 2005a, SVPP 2004).

- Gray Wolf Land Exchange (2005)

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

- Dry Lakes Land Exchange (2005)

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

Ellison Creek Land Exchange (2004)

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

5.5 Key issues for forest planning and management

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

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

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

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

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

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

Much of the current controversy involving land management is encapsulated in the debate over open space. Research shows that the rate of conversion of private parcels from farming, ranching, and forestry to more urban land uses has outpaced population growth over the last several decades (USFS 2005f).

This trend has led to increasingly pointed exchanges between ranchers, farmers, seasonal residents, conservation interests, and home builders over the immediate and long-term value of open space. Meanwhile, all sides of the debate over the management of public lands have become aware of the increasingly important role of Arizona's State Trust lands in conserving natural resources and sustaining urban growth. As such, proposed reforms of the current State Trust land system are likely to be highly relevant to future management plans of the ASNF in light of the amount of State Trust lands within the area of assessment.

Finally, all of the national forests in Arizona are likely to find themselves at the center of growing debate over the management of the state's water resources. This is due to the fact that the forests share primary responsibility for the management of watersheds critical to environmental sustainability as well as residential and industrial growth. Studies have shown that approximately forty percent of surface and subsurface water in Arizona originates on lands administered by the Forest Service (USFS 1983). The role of the ASNF in protecting the integrity of area watersheds is likely to become increasingly important given the rates of projected growth in Coconino, Apache, and Navajo Counties.

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