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Santa Fe National Forest Land Management Plan

Final Environmental Impact Statement

Volume 2. Chapter 3: Socioeconomics and Designated Areas; Glossary; References; and Appendices A through I

Rio Arriba, San Miguel, Sandoval, Santa Fe, Mora, and Los Alamos Counties, New Mexico

Cover photo: Historic photo of snow-covered mountains in the Santa Fe National Forest

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Final Environmental Impact Statement

Rio Arriba, San Miguel, Sandoval, Santa Fe, Mora, and Los Alamos Counties, New Mexico

Lead Agency:	USDA Forest Service
Cooperating Agencies:	East Rio Arriba Soil and Water Conservation District; La Jara Ditch Association; Nacimiento Community Ditch Association; New Mexico Department of Agriculture; New Mexico Economic Development Department; New Mexico Environment Department; New Mexico Forest and Watershed Restoration Institute; New Mexico Department of Game and Fish; New Mexico Energy, Minerals, and Natural Resources Department, State Forestry Division, Las Vegas District and Botany Programs; New Mexico Land Grant Council; Santa Fe – Pojoaque Soil and Water Conservation District; Tierra y Montes Soil and Water Conservation District; and Tesuque Pueblo.
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Abstract: To comply with the National Forest Management Act and address changes that have occurred during the past 30 years, the Santa Fe National Forest proposed to revise the current Land and Resource Management Plan (1987 Forest Plan). This programmatic environmental impact statement documents analysis of impacts of four alternatives developed for programmatic management of the 1.6 million acres administered by the Santa Fe National Forest. The analysis describes anticipated progress toward desired conditions, as well as potential environmental and social consequences of implementing each alternative. Alternative 1 is the no-action alternative, which is the 1987 Forest Plan, as amended. Alternative 2 is the revised Plan and is reflected in the accompanying Land Management Plan for the Santa Fe National Forest; Alternative 2 addresses new information that has become available since the 1987 Forest Plan was published and meets objectives of Federal laws, regulations, and policies; it provides for restoration and diverse ecosystem services. Alternative 3 maximizes natural processes, reducing human uses. Alternative 4 maximizes human uses through timber utilization, access, and facilities maintenance.

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3.17 Socioeconomics

The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. Santa Fe National Forest ("Santa Fe NF" or "the Santa Fe") lands both influence and are influenced by local and national publics. Local communities, particularly those living adjacent to Santa Fe NF lands, benefit from a multitude of goods and services provided by the Santa Fe and the Forest Service. Many local communities were formed based on the availability of roads and ecosystem goods and services such as timber, grazing lands, and other natural resources. Historically, individuals in these communities have benefited from a host of services such as recreation, scenery, employment, and opportunities to connect with nature. The general public across the United States also benefits from the Santa Fe through its provision of clean air and water; conservation of forests; and habitat for aquatic species, wildlife, and threatened or endangered species.

The 2012 Planning Rule states that plans are to guide management so that forests and grasslands contribute to social and economic sustainability, providing people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future (36 CFR 219.35(b)). Specifically, plan components must include standards or guidelines to guide the plan area's contribution to social and economic sustainability, taking into account ecosystem services, as well as multiple uses that contribute to local, regional, and national economies and communities in a sustainable manner. Furthermore, reasonably foreseeable risks to social benefits shall be considered when developing the forest plan. Though not a requirement under the 2012 Planning Rule, job and income estimates—a measure of the economic contribution of forest management—by alternative, is an informative indicator of the economic impacts of different management alternatives on the local economy. Analysis of the socioeconomic setting, and the effects that different alternatives have on it, is also guided by NEPA procedures (36 CFR 220, FSM 1950, FSH 1909.15, FSM 1970 and FSH 1909.17)**.**

The Forest Service manages National Forest System (NFS) lands according to the principle of multiple use. This principle allows the agency to manage land for a variety of uses, including amenity, commodity, non-commodity, and recreation. The Multiple-Use Sustained-Yield Act (Pub. L. 104–333) formalized this management philosophy, stating that the Forest Service is to manage resources to best meet the needs of the American public, with flexibility to provide for "periodic adjustments in use to conform to changing needs and conditions" (Section 4(a) of the Act [16 U.S.C. 531]). For example, cultural and historic resources and uses in the plan area are critical to the social,[1] economic,[2] and ecological sustainability of the plan area, along with the broader southwestern region. Contemporary uses of resources by Native American, Hispanic, and Anglo-American traditional communities are defining elements of the region. Tourists are attracted by the character of these traditional communities, as well as the nature and significance of historic properties on National Forest System lands. This cultural tourism is one source of income for businesses and communities around the Forest. Management and use of public lands also contribute to the

[1] Social sustainability is defined in the 2012 Planning Rule as, "the capability of society to support vibrant communities, and to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another."
[2] Economic sustainability is defined in the 2012 Planning Rule as "the capability of society to produce and consume or otherwise benefit from goods and services including contributions to jobs and market and nonmarket benefits."

economies and social fabric of surrounding communities. Timber and forest products can provide jobs and income, but also maintain communities and local traditions—such as building with vigas and latillas and using fuelwood for heating and cooking; wilderness and other designated areas can generate income as tourist draws and can provide cultural and spiritual values through opportunities for solitude and being close to nature. Other key social benefits include clean air and water, wildfire control, and wildlife and fish habitat. These ecosystem services, along with national forest infrastructure and operations, are considered goods and services related to the Forest Service and are the main ways public lands like the Santa Fe NF contribute to social and economic sustainability.

This section provides a socioeconomic impact analysis. It (1) describes the social and economic conditions of the affected environment; (2) describes how key benefits of the Santa Fe currently contribute to the social and economic sustainability of adjacent communities and national forest users; and (3) evaluates the impacts of the four alternatives on the benefits the Santa Fe provides to local residents and the general public (beneficiaries of the forest). This is only a portion of the full economic and social impacts of the current management and action alternatives and should not be conflated with a representation of the total economic value of the Forest.

3.17.1 Affected Environment

Existing social and economic conditions are necessary to establish the baseline from which to estimate potential consequences of forest management actions. The following section summarizes the current conditions and trends related to the social and economic environment of the planning area, including social and demographic characteristics, local economic conditions, and social benefits. Elements of all these factors have been used as indicators of livelihood, well-being, and resilience (Erbaugh and Oldekop, 2018)—key aspects of understanding the socioeconomic impacts of the Santa Fe and any management actions taken on national forest land.

Information provided in the following section was primarily drawn from the Santa Fe National Forest Assessment (USDA Forest Service 2016b).

3.17.1.1 Study Area

The Santa Fe NF area of influence, or analysis area, is defined as “an area influenced by the management of the plan area that is used during the land management planning process to evaluate social, cultural, and economic conditions. The area is usually a grouping of counties” (FSH 1909.12, zero code). The analysis area is comprised of the six counties immediately surrounding the forest—Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, and Santa Fe counties. Most direct market transactions and expenditures associated with uses on the Santa Fe NF occur in these six counties, and residents have social and economic linkages with the Forest (USDA Forest Service 2016a). There is also 0.2-acre within the Pecos Wilderness of Santa Fe NF located within Taos County. Because of this small amount, Taos County is sometimes included in the analysis area for social, economic, and demographic information. Portions of the Pecos Wilderness Area are located on both the Santa Fe NF and the Carson National Forest (NF).

Additionally, the Santa Fe NF routinely consults with 14 federally recognized tribes that are based in New Mexico. These tribes include: the Pueblos of Santa Clara, Tesuque, Nambe, Ohkay Owingeh, Pojoaque, Santo Domingo, Santa Ana, San Felipe, San Ildefonso, Cochiti, Zia, and Jemez within the analysis area, and the Navajo Nation and the Jicarilla Apache Nation outside of the analysis area. These Tribes recognize the lands managed by the Santa Fe NF as part of their aboriginal or traditional use areas and acknowledge contemporary use of these lands for traditional cultural and religious activities.

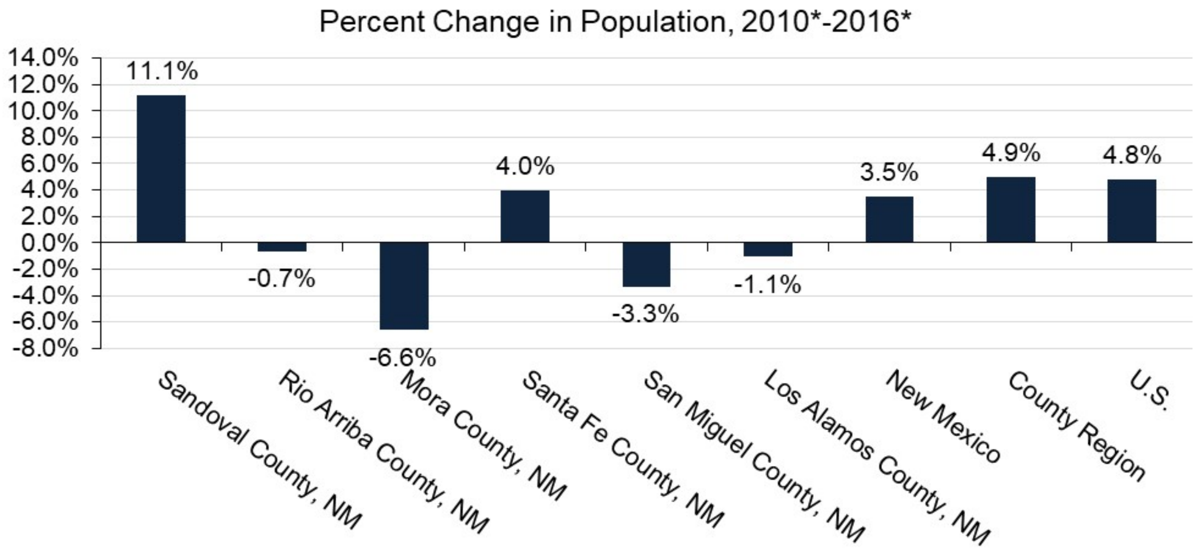
3.17.1.2 Forest Beneficiary Demographics

Beneficiaries are the individuals, groups, and communities that benefit from Forest good and services. This section describes the beneficiaries of the Santa Fe NF by providing an overview of the demographics of the communities in the analysis area. Demographic information provides insight into the social and economic conditions of the communities in and around the Santa Fe NF that may be affected by Forest management.

The data below provide insight into these communities, which are highly heterogeneous, ranging in age, income, race/ethnicity, educational attainment, employment rate, industry, health, cultural values, priorities, and spiritual beliefs. Additionally, Forest beneficiaries may include those outside of the analysis area who value the existence of public lands and the goods and services they provide on a regional to global scale, such as carbon sequestration. Although these beneficiaries are not covered in detail in this report, it is important to acknowledge them as Forest beneficiaries.

3.17.1.2.1 Population, Growth, and Development

New Mexico has a low population density overall, with about 17 people per square mile (UNM-BBER 2013), and the analysis area has only a slightly higher density, at 20 people per square mile since 1980. Despite this, there is variation among the counties, with Los Alamos County at one end (160 people per square mile) and Mora County at the other (3 people per square mile). New Mexico's total population was about 2 million people in 2010, and its growth has been higher than the rest of the United States since the 1980s (USDA Forest Service 2016b). Santa Fe County is the analysis area's population center, with 147,320 people in 2016, followed by Sandoval County with 138,117 people. Mora County has the lowest population by far, with only 4,598 people in 2016—more than 13,000 fewer people than the second least populated (and smallest) county, Los Alamos (USDC 2017b, as reported by EPS 2019a). Within the analysis area, the percent population increase was similar to that of the United States as a whole from 2010 to 2016 (USDC 2017b, as reported by EPS 2019a). Growth was focused in urban counties—those with parts of the cities of Santa Fe, Los Alamos, Albuquerque, or their suburbs (Bernalillo, Rio Rancho, etc.). Sandoval and Santa Fe County, the third and second most urban counties in the analysis area (NASA MODIS 2006, as reported by EPS 2019b), experienced population growth from 2010 to 2016, while Los Alamos (the smallest and most urban county), Mora, Rio Arriba, and San Miguel County all experience population decline in the same time period (figure 1). Despite these recent declines, population has been increasing in all counties since the 1970s with the exception of Mora County, which has seen slight declines (USDC 2017a, as reported by EPS 2019c).

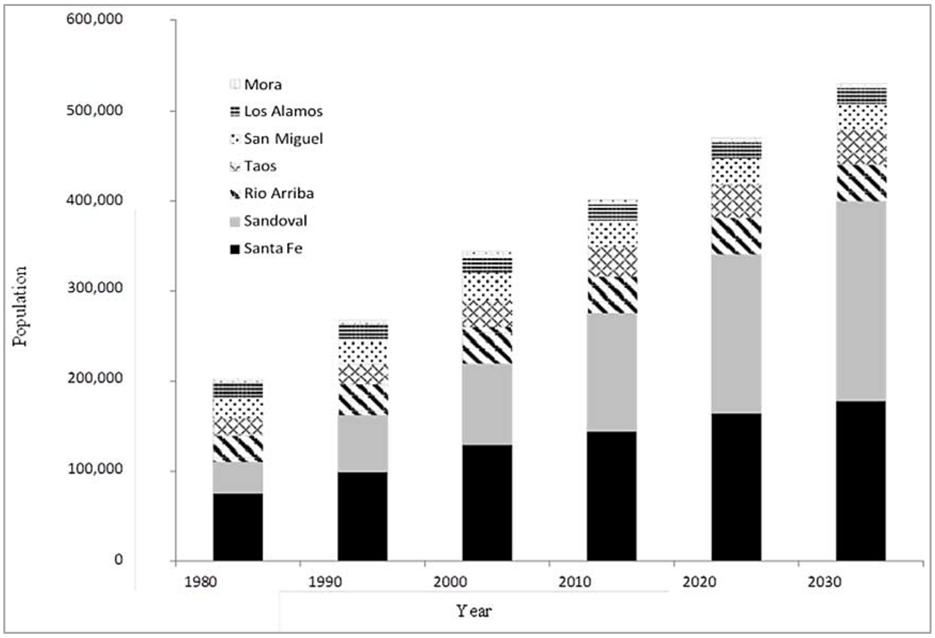


* ACS 5-year estimates used. 2016 represents average characteristics from 2012 to 2016; 2010 represents 2006 to 2010. Data sourced from U.S. Department of Commerce. 2017. Census Bureau, American Community Survey Office, Washington, D.C., aggregated by EPS-HDT (EPS 2019a).

Figure 1. Percent change in population in the six counties of the Santa Fe National Forest analysis area

Much of the population change in the analysis area is driven by migration. Except for Los Alamos County, all counties in the analysis area experienced net migration as the primary factor contributing to population change from 2000 to 2017 (USDC 2014a, as reported by EPS 2019d). This could suggest the areas' amenities, largely public lands-driven, are stimulating in-migration, particularly in the face of growing non-labor income (discussed below) from age-related transfer payments (suggesting an aging or retired population) and dividends, interest, and rent-related payments (EPS 2019a).

The growth rate is expected to slow in the analysis area. While the area experienced growth rates ranging of around 55 percent during the last three decades (over 20 percent greater than the United States as a whole; USDC 2018, as reported by EPS 2019a), between 2020 and 2030 the area's population growth rate is expected to average 15 percent. Growth rates are expected to be highest in Sandoval and Santa Fe County, reflecting past trends (USDA Forest Service 2016b).



Source: U.S. Census Bureau, Decennial Census, 1980, 1990, 2000, and 2010; UNM-BBER, November 2012 population projections.

Figure 2. Historical and projected population of Santa Fe NF counties

Urban areas are expected to increase in population density in the next several decades (UNM-BBER, 2013). Even in counties where the population has been declining, residential development has been growing. This reflects national trends of conversion of agricultural and open space private lands to residential tracts, often at low-densities (Mora County has experienced more residential development since 2000 than Los Alamos County, which is already comparatively urbanized; Theobald 2013, Gude et al. 2008, USDC 2011, as cited in EPS 2019c). Development patterns like this can lead to quality of life issues, largely through wildfire risk, potential for wildlife encounters (Theobald 2013, Gude et al. 2008, USDC 2011, as cited in EPS 2019c), and difficulties in accessing amenities. Natural areas are also impacted by the increase in human traffic and activity as residential developments push farther into previously undeveloped lands. The high degree of second homes being built in wildland-urban interface areas (WUI; Gude et al. 2008, USDC 2011, as cited in EPS 2019e) further suggests growth and development in the analysis may be driven in part by public land amenities, such as access to recreation and scenic opportunities.

Another factor of residential development is development in the WUI, which creates increased challenges for Forest management. WUI development increases residential density along Forest edges, with consequences for potentially sensitive resource areas, like riparian areas, and can impact Forest and fire management activities. Los Alamos County had the most WUI development, 69.5 percent, in 2010 (figure 3), but also has the smallest total land area, and WUI land area (Gude et al. 2008, USDC 2011, as cited in EPS 2019e). Mora County and Sandoval County have had the highest percent change in WUI development since 2000, indicating increased urban development (figure 4) in previously undeveloped land. Although Los Alamos County had the most WUI development, all counties have had increases in residential development in the last decades, portions of which occur within WUI areas, and those with projected population increases may be predicted to have increases in WUI development in the future. In Mora County, almost 50 percent of homes in the WUI are second homes (Gude et al. 2008, USDC 2011, as cited in EPS 2019e), a pattern repeated across the whole of New Mexico (40 percent). This suggests a disparity between those who are benefitting from increased risks and costs of firefighting that are driven by WUI development and those who are bearing those costs; conversely, those who can afford second homes may be more capable of recovering after fire devastation, and thus willing to ignore the risk and impacts.

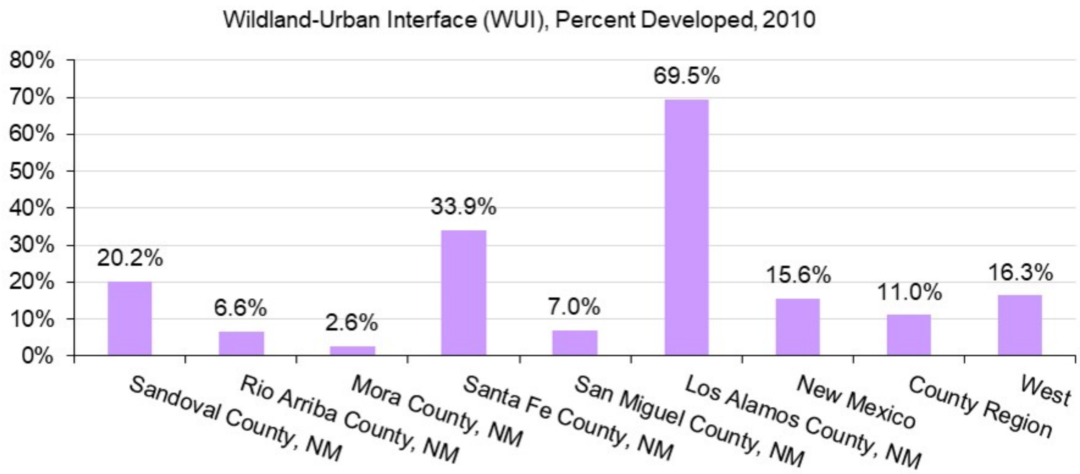


Figure 3. Percent of WUI developed in 2010. (Theobald 2013, Gude et al. 2008, USDC 2011, as cited in EPS 2019c)

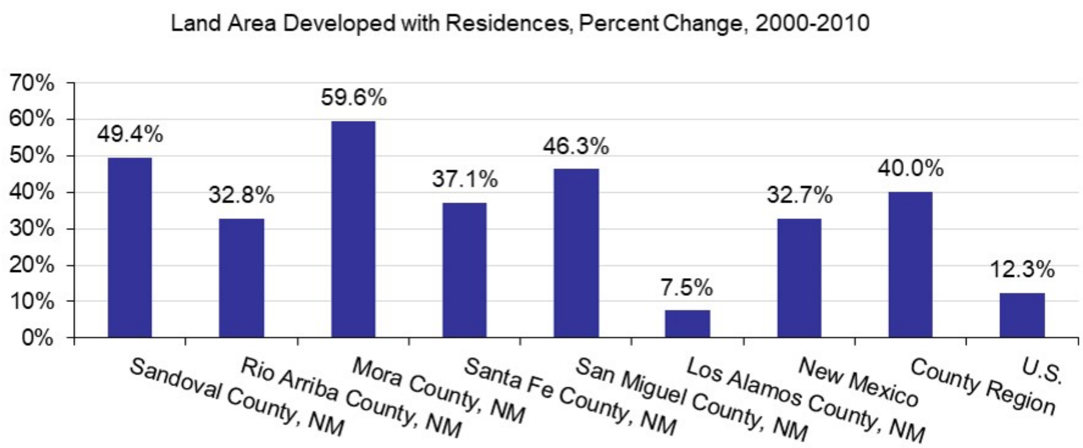


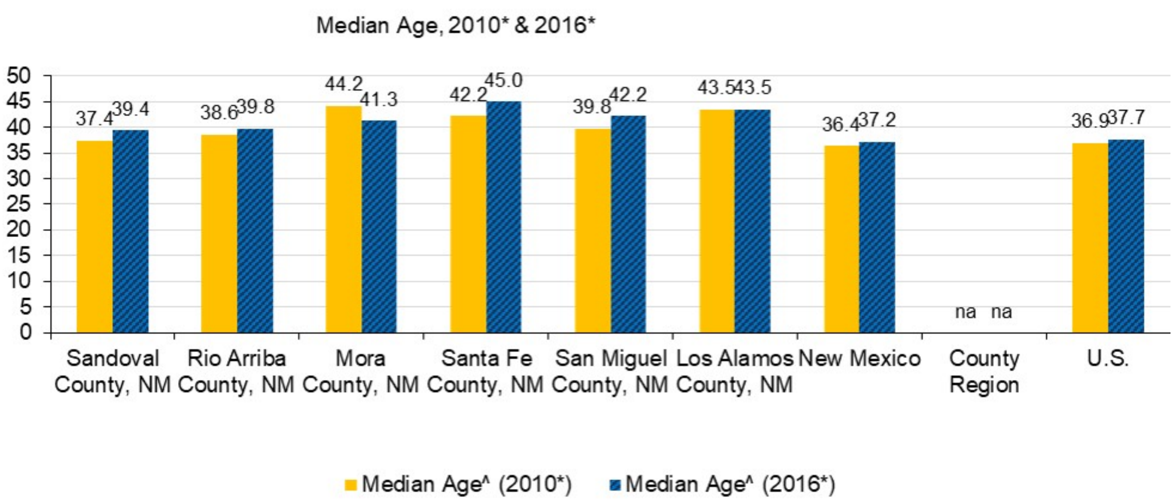
Figure 4. Percent of change of WUI developed between 2000 and 2010

Mora County has had the greatest change, followed by Sandoval County. Little change can indicate either little development or that a county was already highly urbanized in 2000. Increasing WUI development increases wildfire risk to homes, and firefighting dangers and costs. (Theobald 2013, Gude et al. 2008, USDC 2011, as cited in EPS 2019c)

3.17.1.2.2 Age and Education

Characteristics that are associated with labor market outcomes may be important determinants of vulnerability. Educational attainment is associated with earning potential and labor market status. In general, labor markets tend to support more employment opportunities for households with high levels of education relative to those with less education. Age could be associated with vulnerability, although the direction of the relationship is not clear. Younger workers may have greater labor market potential and flexibility, but lack of experience may limit immediate labor market options. Older workers with more experience may have greater earning potential but less labor market flexibility.

Age and education level have also been increasing in the analysis area. Between 2010 and 2016, median age increased slightly or stayed steady in all counties except Mora County, where it decreased slightly. Percent changes in all other counties were higher than that of the United States as a whole. Median ages are skewed older in the analysis area due to the increase in people 65 years and older from 2010-2016. This is the age category with the largest recent increases (USDC 2017b, as reported by EPS 2019a), and reflects a trend toward an increasingly older population in the analysis area. This trend could be a factor driving the growth in second homes in WUI areas (typically bought by older, wealthier families or individuals) and growth in non-labor income over the same time period. However, in 2016 those between 45 and 65 were the largest age group overall, followed by those under 18. This suggests that while there may continue to be a significant contingent of older Forest beneficiaries (particularly if retirees migrate to the area to supplement an aging population), the Forest will still need to consider children, young adults, and families as key beneficiaries. Data from the National Visitor Use Survey (USDA Forest Service 2018b), though, does indicate that those between 40 and 60 are visiting the Santa Fe NF the most.



* ACS 5-year estimates used. 2016 represents average characteristics from 2012-2016; 2010 represents 2006-2010.
Data Sources: U.S. Department of Commerce. 2017. Census Bureau, American Community Survey Office, Washington, D.C.

Figure 5. Average median age of the population of the analysis area in 2010 and 2016. Changes were slight across all counties but show a trend toward an older population. (EPS 2019a).

Education levels in the analysis area have been increasing for the past decade as well (see table 1). In 2012, over 75 percent of the populations of each county had at least a high school diploma, and between 10 and 30 percent of the populations had a Bachelor's degree or higher.[3] In 2016, over 80 percent of the population 25 years or older had at least a high school diploma, and between 13 and 64 percent had a Bachelor's degree or higher.[4] Los Alamos County consistently has the highest education levels in the analysis area, followed by Santa Fe County (USDC 2017b, as reported by EPS 2019a). Educational attainment (the highest level of formal education a person has received) is

[3] Average data of total population 25 years and older from 2008-2012
[4] Average data of total population 25 years and older from 2012–2016

linked to a host of social and economic outcomes, including median earnings, homeownership, health, and children's outcomes. These all impact quality of life over time. Higher education levels are also associated with increased participation in birding, non-motorized winter activities, backcountry activities, and wildlife viewing. However, participation in fishing, hunting, motorized off-road use, and motorized winter activities decreases (UNM-BBER 2013).

Table 1. Percentage of residents within each county of the analysis area with different education levels, representing an average of data from 2008 to 2012*

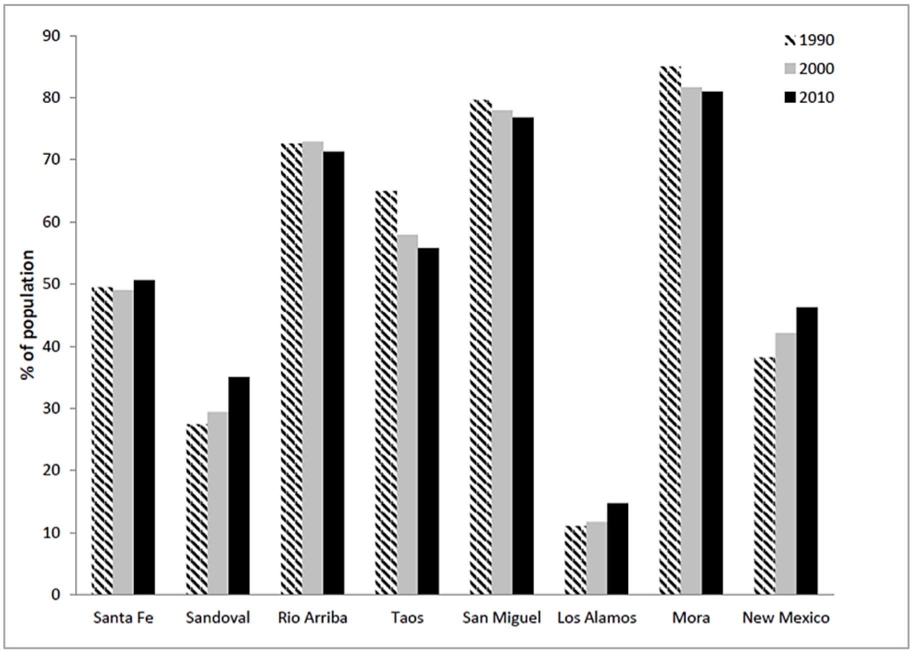
	Rio Arriba County, NM	Sandoval County, NM	San Miguel County, NM	Santa Fe County, NM	Los Alamos County, NM	Mora County, NM	Santa Fe NF Region	United States
Total Population 25 or older	26,792	86,170	19,586	102,931	12,725	3,547	251,751	204,336,017
Percent of Total								
No high school degree	21.7%	9.4%	17.1%	13.3%	2.6%	11.8%	12.6%	14.3%
High school graduate	78.3%	90.6%	82.9%	86.7%	97.4%	88.2%	87.4%	85.7%
Associate degree	7.6%	9.7%	6.1%	5.9%	6.7%	10.0%	7.5%	7.7%
Bachelor's degree or higher	15.9%	28.1%	21.3%	39.3%	63.2%	13.2%	32.4%	28.5%
Bachelor's degree	9.1%	16.8%	12.1%	21.0%	26.1%	3.7%	17.6%	17.9%
Graduate or professional	6.7%	11.3%	9.2%	18.4%	37.1%	9.4%	14.8%	10.6%

* Data were calculated by American Community Survey using annual surveys conducted during 2008 to 2012 and represent average characteristics during this period.

Combined with projected population increases in denser, more urban counties, these changes could result in shifts in what values and priorities dominate public interest in forest management, and how and where forest use occurs. Older populations are more likely to be retired and may have more time to spend on forest recreation; they may also enjoy different types of recreation (e.g., scenic drives or low-level hiking, rather than mountain biking or rock climbing). More urban and more educated populations may also have different connections to the Forest than traditional, rural populations, and different demands for recreation, all of which could change the overall nature of how communities interact with the forest and forest management.

3.17.1.2.3 Ethnicity and Race

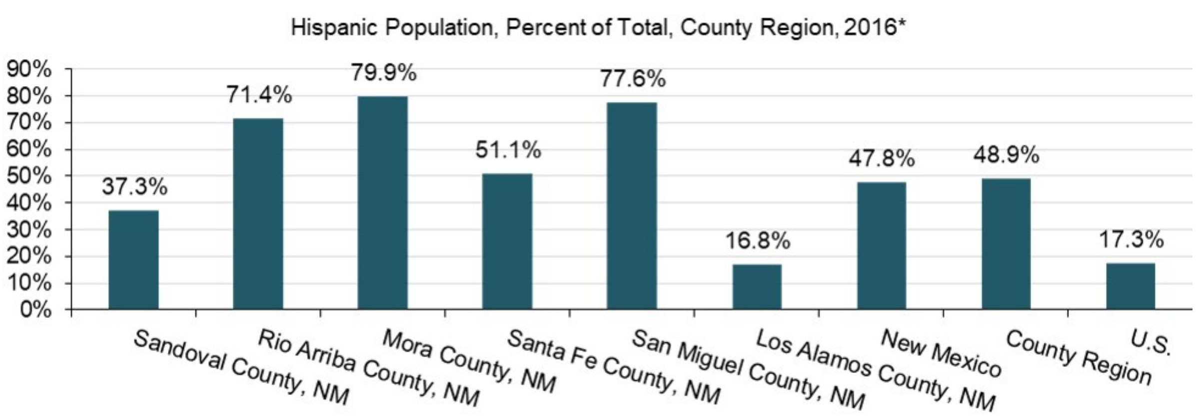
Since at least 1990, the analysis area's ethnic composition has been relatively stable. According to the University of New Mexico Bureau of Business and Economic Research (BBER), the portion of the New Mexico population that is of Hispanic descent is increasing. In 1990, 38 percent of the state's population was Hispanic, and by 2010, 46 percent was Hispanic. In 1990, the analysis area's population was more Hispanic than the state's overall population. As the state's population has become more Hispanic, it more closely resembles the ethnic composition of the analysis area. In 2010, the populations of both the state and the analysis area were approximately 50 percent Hispanic and 50 percent non-Hispanic. Growth in the Hispanic or Latino population varies considerably by county; however, with several counties in the analysis area showing slight decreases in the Hispanic or Latino population over time (figure 6).



Note: There has been an increase in the Hispanic and Latino population state-wide, although it has been more stable for the analysis area. Source: U.S. Census Bureau, Decennial Census, 1990, 2000, and 2010, Summary File 1.

Figure 6. Percentage of Hispanic or Latino population across Santa Fe NF analysis area counties and in New Mexico, for 1990, 2000, and 2010

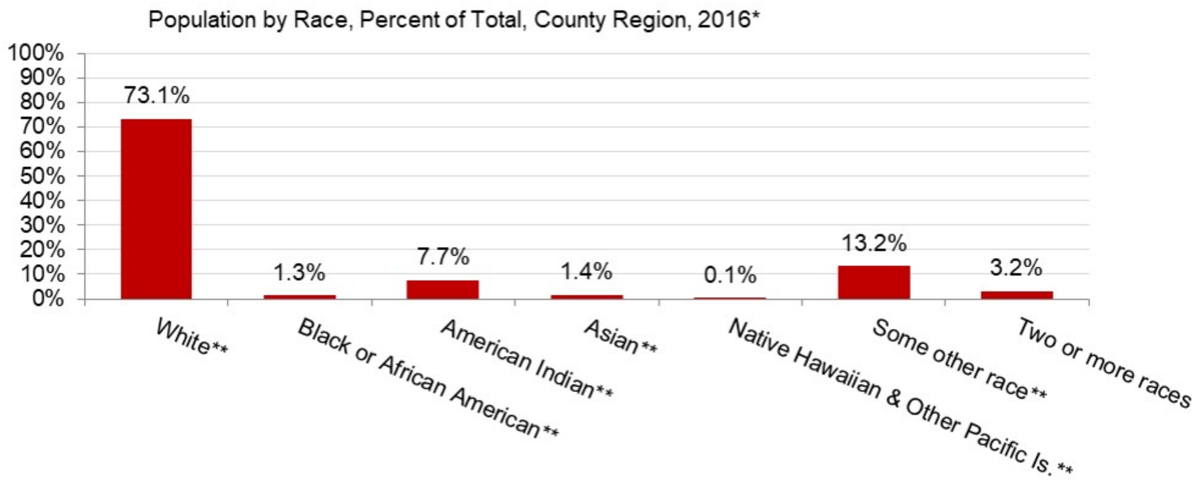
In 2016, the ethnicity of the analysis area remains consistent, with approximately 50 percent of the population identifying as Hispanic or Latino. Mora County remains the most Hispanic/Latino County, at around 80 percent, followed closely by San Miguel and Rio Arriba Counties. Los Alamos had the lowest percent Hispanic/Latino population in 2016, at less than 20 percent and is closely aligned with the ethnic breakdown of the broader United States (USDC 2017a, as reported by EPS 2019a).



Data Sources: U.S. Department of Commerce. 2017. Census Bureau, American Community Survey Office, Washington, D.C.
*ACS 5-year estimates used. 2016 represents average characteristics from 2012-2016. (EPS 2019a)

Figure 7. Population by ethnicity in the six counties in the analysis area, New Mexico, and the United States

In terms of race, "White" is the dominant population, although the portion of population that self-identified as "White" has been decreasing over time. It fell from 76 to 68 percent between 1990 and 2010. It rose slightly to around 73.5 percent in 2016. This decline has been offset by minimal increases among other racial groups, most notably by those who self-identified as "Other" (UNM-BBER 2013), who in 2016 made up about 13 percent of the analysis area racial makeup. Within the analysis area, less than 3 percent of people self-identified as the combined races of Black or African American, Native Hawaiian, and Other Pacific Islander, or Asian (figure 7).



Data Sources: U.S. Department of Commerce. 2017. Census Bureau, American Community Survey Office, Washington, D.C.
* ACS 5-year estimates used. 2016 represents average characteristics from 2012-2016.
** Percentages are by an individual race alone unless otherwise noted

Figure 8. Population by race in the analysis area. ACS 5-year estimates used. 2016 represents average characteristics from 2012–2016. (EPS 2019a)

The third highest racial percentage in the analysis area is American Indian and Alaskan Native. The occupation and use of the plan area by Native Americans (American Indians) with Pueblo and Athabaskan ethnic affiliation, and groups ancestral to these ethnic affiliations, has occurred since time immemorial.

Native Americans comprise roughly 10 percent of the New Mexico's population, and about 8 percent of the analysis area population (USDC 2017b, as reported by EPS 2019a). They are a larger portion of the population in Rio Arriba County (roughly 16 percent in 2010) than other analysis area counties, and up a minimal percent of population in Mora County, San Miguel County, and Los Alamos County (table 2). For all counties in the analysis area except Mora County, there was a higher concentration of Native American-identified populations than seen on average in the rest of the United States. In some counties, the percent of the population identifying as Native American is well over 5 times the percent of the United States population as a whole (USDC 2017b, as reported by EPS 2019a). The Native peoples most represented in the analysis area are those identifying as Navajo, Apache, or Pueblo, with Pueblo peoples outnumbering the other two by far. Populations of identifying as part of other Tribal Nations are highly uncertain and do not make up a significant part of the Native population (USDC 2017b, as reported by EPS 2019a).

It is important to note that Native American populations have been historically difficult to count via methods such as the census, with about 25 percent of Native peoples living in hard-to-count census tracts (LCEF 2018). As seen in table 2 below, there are high levels of uncertainty surrounding Native

American census data (LCEF 2018), and there may well be considerably higher populations of Native Americans in and around the analysis area who have cultural and historic ties to the lands managed by the Santa Fe NF. Impoverished households, those experiencing housing insecurity, and areas of lower educational attainment are typically more difficult to count (LCEF 2018). Native peoples tend to be at-risk for experiencing these stressors due to historic discrimination and geographic and cultural displacement. Native peoples also have a lower median age than the average U.S. population, and children are more difficult to get an accurate count of than adults (LCEF 2018). Undercounting can lead to lack of representation of community interests in policy decision-making (LCEF 2018), potentially resulting in undocumented or unresolved social and environmental justice infractions. For the Santa Fe NF, this is a particular challenge as Native peoples and communities are an important Forest beneficiary group due to their ancient ties to the land and resources the Santa Fe NF manages.

Table 2. American Indian and Alaska Native population and percent by race in the assessment area and the United States. Population totals are from the American Community Survey 5-year average from 2012-2016 (USDC 2017b, as reported by EPS 2019a).

	Los Alamos County	Mora County	Rio Arriba County	Sandoval County	Santa Fe County	San Miguel County	County Region	New Mexico	United States
Total Population	17,895	4,598	39,924	138,117	147,320	28,350	409,165	2,082,669	318,558,162
Percent of Total									
Total Native American	1.3%	*0.1%*	15.6%	12.4%	3.4%	1.3%	7.6%	9.3%	0.8%
American Indian Tribes	1.1%	*0.0%*	14.1%	11.9%	3.1%	1.1%	7.1%	8.7%	0.6%
Alaska Native Tribes	*0.0%*	*0.0%*	*0.1%*	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Non-Specified Tribes	*0.2%*	*0.0%*	0.7%	0.4%	0.2%	*0.1%*	0.3%	0.4%	0.1%

High Reliability (standard font): Data with coefficients of variation (CVs) <12% indicate that the sampling error is relatively small.

Medium Reliability (underlined): Data with CVs between 12 and 40% indicate that the values should be interpreted with caution.

Low Reliability (in italics): Data with CVs >40% indicate that the estimate is considered very unreliable.

3.17.1.2.4 Persons with Disabilities

In the state of New Mexico for 2016, 14.9 percent of the total population identified that they had one or more disability (USDC 2017c). A disability as defined by the U.S. Census Bureau can include hearing difficulty, vision difficulty, cognitive difficulty, ambulatory difficulty, self-care difficulty, and independent living difficulty. See figure 9 for the distribution of people with disabilities in the analysis area.

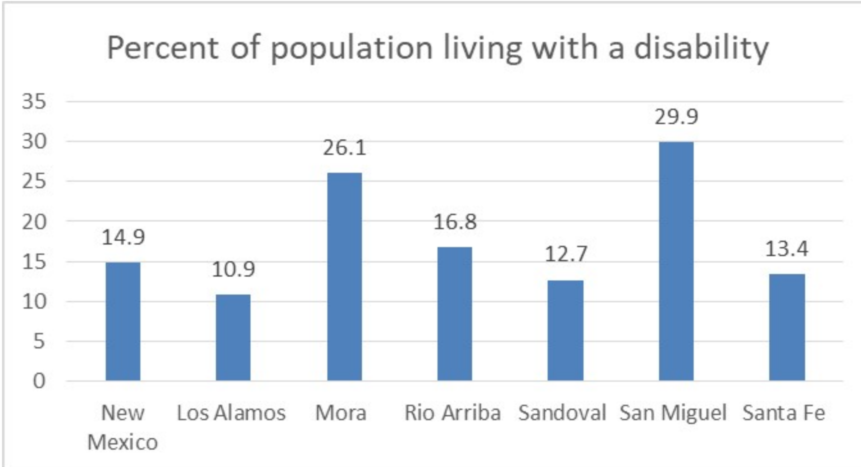


Figure 9. Percentage of the population of New Mexico and the six counties of the analysis area who are living with a disability, as reported in the American Community Survey 2016 5-year estimate, which represents a 5-year average 2012-2016 (USDC 2017c)

The average for the six-county area based on the county percentages is about 17.8 percent. This is higher than New Mexico as a whole, and Mora County and San Miguel County have populations of people with disabilities over five percentage points higher than that of the analysis area average. This suggests that people with disabilities may be a significant minority population in these counties that forest management direction needs to consider. In particular, forest management direction related to developed recreation (e.g., developed recreation sites, trail and interpretive signage, etc.) and access could disproportionately impact people with disabilities.

3.17.1.3 Local Economic Conditions

Overall, economic conditions in the analysis area are mixed when compared to the United States as a whole. Lower average income levels and earnings point to lower levels of prosperity than that of the United States as a whole, and higher unemployment rates indicate higher levels of economic stress. Per capita income in 2016 was $44,135 in the analysis area, compared to the United States' $50,280, and the unemployment rate was 6.4 percent compared to the U.S. unemployment rate of 4.9 percent. However, trends suggest incomes are increasing.

The higher per capita income, the higher the likelihood the region has greater job opportunities, skilled residents, greater economic resiliency, and better developed infrastructure—in other words, increased well-being for individuals and the community. In the context of forest management, economic benefits from forest management activities are variable and depend on economic drivers beyond those in the forest's analysis area (Erbaugh and Oldekop 2018). The forest can contribute to economic sustainability to the surrounding communities, though, through provisioning jobs and labor income directly or indirectly via forest-related programs like mining, agriculture (grazing and timber), and recreation. Payments to counties (Secure Rural Schools and Payments in Lieu of Taxes) also help support community economic sustainability. Resource-dependent communities and individuals, particularly those that may live near or below the poverty line, also may depend on forest products like fuelwood, game animals, edible and medicinal plants to supplement incomes or provide basic needs.

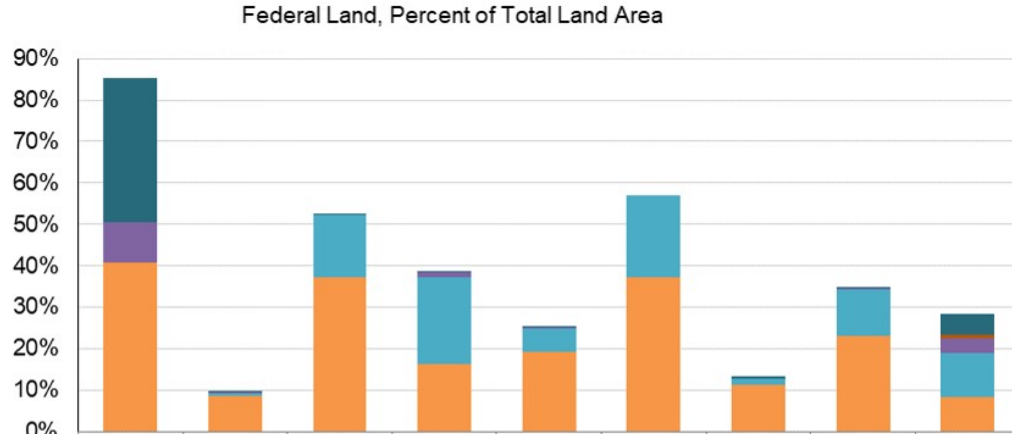
In general, though, the average income of the communities in the analysis area can help assess their baseline ability to access basic needs and thrive, which can then be used to help assess how changes in the forest may affect community livelihoods. Improved livelihoods suggest a community may be more resilient to changes in forest management, while a lack of access to basic needs may indicate a greater reliance on forest products (e.g., fuelwood for survival heating in the winter, or hunting for food), and thus, a greater potential to be impacted by changes in forest management.

Within the analysis area, Santa Fe County has the largest population and serves as an important center for the arts and cultural industries, and provides a multitude of recreational opportunities. It also has the most state government employees (11 percent of total employment), as it houses the New Mexico state capitol, Santa Fe. Santa Fe County provides more employment opportunities than any other Santa Fe NF county with more than 40 percent of all area employment within its borders, and has greater economic opportunities than all counties except for Los Alamos. Together, Santa Fe and Los Alamos Counties consistently have higher per capita incomes and lower unemployment rates than the other four counties in the analysis area. Conversely, Mora County consistently has the lowest per capita income and highest unemployment rates.

Tourism is an important source of economic activity and the accommodation and food services industry represents a significant portion of total covered wage and salary employment in Santa Fe County (13 percent in 2010, a number that has since increased). Tourism-related industries accounted for about 29 percent of jobs in Santa Fe County in 2016 (USDC 2018, as reported by EPS 2019f).

Due to the presence of Intel in the City of Rio Rancho, the Sandoval County manufacturing industry is significantly more prominent there than it is in other assessment area counties or the state as a whole. In Los Alamos County, Los Alamos National Laboratory accounts for the professional, scientific, and technical services industry, which were the assessment area's largest source of employment outside of government in 2010. Today, Los Alamos County provides 10 percent of all area employment—although it has the lowest employment in the tourism sector—and Sandoval County has become the area's second largest source of employment, representing 21 percent of all employment. (USDA Forest Service 2016b)

In terms of land base, a little over 20 percent of land in the analysis area is managed by the USDA Forest Service. Los Alamos has the highest percent of its land under Forest Service management, at 41 percent, closely followed by Rio Arriba at 37.3 percent. Mora County has only 9 percent of its land managed by the Forest Service—a number comparable to the United States as a whole. (USGS GAP, as cited in EPS 2019b)



	Los Alamos County, NM	Mora County, NM	Rio Arriba County, NM	Sandoval County, NM	Santa Fe County, NM	Taos County, NM	San Miguel County, NM	County Region	U.S.
Other Federal	34.8%	0.4%	0.1%	0.2%	0.3%	0.0%	0.6%	0.4%	4.9%
Military	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
Park Service	9.5%	0.1%	0.0%	1.1%	0.1%	0.0%	0.2%	0.3%	3.4%
BLM	0.0%	0.6%	15.1%	21.0%	5.7%	19.9%	1.5%	11.2%	10.6%
Forest Service	40.9%	8.7%	37.3%	16.3%	19.2%	37.1%	11.1%	23.0%	8.4%

Figure 10. Percentage of lands owned by the Federal Government, by county (USGS GAP 2016, NASA MODIS 2006, USDC 2014b, as reported in EPS 2019c)

3.17.1.3.1 *Income and Income Distribution*

In 2012 and 2016, only Los Alamos and Santa Fe Counties had per capita income exceeding the national average. Income and income distribution varied widely by county in 2012. The distribution of household income at different points in time illustrated that the distribution has improved over time—the portion of households with incomes of less than $25,000 has declined, while the portion with incomes of $50,000 or more has increased. This statewide trend is expected to continue, but income and income distribution varies widely by county. Notably, there are varying levels of income distributions among counties (represented by the Gini Coefficient; table 3). Higher Gini Coefficients indicate more unequal income distributions.

In 2012, average per capita incomes ranged from $18,576 to $50,740, and average median household incomes ranging from $30,499 to $106,426 (USDA Forest Service 2016). By 2016, per capita income remained highest in Los Alamos County and lowest in Mora County, and Los Alamos and Santa Fe counties remained the only two in the analysis area that were higher than the national average (table 3). The entire analysis area had an average per capita income less than the national average in 2016 (figure 11).

Table 3. Per capita income and income distributions of the counties in the Santa Fe NF analysis area. Population totals are from the American Community Survey 5-year average from 2012-2016 (USDC 2017b, as reported by EPS 2019a). The Gini Coefficient is a summary value of the inequality of income distribution. A value of 0 represents perfect equality and a value of 1 represents perfect inequality. The lower the Gini coefficient, the more equal the income distribution. Median household income and Gini coefficient are not available for metro and non-metro or regional aggregations and represented by n/a.

	Sandoval County	Rio Arriba County	Mora County	Santa Fe County	San Miguel County	Los Alamos County	New Mexico	County Region	United States
Per Capita Income ($s)	$27,060	$19,600	$13,826	$34,176	$16,990	$51,066	$24,459	*n/a*	$29,829
Median Household Income ($s)	$60,158	$33,972	$21,190	$55,370	$27,000	$105,902	$45,674	*n/a*	$55,322
Total Households	48,534	13,343	1,540	61,286	10,630	7,586	762,551	142,919	117,716,237
Gini Coefficient	0.42	0.51	0.46	0.48	0.51	0.37	0.48	*n/a*	0.48
Percent of Total									
Less than $10,000	6.7%	16.7%	9.4%	7.3%	20.4%	3.7%	9.7%	8.8%	7.0%
$10,000 to $14,999	3.8%	8.9%	25.1%	4.5%	11.1%	2.9%	6.5%	5.3%	5.1%
$15,000 to $24,999	9.2%	13.4%	21.7%	10.1%	15.8%	2.1%	12.5%	10.2%	10.2%
$25,000 to $34,999	7.9%	12.2%	12.1%	10.2%	12.2%	3.8%	11.0%	9.5%	9.9%
$35,000 to $49,999	13.4%	13.5%	13.8%	13.4%	13.5%	8.0%	13.9%	13.1%	13.2%
$50,000 to $74,999	20.6%	15.3%	10.0%	18.0%	13.1%	10.2%	17.1%	17.8%	17.8%
$75,000 to $99,999	13.5%	7.1%	*1.5%*	12.0%	6.0%	16.5%	11.3%	11.7%	12.2%
$100,000 to $149,999	15.2%	7.9%	*5.3%*	13.2%	6.2%	23.6%	11.0%	13.3%	13.5%
$150,000 to $199,999	5.9%	3.9%	*0.3%*	5.4%	1.0%	16.1%	3.8%	5.6%	5.4%
$200,000 or more	3.7%	1.2%	*0.7%*	6.1%	0.7%	13.1%	3.1%	4.7%	5.7%

High Reliability (standard font): Data with coefficients of variation (CVs) <12% indicate that the sampling error is relatively small.

Medium Reliability (underlined): Data with CVs between 12 and 40% indicate that the values should be interpreted with caution.

Low Reliability (in italics): Data with CVs >40% indicate that the estimate is considered very unreliable.

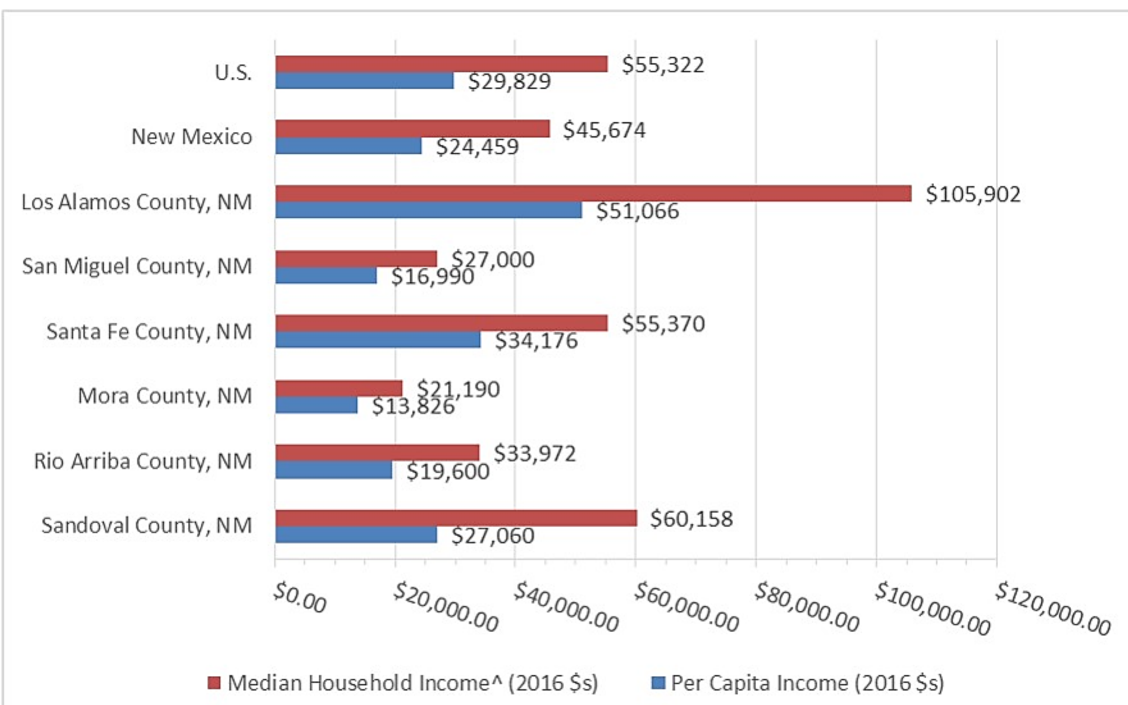


Figure 11. Per capita and median incomes in the analysis area (USDC 2017b, as reported by EPS 2019a)

Of the 14 Tribes and Pueblos the Santa Fe NF regularly consults with,[5] income and income distribution also varied widely. However, the majority of households in the Native region (more than 50 percent) have an income of $35,000 per year or less, with 20 percent of households earning less than $10,000. The top 20 percent of households in the Native region accumulated over half of the total income in 2017. (USDC 2018, as reported by EPS 2019g)

3.17.1.3.2 Non-Labor Income

High non-labor personal income (44.1 percent) may be in part an indicator of a large retiree population (Medicare and Social Security payments) or income from investments (dividends, interest, or rent), which is typically associated with higher educational levels (Lawson 2014). It could also indicate reason for concern. Non-labor personal income can mean there is comparatively little labor income, therefore hardship-related payments, like Medicaid or welfare, are relatively large.

Non-labor income has been growing in the analysis area since the 1970s, with the sharpest increases in age-related payments (1,584 percent increase from 1970 to 2016), followed by hardship-related payments (842 percent increase) and then dividends, interest, and rent (725 percent increase; figure 12). Although age-related payments have increased the most, the largest segment of non-labor income in the analysis area comes from dividends, interest, and rent.

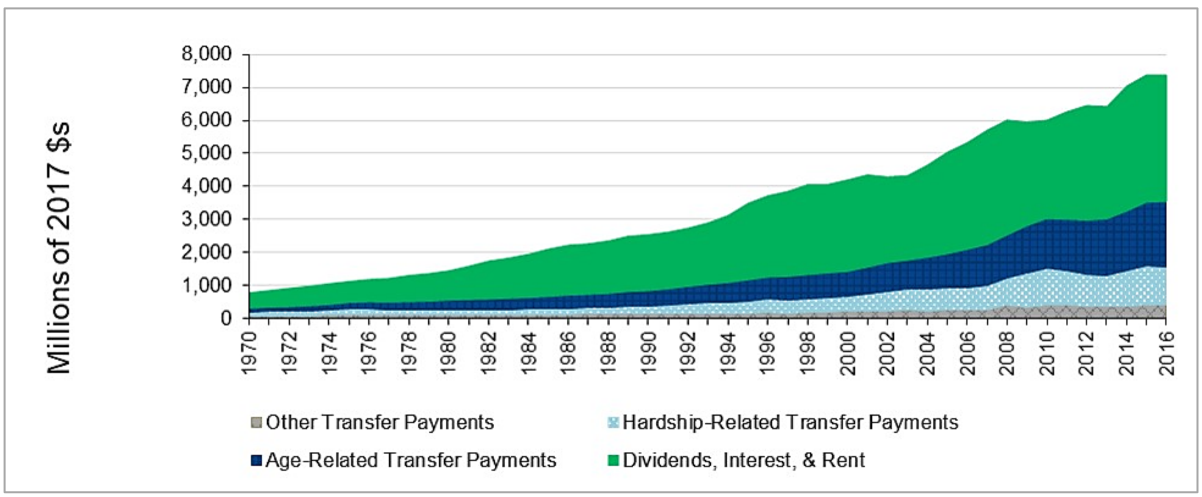


Figure 12. The comparative growth of the different components of non-labor income within the analysis area (USDC 2017a, as reported by EPS 2019h)

Mora, Rio Arriba, and San Miguel County all have non-labor incomes greater than or equal to 50 percent of total personal income, with the majority coming from hardship-related payments (USDC 2017b, as reported by EPS 2019c). This suggests these counties have higher degrees of low-income or economically insecure individuals or families; subsistence use of the Forest may be particularly necessary for communities in these counties, e.g. hunting for food, gathering fuelwood for heating, plant gathering for food or medicine, or grazing for supplemental income. The percent of non-labor income coming from hardship-related payments in these counties is nearly double or more than double that of New Mexico as a whole, suggesting these counties may contain environmental justice populations (see below). Only Los Alamos County has a non-labor income as less than 30

[5] The Navajo Nation, the Jicariila Apache Nation, Nambe Pueblo, Tesuque Pueblo, Pueblo de Cochiti, Santa Clara Pueblo, San Felipe Pueblo, San Ildefonso Pueblo, Santo Domingo Pueblo, Zia Pueblo, Ohkay Owingeh, Pojoaque Pueblo, Santa Ana Pueblo

percent of total personal income, but Santa Fe's non-labor income is dominated by investment payments (USDC 2018, as reported by EPS 2019h). New Mexico as a whole, including San Miguel, Rio Arriba, and Mora Counties, has a higher concentration of non-labor income from hardship-related payments than other western states (Lawson 2014).

3.17.1.3.3 Forest-Related Jobs and Labor Income

Market transactions attributable to activities on the Santa Fe NF support an estimated 1,099 jobs and $43.0 million in labor income in the regional economy. Table 4 displays the economic contribution of Santa Fe NF's activities by program area. Recreation and Forest Service expenditures contribute the most to employment and labor income in the regional economy, supporting 238 and 533 jobs, and $8.7 and $23.5 million in labor income, respectively, on an average annual basis.

The estimation of jobs contributed by Forest Service program areas are distributed across sectors of the local economy (table 4). The two sectors with the most Santa Fe NF-related employment are: government and agriculture; followed by, accommodation and food services and retail trade. The latter two sectors are, in part, associated with the tourism economy, which is supported by the Santa Fe NF and other public and private lands in the analysis area. Relatively, the agriculture sector is the most reliant on Forest Service activities. Approximately 4 percent of employment and 14 percent of labor income in the agriculture sector is attributable to activities on the Santa Fe NF. The agriculture sector includes both grazing and forestry, so the relative importance of Forest Service activities in this sector is expected. Similarly, it is estimated the retail trade sector attributes 5 percent of employment and 4 percent of labor income to Forest Service program areas. Approximately 1 percent of employment and labor income in the government sector is attributable to activities on the Santa Fe NF.

Program areas with the greatest number of jobs, total income, or per job incomes may offer more economic contributions or more desirable employment to the local area. Calculating average contribution per job by dividing the total labor income by the total number of jobs (table 4) suggests the average contributions of a grazing-related job is approximately $19,000 in labor income, timber is $35,000, and a Forest Service expenditure related job is $44,000. Jobs related to Forest Service expenditures and payments to state and counties have the highest per job income and grazing-related jobs have the least, on average. Factors that may contribute to the differences in relative labor income include whether the job is seasonal or part-time or what education or skill level is required.

Table 4. Contribution of Santa Fe NF, by Forest Service Program Area, 2016

Program Area	Employment	Labor Income (thousands of 2016 dollars)
Recreation (incl. downhill skiing; non-wildlife and fish-related)	301	$8,226
Wildlife and fish-related recreation	17	$495
Grazing	205	$3,829
Timber	33	$1,132
Minerals	11	$431
Payments to states/counties	116	$5,318
Forest Service expenditures	417	$23,545
Total forest management	1,099	$42,976

Source: Forest Service generated using MIG 2016 and USDA 2018

Table 5. Contribution of the Santa Fe NF, by Sector, 2016

	Employment (jobs)		Labor Income (thousands of 2016 dollars)	
Sector	**Area Totals**	**Forest Service-Related**	**Area Totals**	**Forest Service-Related**
Agriculture (includes forestry)	5,009	219	$21,207	$2,915
Mining	1,445	10	$65,972	$454
Utilities	396	1	$35,986	$83
Construction	9,184	9	$348,167	$350
Manufacturing	5,791	6	$367,155	$193
Wholesale Trade	3,323	13	$141,282	$836
Transportation & Warehousing	18,509	7	$533,152	$376
Retail Trade	2,095	112	$77,923	$3,220
Information	2,817	4	$126,093	$202
Finance & Insurance	6,049	11	$359,512	$870
Real Estate & Rental & Leasing	8,716	22	$92,644	$283
Prof, Scientific, & Tech Services	23,109	50	$1,867,176	$1,854
Mngt of Companies	442	1	$27,017	$72
Admin, Waste Mngt & Rem Serv	9,825	17	$351,880	$567
Educational Services	4,154	7	$121,131	$214
Health Care & Social Assistance	21,770	37	$968,374	$1,869
Arts, Entertainment, and Rec	7,750	47	$152,206	$988
Accommodation & Food Services	16,005	163	$398,100	$3,926
Other Services	13,384	26	$501,086	$1,110
Government	33,950	337	$2,073,937	$22,594
Total	193,723	1,099	$8,630,000	42,976
Forest Service as Percent of Total	---	0.57%	---	0.50%

Source: Forest Service generated using MIG 2016 and USDA 2018

3.17.1.3.4 Payments to Counties

Counties containing Federal lands have historically received a percentage of the revenues generated by the sale or use of natural resources on these lands. A steep decline in Federal timber sales on national forests during the 1990s significantly decreased revenues from the Department of Agriculture's Forest Service and from some public lands managed by the Department of the Interior's Bureau of Land Management (BLM). The Secure Rural Schools (SRS) and Community Self-Determination Act of 2000, reauthorized in March 2018, was enacted in part to address this decline by stabilizing payments to counties dependent on revenues from Federal timber sales.

The Secure Rural Schools Act comprises three principal titles:

- Title I: Counties are to use the majority of payments they receive for the same purposes for which they used Federal receipts. In most cases, it would be for the benefit of roads and schools.

- Title II: Counties may reserve a portion of the payments to fund certain land management projects that benefit Federal lands.
- Title III: Authorizes the use of a portion of the payments for certain purposes related to wildland fire and emergency services on Federal lands. These authorized uses include carrying out certain activities to increase the protection of people and property from wildland fires, reimbursing the county for search and rescue and other emergency services performed on Federal land, and developing community wildfire protection plans to help protect homes and neighborhoods (Government Accountability Office 2012).

Payments in lieu of taxes (PILT) are Federal payments to local governments managed by the Department of the Interior that help offset losses in property taxes due to nontaxable Federal lands within their boundaries, including lands administered by all agencies of the Interior Department, the Forest Service, Federal water projects, and some military installations (Department of the Interior 2018). PILT help local governments carry out vital services such as firefighting and police protection, construction of public schools and roads, and search and rescue operations. The formula used to compute the payments is based on population, receipt sharing payments, and the amount of Federal land within the county. PILT payments are in addition to other Federal revenues such as oil and gas leasing, livestock grazing and timber harvesting that the Federal Government transfers to the states.

SRS and PILT payments made in the analysis area have been consistent year to year (table 6 and table 7).

Table 6. Secure rural schools and community self-determination (SRSCS) payments by county

Counties	2014	2015	2016*	2017
Los Alamos	$70,106	$69,603	$70,679	$72,395
Mora	$207,021	$214,038	$217,816	$ 229,621
Rio Arriba	$1,529,874	$1,538,409	$1,556,969	$1,586,972
San Miguel	$69,854	$702,200	$716,879	$715,489
Sandoval	$994,661	$968,205	$894,156	$934,042
Santa Fe	$536,730	$53,186	$57,921	$565,705
TOTAL	**$3,408,246**	**$3,545,642**	**$3,514,421**	**$4,104,224**

*SRSCS was not reauthorized for 2016, and payments reverted to 25-percent revenue sharing payments. For national forests, the payments are based on 25-percent of the 7-year rolling average of annual receipts. SRSCS has since been reauthorized.

Table 7. Payments in lieu of taxes to states and counties from the Santa Fe NF*

Counties	2014	2015	2016	2017
Los Alamos	$9,331	$9,054	$3,457	$9,012
Mora	$103,087	$91,913	$10,010	$63,756
Rio Arriba	$666,628	$617,727	$60,879	$605,834
San Miguel	$339,724	$378,386	$40,678	$380,199
Sandoval	$295,047	$267,114	$39,164	$253,268
Santa Fe	$150,519	$124,286	$28,161	$119,171
TOTAL	**$1,564,336**	**$1,488,480**	**$182,349**	**$1,431,240**

Source: USFS 2018a and DOI 2018

*Payments in Lieu of Taxes (PILT) are reported by the U.S. Department of Interior who reports annual payments to each county along with the total number of Federal acres within each county. Amounts shown here were adjusted to reflect only the acres managed by the Forest Service for each county. Some counties contain National Forest System lands managed by forests other than Santa Fe NF.

3.17.1.3.5 Poverty

None of the counties in the analysis area had a median income below the poverty threshold in 2012 (see Assessment, Chapter 3) or in 2016. However, all of the counties in the analysis area had 10 percent of one or more racial or ethnic populations living below or on the border of the poverty threshold in 2016 (table 8). The poverty threshold for 2016 was an annual income of $12,228 for an individual under 65 years of age and $11,511 for those over 65 (this number has since increased; USDA ERS). For a three-person family with one child and two adults, the poverty threshold was $19,318, and for a family with two adults and three children the poverty line was $28,643, (for a complete list of poverty thresholds by size of family and number of children see: United States Census Bureau 2018b). As racial or ethnic minority groups tend to have higher rates of poverty than whites (USDA ERS 2019), table 8 also shows a breakdown of percent of the population in poverty based on racial or ethnic identification. This helps to identify groups in the analysis area that may have intersectional environmental justice concerns—disproportionate impacts based on both minority status and low-income status.

Within the analysis area, White, American Indian, those of Hispanic or Latino ethnicity, or those identified as “Other” had the highest percent poverty. This high percentage could be partly due to their relatively higher populations compared to other racial and ethnic groups in the region. For many low-population racial groups, however, poverty data is highly unreliable, and even for more populous racial and ethnic groups the reliability of information is low (table 8). As noted above, those experiencing poverty or who are housing insecure are traditionally difficult to count for census purposes (LCEF, 2018). However, the data does give some indication of which groups might experience particularly disproportionate impacts from some Forest management actions or decisions.

Multiple Tribal and Pueblo lands in the analysis area have poverty levels 5 percent or more above the New Mexico poverty levels, and 10 percent or more above the poverty level of the counties surrounding them (table 8, figure 13 and figure 14). Compared to the 16 percent of people in poverty and 11 percent of families in poverty in the analysis area, the Native region has 34 and 30 percent of people and families living below poverty, respectively (table 8, figure 13).

Table 8. Median household income, percent of people and families in poverty, and percent of total population in poverty by race and ethnicity for each county, the state, and country

Families are defined as “a group of two or more people who reside together and who are related by birth, marriage, or adoption." Population totals are from the American Community Survey 5-year average from 2012-2016. (USDC 2017b, as reported by EPS 2019a). The Gini coefficient is a summary value of the inequality of income distribution. A value of 0 represents perfect equality and a value of 1 represents perfect inequality. The lower the Gini coefficient, the more eqal the income distribution. Median household income and Gini coefficient are not available for metro and non-metro or regional aggregations and represented by n/a.

	Sandoval County	Rio Arriba County	Mora County	Santa Fe County	San Miguel County	Los Alamos County	New Mexico	County Region	United States
Total Households	48,534	13,343	1,540	61,286	10,630	7,586	762,551	142,919	117,716,237
Median Household Income ($s)	$60,158	$33,972	$21,190	$55,370	$27,000	$105,902	$45,674	*n/a*	$55,322
Gini Coefficient	0.42	0.51	0.46	0.48	0.51	0.37	0.48	*n/a*	0.48
People	137,047	39,623	4,598	144,699	26,871	17,799	2,042,014	370,637	310,629,645
Families	34,164	8,221	753	36,110	5,315	5,064	490,155	89,627	77,608,829
Percent of Total People/Families Below Poverty									
People Below Poverty	14.4%	23.4%	22.5%	15.6%	30.1%	5.1%	20.9%	16.6%	15.1%
Families below poverty	10.0%	16.5%	19.1%	10.9%	21.4%	3.1%	15.9%	11.3%	11.0%
Total Population in Poverty	19,739	9,275	1,036	22,507	8,093	904	426,814	61,554	46,932,225
Percent of Total Population in Poverty by Race and Ethnicity									
White alone	50.3%	56.2%	55.1%	80.6%	41.8%	79.5%	63.9%	61.7%	60.6%
Black or African American alone	1.6%	*0.2%*	*0.0%*	0.6%	*1.7%*	*0.0%*	2.4%	1.0%	21.5%
American Indian alone	27.6%	18.0%	*0.3%*	4.6%	2.2%	*2.4%*	15.3%	13.6%	1.5%
Asian alone	*0.6%*	*0.0%*	*0.0%*	0.3%	*0.3%*	*5.4%*	0.7%	0.4%	4.3%
Native Hawaii & Other Pacific Is. alone	*0.2%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	0.1%	*0.1%*	0.2%
Some other race	14.6%	22.9%	44.6%	11.6%	51.9%	*12.6%*	14.4%	20.1%	8.0%
Two or more races	5.0%	2.7%	*0.0%*	2.3%	*2.2%*	*0.0%*	3.2%	3.2%	3.9%
Hispanic or Latino (of any race)	39.0%	70.0%	84.5%	69.2%	79.4%	32.4%	58.2%	60.7%	27.0%
Not Hispanic or Latino (of any race)	28.3%	12.2%	*15.5%*	26.4%	17.1%	59.7%	23.1%	24.0%	43.5%

High Reliability (standard font): Data with coefficients of variation (CVs) <12% indicate that the sampling error is relatively small.

Medium Reliability (underlined): Data with CVs between 12 and 40% indicate that the values should be interpreted with caution.

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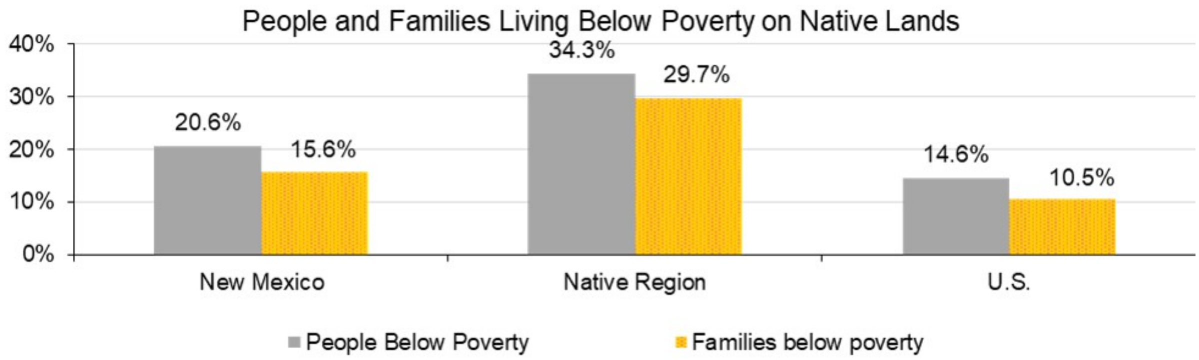
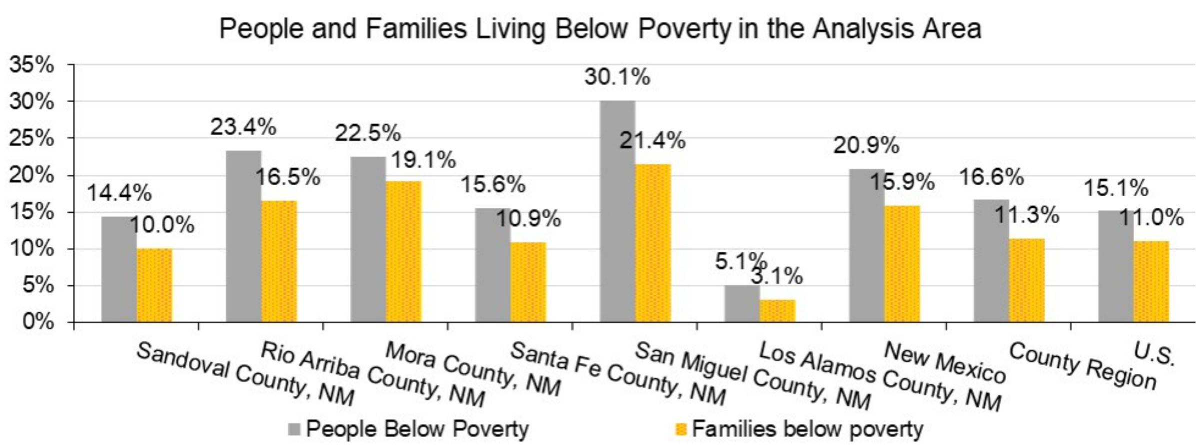


The "Native Region" includes the main Pueblos and Tribal Nations the Santa Fe NF consults with but should not be taken to represent all Native communities with ties to the Santa Fe NF. Data estimates are medium (data with coefficients of variation (CVs) between 12 and 40%) to high reliability (data with CVs <12%) and are based on ACS 5-year estimates averaging 2013-2017 (USDC 2018, as reported by EPS 2019g).

Figure 13. Native peoples and families living below poverty

Overall, the percentage of the analysis area population in poverty is higher than in the United States as a whole (figure 14). This reflects the lower median incomes seen in all but two of the analysis area counties. It may also reflect challenges in Forest management, as many low-income families may rely more heavily on Forest products like fuelwood or Forest uses like hunting for their daily existence. Access to Forest management materials and events may also pose more of a challenge for these groups, who may be more likely to have limited access to transportation, internet, childcare, or time off work.



Numbers are based on a 5-year average from 2012-2016. Data sourced from the U.S. Census Bureau's 2016 ACS 5-year estimates (USDC 2017b, as reported by EPS 2019a).

Figure 14. Percent of families and individuals living below poverty in the analysis area in 2016

3.17.1.4 Quality of Life

Quality of life has an amorphous definition. Some examples of what a high quality of life may include an economic structure compatible with locally preferred work and leisure patterns; forest uses and practices in harmony with community beliefs and values; an absence of disruptive conflicts within the community; or optimism about the advantages of living in the area (FSH 1909.17, chapter 30).

For this report, quality of life encompasses the subjective satisfaction an individual has with their life (e.g., people's experience of life, such as expression and perceived reflection of beliefs and values) and the objective circumstances in which they find themselves (e.g., physical and mental health, safety or lack of conflict, impacts from their environment, respect for their values).

The Santa Fe NF contributes to quality of life in two ways: economically and socially. Both of these contributions can be viewed through an ecosystem services perspective. Healthy, well-functioning ecosystems produce a variety of life-fulfilling goods and services, known collectively as "ecosystem services." Ecosystem services are defined as the components of nature, directly enjoyed, consumed, or used to yield human well-being (Hand et al. 2018). Examples include food, clean air and water, wood products, carbon storage, natural hazard regulation, recreation, and supporting cultural or spiritual values (McMichael et al. 2005; Collins and Larry 2007). Aspects of personal quality of life derived from these services include safety, the basic materials for a viable livelihood, health, social and cultural relations, and freedom and choice (McMichael et al. 2005). The flow of ecosystem services facilitates social and economic vitality and contributes to the general well-being of people and households. In some cases, particularly as it pertains to health and safety or community values, the Forest may contribute directly to enhancing quality of life through its ecosystem services. For instance, clean air and water directly benefit the health of communities in and around the Forest. Management direction protecting historical and cultural sites can indirectly protect cultural and spiritual values that may be associated with those resources. For ease of analysis, quality of life is divided into three main categories: (1) well-being; (2) health and safety; and (3) traditional, cultural, and spiritual practices. These are not mutually exclusive categories but provide a way to conceptualize what goes into quality of life.

3.17.1.4.1 Well-Being

Well-being is a term used to describe the ability of individuals and communities to meet their needs in terms of personal and social functioning, and in terms of their values. According to the Millennium Assessment (McMichael et al. 2005), human well-being depends largely (although not entirely) on ecosystem services and encompasses:

- Security, including resilience to ecological stressors like fire or drought, and rights and access to ecosystem services;
- access to resources and materials for a viable livelihood and good life;
- good health;
- good social relations, including the ability to express and realize cultural, spiritual, aesthetic, and recreational values; and
- freedom and choice

Income, jobs, and education are all indicators of well-being, as they point to the ability to provision oneself with necessities, to flourish—physically and mentally—and to recover from disturbance, ecological or otherwise. These were discussed in above in the demographics and local economic conditions sections above. Health is another indicator associated with well-being but is described below as a separate part of quality of life due to its outsize potential to affect Forest beneficiaries. Equity of resource distribution and access is another indicator of community well-being, and is an element of environmental justice, discussed below. Access to resources has been described by Forest beneficiaries as an issue of concern, particularly water and cultural resources and sites, as has fire management that can aid communities in building resilience. Transparency and partnership in the management of forest resources was also identified as an issue of concern (McMichael et al. 2005), reflecting the freedom and choice aspect of well-being.

Importantly, well-being is subjective; communities may perceive their well-being differently from other communities, depending on cultural and socioeconomic context (McMichael et al. 2005). The Santa Fe NF has multiple communities, as previously described. All of these may have different views of what well-being means for them or their communities, best understood through regular and transparent communication between the forest and its beneficiaries.

3.17.1.4.2 Health and Safety

Health and safety indicators include adaptive capacity to disaster, access to exercise opportunities, income inequality, violent crime, and air and water quality. Access to exercise opportunities can be tied back to recreation work in the Forest that encourages people to get outdoors and provides the appropriate amenities. This also encourages mental health, based on the mental benefits of nature exposure. Both air and water quality can be considered beneficial ecosystem services the Forest can provide, with large impacts on human health, particularly for vulnerable populations like children or the elderly (Martinez-Juarez et al. 2014).

Socially vulnerable populations have also been found to have lower adaptive capacity in the event of natural disasters, such as wildfires. Davies et al. (2018) found higher numbers of socially vulnerable populations in fire-prone areas. Low-income communities, such as those found in Mora County or Rio Arriba County, may have a harder time recovering, as they have fewer resources to rebuild in the event their homes are damaged, and may have a harder time accessing medical treatment. Native American communities (a significant minority community in the Santa Fe NF analysis area, particularly in Sandoval and Rio Arriba Counties) are more likely than other demographic groups to live in high-fire risk areas but are also more likely to have lower adaptive capacity in the face of a wildfire disaster (Davies et al. 2018).

Counties within the analysis area with higher proportions of low-income communities (Mora, Rio Arriba, San Miguel) or minority communities, both potentially vulnerable populations, may also find themselves more at-risk for other health and safety issues, too. For instance, income, ethnicity, and race have been found to affect recreation participation rates, which in turn can have an impact on health—physical health from more or less physical activity or mental health that can be affected by nature exposure (or lack thereof). African-Americans, Hispanics, and Asians are less likely than non-Hispanic whites to participate in many forms of recreation (UNM-BBER 2013), a pattern reflected in visitations to the Santa Fe NF. In 2014, about 96 percent of visitors to the Forest identified as white (USDA Forest Service 2018b). The next highest racial group surveyed were Native Americans, who made up 4 percent of Forest visits. Exceptions do exist. For example, around 14 percent of Forest visitors identified as Hispanic/Latino (USDA Forest Service 2018b), and when controlling for socioeconomic factors and availability of recreation options, they are more likely than non-Hispanic whites to participate in hiking (UNM-BBER 2013). Hispanics are also more likely than others ethnicities to primarily use recreation sites for day-use purposes (UNM-BBER 2013) Rio Arriba County and Mora County both have high Hispanic or Latino populations (figure 7), which could affect exercise in the form of recreation. Low-incomes could also be a factor, as it may impact how much free time a person has to spend on exercise or recreation and what kinds of opportunities they can access.

Income growth is also positively correlated with participation rates in recreation, and recreation activities requiring upfront costs (e.g., skiing) show a particularly large effect (White et al. 2016). This suggests low-income populations may have less ability than others to participate in forest-based recreation activities, or may interact with the Forest more via subsistence-based activities (e.g., hunting for food, gathering plants, collecting fuelwood, etc.). That race and ethnicity become less indicative of participation in some recreation activities (notably hiking) when socioeconomic factors are controlled (UNM-BBER 2013; White et al. 2016) suggest other factors (e.g., cultural differences in relationships to nature, feeling unwelcome) may be limiting the ability of minority populations to take advantage of forest recreation services and associated physical and mental health benefits.

There are some other significant disparities in health and safety conditions among the six counties in the analysis area. There is a range of income inequality ratios across the area. Income inequality can have a wide range of health impacts, including increased mortality risk, poor health, and increased risk of cardiovascular disease (UWPHI 2019). More inequality in a community can also act as a social stressor and affect psychological wellness by decreasing trust, social support, and a sense of community (UWPHI 2019). Inequality is most pronounced in Sandoval County, where households in the top 20 percent of the income distribution earn 6 times more than those in the bottom 20 percent. Rio Arriba has the lowest income inequality ratio, and the Santa Fe, Taos, and Mora County all have similar ratios. Income inequality can be exacerbated, along with violent crime, by resource extraction economies that drive "boom and bust" cycles (Ng et al. 2015).

Table 9. Health and safety indicators for the Santa Fe National Forest analysis area

Health and Safety Indicators	New Mexico	Los Alamos	Mora	Rio Arriba	Sandoval	San Miguel	Santa Fe
Income inequality[1]	5.2	4.8	5.5	4.3	6.0	5.0	5.5
Violent crime[2]	571	259	61	489	270	479	371
Air pollution - particulate matter[4]	10.0	9.7	10.4	10.6	9.6	9.9	9.7
Drinking water violations[5]	--	No	Yes	Yes	Yes	Yes	Yes

Source: County Health Rankings and Roadmaps (UWPHI 2016).

1. Ratio of household income at the 80th percentile to income at the 20th percentile.
2. Number of reported violent crime offenses per 100,000 population.
3. Average daily density of fine particulate matter (2.5 micrometers or less in diameter) in micrograms per cubic meter.
4. Presence of violation.

None of the counties in the analysis area has violent crime rates above that of New Mexico as a whole. In some cases, the disparity in rates in table 9 may be due to population disparities—for instance, Mora County has the lowest population and population density (see Affected Environment, Forest Beneficiary Demographics) of all Santa Fe NF counties, which could play a role in its relatively low violent crime rate.

Air and water quality both contribute to the health of communities. Air quality is fairly uniform among the counties and in New Mexico as a whole, and fresh, clean air has been identified as a public value by Santa Fe NF communities (USDA Forest Service 2016). Communities that have experienced wildfires or are near areas managed with prescribed fire may temporarily experience decreased air quality in the form of coarse and fine particulate matter, but in general, most emissions in the plan area are decreasing or stable.

As described above, some minority or low-income communities may be more vulnerable to fire-related impacts, including decreased air quality. Smoke Management is administered by the New Mexico Air Quality Bureau. The Forest Service complies with the New Mexico State Smoke Management Program, which is described in New Mexico Section 309(g) Regional Haze State Implementation Plan (New Mexico Environment Department 2011). New Mexico's administrative code (20.2.65 New Mexico Administrative Code, Smoke Management) stipulates that all burners must comply with requirements of the Clean Air Act and Federal Regional Haze Rule, as well as all city and county ordinances relating to smoke management and vegetative burning practices.

At the present time, the analysis area attains all national and New Mexico ambient air quality standards and is showing improvements in visibility conditions and decreasing nitrogen deposition rates (see section 3.7 (FEIS Volume 1), Air Quality, for more information).

All counties except Los Alamos have experienced water quality violations (table 9), although current data is not fine-scaled enough to know if those violations stemmed from forest management or from factors outside of Forest Service control.

3.17.1.4.3 Traditional, cultural, and spiritual values

Many local, minority, low income, and tribal stakeholders rely on the Santa Fe NF for livestock grazing, gathering firewood, hunting, and herb and piñon nut gathering. These subsistence uses date back hundreds of years for many local communities. Throughout the Santa Fe NF, grazing is very much a traditional way of life and not merely a way of providing economic support. The tradition of ranching has a very long history in the area. In a report titled, "Social Cultural Economic Aspects of Ranching on the Santa Fe and Carson National Forests" by Carol Raish and Alice McSweeney (2012), approximately 95 percent of people interviewed reported livestock ownership in their families at least from the time of their grandparents, and 72.3 percent had ancestors in the ranching business, ranging from great-grandparents back to the time of Juan de Oñate who established the colony of New Mexico for Spain at the end of the 16th century. The historical significance of the tradition is illustrated by the fact that 76.4 percent of the permittees have had their Forest Service grazing permits over 50 years and received them from their fathers or grandfathers (McSweeney and Raish 2012).

Many tribes rely upon the Santa Fe NF for forest products for personal, commercial, and ceremonial use, as well. Lands managed by the Santa Fe NF have been used and continue to be used by many tribes for a variety of traditional cultural and religious activities. There is also a heavy reliance on parts of the Santa Fe NF for forest products such as boughs for traditional and cultural purposes.

Places and properties valued and used by the tribes for a variety of purposes have been identified on every unit of the Santa Fe NF. One example is sites of cultural and religious significance. Sites can possess traditional cultural or religious significance for a number of reasons. Some of these include locations with long-standing cultural use, locations of buried human remains repatriated under the Native American Graves Protection and Repatriation Act, locations where ceremonial objects have been retired, locations of contemporary ceremonies, and locations of forest products gathered for ceremonial use. The tribes consider all of these types of sites to be Sacred sites. Some locations such as shrines, springs, and resource collection areas have long-standing and ongoing historical, cultural, and religious significance. These consist of site-specific locations, landscape-level properties, and historic districts containing a number of historically or functionally related properties. Other known locations remain minimally documented, but clearly meet the criteria of a Traditional Cultural Property (TCP).

In addition to specific noted locations, entire mountain ranges are regarded as sacred sites, and viewed as an integral part of a tribe's cultural landscape. Specific areas located within the Jemez Mountains are central to the cultural practices of Zia, Jemez, and Santa Clara Pueblos and is critical to maintaining their cultural identity. These mountains are important in ceremony and figure prominently in oral traditions regarding origin, place of emergence, and migration all playing a vital role in their cosmology and religion. Most, if not all, of these mountain ranges have place names tied to tribes' oral traditions.

More detail about the traditional and cultural values associated with the Satan Fe NF can be found in the Northern New Mexico Traditional Communities and Cultural Resources and Archaeology sections (sections 3.8 and 3.9, FEIS Volume 1).

3.17.2 Methodology and Assumptions

3.17.2.1 Assumptions

This analysis also includes a number of assumptions about Forest-related socioeconomics over the life of the plan:

- In most instances, the precise changes in indicators among alternatives is unknown. Therefore, the changes are based on the professional expertise of the resource specialists and previously done research.
- For this analysis, an estimated 1,013,051 recreational visits annually were assumed—an average of the results of each of the three rounds of monitoring (USDA Forest Service 2018b, 2018c, 2018d).
- For consistency, the analysis assumes that current market demand for livestock products would continue throughout the next several decades with a continuing demand for grazing of the forest lands.
- Periods of drought that may impact future Forest-related employment and labor income, and quality of life, are expected to continue into the future.
- Oil and gas production and associated revenues (and therefore, actual economic impact) will fluctuate based on global market conditions
- Forest budgets (that affect expenditures and salaries) are distributed by an act of Congress and may fluctuate over the life of the management plan, but are not dictated by the management plan or alternatives.
- The population of New Mexico will continue to grow, putting pressure on forest goods and services and recreational facilities.
- Providing for improved economic and social benefits to communities in and around the forest, or who have ties to the forest, will continue to be a focus of the forest's management.
- A potential shortcoming of using demographic information is that it can overemphasize socioeconomic characteristics that are easy to observe, and deemphasize other more subtle factors that contribute to vulnerability, such as institutional capacity, community, and social capital (Kelly and Adger 2000). This may limit conclusions about vulnerability and adaptive capacity that can be drawn because they only reflect differences in socioeconomic status. (Hand et al. 2018)

3.17.2.2 Indicators

For the socioeconomic analysis, key social and economic benefits provided by the Santa Fe NF were identified—those that provide income, jobs, or quality of life benefits to the forest beneficiaries (as described in the Affected Environment section). Quality of life is affected by income and jobs, but also includes more qualitative measures such as well-being; health and safety; and traditional, cultural, and spiritual values.

3.17.2.2.1 Indicator: Employment and Labor Income

An economic contribution analysis estimates the role of Forest Service resources, uses, and management activities on employment and labor income in the communities that surround the Santa Fe NF.

Economic contribution to counties local to the Santa Fe NF was estimated with input-output analysis using the IMPLAN (Impact analysis for PLANning) modeling system (MIG 2016). The modeling system allows the user to build regional economic models of one or more counties for a particular year and estimates the economic consequences of activities, projects, and policies on a region. IMPLAN uses Forest Service data on expenditures and resource uses to estimate the economic consequences of forest management.

Input-output analyses represent linkages between sectors in an economy. IMPLAN not only examines the direct contributions from the Santa Fe NF but also indirect and induced effects. Indirect employment and labor income effects occur when a sector purchases supplies and services from other industries in order to produce their product. Induced effects are the employment and labor income generated as a result of spending new household income generated by direct and indirect employment. For example, visitors to Santa Fe NF spend money on accommodation and food, which are direct contributions. Accommodation and food service businesses buy supplies from other businesses, which are indirect contributions. The employees of these firms spend their earnings on a variety of goods and services, which are induced effects. These transactions result in direct, indirect, and induced effects, respectively, in the regional economy. Direct, indirect, and induced effects are combined in the discussion of effects within the environmental consequences.

Potential economic impacts are assessed using the Forest Economic Analysis Spreadsheet Tool (FEAST) developed by the Forest Service Inventory and Monitoring Institute in Fort Collins, Colorado. This tool uses a Microsoft Excel workbook as an interface between user inputs and data generated using the IMPLAN input-output modeling system.

The FEAST analysis assesses the economic impacts of the resource outputs projected under each alternative. Resource outputs in this context are the amount of a resource (forest products, AUMs, recreation visits, etc.) that would be available for use under each alternative. Quantitative inputs (for example, animal unit months, recreation visits, and forest products) were obtained from Santa Fe NF program areas for this analysis, unless otherwise cited. The model for this analysis used 2016 IMPLAN data, which is the latest available dataset.

The effects on employment and labor income under each alternative were examined for six resource areas: recreation, timber and forest products, grazing, minerals, payments to states, and forest expenditures.

3.17.2.2.1.1 Recreation

Recreation spending by visitors is an important part of the economies of communities near the Santa Fe NF. Multiple communities advertise themselves as "gateways" to the forest and rely on the business of Forest visitors. Visitors can be drawn by skiing, mountain biking, hiking, camping, wildlife viewing, scenery viewing, or other recreational activities.

About 6.5 percent of visits to the forest are wildlife-related (hunting, fishing, wildlife-viewing; USDA Forest Service 2018b, 2018c, 2018d). Recently, sport hunting has emerged as a recreational activity, which can involve larger groups, OHVs, and hunting camps. The growth of sport hunting has given rise to a community of commercial outfitters and guides, key members of the recreation community on the Santa Fe NF. The Santa Fe NF also has numerous popular fishing sites, including Cowles Pond, the Pecos River and its tributaries, the Gallinas River, San Gregorio Lake, Fenton Lake, and Espanola. The top cold-water species preferred by anglers is rainbow trout (NMDGF 2012). Statewide, $342 million were spent by hunters on hunting-related activities in 2013, and $268 million was spent on fishing-related activities. Counties within the analysis area contributed a combined total of $60,186,973 and $50,712,641 to hunting and fishing-related activities, respectively. Trappers within the analysis area contributed $481,188 to the state-wide spending total of $3.5 million (Southwick Associates 2014). Although sport hunting and fishing is popular and contributes to recreation spending in the forest, licenses are sold by the New Mexico Department of Game and Fish (NMDGF), and thus beyond the control of the Santa Fe NF. Visits by sport hunters and fishers are captured in the annual recreation visits in table 10, and spending by hunters and fishers in the forest were not analyzed separately from general recreation spending.

Although they have direct economic benefits due to drawing tourists, scenic resources are also not analyzed separately as an economic benefit. Visits for scenic viewing are captured in the annual recreation visits in table 10, and spending by those attracted by scenic resources were not analyzed separately from general recreation spending.

Total annual recreation visits were obtained from the National Visitor Use Monitoring program. For this analysis, an estimated 1,013,051 recreational visits annually was assumed—an average of the results of each of the three rounds of monitoring (USDA Forest Service 2018b, 2018c, 2018d). The distribution of visitor type (local or non-local visitor), and use type (e.g., was the visit wildlife-related?) from the most recent round of monitoring are used to estimate visitor spending. Average visitor expenditures by type were obtained from the Forest Service's NVUM program (White 2017).

Table 10. Estimated annual forest visitors, by alternative

	Alternative 1 (Current)	Alternative 2	Alternative 3	Alternative 4
Wildlife-related visits	66,186	5% increase	20% decrease	20% increase
Downhill skiing visits	144,259	0% change	0% change	0% change
Other recreation visits	802,607	2% increase	10% decrease	10% increase
Total	1,013,051	1,032,413	919,553	1,106,549

The estimated recreation-related impacts capture the expenditures of local and non-local visitors (those who traveled more than 50 miles to the Santa Fe NF). This analysis examines the economic significance of outdoor recreation on Santa Fe NF lands to the local economy and includes the effects of spending by all visitors, both those who reside in the planning area and those who do not. The analysis shows the size and nature of economic activity associated with these recreational experiences to show relative importance to the local economy.

3.17.2.2.1.2 Timber and Forest Products

Table 11 provides the estimated annual forest product volumes available, by alternative. Details of how these numbers were developed may be found in the timber suitability appendix (appendix C). These timber volumes are used to estimate the economic impact of timber-related activities on the Santa Fe NF. Table 11 will be referenced in alternative-specific descriptions of the economic consequences of forest product removal.

Table 11. Estimated annual forest product volumes, by alternative

Forest Product	Alternative 1 (Current)	Alternative 2	Alternative 3	Alternative 4
Harvest-Softwood Sawtimber (CF)	16,050	34,550	13,650	81,950
Fuelwood (CF)	4,000	9,250	2,550	28,600
All Other Products (CF)	4,350	10,600	4,550	28,350
Total (CF)	24,400	54,400	20,750	138,900

3.17.2.2.1.3 Grazing

The baseline economic impact of grazing was estimated using an average of authorized use during the last 10 years, during periods when the forest was experiencing drought. Changes across alternatives are estimated as changes from this baseline. Santa Fe NF provided a range of possible authorized uses for each alternative; however, the economic impact analysis used the midpoint of this provided range. Actual use is permitted annually based on a number of factors, such as current forage and market conditions. For consistency, the analysis assumes that current market demand for livestock products would continue throughout the next several decades with a continuing demand for grazing of the forest lands. While new plan direction is designed to improve vegetation condition, periods of drought are also expected to continue into the future.

Table 12. Estimated annual AUM authorization, by alternative

	Alternative 1 (Current)	Alternative 2	Alternative 3	Alternative 4
AUM minimum	64,339	66,229	61,429	63,877
AUM maximum	93,500	102,192	71,616	89,771
Average	78,920	84,211	66,523	76,824

3.17.2.2.1.4 Minerals

Natural gas and oil, as well as stone and sand and other materials are removed from the Santa Fe NF. However, quantities removed are insufficient to result in measurable economic impacts in the region (about one job is contributed from all minerals extraction, excluding impacts from oil and gas). Furthermore, firms in these mining sectors purchase most of their equipment and supplies outside the region. Therefore, most of the economic consequences related to mining activities in the forest occur outside the region.

While oil and gas production and associated revenues (and therefore actual economic impact) will fluctuate based on global market conditions, this is outside the control of forest management. Since we can’t predict global market conditions, the present condition was used for all alternatives.

3.17.2.2.1.5 Payments to States and Counties

Counties that contain Forest Service-managed lands receive payments from the Forest in two categories: Payments in Lieu of Taxes (PILT) and Secure Rural Schools and Community Self-Determination Act payments (SRSCS). Federal agencies do not pay property taxes; therefore, PILT is distributed to counties to compensate for the local services, such as law enforcement, road maintenance, and fire departments that support activities on Federal lands. SRSCS payments are based on historical Forest Service receipts (from grazing, timber, and recreation, for example). SRSCS payments are intended to improve public schools, maintain infrastructure, improve the health of watersheds and ecosystems, protect communities, and strengthen local economies. Table 13 lists the Payments in Lieu of Taxes attributable to the Santa Fe NF lands for fiscal years 2014 through 2017. The analysis uses an average of the payments in fiscal years 2014 through 2017. Forest management, as directed by the forest plan, has no impact on payments, and therefore, they do not vary across alternatives. Table 13 also lists the Secure Rural Schools and Community Self-Determination Act payments from the Santa Fe NF for fiscal years 2014 through 2017. The analysis uses an average of the payments in 2014, 2015, and 2017. Congress did not authorize the SRSCS Act and no payments were made in 2016. For a breakdown of PILT and SRSCS by county, see table 6 and table 7.

Table 13. Payments to states and counties from the Santa Fe NF (2016 dollars)

	PILT*	SRSCS
2014	$3,519,632	$1,615,460
2015	$3,601,475	$1,511,919
2016	$3,514,421	No SRS re-auth. By Congress
2017	$4,023,749	$1,403,176

Source: USFS 2018a and DOI 2018

*Portion of PILT attributable to Forest Service-managed acres. Additional payments to the analysis area are made as a result of other Federal land management (for example, BLM).

3.17.2.2.1.6 Forest Expenditures

The Santa Fe NF's annual budget (including expenditures and salaries) was approximately $26.6 million in fiscal year 2016. Approximately 56 percent of the budget was spent on salaries, and the remainder was spent on equipment and other non-salary expenditures that contribute to land management. Forest budgets may fluctuate over the life of the management plan, but are not dictated by the management plan or alternatives.

3.17.2.2.2 Indicator: Quality of Life

As discussed in the Quality of Life section, the Santa Fe NF provides socioeconomic benefits via ecosystem services. In addition to the resources identified above (i.e., market-valued ecosystem services), the following key non-market ecosystem services were identified in the Assessment (USDA Forest Service 2016b) and Need-for-Change documents (see project record):

- Water quality and quantity (for details see section 3.4)
- Air quality (for details see sections 3.7.1-3.7.2)
- Solitude, and biocentric and spiritual values
- Cultural and traditional values (for details see sections 3.8 and 3.9)

- Carbon sequestration (for details see sections 3.7.4 and 3.7.5.2).

All of these market and non-market ecosystem services contribute to the quality of life of forest users by supporting various aspects of well-being, health and safety, and traditional, cultural, and spiritual values (i.e., values that don't have a direct economic effect; table 14).

Table 14. Contributions of the Santa Fe National Forest to social and economic sustainability of communities in and around the forest

	Indicator: Employment and Labor Income		Indicator: Quality of Life		
Key Ecosystem Services	**Income**	**Jobs**	**Well-being**	**Health and Safety**	**Traditional, Cultural, and Spiritual Values**
Payments to Counties	X	X			
Forest Expenditures (direct income and jobs)	X	X			
Grazing	X	X	X		X
Minerals	X	X	X		
Recreation	X	X	X	X	X
Scenery			X		
Timber and Forest Products	X	X	X		X
Traditional and cultural values			X		X
Solitude and biocentric or spiritual values			X		X
Fish and wildlife	X	X	X		X
Water quality and quantity				X	
Air quality				X	
Fire management				X	
Climate change mitigation (carbon sequestration)				X	

It is assumed the ecosystem services may contribute to multiple aspects of quality of life. For instance, recreation opportunities contribute to well-being by providing economic benefits to surrounding communities, but also contributes to mental and physical health. Well-being, health and safety, and traditional, cultural, and spiritual values do not encompass all of the ways the Forest's ecosystem services may impact quality of life. Using them as a lens to examine ecosystem services, though, provides an estimate of how forest management that alters service provisioning may impact local communities and Forest users in ways not typically measured in dollar values.

Social data was compiled using Headwater Economics' Economic Profile System (EPS) Toolkit and from previous work done through the Forest Assessment. Additional data sources include relevant scientific literature, County Health Rankings Reporting, and the U.S. Census Bureau's (USCB) American Community Survey (ACS). The geographic scale this identification took place on was primarily the county level, with some additional analysis at the sub-county level to gain insight into Tribal populations organized around Pueblos and reservations.

As insufficient data and resources are available to assign quantitative values to quality of life impacts that may result from changes among alternatives, the subsequent analysis considers potential impacts in qualitative terms. This is consistent with direction provided in 40 CFR 1502.23 and Forest Service Handbook 1909.15 (7/06/04) and 22.35 (01/14/05). Expert knowledge and reviews of relevant scientific literature was used to estimate social impacts under each alternative.

3.17.2.2.2.1 Well-being

Well-being describes the ability of individuals and communities to meet their needs in terms of personal and social functioning, and in terms of their values (see Affected Environment, section 1.1.1.4—Quality of Life, for full definition). It is related in part to employment and labor income, as income can affect an individual or community's ability to achieve a sense of wellbeing (e.g., a sense of security and resilience in the face of stressors, access to resources that allow a person to achieve a viable livelihood, health, social relations and values, and freedom and choice). Economic situations can also affect expression of social values, as can the degree to which an individual or community feel welcome or listened to in a space. For instance, grazing is an important way of life for rural traditional communities, and has contributed to local economies since 1600, when the Spanish first settled the land. Due to its long history in the region, though, the economic aspects of grazing go hand-in-hand with its role as an important cultural tradition. Many ranching communities pass down Forest grazing permits through the generations (McSweeney and Raish 2012). It can be assumed that decreases or increases in grazing opportunity and support through forest management may have effects on the quality of life of traditional grazing communities. This example show that the way alternatives affect employment and labor income relates closely to how they impact quality of life, although well-being as an indicator looks at how employment and income may affect an individual or community's subjective experience of life rather than the actual dollars gained or lost.

For this analysis, well-being is estimated based on what income or employment-providing activities the Forest is supporting (e.g., income from grazing provides subsistence that helps sustain traditional communities), how Forest management would affect community resilience (e.g., fire or watershed management) and the degree to which communication and partnership between the forest and its communities is emphasized. It is assumed that forest plan components that contribute to increased income or employment, health and safety, or support traditional, cultural, or spiritual values also have beneficial effects on overall well-being, and vice versa.

3.17.2.2.2.2 Health and Safety

Health and safety are related to numerous goods and services provided by the Forest. Recreation and scenic opportunities, air and water quality, climate change mitigation, fire management, and economic opportunities can all affect mental and physical health to varying degrees. The extent to which the Forest provides these goods and services provides an estimate of how much the health and safety of forest adjacent communities or forest users may be affected by changes in how the Forest is managed. In some cases, such as climate change mitigation, the Forest's actions are assumed to have negligible immediate effects on surrounding populations, and in all cases, it is assumed the Forest's management actions may contribute to health and safety impacts for communities but are not solely responsible.

Additionally, the Santa Fe NF and other Forest Service units provide wildland fire suppression services to local communities. By implementing restoration activities such as vegetation treatments aimed at achieving desired forest conditions, the Santa Fe NF moves the landscape toward a healthier and more resilient state, thus reducing risk of uncharacteristic fire for communities in and around the Forest.

3.17.2.2.2.3 Traditional, Cultural, and Spiritual Values

The social impacts of traditional, cultural, and spiritual values were estimated in several ways. As many forest users rely on the Santa Fe NF for culturally significant resources, examining how these resources are provisioned among alternatives gives an estimate of how much differing management activities may affect the quality of life of forest communities. These resources include those used by Pueblo or Tribal Nations for personal, commercial, and ceremonial use, which include but are not limited: collection of plants, stone, minerals, pigments, feathers, and soil; hunting game and birds; religious pilgrimages; and visiting shrines and springs. Fuel wood, including juniper, piñon, oak, and ponderosa pine, is another forest product that is widely collected by tribal members for personal, ceremonial, and commercial use. Spanish and Mexican Land Grant-*Mercedes* heirs and communities are another example of traditional New Mexican communities that rely on many of these same Forest resources as part of their connection to their traditions and culture.

Spiritual and cultural values derived from the forest may also take the form of religious importance of certain places in the forest, the valuation of the ecological integrity of the Forest (e.g., biocentrism[6] or valuing species' or nature's existence), or opportunities to connect with nature and experience solitude. The social impact of these values was estimated through the degree of protected open spaces and provision of diverse recreation opportunities via designated or management areas and recreation opportunity spectrum settings. How sacred sites and historical or archaeological sites are protected can also provide an estimate of how forest management may impact traditional, cultural, or spiritual values of forest users.

3.17.3 Stressors and Drivers

The primary stressors and drivers for economic and social conditions in the analysis area are regional, national, and global economic and political factors, including supply and demand for resources, demographic shifts and migration, political decisions, and climate change. These factors determine whether local resource-based industries, such as timber and wood products industries, are economically viable and able to support local jobs and income and contribute to community wellbeing. They also determine who the Forest beneficiaries are, what goods and services they expect from the Forest, and how well the Santa Fe NF is able to control provisioning. (Hand et al. 2018)

3.17.3.1 Demographic Change

As described in the Affected Environment section above, demographic changes may affect recreation spending and demand for forest products associated with traditional practices. Immigration from other states or regions may drive up demand for recreation opportunities as opposed to other Forest goods and services, and expected increases in visitor use may increase stress on vulnerable cultural and ecological sites. Emigration from rural communities may lead to decreases in demand for subsistence products, like fuelwood, and agricultural services, like acequia access and water supply. Decreased populations in rural areas may also exacerbate social and economic distress in these communities, as needed amenities move to more populous areas. If this occurs, remaining rural populations may become more dependent on forest goods and services, despite an overall decrease in demand. Rising urban populations will demand increased water supplies, stressing water resources and infrastructure (Allen et al. 2005), and competing with agriculture and livestock demands. Finally, if the trend toward an older population continues, recreation demands will likely move more toward low-impact experiences, such as motorized recreation, scenery and wildlife viewing.

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[6] Biocentrism, in general, considers the natural world to have inherent value whether or not it provides resources to humans (Steel et al. 1994).

Population growth in the wildland-urban interface is also a concern. As noted in the Affected Environment section and in the Santa Fe National Forest Assessment, the growth of residential development on lands adjacent to public lands has been identified as a significant factor contributing to rising costs of forest and wildland fires; fire suppression challenges will likely continue to rise with WUI populations (EPS 2019e). This could result in increased risk of adverse effects of uncharacteristic fire and strain the provision of already-overburdened fire management services.

3.17.3.2 Climate Change

As noted above, ecosystem services support communities' social and economic livelihoods. However, forest and grassland ecosystems are likely to be altered due to a changing climate (IPCC 2007), which will affect the type and amount of ecosystem services provided (Alig et al. 2011).

According to Hand et al. (2018), research in the Southwest suggests that the climate in the region will continue to grow more variable, which is expected to result in an increase in the frequency and intensity of disturbances such as floods, droughts, heat waves, intense storms, wildfires, pest infestations, and invasive species. These changing disturbance patterns are what may drive changes in ecosystem services.

In the long term, climate change may drive market and demographic changes by affecting resource availability (MacDonald 2010) and whether or not people decide to move to northern New Mexico. This could increase the stress on Forest operations and decrease the ability of the Forest to supply beneficiaries with goods and services. However, in the short term, as temperatures rise, heat-related impacts, catastrophic wildfires, and drought may be the most salient stressors on the social well-being and economic viability of individuals and communities. If trends in WUI development continue, these communities may be particularly impacted by fire-related threats; growth within WUI corridors combined with increasingly fire-prone climatic conditions will continue to place stress on Forest Service fire operations and personnel.

Recent climatic drought conditions and the resultant decline in winter and summer precipitation have contributed to decreased water storage, runoff, and yield. Since 1996, annual water yield from the Santa Fe municipal watershed (in the Santa Fe NF) is less than 80 percent of the long-term (98-year) average. Water shortages from reduced snowpack and longer, hotter warm seasons that result in longer low-flow periods may reduce water supplies forestwide and cause seasonal shortages. Shortages will be exacerbated if population growth, and concomitant demand for water, continues to increase. Water resources and infrastructure will become increasingly stressed and competition among water users will likely increase. Decreased snowpack and surface water resources will not only reduce accessible water, it will reduce recreation opportunities (including winter sports recreation, fishing, and water sports) and the jobs and income they provide. (Allen et al. 2005) While climate effects on recreation tend to be ambiguous, climate effects on winter recreation tend to be negative. The Forest has higher sensitivity for recreation due in part to winter recreation, which could raise vulnerability. (Hand et al. 2018)

Although a changing climate and its effects on ecosystem services will have broad impacts, not all people and communities will be equally affected (IPCC 2007). A number of factors may determine the extent to which people are impacted by climate change effects to ecosystem services, including proximity to the forest or grassland, reliance on ecosystem services, level of recreation use, and exposure to natural hazards. Further, people and communities have different capacities to adapt to changes in supply of ecosystem services, mitigate potential negative effects, and take advantage of potential opportunities related to climate change. People who are at greater risk of changes in quality of life are considered more vulnerable[7] to ecological changes. (Hand et al. 2018)

Environmental justice populations are one potentially vulnerable segment of the population that may be impacted by these climate-related stressors. For example, low incomes can restrict the ability to move or recover in the event of fires, afford heating or cooling, or afford access to water. Continued ability to practice traditions associated with Forest products or species that have reduced populations could be also be impeded under altered climate conditions. Low-income and socially vulnerable populations may experience higher degrees of health effects due to these stressors that decrease quality of life, such as respiratory distress due to smoke or dust, inability to stay warm in the mountain winters if fuelwood supplies decrease or energy costs rise, heat-related illness and mortality, and physical or psychological distress in the face of water shortages. Heritage sites, subsistence systems (i.e., farming, grazing, hunting), and species with spiritual or cultural value may also be impacted by climate change and its effects, thereby disrupting sense of place, cultural continuation and identity, and overall quality of life these sites may afford individuals and communities (Allen et al. 2005).

Although the extent and magnitude of the impacts of these stressors and drivers is largely unknown, some general conclusions can be drawn from studies such as the Socioeconomic Vulnerability Assessment performed by Hand et al. (2018). They found that overall exposure to climate change-drive ecological changes was moderate for the Santa Fe NF, and adaptive capacity[8] was generally high. Of the five ranger districts on the forest, Jemez and Española show above-average exposure to change and the lowest exposure to change is found in grazing resources and vegetation change found on the Coyote and Cuba districts, and the grazing resources found on the Jemez district. Vulnerability was found to be moderate too low for the Santa Fe. Some pockets of greater vulnerability could arise, however, in communities with limited adaptive capacity or those sensitive to economic changes. (Hand et al. 2018)

3.17.4 Environmental Consequences

This section presents the likely socioeconomic consequences of implementing the alternatives presented in chapters 2, 3, and 4 of the forest plan. The quantitative part of this analysis considers mainly the market transactions that result from activities on the Santa Fe NF; non-market values provided by ecosystem services are analyzed qualitatively in terms of their potential social impacts, but may have indirect economic consequences that are not captured. Therefore, this analysis should not be conflated with a representation of the total economic value of the forest. In all cases, the forest may contribute to socioeconomic conditions, but is not solely responsible for these conditions due to factors (such as market trends and demographic changes) outside of the control of the Santa Fe NF. Unless otherwise noted, all effects are for the life of the forest plan (10 to 15 years) and affect the area of analysis.

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[7] Vulnerability is defined by the Intergovernmental Panel on Climate Change (IPCC) as: The degree to which people or communities are susceptible to, and unable to cope with, adverse effects of climate-related ecosystem changes. The vulnerability of people and communities is a function of the character, magnitude, and rate of ecosystem changes to which they are exposed, as well as their sensitivity and capacity to adapt to ecosystem changes (adapted from IPCC [2007]).

[8] Adaptive capacity is defined as: "the ability to engage in activities that either alter the risk of experiencing ecological changes or change dependence on ecosystem services" (Murphy et al. 2015; Smit and Wandel 2006, as cited in Hand et al. 2018).

3.17.4.1 Indicator: Employment and labor income

3.17.4.1.1 Effects Common to All Alternatives

Changes in income and jobs due to goods and services provided by the forest can be assumed to ***affect economic conditions of the study area***[E1] (Ng et al. 2015)**,** resulting in ***changes to community or personal quality of life of Forest beneficiaries, including gain or loss of personal income, alteration in the ability of communities to continue traditional practices, changes in how well communities (especially small communities) can retain a stable population, and changes in how well community members can provide for their families and access essential products necessary for physical and psychological health***[E2]**.**

Under all alternatives, employment and labor income supported by activities on the Santa Fe NF would account for less than 1 percent of regional totals.

Table 15. Employment estimates by program area, total number of jobs contributed, by alternative

Resource Area	Alternative 1 (current)	Alternative 2	Alternative 3	Alternative 4
Timber	148	329	125	832
Recreation: wildlife and fish-related	17	18	14	20
Recreation (incl. downhill skiing; non-wildlife and fish-related)	301	304	288	314
Payments to States/Counties	116	116	116	116
Minerals	11	11	11	11
Grazing	205	219	173	199
Forest Service Expenditures	417	417	417	417
Total Forest Management	1,214	1,413	1,143	1,909
Percent Change from Current	---	16.30%	-5.80%	57.20%

Source: Forest Service generated using MIG 2016

Minerals: Natural gas and oil, as well as stone and sand and other materials are removed from the Santa Fe NF. The quantities removed are not expected to differ between alternatives. Using 2016 revenues, mineral activities on the Santa Fe NF would support approximately 11 jobs (table 15) and $431,000 in labor income, annually (table 16). Mineral program area provides limited economic contributions relative to other Forest Service program areas, but on average these jobs pay relatively well. Therefore, the mineral program ***contributes jobs, income, and raw materials to the local and national economy under all alternative*** [E3].

Payments to States and Counties: As noted above, the Santa Fe NF makes payments to local governments through the PILT and SRSCS programs. Across all alternatives, these payments would support approximately 116 jobs and $5.3 million in labor income annually (table 15 and table 16). In addition to the total employment and labor income supported by these programs, they provide the highest average labor income contribution on a per job basis—approximately $46,000. PILT and SRSCS programs ***offer local economic stability in the form of jobs and labor income*** [E4]**.**

Table 16. Labor income contributed ($1,000s of 2016$) (estimates by program area and by alternative)

Resource Area	Alternative 1 (Current)	Alternative 2	Alternative 3	Alternative 4
Timber	$5,093	$11,287	$4,347	$28,408
Recreation: wildlife and fish-related	$495	$520	$396	$594
Recreation (incl. downhill skiing; non-wildlife and fish-related)	$8,226	$8,300	$7,857	$8,595
Payments to states/counties	$5,318	$5,318	$5,318	$5,318
Minerals	$431	$431	$431	$431
Grazing	$3,829	$4,085	$3,227	$3,727
Forest Service expenditures	$23,545	$23,545	$23,545	$23,545
Total forest management	$46,937	$53,486	$45,122	$70,617
Percent change from current	---	13.95%	-3.87%	50.45%

Source: Forest Service generated using MIG 2016

Forest Expenditures: The Santa Fe NF's operational expenditures contribute to economic activity in the communities that surround the lands. Forest Service employees live in these communities and spend their income on housing, food, and a variety of other local goods and services. The Santa Fe NF's non-salary expenditures ***generate economic activity in businesses that supply goods and services to support Forest Service programs***[E5].

Across all alternatives, expenditures by Santa Fe NF, including salary and non-salary (e.g., field and office equipment and supplies, trail construction and range improvements) expenditures support approximately 417 jobs and $23.5 million in labor income in the local economy, annually (table 15 and table 16). This accounts for the largest contribution to the local economy in terms of jobs and labor income relative to other program areas (table 16), and offers the greatest ***local economic stability both in number of jobs and total labor income***[E6].

3.17.4.1.2 Alternative 1 - 1987 Forest Plan

Alternative 1 would continue Santa Fe NF management according to the 1987 plan. Management actions under alternative 1 are expected to support 1,214 jobs and approximately $47 million in labor income in the local economy (table 15 and table 16). The contribution of jobs and labor income in alternative 1 is the second lowest of all alternatives.

Recreation: There are an estimated 1 million recreation visits to the Santa Fe NF annually; 41 percent of these visits originate outside of the local area. The expenditures of non-local visitors to the Santa Fe NF would support approximately 238 jobs and $6.5 million in labor income, annually. Local visitors contribute an additional 80 jobs and $2.2 million in labor income. Alternative 1 provides the second lowest recreation-related contribution to the local economy in terms of jobs and labor income (***E3-E6)***.

Range: Actual use varies based on local forage and market conditions. Current authorized use averaged 78,920 animal unit months (AUMs) over the last decade, during which the forest experienced drought. Periods of drought are also expected to continue. Current utilization supports 205 jobs and $3.8 million in labor income. Alternative 1 provides the second highest economic contribution in terms of jobs and total income (***E3-E6***) from grazing-related activities.

Timber: Current annual forest product removal is 24,000 CCFs, annually (table 11), the second lowest removal rate of all alternatives. Forest product removal under alternative 1 would support 148 jobs and approximately $5.1 million in labor income in the local economy, annually. Alternative 1 provides the second lowest level of timber-related jobs and total income (***E3-E6***). These estimated economic contributions, in terms of jobs and income, are about average compared with other Forest Service program areas.

3.17.4.1.3 Alternative 2 – Forest Plan

Management actions under alternative 2 are expected to support approximately 1,413 jobs and $53.5 million in labor income in the local economy (table 15 and Table 16). The contribution of jobs and labor income to the local economy due to Forest Service management activities in alternative 2 is the second highest of all alternatives.

Recreation: Santa Fe NF visitation is estimated to increase under alternative 2. Fishing opportunities would improve as a result of desired conditions to improve stream quality and riparian health. Improvements made in the riparian zone would also improve habitat conditions for other wildlife and is expected to increase visits for wildlife viewing. In addition, wildlife related visits are estimated to increase in alternative 2 because the Caja del Rio Wildlife Management Area may attract additional visitors for wildlife viewing. While the objectives within the draft proposed plan for alternative 2 should lead to improved habitat for wildlife, the amount of hunting that can occur on the forest is dependent upon the number of permits sold by the New Mexico Department of Game and Fish. Therefore, hunting is not expected to increase under any alternatives. Recreation is also estimated to increase with the addition of cultural interpretive management areas, which include hiking trails to visit archeological sites. Research suggests visiting interpretive sites is a recreation activity that has had positive growth in participation rates nationally and will continue to see increasing participation into the future (White et al. 2016).

Food services and retail trade, in part associated with tourism and recreational visitors, is one of the largest sectors of Santa Fe NF-related employment. Plan direction that ***increases potential visitation would benefit the economy of surrounding communities with jobs and income due to visitor expenditures, including lodging, meals and other expenditures*** [E7]***.*** Plan direction in alternative 2 would support the second highest estimated recreation-related jobs (322 average annual) and labor income ($8.8 million, annually) (***E3-E6***) to the local economy relative to other alternatives.

Range: Objectives for vegetation treatments (mechanical and fire) in alternative 2 of the Plan would increase herbaceous understory growth, resulting in increased forage cover. These plan components would increase ***opportunities to graze livestock, benefitting area ranchers, ranching related industries and sustaining traditional uses of the forest*** [E8]. Alternative 2 is estimated to promote the greatest increase in forage. Therefore, alternative 2 results in the greatest amount of available AUMs and provides the greatest economic benefits (***E3-E6***) both in number of jobs (219 average annual) and labor income ($4.1 million annually) to the local economy of all alternatives from grazing-related economic activity.

Timber: Objectives for mechanical vegetation treatments in alternative 2 increase the production of softwood sawtimber and fuelwood relative to alternative 1. This increased production would, therefore, increase local employment (329 jobs) and labor income ($11.3 million annually) and their effect (***E3-E6***) related to timber activities on the Santa Fe NF relative to alternatives 1 and 3. ***This increase in employment and labor income generated from timber and other forest product***

removal may cultivate opportunities for the growth or development of local or regional timber and other forest products industries within the plan area in the future [E9].

3.17.4.1.4 Alternative 3 – Natural Processes Emphasis

Management actions under alternative 3 are expected to support approximately 1,143 jobs and $45.1 million in labor income in the local economy. This alternative supports the lowest estimated economic impact, in terms of jobs and labor income, in the local economy (table 15 and table 16).

Recreation: Santa Fe NF visitation is estimated to decrease under alternative 3 due to forest access becoming more difficult with the proposed inclusion of an additional 169,439 acres for wilderness designation. Under this alternative, plan directives also warrant more road decommissioning and protected areas, and they place less focus on managing existing recreation sites (e.g., less maintenance and fewer improvements to trails and campgrounds). As developed site use has been growing in popularity (White et al. 2016), these changes may result in decreased ***user satisfaction and lead to less frequent visitation, especially from non-local visitors***[E10] as well as reduced economic effects (***E3-E6***). ***Reducing the number of visitors to the Forest would impact the economy of the surrounding communities, reducing income and job opportunities relative to other alternatives*** [E11].

The availability of wildlife for viewing, hunting licenses, and fishing opportunities do not change in this alternative. However, restrictions for motorized (or mechanized-i.e., bikes) access in wilderness areas is estimated to contribute to some people being less willing to make the effort to participate in the aforementioned activities, as increasing wilderness areas can create the perception that motorized access to the Forest is being limited or decreased. Overall, the estimated economic impact of recreation is the lowest under this alternative—approximately 302 jobs and $8.3 million in labor income (***E3-E6***) in the local economy annually.

Range: Plan objectives for alternative 3 predominately incorporate fire to restore proper structure, function, and processes to Forest ecosystems. The predominance and frequency of fire on the landscape is expected to increase forage production to the second highest out of all alternatives. However, severe fires that can damage grasslands and soils are more at risk of occurring under this alternative. Combined with little mechanical thinning to combat shrub and tree encroachment and permit limits, alternative 3 has the lowest estimated AUMs of all alternatives and the lowest level of economic effects, in terms of jobs and income (***E3-E6***), related to livestock grazing (***E8***). Alternative 3 would support approximately 173 jobs and $3.2 million in labor income annually in the local economy.

Timber: Because alternative 3 proposes substantial acreage for wilderness designation, this alternative would result in the lowest availability and removal of forest products and associated economic effects related to the timber industry (***E9***). Economic effects of forest product removal under alternative 3 would also result in the lowest economic contribution, supporting 125 jobs and $4.3 million in labor income (***E3-E6***) in the local economy annually.

3.17.4.1.5 Alternative 4 – Human Uses Emphasis

Management actions under alternative 4 are expected to support approximately 1,909 jobs and $70.6 million in labor income in the local economy. This alternative provides the largest economic contribution in terms of jobs and labor income impacts within the analysis area (table 15 and table 16).

Recreation: Santa Fe NF visitation is estimated to have the greatest increase under alternative 4 (***E1***). In alternative 4, an estimated 20 percent increase in wildlife-related visits is primarily a result of ease of access due to Plan objectives that place a strong emphasis on road and trail maintenance. By improving the conditions of roads and trails, people are able to more easily reach areas they previously could not, thereby increasing visitation rates and user satisfaction in the forest. Research shows that fishing and other wildlife-related activities are increasing overall, primarily in National Park System (NPS) lands, but Forest Service wildlife activity numbers are trending down (Cordell 2012). This alternative's increase in roads and facilities (through Plan objectives) may more closely mimic ease of access that NPS lands offer. Overall, the estimated economic effects are highest in this alternative as it would support approximately 334 jobs and $9.2 million in labor income (***E3-E6***) annually in the local economy.

Range: In alternative 4, plan objectives for vegetation treatments predominantly implement prescribed cutting and have minimal to no use of fire. Since the use of fire, which promotes nutrient turnover, exposes bare ground, and stimulates the response of grasses, is minimized under this alternative, lower amounts of forage are produced. Lower production rates of forage reduce the number of AUMs the forest can support, and as a result, grazing program-related economic impacts are slightly lower (***E8***) than alternative 2. Under this alternative, AUMs are expected to be slightly lower, forestwide, relative to the current management actions (alternative 1). Overall, average annual number of jobs (199) and annual labor income ($3.7 million) contributed due to grazing-related activities in the forest in alternative 4 would be second to alternative 2.

Timber: Alternative 4 has the highest overall forest product removal as a result of the emphasis on prescribed cutting for vegetation restoration in Plan objectives. The resulting economic impact is greater than all other alternatives (***E9***)—supporting jobs (832, average annual) and labor income ($28.4 million annually) in the local economy (***E3-E6)***.

3.17.4.2 Indicator: Quality of Life

3.17.4.2.1 Effects Common to All Alternatives

Under all alternatives, market and non-market ecosystem services contribute to the quality of life of Forest beneficiaries through improving or maintaining well-being, health and safety, and traditional, cultural, and spiritual values.

Well-being: Other than contributing minor economic benefits, mineral activities' benefits include ***meeting the requests of the public for the minerals, increasing national energy security, providing local employment, supporting Federal and state programs through royalties paid, and providing a tax base for the state and county*** [E12]. Mineral extraction activity can also have negative impacts to other forest users and resources (see section 3.15.3, FEIS Volume 1). For instance***, equipment can detract from scenic views*** [E13]—a noted concern among Southwest forest users (Haefele, M. et al. 2005). Ecological impacts due to mining may affect quality of life for those holding biocentric values or who have cultural or spiritual connections to the Forest. Mineral activities are not expected to change significantly among alternatives.

Traditional socioeconomic activities in the Forest, such as grazing and the ability to collect and use forest products, are supported under all alternatives. ***Being able to freely practice traditions, maintain a sense of cultural identity, and know their cultures are recognized and valued can have positive effects for the well-being of individuals and communities***[E14] (Tang and Jardine 2016), while ***cultural devaluation and suppression can have long-term adverse impacts to well-being***[E15] (Halloran 2004; Kirmayer 2014; Whitbeck et al. 2002).

Local timber operations improve individual and community well-being ***by creating the potential for long-term jobs that may combat out-migration to more urban areas***[E16]. Small wood-based companies also produce wood pellets, coyote fencing, vigas, latillas, posts, and poles that generate economic activity and ***sustain traditional ways of life***[E17]. Other forest wood products have important economic, cultural, and subsistence value that contribute to well-being by helping individuals and communities maintain viable livelihoods. They ***help support traditional rural communities that depend on Forest products as supplemental income or as part of their day-to-day lives***[E18] (e.g., fuelwood for winter heating, or plants for medicine or cooking). These products are provided under all alternatives.

Wildlife contributes to well-being in multiple ways. Culturally, hunting is an important activity for the people of northern New Mexico. Early inhabitants hunted and lived off the land. Their descendants continue this ***traditional practice that provides food, is a bonding activity between parents and children, and is a way of teaching children about nature and the land around them***[E19]. Sport hunting can be very social, and many hunters return to the Forest annually for this activity and ***the community and positive social interactions they find through it***[E20]. People who come to the Forest to view or hunt wildlife ***contribute to the overall economy of the analysis area and contribute to quality of life through supporting income and jobs related to recreation and visitor spending***[E21]. Numerous species found in the forest also ***provide ecosystem services, such as nutrient cycling, soil formation and manipulation, see dispersal, pollination, game and edible plants, recreation (e.g., hunting, fishing, viewing), and cultural or spiritual inspiration that contribute to ecological stability and provide socioeconomic value***[E22]. Habitat is provided to support species' viability across the planning area for all alternatives, contributing to the provision of associated ecosystem services (***E22)*** that support individual and community well-being (***E14, E17-E21***).

Access to these and other natural resources and materials that contribute to viable livelihoods and a subjectively good life, including water, cultural sites, traditionally used forest products, designated areas, and recreation opportunities, is maintained and available to communities under all alternatives.

Recreation plan components under all alternatives also ***provide access to nature and cultural sites***[E23]***.*** These sites play an important role in sense of place, history, and culture for local forest beneficiaries, and may ***promote good social relations through cultural sharing, education, and valuation***[E24]. Scenery is enjoyed by locals as they move about their communities and ***contributes to community identity and sense of place***[E25]. Visitors who come to enjoy the mountain and forest vistas or view the wildlife ***patronize local businesses and contribute to income generation in local communities***[E26] (Berrens et al. 2006). High-quality scenery can further increase community resilience and ability to obtain viable livelihoods by ***increasing property values, which contributes to higher rental incomes and home values***[E27] (Berrens et al. 2006) and contributes to sense of place.

Scenic views are facilitated by air quality, which is also a valued cultural resource by Forest users and residents (USDA Forest Service 2016b). ***Poor air quality can negatively impact scenic resource, affecting well-being through reduced socioeconomic effects (E25, E26) and impacts to sense of place and security (e.g., smoke can be alarming and create a sense of ecological insecurity).***[E28]

The Santa Fe NF largely consists of fire-adapted ecosystems. By implementing restoration activities such as vegetation treatments aimed at achieving desired Forest conditions, the Santa Fe NF moves the landscape toward a healthier and more resilient state. This results ***in greater resistance to uncharacteristic wildfire that can cause long-term damage to ecosystems (e.g., soil burn that can cause run-off and sedimentation into water systems, loss of wildlife habitat, potential system state shifts from forest to grassland, loss of old growth characteristics, etc.) and socioeconomic systems (e.g., via loss of life and property)***[E29]. Fire management activities also result in direct and indirect socioeconomic benefits, including ***job creation, manufacture and purchase of equipment, and avoided costs in the form of avoiding damages to property, infrastructure, and clean water supplies, and avoiding costs and damages associated with fire suppression and cleanup***[E30] (Bagdon and Huang 2016). All alternatives have vegetation treatments aimed at reducing risk of uncharacteristic fire and fire management activities that contribute to community resiliency and security.

Health and Safety: Access to clean water fulfills ***a basic human need that can have severe health impacts if not provided***[E31]. It is highly valued in the arid climate of northern New Mexico, and communities in the analysis area have been vocal about their concern over maintaining water quality and access to sufficient quantities (USDA Forest Service 2016b). Forests and vegetation, forest soils, and functioning forest watersheds and riparian system all contribute ***to clean water supplies for human and livestock populations through removal of dissolved substances, dilution of pollutants, uptake of metals, and removal of harmful bacteria***[E32] (McMichael et al. 2005). Ecosystems that perform these water-cleaning function ***reduce water cleaning and filtration costs for communities***[E33]. ***Adequate clean water contributes to food production, sanitation, continuation of traditional practices (e.g., use of acequias and grazing), and economic development for Forest beneficiaries*** [E34] (McMichael et al. 2005). Forest management activities, human uses like recreation, and natural forces like fire can all impact the forest's ability to provide clean, abundant water. Poor water quality can stem from (and contribute to) impaired or functioning at-risk watersheds. ***Affects to water resources from Forest management activities can impact quality of life through impacting economic wellbeing (e.g., ability to access and use water for livestock), physical or psychological health (e.g., sufficient drinking water or stress from lack of water access), or traditional and cultural values (e.g., acequia associations)***[E35]**.** Like water quality, air quality is a provisioning ecosystem service particularly important to human health. Poor air quality can ***negatively impact forest health, water quality, scenic resources, and fisheries that forest users depend upon or value***[E36], too.

Air quality on the Santa Fe NF can be measured in terms of concentrations of air pollution, visibility, and deposition of pollution onto the forest. Under all alternatives, water resources are conserved and protected from significant or permanent impairment, and air quality is maintained to meet or exceed Federal, State, and local standards and regulations. Thus, the health of forest users and communities is protected from adverse effects (***E29***).

In addition to the impact of recreation visits on income and jobs, Forest Service recreation programs contribute to community and individual quality of life through ***providing opportunities to improve physical health and mental health***[E37] (Bergman et al. 2008), such as through maintaining trail systems and campgrounds that allow a wide variety of recreationists to interact with nature, and through maintaining scenic resources. ***Viewing nature, such as the scenic landscapes provided by the Santa Fe NF, has been shown to have restorative properties that can improve mental health***[E38] (***E3***; Bergman et al. 2008; Kaplan 2001; Bowler et al. 2010), further improving quality of life.

Vegetation treatments and control operations to reduce fire risk (***E29***) would also occur under all alternatives. Wildland fire management ***contribute to the safety of community homes and infrastructure***[E39] and ***increase quality of life in Forest-adjacent communities, particularly those on the wildland-urban interface (WUI) where fire-risk is high***[E40]. However, ***smoke from fires can cause health problems in human and wildlife population, and it can adversely affect visibility, all of which can adversely impact quality of life***[E41]***.*** Variations in vegetation treatments may affect the magnitude of fire resilience in the Forest over the long term, which may differentially impact the quality of life of Forest beneficiaries (***E29, E39-E41).***

The forest plays an important role in climate change mitigation through carbon sequestration, the removal of CO2 from the atmosphere (USDA Forest Service 2016a). Carbon dioxide uptake by forests in the conterminous United States ***offset approximately 16 percent of our national total CO2 emissions in 2011***[E42] (U.S. Environmental Protection Agency 2013). Maintaining healthy forests and restoration—bringing badly disturbed forests and grasslands back to producing a full range of environmental services—are two of the most ***cost-effective carbon storage measures***[E43] (USDA Forest Service 2016a) that can contribute to long-term health and safety benefits through mitigating climate change effects (i.e., drought, increased risk of extreme fires, decreased snowpack, etc.).

Traditional, Cultural, and Spiritual Values: Forest resources such as plants, stone, minerals, pigments, feathers and other wildlife-related materials, soil, pinon nuts, forage, and fuel wood (including juniper, piñon, oak, and ponderosa pine) ***play an important role in sustaining the cultural values of tribal communities, and sustaining their lifeways***[E44]***.*** These products and materials are made available to forest beneficiaries under all alternatives, although differences in vegetation treatments may create differences in how much are available among alternatives. All alternatives maintain cattle grazing on the forest in support of traditional ranching communities.

Wildlife also has a long tradition of ***inspiring works of art, spirituality, and educational discovery***[E45] (McMichael et al. 2005). Different impacts to wildlife across alternatives may impact communities with these values (***E17***), but species habitat is supported under all alternatives.

Solitude, Biocentric, and Spiritual Values: The Forest also contains many historic cultural and heritage sites that are valued by tribal communities, locals, and visitors. These sites form the historic character of northern New Mexico, and management of them by the Forest ***increases public awareness of their significance and preserves them for future generations***[E46]. The existence of these sites increases community quality of life through tourism and associated economic impacts (***E1, E2***), and by ***ensuring a sense of place and cultural legacy are maintained for the community***[E47]***.***

Another benefit the Forest provides to all users under all alternatives is the opportunity to connect to nature and experience solitude. These benefits ***enhance the quality of life of those who hold biocentric values or spiritual values associated with nature***[E48]. The establishment and management of wilderness areas, wild and scenic rivers, wildlife habitat, and designated management areas ***also provide the knowledge of nature's continued existence in the modern world***[E49]***,*** which is an important benefit for some people who may never even visit the Santa Fe NF. Additionally, multiple tribal groups in the region attach spiritual or cultural significance to specific places in the forest, as described in the Quality of Life section of the Affected Environment. Through their religious or cultural importance, these sites ***support connections with the past and ancestors, religious ceremonies and experiences, oral traditions and cosmology***[E50]***.***

3.17.4.2.2 Alternative 1 - 1987 Forest Plan

Well-being: Alternative 1 provides the second highest economic contribution in terms of jobs (***E3-E6***) and total income (***E3-E6***) from grazing-related activities. These economic contributions support social effects related to well-being and traditional uses (***E8, E14, E15, E17, E18***). However, this alternative has few restoration objectives, leading to the second lowest availability of forage resources and other forest products (fuelwood, vigas, latillas, etc.). Projected wood and timber sale quantities are the second lowest under this alternative, too, with consequently less potential for beneficial social effects stemming from timber-based economic activity (***E9, E16, E17***).

This alternative also has no specific objectives to improve terrestrial or general aquatic wildlife habitat, or restore riparian areas. Guidelines promote fence management that allows wildlife passage, however, and riparian areas are managed via specific guidelines. Overall, this alternative provides the least amount of quality habitat (similar to alternative 4) and the second least improvement in terms of habitat connectivity. This alternative would therefore trend away from having a positive impact on the quality of life for those who value wildlife and the services they provide (***E17-E20, E22, E44, E48, E49***).

Alternative 1 provides the second lowest recreation-related contribution to the local economy in terms of jobs and labor income (***E3-E6)***, resulting in the second least potential for beneficial social effects related to recreation-based economic activity (***E7, E19, E20, E27, E37***). Alternative 1 has no specific recreation management plan components, and recreation opportunities are not consistent with the social, economic, or environmental resource capacity of the Forest. This could limit the degree to which recreation continues to contribute to quality of life over time (***E7, E26, E27***). Natural-appearing scenery is not emphasized under this alternative, which could impact some socioeconomic benefits related to scenic views (***E25-E27***)

Health and Safety: Alternative 1 would maintain current management of all ecosystem services. There are no objectives for restoration of water resources (e.g., watersheds, streams, or riparian areas), which would be adversely affected the most out of all alternatives by roads, recreation, and grazing (at a similar level to that of alternative 4). Watersheds would show the least improvement toward proper functioning condition (PFC). Air quality would be second best due to second lowest fire emissions (particulate matter and CO2) from controlled and natural fires. Potential health impacts due to water and air quality (***E32, E34-E36, E41***) would be the highest and second highest, respectively, under this alternative. Potential carbon sequestration (***E42, E43***) would be the second lowest.

Of all alternatives, alternative 1 has the least beneficial and most adverse health and well-being effects due to fire (***E29, E30, E39, E40),*** excepting air quality effects (***E36, E41***). Risk of uncharacteristic fires would be reduced the least under this alternative.

Traditional, Cultural, and Spiritual Values: Lack of specific objectives for improving vegetation and improving and maintaining range infrastructure could adversely impact the ability of grazing communities to continue their practices in the long-term (beyond the life of the Plan) due to lack of improvement toward healthy grasslands and riparian systems (***E17, E44, E8***). Other forest products are the second most accessible for traditional uses after alternative 4. Alternative 1's vegetation management objectives, though, result in this alternative supporting the second lowest resource output, decreasing potential for traditional uses and associated effects on traditional and cultural values (***E14, E17, E18, E44, E50***).

Alternative 1 has no standards or guidelines addressing traditional or cultural use of the Forest. Access to the Forest is second greatest, but conflicting road decommissioning objectives and road construction objectives mean motorized access frequently changes, which could ***adversely impact local communities trying to navigate the Forest, such as to access grazing sites, traditional resources, or spiritual sites***[E51]. Accessibility to cultural sites can also lead to negative impacts to the sites, such as looting, damage, or loss of privacy. This ***could affect the quality of life of those who value these sites through damage to important cultural or spiritual landmarks, loss of privacy for traditional or spiritual practices, loss of sense of place, loss of recreation tourism and associated economic benefits, or loss of research and educational opportunities***[E52]. This alternative has the least emphasis on the preservation and protection of traditional resources, and the needs for confidentiality and privacy around traditional and cultural practices that take place in the forest. The continuation of this state of affairs could ***erode trust in the Forest Service by traditional communities***[E53]***,*** and decrease well-being by failing to ***recognize important traditional resources and practices as valuable***[E54] (***E14, E15***).

Finally, this alternative would have the second least amount of recommended wilderness, recommending only 0.12 percent of the forest be added to current designated wilderness. Alternative 1 also does not emphasize natural appearing scenery as much as the other alternatives, with the most land allocated to low and very low scenic integrity objectives (SIO; “Low’ and “very low” SIO indicate modified landscapes that are often considered less scenic and visually appealing). It also has no special management areas, compared to the other alternatives. Therefore, this alternative would provide the least benefits to quality of life in terms of solitude, biocentric values, and services supported by protected areas, primitive recreation, and open spaces (***E19, E22, E47-E50***), with the exception that alternative 4 has fewer acres of recommended wilderness.

3.17.4.2.3 Alternative 2 –Forest Plan

Well-being: Objectives for vegetation treatments (mechanical and fire) in alternative 2 of the Plan would increase herbaceous understory growth, resulting in the greatest increased forage cover and potential socioeconomic benefits due to grazing-related activities (***E8, E14, E15, E17, E18***). Alternative 2’s plan objectives also maintain access to acequias, specify the maintenance, improvement, or installation of water features for livestock where natural water sources are limited, and stipulate removing, improving, or reconstructing 5 percent of poor and non-functional range infrastructure annually. These plan components all support grazing-related activities and contribute to socioeconomic benefits provided by them (***E16-E18***).

Objectives for mechanical vegetation treatments in alternative 2 increase the production of timber and fuelwood, resulting in the second highest benefits to individual and community well-being due to timber activities (***E9***, ***E16, E17***). As a product of vegetation treatments, alternative 2 also has the second greatest output of non-timber forest resources, with associated effects (***E8, E14, E17, E18, E44***).

Access to the forest will be maintained under all alternatives, but alternative 2 provides the second least amount of motorized access to forest resources out of all alternatives due to motorized travel restrictions in management and designated areas (***E8, E10, E11, E51, E52***). Possible effects include ***resource acquisition and site accessibility difficulties for those who require motorized transportation***[E55], but also ***increased possibility of privacy for ceremonies or sacred sites***[E56].

The cultural interpretive areas proposed under this alternative would contribute to well-being by encouraging learning and discovery about the history and cultures of northern New Mexico (***E47, E54***). Communicating the value of traditional practices and cultural identities (***E14, E47, E54***) would support good social relations among Forest communities. Plan components also emphasize working collaboratively with communities, so the voices of Forest beneficiaries are heard in the process of Forest management.

Alternative 2 has the most quality habitat of all alternatives and supports the needs of the most species. Habitat connectivity would be improved the second most out of all alternatives, only slightly less than alternative 3. Consequently, alternative 2 provides the most overall support for wildlife and the ecosystem services they provide to communities on the Santa Fe NF (***E17, E19, E20, E21, E22, E44, E45***). Fishing opportunities would improve under this alternative as a result of desired conditions to improve stream quality and riparian health, although fishing (and hunting) licenses would not change by alternative. Improvements made in the riparian zone would also improve habitat conditions for other wildlife and is expected to increase visits for wildlife viewing.

Santa Fe NF visitation is estimated to increase overall under alternative 2, and out of all alternatives, potential recreation benefits to quality of life would be the second highest (***E37, E26, E27, E7***). Estimated increases in recreation could negatively impact sites with cultural or spiritual value (***E52***), but increased visits may contribute to awareness of and valuation of traditional culture, needs, and history, with associated benefits to social relations and other aspects of well-being (***E47, E54***).

Health and Safety: Alternative 2 provides specific restoration, treatment, and management objectives that benefit multiple ecosystem services. It has objectives to restore the second highest amount of water resources, and has the second lowest impacts to water resources from roads, recreation, and grazing. This alternative also moves watersheds toward proper functioning condition (PFC) the most out of all alternatives, leading to positive effects to quality of life (***E32***). Alternative 2 provides the highest quality of life out of all alternatives in terms of providing Forest beneficiaries with access to water (***E31-E35***).

This alternative has the second highest initial emissions from active fire due to its use of fire for restoration. This creates temporarily poorer air quality during prescribed and wildfires that could cause adverse health effects to communities near active burn sites (***E36, E41***). However, while these short-term impacts have negative effects on adjacent populations, work to return the Forest to a more natural fire regime and support fire resilience results in this alternative having the second highest potential carbon sequestration over time. This leads to long-term[9] improvements to quality of life in terms of climate change mitigation (***E42, E43***) for both local and distant Forest beneficiaries. It also improves quality of life in terms of reducing uncharacteristic fire hazards (***E41, E29, E39, E40***) over both the short and long term by moving the Forest toward a more natural fire regime. Alternative 2 has the highest reduction in uncharacteristic fire risk of all alternatives.

This alternative emphasizes natural-appearing scenery, which may provide mental health benefits (***E37, E38***). Alternative 2 also has the second highest number of recreation sites and trails maintained, providing opportunities for physical exercise and associated health benefits (***E37***).

Traditional, Cultural, and Spiritual Values: Plan components under alternative 2 ensure access to traditional resources and practices, such as acequias, forage for grazing, and forest products that

[9] In this context, "long-term" refers to a span of time beyond the life of the plan, which is 10 to 15 years.

contribute to quality of life for traditional and rural communities (***E37, E23, E17, E34, E36, E15, E51***). Vegetation management supports forage growth and provision of other forest products. Overall, long-term social benefits related to traditional or cultural practices associated with grazing resources (***E8, E14, E15, E17, E18***) and forest products (***E14, E17, E18, E44, E9)*** are supported the most by alternative 2.

Alternative 2 explicitly outlines desired conditions for improving partnerships with Forest beneficiaries, focusing on the traditional communities of northern New Mexico. This alternative's emphasis on preservation and protection of traditional resources, along with plan components on collaborating with tribes on areas of tribal importance, will help preserve cultural and spiritual resources (***E44, E47, E50***) and emphasizes the value of traditional, cultural, and spiritual practices associated with the Forest ***(E14***).

Plan components supporting wildlife habitat and needs contribute to the continuation of traditional practices and values associated with species (***E17-E20, E22, E44, E45***). Forest beneficiaries, both local and non-local, would have biocentric values and wildlife-associated spiritual or cultural values supported (***E48-E50***).

Out of all alternatives, alternative 2 has the second most acres of recommended wilderness (***E26***), at 25,868 acres (1.67 percent of the forest). These areas provide opportunities for solitude, primitive recreation, and viewing high quality scenery, with associated quality of life effects (***E17, E21, E45, E48, E49***).

3.17.4.2.4 Alternative 3 – Natural Processes Emphasis

Well-being: Range condition would improve under alternative 3 to a similar degree as it would under alternative 2, with associated positive effects (***E16, E17, E18***). Higher risk for range-damaging severe fires, little mechanical thinning to combat shrub and tree encroachment, lack of range infrastructure improvement, and permit limits means this alternative has less potential to provide long-term support to the well-being of ranching communities on the Santa Fe NF, though. Alternative 3 has the lowest estimated AUMs of all alternatives and the lowest level of social benefits stemming from ranching-related economic effects (***E8, E14, E16, E18, E47***).

Alternative 3 reduces access to forest products and reduces resource output on the forest the most out of all alternatives, with associated adverse and beneficial effects (***E37, E23, E51, E52, E11***). Limited use of mechanical thinning in alternative 3 may reduce the availability of some forest products, like fuelwood (***E18***), and economic opportunities for local wood products industries (***E10***). Road and trail decommissioning objectives that aim to reduce negative impacts to water resources may also reduce access to these resources for Forest beneficiaries (***E51***) and visitors (***E10, E11***), and overall forest access would be limited the most under this alternative with associated effects (***E51, E10, E11, E55, E56***).

Alternative 3 is the second-best alternative for improving wildlife habitat and would provide the most habitat connectivity. The support for long-term species viability would benefit forest communities that rely on ecosystem services supported by healthy biodiversity (***E22***), and communities would continue to benefit from hunting and fishing activities at a similar level as other alternatives (hunting and fishing licenses are controlled by the New Mexico Department of Game and Fish (***E17, E19, E20***), with potential increases in opportunities for wildlife viewing and associated socioeconomic effects (***E26, E21***).

Reduced access to the forest under alternative 3 may impede some wildlife-related activities, as well as resource-procurement for traditional or subsistence use, with associated effects to the well-being of Forest beneficiaries (***E55, E56, E51***). Decreased activity in the forest may have the beneficial effect of increasing privacy for certain traditional or cultural practices (***E44, E50, E54***). Conversely, reduced access could also reduce educational value of cultural sites and broader understanding and valuation of Northern New Mexico history, traditions, and cultures (***E15, E54***). This could decrease well-being in the form of good social relations among Forest beneficiaries.

More limited access than in other alternatives may also affect overall recreation visits. Santa Fe NF visitation is estimated to decrease under alternative 3, with the least social benefits associated with recreation-related economic activity (***E10, E11***). This alternative also emphasizes natural-appearing scenery the most out of all alternatives, with associated socioeconomic benefits to well-being (***E37, E45***).

Health and Safety: Alternative 3 has the highest restoration objectives for water resources and vegetation. More "properly functioning" watersheds would be maintained and more "impaired" or "functioning at-risk" watersheds would be improved under this alternative than under any other. Objectives for riparian restoration are also the highest of all alternatives. These elements result in alternative 3 having the most benefits associated with quality water (***E31, E32, E33, E34, E35***).

Vegetation treatments are primarily fire-based, which will move fire-adapted ERUs toward a more natural fire regime the fastest of all alternatives, with associated long-term benefits (***E41, E29, E39, E40)***. Healthier ecosystems are better able to provide services that support the quality of life of forest beneficiaries (***E3-E6, E8, E19, E20, E21, E22, E23, E29, E37, E42, E43, E45, E47-E50***). However, the high use of fire without accompanying mechanical treatments on a landscape in which fire has traditionally been suppressed could lead to extensive adverse effects due to fire, including the poorest air quality of all alternatives due to active fire (***E36, E41, E29***), and higher risk of uncharacteristic fires. These outcomes would have particular impact on WUI communities, and low-income communities (environmental justice communities) that may be less resilient to fire damage, health impacts of smoke, or that rely on forest goods and services damaged by uncharacteristic or catastrophic fires (e.g., water resources, rangelands, wildlife, recreation, cultural resources; ***E1, E35, E36, E41, E29, E11***).

Alternative 3 contributes to long-term safety from the effects of climate change the most. It has the greatest potential carbon sequestration (***E42, E43***) of all alternatives due to its focus on supporting the fastest return to a natural fire regime and more stable and resilient forests in the long term.

Traditional, Cultural, and Spiritual Values: Plan components under alternative 3 ensure access to traditional resources and practices, such as acequias, forage for grazing, and forest products that contribute to quality of life for traditional and rural communities (***E37, E23 E17, E34, E36, E15, E51***). Overall, this alternative provides less support for ranching communities than alternative 2, though, and has the least amount of accessible forest resources that may be important for traditional lifeways or supporting cultural continuation (***E18, E14, E47, E8***).

While the reduced access to the Forest could adversely impact Forest beneficiaries needing to obtain forest products, it also helps preserve cultural and spiritually-important sites from visitor impacts (***E52, E48, E50***). This alternative has a similar emphasis on confidentiality and communication with Tribal and rural historic communities as alternative 2 (***E14, E54***).

Wildlife habitat quality would improve second only to alternative 2, and wildlife habitat connectivity would improve the most, with associated social effects of a healthier wildlife population (***E17, E22, E19, E20, E45, E44, E18, E50***).

Out of all alternatives, alternative 3 has the most proposed management and protected areas (***E14***). Acres of recommended wilderness are the highest in alternative 3, at 270,130 acres (17.5 percent of the Forest). This provides the most opportunities for solitude, primitive recreation, and associated quality of life effects out of all alternatives (***E37, E21, E45, E48, E49, E50***).

3.17.4.2.5 Alternative 4 – Human Uses Emphasis

Well-being: Under this alternative, range conditions would fail to improve without fire treatments; grazing-oriented communities could experience adverse impacts to their traditional ways of life and their sense of identity over the long term as forage resources and grassland health continue to decline (***E2, E18, E47***). However, this alternative's objectives to improve or reconstruct the most range infrastructure provides the most support to grazing communities and their values (***E54***).

Alternative 4 also provides the most overall resource output and forest access. The high level of resource output compared to the other alternatives is largely due to this alternative's focus on mechanical thinning for vegetation treatment. Thinning treatments provide byproducts that can be collected by Forest beneficiaries, such as fuelwood (***E17, E44, E18***), and potential economic opportunity for local industries that can support community well-being (***E4, E9***).

Impacts to water resources from roads and recreation, though, could result in decreased habitat for fish under this alternative. Impacts could affect anglers and associated recreation (***E19, E20, E21)***, and alter timing of peak flows, which could have consequences for downstream agriculture and urban development (***E34***). Of all alternatives, alternative 4 provides the least improvement of habitat quality and connectivity, and the potential for wildlife to maintain viable populations and their associated effects on social and cultural wellbeing (***E17, E22, E19, E20, E21, E45, E44, E18, E48, E49***) may decrease.

Alternative 4's proposed recreation areas—the Greater Santa Fe Recreation Area, Motorized Recreation Area, and four Cultural Interpretive Areas—would promote access to the forest for diverse recreationists along with associated positive effects on well-being and health (***E37, E23***). Similar to alternative 2, the proposed cultural interpretive areas would encourage learning and discovery about the history and cultures of northern New Mexico (***E47, E54***) and communicate the value of traditional practices and cultural identities (***E14, E47, E54***).

Health and Safety: Water resources would be restored the least under alternative 4, with objectives focusing solely on invasive species removal. This alternative would also have the highest degree of impact to water resources from roads and recreation, and only alternative 1 would have higher grazing impacts to water resources. Watersheds would show the second least improvement toward proper functioning condition. These impacts could result in decreased quality of life for Forest beneficiaries through decreased water quality via sedimentation and pollution (e.g., from heavy recreation use; ***E32-E35***).

The focus on mechanical thinning and limited use of fire for ecosystem restoration in this alternative would also lead to the lowest adverse air quality impacts (***E36, E41***) and reduce the risk of uncharacteristic fires and associated impacts to community health and safety (***E29, E39, E40***) the second most, with alternative 2 having the most reduction. However, lack of fire treatments largely fails to move the forest toward a natural fire regime and a greater resiliency to uncharacteristic fires over time, leading to potentially long-term risks to communities' safety and ability to procure resources (***E29, E39, E40***), and decreased carbon storage capacity (***E42, E43***).

Alternative 4's focus on human uses would lead to the most recreation management direction and a focus on developed recreation opportunities. Of all alternatives, alternative 4 would have the most recreation-based management areas, which could promote more recreation-based activity that promotes physical and mental health for Forest beneficiaries who prefer developed over primitive recreation (***E37***).

Traditional, Cultural, and Spiritual Values: Traditional communities that rely on forest resources like forage or forest products would have their values and traditions supported the most under this alternative in the short term due to this alternative's high degree of access and resource output (***E44, E18),*** which has numerous benefits to the quality of life of Forest beneficiaries (***E37, E23, E21, E45, E44, E18***). However, over the long term, forest resource availability may decline as the limited use of fire treatments in the alternative does not encourage a return to the natural fire regime that many forest ecosystems need to provide resources.

Wildlife-related values would be the least supported in this alternative, as the habitat quality and connectivity would be improved the least. This may decrease species' resiliency and long-term viability, with associated adverse effects for Forest beneficiaries with biocentric values or who have spiritual or cultural values connected to wildlife (***E45, E44, E48-E50***).

The higher human use of the Forest may also create a situation where cultural sites and traditional resources are more at-risk than under other alternatives. Communities valuing these sites and resources may experience declines in quality of life related to their connection to these resources under this scenario (***E14, E47, E48, E50, E52***). The increased activity in the Forest may also decrease privacy for traditional or spiritual practices (***E44, E14, E48***, ***E52***) and strain effective communication among Forest managers and Forest beneficiaries due to lack of capacity (***E53***).

Of all alternatives, alternative 4 would have the least amount of recommended wilderness. Its recommendation to remove 68 acres of designated wilderness would support recreational fishing and associated benefits to social well-being (***E37 E23 E19-E21***). This alternative would provide the least support or protection for those valuing solitude, those who are inspired by primitive recreational experiences, and those with spiritual or cultural connections associated with undeveloped places on the landscape (***E45, E47, E48, E49, E52***).

3.17.4.3 Cumulative Effects – All Alternatives

The timeframe for the economic cumulative effects analysis is the next 10 to 15 years, and the geographic scope for the economic cumulative effects analysis is the six-county region identified above. This analysis considers how past, present, and reasonably foreseeable future actions on lands throughout the region may interact with decisions made under the proposed Plan to affect the economic environment.

Over the short term, the socioeconomics of the analysis area are likely to be driven largely by stressors outside of the Santa Fe NF's control (e.g., demand for products, demographic change, market forces). The socioeconomic analysis of the proposed Plan is unique among the resources and uses in that the effects occur primarily off the forests. In this way, the indirect effects described above are cumulative in nature—they evaluate the role of Forest Service decisions under the proposed Plan both on and off the Santa Fe NF. The job and income estimates presented in the environmental consequences section are based on a static model of the economy. However, if additional businesses locate in the area, the local economic impact of activities to occur under the proposed plan would increase. Conversely, if businesses leave the area, or if it becomes necessary to process greater amounts of timber, for example, outside of the analysis area the local economic impact of activities under the proposed plan would decrease.

The recreation-related effects identified in the economic environmental consequences section may be influenced by trends and activities that occur off the forest. Under all alternatives, the proposed Plan supports diverse and sustainable recreational opportunities on the forest. Increased recreational use on the Santa Fe NF would lead to a higher economic impact (***E1)*** than predicted in the indirect effects discussion. Population growth in the surrounding communities can contribute to high recreation visitation, and opportunities for solitude and related values may decrease. Changes to visitation rates on public lands adjacent to the Santa Fe NF, such as the Valles Caldera National Preserve, the Carson National Forest, and the Bandelier National Monument, may also impact visitation rates in the forest, and influence the economic impact on surrounding communities.

Population growth can also lead to changes in preferences for the types and qualities of recreation supported on the Santa Fe NF, particularly as it coincides with demographic change. Increased population density near recreation sites, such as may occur as WUI development continues in Forest-adjacent communities, can lead to crowding at sites and reduce the quality of recreation experiences (White et al. 2016). Decreases in Forest Service budgets for recreation infrastructure maintenance could further stress sites and lead to ecological impacts and declining visitor experiences.

In the case of climate change, the Forest's actions will likely have negligible immediate effects on surrounding populations. However, long-term impacts may occur across the country to which forest management contributes. This creates a cumulative positive impact to health and safety of populations at-risk from climate change effects such as increased fire and drought. Additionally, water quality and air quality are impacted by Forest management actions, but are also impacted by the actions of other government, non-government, and private entities around the state. The combined actions of these entities contribute to improving or decreasing the quality of air and water resources available to Forest beneficiaries. This applies similarly to all ecosystem services that are provided by cross-boundary resources.

Increased connection of lands across administrative boundaries improve access to recreation opportunities and associated quality of life benefits (***E37, E23***). For instance, Los Alamos County's Comprehensive Plan formalizes an open space system that connects to a number of Forest Service trails. Other counties and cities within the analysis area have similar goals to improve recreation and tourism that dovetail with recreation objectives for the Santa Fe NF and will support regional economic gains in recreation and tourism while also improving resident quality of life through improved access to opportunities for physical activity and the psychological benefits of experiencing nature.

As described in section 3.10.3.4, forest products are available on forest-adjacent Tribal, State, and Federal lands. These lands generate jobs and income related to timber and contribute to the overall timber economy of the analysis area and New Mexico as a whole. Partnerships between the Santa Fe NF and multiple Forest beneficiary groups (for instance, nearby Tribes and Pueblos, and private landowners) have resulted in both economic benefits to the analysis area and social and ecological benefits, as partners work to harvest and provide forest products to local communities while moving ecosystems toward desired conditions and reducing fire hazards. Walatowa Timber Industries is an example of one such partnership, between the Pueblo of Jemez, the Santa Fe NF, Valles Caldera National Preserve, and private landowners.

Forest-adjacent communities also contribute to, support, and benefit from water resource quality and watershed maintenance performed on and around the Santa Fe NF. For example, the Santa Fe Municipal Watershed is on Santa Fe NF land but provides water to the City of Santa Fe. The City acts as a partner in managing the watershed, using a variety of vegetation treatments to reduce fire risk (***E20, E29, E39, E40***) and resulting damage to water quality and the ecological processes that maintain it (***E32***). Another example are the Collaborative Forest Landscape Restoration projects occurring on and around the Santa Fe NF. These projects are collaborations among multiple Federal, State, and Tribal agencies and non-governmental organizations to perform restoration work across ecological and administrative boundaries with the goal of increasing overall ecosystem resilience and sustaining healthy forests and watersheds. One Collaborative Forest Landscape Restoration is the Southwest Jemez Mountain Project. Water from the Jemez River watershed is critical to communities big and small, including the greater Albuquerque-Rio Rancho area. The project was a collaboration among the Santa Fe NF, the Valles Caldera National Preserve, and multiple New Mexico state agencies, Pueblo governments, and non-governmental organizations. Project objectives included using wood by-products, reducing fire risk through vegetation management and a return to a natural fire regime, improving water quality and wildlife habitat, mitigating climate change, and preserving heritage resources. Landscape-scale restoration efforts like these contribute to the overall socioeconomic development of the analysis area. Economic support is provided in the form of decreased property, infrastructural, and business losses due to environmental disaster (i.e., uncharacteristic fires or drought) and provision of wood products, maintenance of recreational opportunities, improved forage and water resources for livestock grazing and agriculture; and social support in the form of ecosystem services that improve the quality of life of communities and individuals.

For forest-dependent communities or those with significant cultural ties to the Forest, multi-agency and governmental efforts supporting landscape-scale restoration may improve quality of life through maintaining and restoring ecosystem services on the landscape and increasing Forest resiliency to disturbance. Thus, a sense of place and the resources needed for the continuation of cultural or spiritual traditions can be maintained into the future. Continued restoration efforts will likely improve quality of life for Forest-dependent communities over the long term, due to the support of these communities' values and traditions that can then continue to be passed down to the next generation (***E14, E47, E50, E54)***. Traditional and cultural values and practices are further supported by the policies and goals of counties within the analysis area, many of which voice support for cultural diversity, the maintenance of heritage resources, and the importance of forest products to their residents (see appendix H). For example, San Miguel County's Comprehensive Plan has a section on Forest Products and Forest Health recognizing the desire for fuelwood gathering opportunities within the county, and Mora County's Comprehensive Plan identifies the protection of historic and cultural ties to the land, including acequia infrastructure, as a goal. For communities and individuals who value these resources and whose culture is tied to the land, these cumulative policies promote broad acceptance and valuation of diverse cultural identities and preserve a sense of place important for intergenerational cultural exchange (***E14, E47, E54***). Landscape-scale restoration efforts will also reduce the risk and impact of fire on communities (***E20, E29, E39, E40***) in the analysis area over the short-term through vegetation management like thinning. Over the long term, a return to natural fire regimes will reduce both fire risk and the financial and human toll of fire suppression and control on Federal, State, and Tribal governments. Continued development in the WUI may place increased stress on fire management efforts on the Santa Fe NF, though, and slow the realization of a region of increased fire safety and healthy fire regimes. City programs to raise awareness of fire danger and reduce development in WUI areas may mitigate some of this stress and support restoration and fire management efforts in the forest. For instance, the Wildland Fire Preparedness programs through the Santa Fe Fire Department conduct hazardous fuels reduction for landowners and perform home assessments to evaluate individual fire risk. Multiple counties, including Santa Fe County, Rio Arriba County, and Los Alamos County, also have goals and policies associated with fire-risk reduction or programs to work with private land owners to reduce their vulnerability to fire, which may help manage the stress increasing WUI populations put on Forest Service fire operations.

3.17.5 Environmental Justice

In 1994, President Clinton issued Executive Order 12898. This order directs Federal agencies to focus attention on the human health and environmental conditions in minority and low-income communities. The purpose of Executive Order 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations—to capture this purpose, this report analyzes environmental justice as part of the potential social and economic impacts of the Plan.

Environmental justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes, with respect to the development, implementation, and enforcement of laws, regulations, policies, programs, and activities. The 2012 Planning Rule requires forest plans to consider ways to reduce or eliminate adverse impacts to any environmental justice communities identified in the planning area.

An environmental justice community is a population of people or a community that meets the criterion for being considered either low-income or minority under Executive Order 12898. These populations are defined based on guidance from the Council on Environmental Quality (CEQ):

- "Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is *meaningfully greater* than the minority population percentage in the general population or other appropriate unit of geographic analysis...."
- "Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect."

In the context of forest planning, it is important to assess whether the forest plan and alternatives might affect how key social and economic benefits are currently distributed across populations. Specifically, the environmental justice mandate dictates that the Forest examine whether low-income and minority groups would be disproportionately deprived of these benefits or have more difficulty accessing these benefits compared to the population as a whole.

3.17.5.1 Environmental Justice Communities

The demographic and poverty data presented in the Affected Environment (Forest Beneficiary Demographics, Ethnicity and Race, and Local Economic Conditions, and Poverty) describe the demographics of communities surrounding the Forest. These data indicate that there is a concentration of minority and low-income populations within the analysis area.

The primary environmental justice communities identified are the Hispanic/Latino, Native American communities, persons with disabilities, and low-income communities of all races and ethnicities (table 17). These populations meet the definition of environmental justice communities outlined above as they have a *meaningfully greater* population in the analysis area than in the adjacent geographic areas—in this case, the analysis area and New Mexico as a whole. In Rio Arriba, Mora, Santa Fe, and San Miguel Counties Hispanic or Latino individuals make up at least 50 percent of the population or more. In Rio Arriba and Sandoval Counties the Native American population is more than five percent greater than the population of Native Americans in the analysis area as a whole (table 2), making these counties stand out in terms of having Native American populations that could be considered environmental justice communities.[10] Communities with high populations of persons with one or more disabilities may also be considered an environmental justice population, particularly in Mora and San Miguel Counties (figure 9).

Additionally, the Tribes and Pueblos with which the Santa Fe NF consults are typically the majority racial group within their reservations' boundaries. These minority populations meet the *meaningfully greater* CEQ guidelines for identifying a minority environmental justice population when considered in the context of the surrounding county lands (Grinspoon et al. 2014). Although not all of these Tribes and Pueblos reside within the analysis area, they all have historic, cultural, or spiritual ties to the forest and may experience disproportionate quality of life impacts due to management decisions and actions taken by the Santa Fe NF. Other minority ethnic or racial populations may also be affected by changes in the forest, but do not at present make up meaningful proportions of communities within the analysis area.

Although none of the counties in the analysis area had a median income below the poverty threshold for an individual in 2012 (table 3), Mora County and San Miguel County had median incomes below the poverty threshold for a two-adult, three-children household in 2016. These two counties and Rio Arriba County also have a higher percentage of their populations living below the poverty line than New Mexico as a whole. Additionally, all of the counties in the analysis area had at least 10 percent of one or more racial or ethnic populations living below or on the border of the poverty threshold in 2016, with low-income Hispanic or Latino individuals showing particularly high concentrations (table 8). In Rio Arriba, Santa Fe, Mora, and San Miguel Counties the percent of the Hispanic or Latino population living in poverty was more than 5 percent greater than that of New Mexico as a whole. Sandoval County and Rio Arriba County also had concentrations of Native American individuals living below the poverty line greater than that of New Mexico as a whole (table 8).

Finally, multiple Tribal and Pueblo lands in the analysis area have poverty levels 5 percent or more above the New Mexico poverty levels, and 10 percent or more above the poverty level of the counties surrounding them (table 8, figure 13, and figure 14). Compared to the 16 percent of people

[10] "Identifying meaningfully greater populations means making efforts to measure the study area population in relation to the general area population. A difference of more than 5 percent between the study area and the surrounding geographic area may indicate a minority population" (Ginspoon et al. 2014).

in poverty and 11 percent of families in poverty in the analysis area, the Native region has 34 and 30 percent of people and families living below poverty, respectively (table 8, figure 13).

Thus, on a sub-county scale, there are a number of low-income environmental justice communities that may be uniquely impacted by changes in the Forest, depending on their situations and relationships to the Santa Fe NF; many of these low-income communities are also ethnic or racial minorities, and may experience intersectional impacts due the dual experiences and stresses of poverty and existing as a racial or ethnic minority in a White-dominated society.

Table 17. Breakdown of potential environmental justice communities and why they might qualify as such. Communities were identified using the data in table 2 and table 8 and figure 7 through figure 9, figure 13, and figure 14.

Community	Why they might qualify as an environmental justice community	Counties likely to have populations that might qualify as environmental justice communities
Hispanic/Latino	Minority demographic group with high populations and high instances of poverty compared to the analysis area as a whole and New Mexico.	Rio Arriba Co., Mora Co., Santa Fe Co., San Miguel Co.
Native American	Minority demographic group with high populations and high instances of poverty compared to the analysis area as a whole and New Mexico.	Rio Arriba Co., Sandoval Co., Pueblos and Tribes
Persons with Disabilities (all races and ethnicities)	Minority population with high populations compared to New Mexico as a whole.	Mora Co., San Miguel Co.
Low Income Communities (all races and ethnicities)	Communities where the percent of individuals or families living below the poverty line is greater than that of the analysis area and New Mexico as a whole.	Rio Arriba Co., Mora Co., San Miguel Co.

3.17.5.2 Methodology

3.17.5.2.1 Assumptions

Predicted impacts among alternatives with regard to minority or low-income environmental justice groups are not dramatically different. The bulk of these communities in the Santa Fe NF analysis area fall into the category of rural historic communities and federally recognized tribes, impacts to whom are analyzed in the Northern New Mexico Traditional Communities and Uses and the Cultural Resources and Archaeology sections. Other differences among alternatives concerning potential environmental justice groups are small because:

- All alternatives are expected to achieve desired conditions that contribute opportunity for local Hispanic and Native American communities in the proposed forest plan.
- When needed, projects implemented on the forest would require a site-specific analysis of their potential impacts to local Hispanic and Native American communities and the ability to access traditional uses important to their culture.
- None of the alternatives prohibit future site-specific project planning that contribute to the social, cultural, and economic opportunity.
- Coordination with the Carson and Cibola NFs' forest management plans ensure similar plan components for rural historic communities and federally recognized tribes, facilitating ease of

interpretation for people in these communities who use and depend on the national forests, irrespective of forest boundaries.

Overall, the effects on environmental justice communities are not expected to be a primary driver in selecting one alternative over another.

3.17.5.2.2 Indicators

3.17.5.2.2.1 Disproportionately high or adverse impacts

The environmental justice examines disproportionately high or adverse health effects resulting from a community's environment. The CEQ has interpreted health effects with a broad definition: "Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low-income communities, or Indian Tribes…when those impacts are interrelated to impacts on the natural or physical environment" (CEQ 1997).

3.17.5.2.2.2 Exposure pathways

An exposure pathway is how an individual or community is exposed to a particular hazard. Exposures may be cumulative (e.g., low-level exposure over a long period of time leading to build up of toxins in the system) or there may be multiple hazards a community is exposed to (e.g., water contamination and smoke inhalation). Identifying major exposure pathways for an environmental justice community can help understand what health effects they may be facing.

On the Santa Fe NF, the primary hazardous exposure communities may face is smoke due to managed and natural fires. Although smoke direction cannot be entirely controlled, in the event of prescribed fire treatments in the forest, Forest Service personnel can mitigate health hazards associated with smoke via communication with communities or timing and placement of burns.

3.17.5.2.2.3 Community ability to participate in NEPA process

Environmental justice communities may be less likely to be able to access public meetings or Forest Service materials due to factors such as lack of childcare, working multiple jobs, lack of transportation, linguistic barriers, etc. This could impede their representation in the forest plan revision process.

3.17.5.3 Environmental Consequences

3.17.5.3.1 Disproportionately High or Adverse Impacts

3.17.5.3.1.1 Effects Common to All Alternatives

Under all the alternatives continued management of the forest's ecosystems for ecological integrity; sustainable production of forest products; and healthy, plant, fish and wildlife populations will ***contribute to the resilience of Forest-dependent communities[E57].*** These contributions are important to some of northern New Mexico's environmental justice communities for subsistence or cultural reasons, and will continue to help ensure these communities do not face adverse impacts due to lack of resources. Thus, the ongoing social and economic health of environmental justice communities in the analysis area that rely on Forest resources is supported under all the alternatives. In addition, the Forest will continue to provide protection and access to areas of cultural and historic importance under all alternatives, impacts to which have a disproportionate effect on minority communities (***E18-E15, E47, E50, E52)***.

Under all the alternatives, the Forest will continue to provide opportunities for livestock grazing including transitory forage. Opportunities for both existing and new grazing allotments will not vary greatly by alternative and traditional values associated with range management would not be greatly impacted by any of the plan alternatives. The level of road and trail management activities does vary by alternatives, thus the opportunity to access the forest may also vary by alternatives. Proposed management areas, such as recommended wilderness, may restrict the potential for future motorized or mechanized access and affect those who require mobility assistance. However, current access is not expected to change greatly among alternatives, and public roads on the Motor Vehicle Use Map will not change by alternative. Furthermore, management approaches suggest communicating with Tribes and other users to maintain access to the Forest for traditional uses. These directions ***support continued access to the Forest for those who require motorized transport to benefit from Forest ecosystem services***[E58].

3.17.5.3.2 Effects Common to Alternatives 2, 3, and 4

Alternatives 2, 3, and 4 all have plan language in both the rural historic communities and federally recognized tribes' sections that directly addresses the culture, values, and uniqueness of traditional Hispanic and Tribal communities. This plan language would result in forest management ***that considers the needs of forest-dependent communities when planning project work and the effect the projects would have on them***[E59].

There are desired conditions in the grazing section that state livestock grazing should contribute the socioeconomic diversity and cultural identity of rural communities. Desired conditions in the forest products section are that forest products are available to traditional communities and for culturally important activities and contribute to social and economic stability. This plan language would ***help traditional communities continue to use the lands that have been important to their families for generations***[E60].

There are desired conditions that emphasize partnering and collaborating with local communities (federally recognized tribes, rural historic communities, descendant communities), non-governmental organizations, volunteers, and government entities when identifying and planning projects in the forest. The plan language that considers the social, cultural, and economic needs of the Hispanic and Native American communities encourages the Forest to partner with and balance the needs these communities with those of other Forest users. Partnering opportunities for larger vegetation and watershed restoration work would consider the benefits to rural areas as well as more populated communities, resulting in ***more equal distribution of the benefits of forest management***[E61].

3.17.5.3.3 Exposure Pathways

3.17.5.3.3.1 Effects Common to All Alternatives

Under all alternatives, the Forest Service complies with the New Mexico State Smoke Management Program (New Mexico Environment Department 2011). New Mexico's administrative code (20.2.65 New Mexico Administrative Code, Smoke Management) stipulates that all burners must comply with requirements of the Clean Air Act and Federal Regional Haze Rule, as well as all city and county ordinances relating to smoke management and vegetative burning practices.

Vegetation treatments to reduce fire risk would also occur under all alternatives, as would fire control operations by Forest Service personnel that protect quality of life for all communities (***E34, E35)***. Variations in vegetation treatments may affect the magnitude of fire resilience in the Forest over the long term, though, which may ***differentially impact the long-term quality of life of Forest beneficiaries*[E62]*.***

Fire operations do not change by alternative. Under all alternatives, locations of prescribed burns are based on ecological factors (e.g., does a particular area of forest need to burn in order to increase its health and return it to a natural fire regime?) and social factors (e.g., is there a major risk to water supplies or lives if a wildfire were to burn in this area?).

3.17.5.3.3.2 Alternative 1

Alternative 1 would have the second lowest emissions and associated effects (***E41)*** due to prescribed or wildfires. Lack of vegetation treatment objectives result in this alternative having the least reduction in uncharacteristic fires, and the most potential for adverse effects due to fire (***E36, E41, E29)***, including air quality degradation and smoke impacts to vulnerable communities.

3.17.5.3.3.3 Alternative 2

Alternative 2 would have the second highest emissions due to prescribed or wildfires and associated effects (***E41***). Uncharacteristic fires would be reduced the most under this alternative, leading to beneficial long-term reductions in extreme smoke events from catastrophic fires.

3.17.5.3.3.4 Alternative 3

Alternative 3 would have the highest emissions due to prescribed or wildfires and associated effects (***E41)***. This alternative has the most potential to return the forest to a natural fire regime, with decreased long-term exposure to catastrophic fire events and associated smoke build-up. However, limited use of mechanical vegetation treatment results in this alternative also exposing communities to the most smoke over the length of the plan.

3.17.5.3.3.5 Alternative 4

Alternative 4 would have the lowest emissions due to prescribed or wildfires and associated effects (***E41***). Limited use of prescribed fire to treat vegetation may increase risk of wildfires in the long-run as a natural fire regime would not be reinstated. This would result in higher potential exposure risks to smoke in the future.

3.17.5.3.4 Community Ability to Participate in Plan Revision Process

3.17.5.3.4.1 Effects Common to All Alternatives

Throughout the planning process from the development of the assessment, the wilderness evaluation, the wild and scenic river evaluation, to the draft Plan and draft EIS the Santa Fe NF continually provided opportunity for the general public to be involved in the process. Public meetings were held throughout the process in the many small rural communities within and around the Forest, as well as in urban community centers. The Forest advertised these meeting on local radio and in local newspapers. Flyers were hung up at post offices, libraries, and other community buildings. The Forest had a Spanish translator available early in the process, and advertisements for some meetings were in both English and Spanish. Due to lack of use, translation services were not continued at every meeting, but could be requested. During comment periods, paper comment forms were provided, and maps were displayed at community buildings such as libraries to ensure those without computers or internet access could still participate in the process. Verbal comments at public meetings and mailed in comments were also considered, even outside of formal comment-request periods. This ensured that even those who could not make it to a meeting, or could not get a comment form, were still able to have their voices heard.

Throughout the planning process the forest worked very closely with community leaders of land grants, acequias, grazing associations, Tribes and Pueblos, and local government officials to ensure the voices of the rural, traditional, and Tribal communities were represented in the planning process. Many of these communities have high proportions of members who identify with a minority ethnic or racial group (e.g., Hispanic or Latino, or Native American). Even members of these communities who may not identify with government categories of race or ethnicity have strong social, cultural, historical, and economic ties to the land the Santa Fe NF manages and are therefore considered particularly vulnerable to impacts due to forest planning, management, and decision-making.

The Forest has signed MOUs with four Tribes that dictate regular meetings between Santa Fe NF and Tribal leadership. Including these quarterly MOU meetings (where forest planning was discussed as one topic), over 73 meetings were held with Tribal leadership and councils concerning the forest plan and EIS. Outreach to Tribal governments also occurred for non-Tribal specific public meetings.

3.18 Designated Areas

The Santa Fe NF has areas that contain special, exceptional, or unique values that provide important ecosystem services. Some of these areas meet the criteria to be considered special places and become designated areas: An area or feature identified and managed to maintain its unique special character or purpose. Designated areas may be statutorily designated by Congress or administratively designated by authorities such as the responsible official, regional forester, Secretary of Agriculture, or Forest Service Chief. Once established, the designation continues until a subsequent decision by the appropriate authority removes the designation.

The designated areas within the Santa Fe NF include:

- Four wilderness areas
- Fifty-four individually named inventoried roadless areas
- Two research natural areas
- Three wild and scenic rivers (figure 15)
- The Jemez National Recreational Area
- One wild horse territory
- National designated trails
  - ♦ One national scenic trail
  - ♦ Three national historic trails
  - ♦ Two national recreation trails
- Six nationally designated scenic byways
- Three critical habitats for Federal threatened and endangered species[11]

3.18.1 Wilderness Resources

Wilderness resources include designated wilderness and recommended wilderness.

In 1964, Congress acknowledged the immediate and lasting benefits of wild places, by passing legislation that permanently protected some of the most natural and undisturbed places in America. The Wilderness Act established the National Wilderness Preservation System ". . . to secure for the American people of present and future generations the benefits of an enduring resource of wilderness." Wilderness areas are meant to be protected, have their wilderness character preserved, and administered for the use and enjoyment of the American people now and in the future. Wilderness areas are congressionally designated.

The four congressionally designated wildernesses on the Santa Fe NF were established under either the original Wilderness Act of 1964, the Endangered American Wilderness Act of 1978 (Act; 16 U.S.C. § 1132), or the New Mexico Wilderness Act of 1980 (Act, 16 U.S.C. § 1132 et seq.). Because these lands were subjected to pressures of population growth and development, Congress found it in the national interest to designate these areas to promote and perpetuate the wilderness character for future generations. The New Mexico Wilderness Act was enacted to promote and preserve the

[11] Endangered species and their habitats are analyzed as part of the analysis on Wildlife Fish and Plants in chapter 3.

wilderness characteristics of the land, protect watersheds and wildlife habitat, and promote scientific research and primitive recreation.

Recommended wilderness areas are lands that the Forest Service has determined, through land management planning, have the potential to be included in the National Wilderness Preservation System. Any area recommended for wilderness through the planning process is a preliminary administrative recommendation that would receive further review and possible modification by the Chief of the Forest Service, Secretary of Agriculture, and the President of the United States. Congress has reserved the authority to make final decisions on wilderness designation. Recommended wilderness areas are managed in a manner to preserve the area's wilderness character. Management of recommended wilderness areas does not alter or restrict existing rights.

3.18.1.1 Affected Environment

3.18.1.1.1 Designated Wilderness

Designated wilderness comprises about 19 percent of the Forest for a total of 291,669 acres. There are four designated wilderness areas: Chama River Canyon, San Pedro Parks, Dome, and Pecos. For more information on each individual wilderness please refer to the Socioeconomic Assessment (Volume 2) (USDA Forest Service 2016b, pages 195-200) and the summaries below.

Wilderness areas provide a wide variety of user opportunities for exploration, solitude, natural risk, challenge, and primitive and unconfined recreation. They also provide wildlife habitat and a variety of natural resource and social values. The Santa Fe NF follows the guidelines set forth in the Wilderness Act to maintain wilderness character of the four wilderness areas. Only the Pecos Wilderness has a management plan (USDA Forest Service 1972). With some exceptions, prohibitions in wilderness areas include closure to motorized and mechanized vehicles, timber harvest, new grazing and mining activity, or any development. Livestock grazing is allowed in wilderness areas, unless specifically excluded by the law designating the area. The Wilderness Act of 1964 defines wilderness, which is often characterized by four attributes:

1. *Untrammeled.* Wilderness is essentially unhindered and free from modern human control or manipulation.
2. *Naturalness.* Wilderness ecological systems are substantially free from the effects of modern civilization.
3. *Undeveloped.* Wilderness is essentially without permanent improvements or modern human occupation
4. *Outstanding opportunities for solitude or primitive and unconfined recreation.* Wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge

3.18.1.1.1.1 Chama River Canyon Wilderness

The Chama River Canyon Wilderness, designated in 1978, encompasses 50,300 acres, 47,400 acres of which are on the Santa Fe NF. The remaining acres are on the Carson NF. The BLM's 12,671 acres Rio Chama Wilderness Study Area is continuous with the most northeastern edge of the Chama River Canyon Wilderness. In 1986, the Rio Chama River, which flows through the middle of the entire wilderness and is within the northern half of the wilderness, was given an additional designation as a wild and scenic river. The wild and scenic Rio Chama River runs through 6 miles of the wilderness. While no management plan exists for the wilderness, the wild and scenic section of the river has a completed comprehensive river management plan.

The Chama River Canyon Wilderness is lightly used, for the most part. Trail access is poor above the colorful sandstone bluffs and impressive rock formations that rise to high rims on both riverbanks. Varying canyon elevations also provide a wide range of vegetation, from low-lying piñon-juniper woodland to ponderosa pine and fir. The heavily used portion of the Chama River Canyon Wilderness is the Rio Chama river corridor, which sees a dramatic increase in use during the summer from both the public and outfitters and guides utilizing the river corridor for overnight river trips.

3.18.1.1.1.2 San Pedro Parks Wilderness

San Pedro Parks Wilderness began as a primitive area, established by the Chief of the Forest Service in 1931. In 1941, the Secretary of Agriculture classified it as a Wild Area and set its acreage at 41,132 acres. It became the San Pedro Parks Wilderness as part of the original Wilderness Act in 1964.

The San Pedro Parks Wilderness is known for high, moist, rolling mountaintops with numerous meadows and large grassy “parks.” Dense stands of Engelmann spruce and mixed conifers are intermixed with small stands of aspen. Clear streams wander through the forest openings and are usually abundant with trout. The Continental Divide National Scenic Trail crosses through the San Pedro Parks Wilderness from Cuba, New Mexico, to the Carson NF.

San Gregorio Reservoir, a small irrigation reservoir predating the establishment of the San Pedro Parks Wilderness, is the largest body of water. It is a human-made reservoir that serves as an irrigation catchment as well as a stocked fishery. The reservoir is located 1 mile from the Vacas Trailhead. Although in the wilderness, the New Mexico Game and Fish has used motorized vehicles to stock this lake, which was in accordance with the Santa Fe NF Forest Plan of 1987. The Forest has completed a minimum requirements decision guide to analyze this use.

The San Pedro Parks Wilderness is located just outside the Albuquerque metro area and sees considerable use from the population of the area. The Vacas trail between the trailhead and the reservoir is likely the most heavily used trail in the San Pedro Parks Wilderness, with heaviest use occurring on weekends and holidays. The close proximity to this population center results in increased use of wilderness and designated areas due to the ease of accessibility. The wilderness is also an important source of water for the surrounding local communities. Numerous acequias are fed by waters originating in the wilderness.

3.18.1.1.1.3 Dome Wilderness

The Dome Wilderness was designated in 1980, and totals 5,200 acres in the Jemez Springs Ranger District. The Dome Fire in the 1990s burned the majority of the wilderness. The Dome Wilderness is bordered by the Bandelier Wilderness (National Park Service) to the east. In 2011, the Las Conchas Fire reburned the wilderness almost completely. There are primitive canyon lands and prehistoric ruins in the wilderness, as well as an abundance of wildflowers and strawberries in spring. The trail system entering the area also provides access into the west side of Bandelier Wilderness with several trailheads located along NFS Road 289. The location of the Dome Wilderness makes it accessible to both the Santa Fe and Albuquerque metro areas.

3.18.1.1.1.4 Pecos Wilderness

In 1964, Congress designated more than 168,000 acres as the Pecos Wilderness. In 1980, an additional 55,000 acres were added, bringing the total to 223,333 acres. The wilderness spans two national forests, the Santa Fe (198,597 acres) and the Carson (24,736 acres). A management plan that guides management and use of the Pecos Wilderness on both the Santa Fe and Carson National Forests was signed in 1972.

Deep and narrow canyons, long and broad mesa tops, heavily forested slopes, and rugged ridges with peaks above timberline characterize the Sangre de Cristo Mountains of the Pecos Wilderness. This small mountain chain comprises the extreme southern extent of the Rocky Mountains. The scenery varies from 100-foot-drop waterfalls and crumbled talus slopes to dramatic rock cliffs, towering peaks, and wildflower meadows at their peak in July and August. The wilderness is home to a diverse collection of wildlife, including elk, deer, bear, turkey, and one of America's healthiest herds of Rocky Mountain bighorn sheep.

Currently, effects of livestock grazing, fire, and trail conditions are the issues dominating management of the wilderness. Wildfires in 2016 had serious effects on trail conditions, resulting in difficulty in locating and a recommendation not to travel on approximately 15 miles of trails throughout the wilderness.

3.18.1.1.2 Wilderness Use, Trends, and Monitoring

Wilderness use on the Santa Fe NF is estimated to be approximately 26,000 visits annually (about 3 percent of the national forest visits) (USDA Forest Service 2014). Demographics show that 64 percent of wilderness visitors are male, 95 percent identify with the white race, 23 percent identify with Hispanic or Latina ethnicity, 46 percent are between age 20 and 49, and 41 percent between age 50 and 70+. All those who responded traveled within 50 miles of home to use the wilderness area. The majority of wilderness visitors spend 7.7 hours on their visit and 61 percent felt a low rate of crowding (USDA Forest Service 2014). As the population of northern New Mexico continues to grow, visitation to wilderness areas near population areas is expected to increase. Increased use is typically concentrated in wilderness areas near population areas that are easily accessed.

The Santa Fe NF does not require a permit for wilderness visitors. General regulations for wilderness visitors include: all garbage and refuse must be packed out; do not shortcut switchbacks on trails; cutting live or dead standing trees for any purpose is prohibited; possessing, storing, or transporting any part of a tree or plant is prohibited (exceptions for dead and down trees for campfires); camping for more than 14 consecutive days in one place is not allowed; and storing equipment or supplies is prohibited. Regulations for group size sets a maximum group size for camping, hiking, and riding at 15 people and a maximum number of pack and saddle stock allowed in a group is 15 head.

Campsite and visitor experience conditions have a monitoring and evaluation plan that directs action when needed, including area closures and restoration actions. The most recent monitoring was done in 2013, and no indications for more restrictive management were noted. As of 2014, all outfitter operating plans include additional conditions directing modeling of appropriate wilderness practices and incorporation of wilderness values awareness.

The Forest Service developed Wilderness Stewardship Performance (WSP) measures in 2016 to more effectively determine how well the Forest Service is meeting its primary responsibility under the Wilderness Act—to preserve wilderness character. WSP replaced the 2002 Chief’s 10-Year Wilderness Stewardship Challenge performance measure. WSP elements reflect areas of focus and improvement. Livestock grazing (special provisions) and agency management actions (untrammeled quality) were the most common areas that need focus or improvement across the Santa Fe NF wilderness areas, only absent from the Dome and Chama River Canyon Wildernesses, respectively.

Table 18. Areas with high wilderness characteristics recommended for wilderness in one or more alternatives and acreage recommended

Recommended Wilderness Area (ID number – Name)	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)	Alternative 4 (acres)
Co05A – Canones Creek	0	0	12,551	0
Co06B – West San Pedro Parks	0	0	8,171	0
Co07 – Mesa Alta	0	0	1,802	0
Co14 – Windmill	0	0	139	0
Co21A – Chupadero	0	0	247	0
Co23B – Dark Canyon	0	2,218	2,218	0
Cu33 – Wolf Draw	0	0	5,439	0
Cu36B – Pollywog	0	0	13,469	0
E39 – White Rock Canyon	0	10,274	19,259	0
E40A – Black Canyon	0	0	4,327	0
E41 – Tesuque Peak	0	0	2	0
E42 – Tesuque Creek	0	0	10,958	0
E43 – Rio En Medio	0	0	5,049	0
E44A – Ortiz Mountain	0	0	10,157	0
E45 – Rio Nambe	0	0	4,889	0
E48 – Guaje Canyon	0	0	6,580	0
E49B – Rio Medio	0	0	2,659	0
E52B – Arroyo de la Presa	0	0	9,073	0
E53A – Polvadera IRA	0	0	2,817	0
E53B – Polvadera	0	0	12,966	0
E53B – El Invierno	0	0	34,051	0
E55 – Barranca	0	0	6,213	0
J58 – Cerro Boletas	0	0	3,072	0
J59 – Cercado Canyon	0	0	5,921	0
J62 – Alamo Canyon	0	0	6,988	0
J63B – Bearhead Peak	0	0	12,141	0
J63C – Cochiti Canyon	0	0	6,069	0
J64B – Virgin Mesa	0	0	9,491	0
P79B – Burro Basin	0	0	16,402	0
P81 – Sapello	0	0	155	0
P82 – Johns Canyon	0	0	14	0
P84A – Cowles and Wesner Spring	0	0	300	0
P84B – Grass Mountain	0	0	4,652	0
P85B – Thompson Peak	0	11,506	21,849	0
P86A – Lost Lake	0	0	1,123	0
P87 – Bartley	0	0	236	0
P88A – Enchanted Lakes	481	925	925	0
P88B – Enchanted Lakes IRA	428	0	803	0
P89A – Falls	0	0	2,471	0
P89C – Grace Tract	945	945	945	0
Total Acres Recommended Wilderness in Alternative	1,853	25,868	177,037	0

Other needed improvements included invasive species (natural quality) in the San Pedro Parks and Dome Wildernesses, workforce capacity (administration) in the Chama River Canyon Wilderness, and cultural resources (other features of value) in the Dome Wilderness. The Pecos Wilderness had the lowest WSP scores on the Santa Fe NF. For more information on the wilderness stewardship level of the Santa Fe NF, please refer to the Socioeconomic Assessment (Volume 2) (USDA Forest Service 2016b, page 196).

3.18.1.1.3 Recommended Wilderness

Pursuant to the planning direction in the 2012 Forest Service Planning Rule, the Santa Fe NF conducted a wilderness inventory and evaluation process as part of the forest plan revision to identify lands that may be suitable for inclusion in the National Wilderness Preservation System. The wilderness recommendation process occurs in four primary steps: inventory, evaluation, analysis, and recommendation. A description of this process can be found in FSH 1909.12 chapter 70 section 71. In addition to being required by the 2012 Planning Rule, evaluation of recommended wilderness areas was identified as a critical need during the final assessment of the current forest plan.

In the inventory step (step 1), the Santa Fe NF identified 117 inventory areas, for a total of 885,992 acres. Two broad categories of criteria were used to identify an area for in the inventory: (1) size, and (2) improvements. The "improvements" category includes, as follows: roads and substantially noticeable improvements. In the evaluation step (step 2), the forest evaluated the wilderness characteristics of these 117 inventory areas. The evaluation criteria address the apparent naturalness; opportunities for primitive or unconfined recreation or opportunities for solitude; size, unique or outstanding features; and manageability outlined in the Forest Service Handbook. All inventory areas were evaluated, which is documented through an evaluation worksheet for each area found in appendix J. During the evaluation process, the forest identified 29 areas with high wilderness characteristics, totaling about 177,037 acres. Based on the evaluation and input from public participation opportunities, the responsible official identified these 29 areas from the evaluation to carry forward as recommended wilderness in one or more alternatives. In addition, areas that were inventoried roadless areas (IRAs) greater than 5,000 acres or adjacent to designated wilderness and with moderate or low wilderness characteristics were also included in alternative 3 of the analysis. The analysis process used to make this determination is found in appendix J.

3.18.1.2 Methodology and Analysis process

The presence of designated wilderness areas, along with the existing condition, was analyzed. The only wilderness resource that changes by alternative is recommended wilderness. Therefore, the majority of analysis is directed toward the programmatic environmental consequences of the recommended wilderness management area. For each alternative, the consequences of wilderness recommendations, as well as the effects to wilderness characteristics, will be evaluated.

3.18.1.2.1 Analysis Assumptions

- All designated wilderness is managed according to the Wilderness Act, 36 CFR 293, applicable Forest Service manuals and handbooks, any wilderness management plans, and the land management plan.
- Wilderness Stewardship Performance (WSP) is used to measure how well the Forest Service is meeting its primary responsibility under the Wilderness Act—to preserve wilderness character. There are seven categories of WSP elements for forests to choose from for each wilderness: natural quality of wilderness character; undeveloped quality of wilderness character;

untrammeled quality of wilderness character; outstanding opportunities for solitude or primitive and unconfirmed recreation quality of wilderness character; other features of value quality of wilderness character; special provisions; and administration. Recommended wilderness areas are not measured against the WSP.

- Wilderness Stewardship Performance scores are expected to rise steadily over the next decade as the Santa Fe NF adjust management to meet this new performance measure and through revision of the forest plan.
- Additional management tools and metrics used to manage wilderness values include the Scenery Management System, the Recreation Opportunity Spectrum (ROS), and trail classifications. Typically, the scenic integrity objective for wilderness is "very high"; ROS class primitive or semi-primitive non-motorized; and trails classified as class 1 or 2 management objectives.
- Livestock management in the wilderness is in conformance with the Congressional Grazing Guidelines (FSM 2320 – Wilderness Management 2323.22-Exhibit 01, Congressional Grazing Guidelines).
- Any area recommended for wilderness through the planning process is a preliminary administrative recommendation that would receive further review and possible modification by the Chief of the Forest Service, Secretary of Agriculture, and the President of the United States. Congress has reserved the authority to make final decisions on wilderness designation.

3.18.1.2.2 Indicators

Wilderness and protected areas were identified as a significant issue during scoping; however, the scope of this issue was primarily focused on recommended wilderness. In the summarized findings of the final Santa Fe Forest Plan assessment, it was identified that a need for change included the need to "update plan direction for designated wilderness areas…in order to protect and enhance wilderness values and character" (USDA Forest Service: Santa Fe NF 2016b). Indicators for designated wilderness and recommended wilderness include:

- Designated Wilderness – acres and protection of wilderness character
- Recommended wilderness – acres, including acres recommended for removal from designated Wilderness, and protection of wilderness characteristics
- Additional information relevant to the analysis including FSH 1909.12 Chapter 73 required information for all areas in one or more alternative can be found in appendix J.

3.18.1.3 Environmental Consequences

3.18.1.3.1 Indicator: Designated Wilderness

3.18.1.3.1.1 Effects common to all alternatives

Under all alternatives, there is no change to current designated wilderness. Designated wilderness would continue to be managed using the applicable law, regulation, and policy to preserve wilderness character. ***People would continue to have opportunities for primitive experiences***[Wi1] for all four wilderness areas**.** These places would serve as reserves where natural ecological processes and disturbance are the primary forces affecting the composition, structure, and patterns of vegetation, ***providing a baseline of ecosystems that function with as little influence from human beings as any on Earth***[Wi2]***.*** Wilderness areas would continue to be managed to ***protect and maintain***

their wilderness character*[Wi3]*. Regulations for group size is the same across all. Of the wilderness areas on the Santa Fe NF, only the Pecos Wilderness has a wilderness management plan, dated 1972.

Wilderness would be managed for the highest scenery integrity objectives of Very High or unaltered. This would promote the maintenance of natural, untrammeled, and undeveloped qualities and have positive effects on wilderness character (***Wi2***) throughout all alternatives.

3.18.1.3.1.2 Alternative 1 - 1987 Forest Plan

Under alternative 1, management direction in the current forest plan designates Management Area H to cover all designated Wilderness areas. Under the current plan, there are no desired conditions and no distinction between standards and guidelines. However, the existing standards and guidelines do cover concepts to improve or maintain Wilderness character; apparent naturalness (using natural materials for facilities and signs, managing for native plant and animal species, management of livestock improvements, use of fire in its natural ecological role), untrammeled character (allowing natural processes to continue without human intervention, e.g., fire), undeveloped (prohibition of mechanical conveyances, including mountain bikes; emphasizing personal contact over regulatory signing, trails designed with Primitive ROS settings), outstanding opportunities for primitive and unconfined recreation (prohibited organized recreation events, trail construction consistent with Primitive ROS setting, maximum group size). Collectively, this plan guidance would help maintain wilderness character (***Wi1-3***).

The 1987 Forest Plan allows for stocking of fingerlings in several wilderness rivers and lakes by non-mechanical, air drops, and motorized means in the Pecos and San Pedro Parks Wildernesses. Stocked fisheries provide for high quality fishing experiences (***Wi1***) but doing so can affect wilderness character, including untrammeled if stocking is with nonnative fish, the undeveloped character when stocking is done with air drops or motorized means (***Wi2-3***). In this alternative, these Wilderness areas would have some aspects of wilderness character promoted (***Wi1***) while others would be degraded (***Wi2-3***).

3.18.1.3.1.3 Effects common to Alternatives 2, 3, and 4

In alternatives 2, 3, and 4, plan components for designated wilderness are consistent with the current Forest Service WSP management and monitoring requirements. This direction would better ensure meeting local WSP priorities and collaboration between resource areas required to manage wilderness resources. Plan components also reflect objectives currently in use for scenery management. Ultimately, this direction would promote more positive effects (***Wi3***) for wilderness than alternative 1.

3.18.1.3.1.4 Alternative 3 - Natural Processes Emphasis

Alternative 3 has objectives for the most prescribed fire and naturally ignited wildfires as a means to accomplish vegetation restoration. Although these actions could only occur in wilderness if they improved wilderness character and often without using motorized or mechanized equipment, ***the magnitude of fires under this alternative and the amount of smoke they would produce would have a greater potential to affect air quality and visual conditions***[Wi4] within designated wilderness. Alternative 3 moves toward desired conditions faster than other alternatives due to the inclusion of an objective that improvement in the four qualities of wilderness character (untrammeled, natural, undeveloped and opportunities for solitude and primitive and unconfined recreation) as measured by WSP within 10 years. This objective would improve wilderness character in alternative 3 (***Wi1-3***) more than other alternatives.

3.18.1.3.2 Indicator: Recommended Wilderness

3.18.1.3.2.1 Effects common to all alternatives

Recommended wilderness management areas include plan components that would maintain the wilderness characteristics until the area is designated Wilderness by Congress. All alternatives include standards and guidelines that specify that no new roads, new mineral leases (leasable and salable only), or mountain biking will be authorized and that the areas are managed for the highest scenic quality as well as primitive recreation. This plan direction would maintain the apparent naturalness of the area (***Wi2***), especially by limiting the addition of any further improvements as defined in the wilderness evaluation (e.g., roads, trails, and facilities). Primitive recreation opportunities and ***opportunities for people have be able to find solitude will also be maintained***[Wi5] or enhanced by the limitation on development, especially roads, and limitation on motorized and mechanized uses. Since no limitations exist on dispersed recreation that includes non-motorized and non-mechanized activities (e.g., hiking, backpacking, fishing, hunting, horseback riding), primitive recreation opportunities would be maintained or expanded (***Wi1***). In addition, the quality of this sort of primitive recreation as well as opportunities for solitude would increase as there would be ***less exposure to and conflict with motorized and mechanized users***[Wi6].

Livestock grazing permit availability and numbers would not change in recommended wilderness. Activities associated with valid existing rights, mainly existing mining leases and acequia management, would continue in recommended wilderness. Recommended wilderness areas would continue to provide uses that are beneficial for ***maintaining traditional and cultural uses***[Wi7], ***providing economic opportunities***[Wi8], and ***providing ecosystem services benefits to local communities***[Wi9].

Recommended wilderness increases areas without motorized disturbance which would provide greater ***protection for wildlife and wildlife habitats***[Wi10]. Restrictions on roads and trails would ***enhance wildlife connectivity***[Wi11]. These activities would improve the ability to maintain wilderness characteristics (***Wi1-2***) in recommended wilderness areas evenly across alternatives, even though recommended wilderness acres vary.

3.18.1.3.2.2 Alternative 1 – 1987 Forest Plan

Alternative 1 carries forward the 1987 plan recommendations for 1,853 acres of recommended wilderness in two management areas, Enchanted Lakes and Grace Tract, which would be additions to the Pecos Wilderness. This represents managing only 0.12 percent of the Santa Fe NF as recommended wilderness and in combination with designated Wilderness represents 19 percent of the Forest. Recommended wilderness is managed under Management Area L which provides standards and guidelines that direct managing for primitive recreation settings and prohibit trailhead construction, utility corridors, mountain biking, and new roads. These areas have been managed to not have motorized and mechanized recreation for over three decades including 1.07 mile of system trail within Grace Tract. Although the area has some evidence of past human disturbance in the form of invasive species and past Christmas tree and fuelwood cutting, the area still has a predominantly natural appearance without improvements, which would be preserved. Other standards and guidelines specify the area would have minimal disturbances and minimal management interventions in fire and other forest protection activities. ***This would allow for high quality primitive and unconfined recreation opportunities which have challenge and risk associated with them in the area***[Wi12]. This guidance would retain the wilderness qualities of the area. Since the recommended wilderness areas in alternative 1 are minimal (just under 2,000 acres) the effects of recommended wilderness (***Wi-3. Wi5-6***) would be the second least of all alternatives.

3.18.1.3.2.3 Alternative 2 –Forest Plan

Alternative 2 adds about 25,868 acres of recommended wilderness in five management areas. This represents managing 1.67 percent of the Santa Fe NF as recommended wilderness an in combination with designated wilderness represents just over one-fifth (20.5 percent) of the forest. This includes several additions to Pecos Wilderness Area (Thompson Peak, Enchanted Lakes and Grace Tract), one addition to Chama River Canyon Wilderness Areas (Dark Canyon), and one addition to the White Rock Canyon area on the Caja Del Rio division of the Espanola Ranger District. Almost all of the polygons are currently managed as inventoried roadless areas. As such, these areas have existing limitations on timber cutting and road building and maintenance which will continue to have effects (***Wi1, Wi2, Wi5***) as they are transferred to recommended wilderness. All areas are also adjacent to existing wilderness, enhancing existing wilderness characteristics by providing larger acres of uninterrupted land and its beneficial effects (***Wi1, Wi2, Wi5, Wi6***). The areas also have different vegetation types than the predominantly the spruce-fir vegetation type characteristic of the Designated Wilderness areas, especially the Pecos and San Pedro Parks Wilderness areas. The amount of mixed-conifer frequent fire and ponderosa pine would be increased with the additions of Dark Canyon, Grace Tract, Enchanted Lakes, and Thompson Peak. White Rock Canyon is dominated by piñon-juniper and sagebrush and would add a new vegetation type to the Santa Fe NF's wilderness system. These recommended wilderness polygons would bring in more ***diversity in vegetation types to the wilderness system***[Wi13].

The areas also have no identified untenable tradeoffs (e.g., major non-conforming uses, high need for restoration treatments), no motorized intrusions or encroachments, and have support from stakeholders. The recommended wilderness areas have few if any non-conforming uses, including motorized and mechanized recreation. Boundaries for these areas were drawn to specifically exclude a popular mountain biking trail, old roads, and past mining from the Thomson Peak area and range infrastructure and old roads from the White Rock Canyon area. Removing areas of popular current uses and old roads ***reduce the likelihood of illegal motorized use or trespass***[Wi14] in recommended wilderness. Near the south of the Dark Canyon polygon is a road to private property that nearly bisects the polygon. However, this road is seldom used and is not expected to have impacts (***Wi5***).

Although legally established rights and uses would be allowed to continue in recommended wilderness areas, none of the recommended polygons include livestock infrastructure, acequias, or mineral leasing activities and there would be no change to these uses or effects (***Wi7-9***).

About 2.8 miles of non-motorized system trails occur within the recommended wilderness areas in alternative 2. Only the 1.7 trail miles of system trail within the Enchanted Lakes polygon would become unavailable to mechanized uses in this alternative because the 1 mile of trail within the Grace Tract polygon has historically been managed for no mechanized use as existing recommended wilderness. This trail accounts for just 1.7 percent of the trail mileage available to mountain bikes on the Pecos/Las Vegas District and less than 1 percent of the system trail mileage available forestwide. In addition, there is no record that this trail is popular or even currently being used by mountain bikers. Since the length of trail is so minimal, increasing the non-motorized trail system in recommended wilderness would have minimal beneficial effects (***Wi1, Wi6***) but also wouldn't have negative effects of ***eliminating or curtailing existing uses in the area***[Wi15]**.**

In this alternative, objectives for vegetation treatments include thinning and burning. Standards and guidelines for recommended wilderness encourage fire and allow for mechanized uses that enhance wilderness characteristics. Although, the level of thinning needed to restore desired conditions would be impossible to implement with only mechanized equipment, a large part of the vegetation within these areas is not out of reference condition and therefore would not need or be subject to this type of work.

Having the second greatest acres of recommended wilderness of all alternatives would have the second greatest beneficial effects for wildlife (***Wi10-11***). The White Rock Wilderness would have particularly beneficial effects to wildlife (***Wi10-11***) as it runs along the Rio Grande River where wildlife connectivity is important and particularly rich including the southwestern willow flycatcher, Santa Fe blazing star, Rio Grande chub, and Rio Grande sucker.

3.18.1.3.2.4 Alternative 3 – Natural Processes Emphasis

Alternative 3 includes about 270,130 acres of recommended wilderness in 42 management areas. This represents managing 17.5 percent of the Santa Fe NF as recommended wilderness, and in combination with designated wilderness, represents just over one-third (36 percent) of the forest. This includes all of the lands with (1) high wilderness characteristics from the evaluation, and (2) IRAs with low or moderate wilderness characteristics that are greater than 5,000 acres or adjacent to designated wilderness. Alternative 3 includes additions to all four wilderness areas on the forest. Almost all IRAs in the forest would become recommended wilderness in this alternative. Exceptions include areas with no wilderness characteristics such as the Santa Fe watershed, or that are too small such as the Mesita de los Ladronas RNA on Anton Chico, which is less than 1,000 acres. This quantity and diversity of areas provides the most beneficial effects of recommended wilderness (***Wi1, Wi2, Wi5, Wi6, Wi13***).

Despite these benefits, many of these areas have identified untenable use tradeoffs that would be affected by managing them as recommended wilderness. The Santa Fe NF has a long history of use including the pueblos and land grants. Today, the descendants of these communities still rely on the Santa Fe NF for fuelwood and other wood products, forage for grazing, medicinal herbs, spiritual activities, and even recreation. Some of these activities require machines for them to be practical, such as cutting fuelwood with a chainsaw. Motorized access is also important for many of these activities. The motorized use that affects these recommended wilderness polygons may be permitted, like it is through a standard allowing permittees to access and maintain their range allotments and infrastructure, or illegal because it is on routes that are not on the motor vehicle use map (MVUM). Regardless, the mechanized and motorized uses would have negative impacts on wilderness characteristics (***Wi2, Wi15, Wi16***) while also suffering from the negative effects of limiting these activities (***Wi7-9***).

About 175 miles of non-motorized system trails occur within the recommended wilderness areas in alternative 3. This accounts for just over 38 percent of the current non-wilderness system trails forestwide that would become unavailable for mountain bike use. Over half of these system trails (102 miles) are on the Española Ranger District, particularly the west slopes of the Sangre de Cristo Mountains below the ski basin (e.g., polygons E42, E45), the northwestern part of the Caja del Rio (polygon E44A), around Window Rock and north of the Rio del Oso (e.g., polygon E54B), around the city of Los Alamos (polygon E48), and around Polvadera Peak (polygon E53B). These areas, except perhaps around Polvadera, represent some of the most popular system trails for mountain biking across the forest. In contrast, this includes almost no to very few miles of trails in the Coyote and Cuba Ranger Districts (less than 1 mile and just over 3 miles, respectively). Reducing the system trails available for mountain bikers forestwide, and in particular on these highly popular trails in Española, would reduce the opportunities for this use (***Wi15***) and could ***move and concentrate mountain biking to other areas of the forest which may increase user conflict there***[Wi16]. On the other hand, this alternative would have the greatest miles of trails where use would be limited to hikers and horseback riders and associated effect (***Wi1, Wi16***). If this recreation occurred predominantly on trails the types of recreation experiences and effects characteristic of wilderness (***Wi12***) would not necessarily increase in this alternative.

Recommended wilderness management in this alternative would also eliminate just over 2.3 miles of motorized trail on the Española Ranger District (polygon E43). This affects a single trail that was designated specifically for turkey hunting with ATV and is only open for this use one month each year. Given that this is the only trail of this type on the forest, its elimination would ***completely eliminate this use in the forest***[Wi17]. ***The area could be converted to non-motorized trail uses such as hiking and horseback riding and provide more opportunities for this use with less user conflict***[Wi18], although this particular route is not as popular as other trails in the general vicinity.

Other existing uses could impact many of these polygons. Areas with existing mining claims (e.g., polygons Co06B, P85B) that, if developed, would conflict with wilderness characteristics (***Wi1, Wi2, Wi5***). Some areas include private property without a road (e.g., polygons E49B, J63B, J63C, P86B, P88B). A standard directs no new roads because roads affect wilderness characteristics (***Wi1, Wi2, Wi5***). In other areas, roads from the MVUM penetrate the polygon (e.g., polygon E44A), bringing the sights and sounds of man, which have effects on wilderness characteristics (***Wi2, Wi5***).

Areas with none of the above use tradeoffs may be so small (e.g., Co14, P81, P82) that adding them brings no real benefit (***Wi1, Wi2, Wi5, Wi6, Wi10, Wi11, Wi12***) to the wilderness system.

This alternative includes existing NEPA decisions such as Mesa Alta (Co07), Hyde Park WUI Project (E40A), and Gallinas (P79B) that propose thinning to improve vegetative desired conditions. Similarly, many communities near the recommended wilderness areas expressed concern of nearby overstocked vegetation that needs thinning to reduce fire risk (e.g., E52B, E53A, P79B, P85D). However, objectives for vegetative treatments in alternative 3 would occur almost exclusively with fire. Fire as part of the natural process of the ecosystem is encouraged in recommended wilderness. Areas that are overstocked may not respond well to fire in the absence of pre-thinning; the ***excessive fuel loads can lead to increased fire intensity as well as fire size***[Wi19]. Therefore, in this alternative it is the most unlikely that ***vegetation would move toward desired conditions***[Wi20]**,** which would also have negative effects on wilderness characteristics (***Wi2***).

Having the most acres of recommended wilderness of all alternatives would have the greatest beneficial effects for wildlife (***Wi10-11***). In addition, this alternative adds many large areas and expands existing designated Wilderness which would benefit wildlife (***Wi10-11***) the most of all alternatives.

3.18.1.3.2.5 Alternative 4 – Human Uses Emphasis

Alternative 4 does not propose any new recommended wilderness, but does propose to remove about 68 acres from the existing San Pedro Parks Wilderness that includes the San Gregorio Reservoir and road currently used to stock the reservoir. This recommendation would be a preliminary administrative recommendation only that would receive further review similar to recommended wilderness. Congress has reserved the authority to make final decisions on wilderness designation.

Fishing in San Gregorio Reservoir is a popular activity. However, the reservoir is too shallow for fish to survive winter. Therefore, the reservoir is stocked almost annually to maintain the fishing and driving up the road is the most practical way to stock the reservoir, although not consistent with the Wilderness Act. If removed from wilderness designation as described, the use of motorized vehicles to stock San Gregorio Reservoir could continue, which would ***preserve a longstanding and popular recreational use in this area***[Wi21].

In this alternative, objectives for vegetation treatments would almost exclusively occur through mechanical means. However, there would be no new limitations on where this work could occur because there are no restrictions on motorized or mechanized uses to thin treats. Therefore, the greatest area of the forest has the potential to benefit from treating vegetation (***Wi20***).

This alternative represents no untenable tradeoffs or the beneficial effects (***Wi1, Wi2, Wi3, Wi5, Wi6, Wi12, Wi13***) of having them displaced by recommended wilderness. Having no acres of recommended wilderness would provide none of the beneficial effects for wildlife (***Wi10-11***).

3.18.1.4 Cumulative Effects

The cumulative effects analysis area includes the adjoining federally managed lands, including the Carson NF, National Park Service (NPS) and Bureau of Land Management (BLM), which also manage wilderness, wilderness study areas, or recommended wilderness. The Carson NF is also completing plan revision and has recommended wilderness adjacent to the Pecos and Chama River Canyon Wilderness Areas in at least one alternative. Recommended wilderness areas in alternatives 2 and 3 would provide for more wilderness opportunities in areas adjacent to these two wilderness areas. Recommended wilderness areas in alternatives 2 and 3 would be adjacent to the Bandelier Wilderness in the Bandelier National Monument (NPS), with alternative 3 providing for the most adjacent recommended wilderness opportunities. Dark Canyon recommended wilderness area (alternatives 2 and 3) is adjacent to recommended wilderness by the Carson NF and Rio Chama Wilderness Study Area (BLM), providing more wilderness opportunities across Federal ownership. Alternative 3 provides the most wilderness opportunity across Federal ownership boundaries. Expanded areas to preserve wilderness characteristics across land management boundaries improve effects to wilderness characteristics (***Wi1, Wi2, Wi6, Wi10, Wi11, Wi12, Wi14***).

3.18.2 Inventoried Roadless Areas

Inventoried roadless areas (IRAs) are a Forest Service administrative designation identified in the 2001 Roadless Area Conservation Rule (2001 Roadless Area Conservation Rule (Special Areas; Roadless Area Conservation; Final Rule, 66 Fed. Reg. 3243 (January 12, 2001)). IRAs are relatively undisturbed areas that serve as reference areas to measure the effects of development on other parts of the landscape. Road construction, reconstruction, and timber harvest activities are limited within these areas to sustain the social and ecological roadless characteristics of each area. These activities were selected because they commonly occur on forests and grasslands across the Nation, have the greatest likelihood of altering landscapes, cause significant landscape fragmentation, and result in immediate and long-term loss of roadless characteristics (USDA Forest Service 2000).

In 2000, the Forest Service completed an inventory of NFS lands for each forest and grassland that had been inventoried as roadless for planning purposes. This inventory was based on existing forest plans, plan revisions in progress where the agency has established a roadless inventory, or other assessments completed and adopted by the agency, including the Roadless Area Review and Evaluation (RARE) II inventory (USDA Forest Service 2000). These areas became identified as inventoried roadless areas under the 2001 Roadless Area Conservation Rule and are managed to preserve roadless character. As defined by the 2001 Roadless Area Conservation Rule, the following values or features characterize inventoried roadless areas:

1. high quality or undisturbed soil, water, and air;
2. source of public drinking water;
3. diversity of plant and animal communities;
4. habitat for threatened, endangered, candidate, proposed and sensitive species on large areas;
5. natural-appearing landscapes with high or very high scenic integrity;
6. Primitive, Semi-Primitive Non-Motorized and Semi-Primitive Motorized recreation opportunity spectrum classes of dispersed recreation;
7. reference landscapes;
8. traditional cultural properties and sacred sites; and
9. other locally identified unique characteristics.

During the plan revision, areas that may be suitable for inclusion in the National Wilderness Preservation System were inventoried and evaluated. IRAs were considered in that inventory and evaluation; however, IRA boundaries were not reconsidered in the plan revision process.

3.18.2.1 Affected Environment

In an increasingly developed landscape, IRAs provide large unfragmented tracts of land. As such, undisturbed landscapes that are important to biological diversity are a supporting ecosystem service of IRAs. They provide provisioning services such as clean drinking water and regulating services such as serving as bulwarks against the spread of nonnative invasive plant species. Opportunities for dispersed outdoor recreation, serving as reference areas for study and research, and their high scenic quality are cultural ecosystem services of IRAs.

The Santa Fe NF has 54 IRAs, totaling more than 241,400 acres. The largest is the Thompson Peak IRA at about 33,000 acres. The smallest is the Sparks Creek IRA with about 80 acres. IRAs are found on every district of the forest. Inventoried roadless areas may overlap other designated areas such as the Pecos Wild and Scenic River within the Pecos Wilderness. The most restrictive management direction applies when designated areas overlap.

Following existing regulation and policy, the Chief of the Forest Service reviews all projects involving road construction or reconstruction and the cutting, sale, or removal of timber in an IRA, with exceptions that are reviewed by the Regional Forester.

3.18.2.2 Methodology and Analysis process

Effects of the various alternatives to inventoried roadless areas were evaluated by comparing the plan direction of each alternative toward protecting the roadless character of these areas.

3.18.2.2.1 Analysis Assumptions

- Activities in IRAs under all alternatives would be consistent with the 2001 Roadless Area Conservation Rule to maintain their roadless characteristics.

- IRAs are managed to maintain the integrity of roadless characteristics listed in the background section above.

3.18.2.2.2 Indicators

Indicators selected as a means of comparing effects of the alternatives include:

- protecting roadless character through plan direction; and
- acres of IRA overlapping recommended wilderness management areas.

3.18.2.3 Stressors and Drivers

Ecological stressors such as drought, uncharacteristic wildfire, insects, and disease, have the potential to affect the vegetation, water, air quality, and wildlife resources within IRAs, which in turn, may indirectly affect overall roadless characteristics.

3.18.2.4 Environmental Consequences

3.18.2.4.1 Indicator: Protecting roadless character through plan direction

3.18.2.4.1.1 Effects common to all alternatives

No new IRAs are proposed for any alternative. Under all alternatives, IRAs would be managed in accordance with current regulation and policy. Activities within IRAs must follow the 2001 Roadless Area Conservation Rule (Special Areas; Roadless Area Conservation; Final Rule, 66 Fed. Reg. 3243 (January 12, 2001) and Forest Service policy on road construction and tree cutting, which is consistent with national Forest Service policy on preserving their roadless character. All alternatives include the oil and gas leasing EIS project area or management area. Exploration and development would continue within the area under the appropriate regulations and stipulations to protect resources. An IRA would be managed to protect its roadless character and the values and features that characterize the IRA. ***IRAs would continue to be reference areas to measure the effects of development on other parts of the landscape and a variety of ecosystem services such as undisturbed landscapes that are important to biological diversity, clean drinking water, opportunities for dispersed outdoor recreation, reference areas for study and research, and high scenic quality***[IRA1].

3.18.2.4.1.2 Alternative 1 – 1987 Forest Plan

Alternative 1 does not include specific plan components for IRAs and provides the least direction for IRA management of all the alternatives. Emphasis for management in alternative 1 would continue under the management areas that IRAs occupy and the 2001 Roadless Area Conservation Rule. Although a management area's emphasis may differ (such as timber emphasis), Forest Service regulation and policy would provide management guidance for an IRA to protect roadless character with associated effects (***IRA1***).

3.18.2.4.1.3 Effects Common to Alternatives 2, 3, and 4

IRAs are included in the plan as a designated area with specific plan components specific to these areas to protect roadless character in alternatives 2, 3, and 4. According to plan components, IRAs should be managed for Primitive, Semi-Primitive Non-Motorized, and Semi-Primitive Motorized ROS and consistent with the High SIO. Under any of these alternatives, IRAs would also be managed under the emphasis of the management areas or geographic areas they occupy, the designated area's plan components, and the 2001 Roadless Area Conservation Rule. Where designated areas, geographic areas, and management areas overlap, the most restrictive plan components apply. Overall, IRA plan components seek to preserve natural settings and roadless character.

Alternatives 2, 3, or 4 would include an oil and gas leasing management area. Guidelines include no surface occupancy within IRAs with a few exceptions. As per agency NEPA processes, public notice and comment period is required prior to waiver, exception, or modification of this stipulation (USDA Forest Service 2008c).

Each of these alternatives would also include eligible wild and scenic rivers that may overlap with IRAs. Plan components for this management area complements the management for roadless characteristics.

Alternatives 2, 3, and 4 provide more comprehensive direction than alternative 1. The management direction causes the best management and protection of IRAs and the associated effects (***IRA1***).

3.18.2.4.1.4 Alternative 2 – Proposed Action

Under this alternative, several additional management areas would overlap inventoried roadless areas: the Caja del Rio Wildlife and Cultural Interpretive Management Area, and the three Cultural Areas (Nogales Cliff House, Poshuoiunge, and Tsipinuouinge). Plan components for these management areas would complement the management for roadless characteristics with associated effects (*IRA1*).

3.18.2.4.1.5 Alternative 3 – Natural Processes Emphasis

Alternative 3 would propose several management areas that overlap inventoried roadless areas: Wetland Jewels, Holy Ghost Canyon, Cultural Interpretive. Plan components for these management areas would complement the management for roadless characteristics with associated effects (***IRA1***).

3.18.2.4.1.6 Alternative 4 – Human Uses Emphasis

Alternative 4 includes a motorized recreation management area; none of this management area would be located within IRAs. Alternative 4 would also include the Greater Santa Fe Recreation management areas, with plan components to balance the natural setting with recreation values. Components include a guideline to avoid construction of permanent or temporary roads unless required by a valid permitted activity or for management actions that would help meet desired conditions (e.g., ecological health, restoration). The proposed management area's direction would complement management for roadless characteristics with associated effects (***IRA1***).

3.18.2.4.2 Indicator: Acres of IRA overlapping recommended wilderness management areas

3.18.2.4.2.1 Effects Common to All Alternatives

In some alternatives, IRAs overlap with recommended wilderness areas. Since the most restrictive management direction would apply, these overlapping areas would be also managed to protect the wilderness character present at the time of recommendation, which ***would protect roadless characteristics present in overlapping areas likely resulting in the highest quality roadless character due to the more restrictive management direction for wilderness character***[IRA2] and in turn result in greatest protection of roadless character, values, and features and other associated effects of protecting roadless character (***IRA1***). Areas of wilderness recommendation vary by alternative and are shown in the table below (table 19).

Table 19. Acres of IRA overlapping recommended wilderness management areas in all alternatives

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Acres of IRA as recommended wilderness	1,842 acres	23,978 acres	119,970 acres	0 acres

3.18.2.4.2.2 Alternative 1 – 1987 Forest Plan

Alternative 1 has about 1,842 acres of overlapping IRA and recommended wilderness, with effects of protecting roadless character (***IRA2***) more than alternative 4.

3.18.2.4.2.3 Alternative 2 –Forest Plan

Alternative 2 has about 23,978 acres of overlapping IRA and recommended wilderness, with effects of protecting roadless character (***IRA2***) better than alternatives 1 and 4.

3.18.2.4.2.4 Alternative 3 – Natural Processes Emphasis

Alternative 3 has about 119,970 acres of overlapping IRA and recommended wilderness, proposing the most acreage of IRA as recommended wilderness than any other alternative with effects of protecting roadless character (***IRA2***) the most among alternatives.

3.18.2.4.2.5 Alternative 4 – Human Uses Emphasis

Alternative 4 has no overlapping IRA and recommended wilderness effects of protecting roadless character (***IRA2***) the least among alternatives.

3.18.2.4.3 Cumulative Effects

The cumulative effects analysis area includes the adjoining federally managed lands, including the Carson NF bordering the Santa Fe NF, National Park Service and Bureau of Land Management, which also manage inventoried roadless areas, wilderness, or wilderness study areas. Roadless character of IRAs with the cumulative effects analysis area would be maintained or enhanced through Forest Service or other agency regulation and policy. Other agencies and adjacent forests may also recommend portions of IRAs as wilderness or wilderness study areas, resulting in cumulative effects that protect roadless character (***IRA1, 2***) and associated benefits (***IRA1***).

3.18.3 Research Natural Areas

Research natural areas (RNAs) are administratively designated by Forest Service regional foresters and the research station directors, and managed to maintain the natural features for which they were established. Because of the emphasis on natural conditions, they are excellent areas for studying ecosystems or their component parts and for monitoring succession and other long-term ecological changes. Non-manipulative research and monitoring activities are encouraged in natural areas and can be compared with manipulative studies conducted in similar areas that are not in RNAs. RNAs help protect biological diversity at genetic, species, and ecosystem scales. As ecosystems in relatively pristine condition, RNAs are managed primarily for their natural ecological processes, and in some cases, to help protect rare or threatened species (P.N.I.N.A. 2014).

3.18.3.1 Affected Environment

The Santa Fe NF has two established RNAs (Monument Canyon and Mesita de los Ladrones) and one proposed RNA (Cañada Bonita). The 1987 Forest Plan assigns management area M to both the established and proposed RNAs. Additional management direction was included for the Monument Canyon RNA in Amendment 11, with the designation of the Jemez National Recreation Area. Mesita de los Ladrones RNA was established in 1991 (USDA Forest Service 1991); however, the 1987 Forest Plan inaccurately lists it as proposed in management area M.

3.18.3.1.1 Monument Canyon Research Natural Area

The Monument Canyon RNA is composed of approximately 640 acres on the Jemez Ranger District. The area is located along a trail from Jemez Springs to Upper Vallecitos. The Monument Canyon RNA was set aside to preserve in natural state a "typical area of western yellow pine (*Pinus ponderosa*) forest as found in northern New Mexico" (USDA Forest Service 1932b). The stands of western yellow pine in this region differ from those of the Colorado Plateau in being denser and more evenly spaced with trees of relatively small diameter.

3.18.3.1.2 Mesita de los Ladrones Research Natural Area

The Mesita de los Ladrones RNA embodies approximately 500 acres of one-seed juniper (*Juniperus monosperma*) savannah. The RNA is located on the Pecos/Las Vegas Ranger District in San Miguel County. Juniper savannah has been recognized as a significant open woodland community for protection and study in the RNA program (USDA Forest Service 2016b, page 207). Difficulties in locating an intact, suitable examples of this ecosystem are a result of the forage value of the accompanying grass understory. Vegetation composition in most juniper savannahs has been substantially modified by grazing, and, in many cases, the landscape has been intentionally altered by chaining or fuelwood harvesting with the aim of favoring forage production (USDA Forest Service 2016, page 207). The Santa Fe NF recommended Mesita de los Ladrones as a potential suitable representative due to its minimal grazing use history (USDA Forest Service 1991).

3.18.3.1.3 Cañada Bonita Proposed Research Natural Area

The Cañada Bonita proposed RNA includes approximately 300 acres in the Jemez Mountains. The area was originally proposed in 1988, and will remain as a proposed RNA until designated by the regional forester and research station director or released for management through the plan revision process. The proposed RNA is located on the Española Ranger District in Los Alamos County.

Cañada Bonita proposed RNA is an example of an outstanding high-elevation (9,200 to 9,700 feet) Thurber fescue(*Festuca thurberi*) community at or very near its climax expression (USDA Forest Service 2016b, pages 206-207). Thurber fescue meadows are dominant on south-facing slopes. On upper slopes and ridge tops in the proposed RNA are patches of aspen which provide abrupt contrast to the fescue meadows. Steeper north-facing slopes within or adjoining this proposed RNA have closed forests of Engelmann spruce (*Picea engelmannii*) and corkbark fir (*Abies lasiocarpa* var. arizonica) (USDA Forest Service 1988).

The proposed Cañada Bonita RNA provides the best, and possibly the only, opportunity for maintenance of a Thurber fescue meadow within the USDA Forest Service Southwestern Region (USDA Forest Service 2016b, pages 206). Examples of this important high-elevation ecosystem type are in very short supply with most acreage already within grazing allotments or suffering from major erosion problems or heavy public use. This area has not been grazed by permitted domestic livestock since at least 1940, when the area was withdrawn as a defense facility (USDA Forest Service 2016b, pages 206-207).

3.18.3.2 Methodology and Analysis process

Effects of the proposed action, no action, and alternatives were determined by evaluating plan components for research natural areas across alternatives.

3.18.3.2.1 Analysis Assumptions

- In all alternatives, completion of RNA designations and establishment reports would depend on agency capacity (such as staffing, budget). Implementation of establishment reports and management plans should provide additional emphasis toward meeting the desired conditions of the RNAs. Until designation, proposed RNA would be managed to protect and maintain a natural condition.

3.18.3.2.2 Indicators

When evaluating effects to research natural areas, the primary focus is on the direction provided in each alternative guiding the management and protection of the critical resources identified in each of these areas. There is only one indicator to evaluate effects to these areas: effects to the natural features for which an RNA was established through plan components.

3.18.3.3 Stressors and Drivers

Plant species, vegetation types, or natural ecosystem conditions are primary reasons for proposing or establishing most RNA. Ecological stressors that affect vegetation could have effects on the natural features for which an RNA was established or proposed. Vegetation and ecosystems may be vulnerable to stressors which include drought, increased number and intensity of wildfires, increased stress on vegetation including insect and disease outbreaks and decreased water yield and availability. Each of these stressors may affect one or more species or vegetative ecosystems within an RNA, including those natural resources for which an area was established or proposed. This may decrease the opportunity for scientists and others who use the RNA to study specific plants and animals, but may also increase opportunity for scientists or others who use the RNA to study and consider the effects of these stressors on various ecosystem processes and natural conditions.

3.18.3.4 Environmental Consequences

3.18.3.4.1 Indicator: Effects to the natural features for which an RNA was established through plan components

3.18.3.4.1.1 Effects Common to All Alternatives

Through agency policy and direction (FSM 4000, 4063 Research Natural Areas) both designated and proposed RNA would be ***protected and maintained in a natural condition allowing them to provide information through non-manipulative research and education***[RNA1].

3.18.3.4.1.2 Alternative 1 – 1987 Forest Plan

RNAs would be managed using the direction in Management Area M and agency policy and direction with associated effects (***RNA1***). Additional management direction was included for the Monument Canyon RNA in Amendment 11, with the designation of the Jemez National Recreation Area. Management direction includes standards for various management activities that would not be appropriate with an RNA such as prohibit all timber and firewood activities, stipulating no surface occupancy for mineral leasing, excluding utility corridors, prohibiting new trail construction, and allowing non-motorized dispersed recreation activities. These plan components protect and maintain the conditions for which an area was proposed or established along with associated effects (***RNA1***).

3.18.3.4.1.3 Effects Common to Alternatives 2, 3, and 4

Alternatives 2, 3, and 4 include established RNA as a designated area with comprehensive plan components. Plan components emphasize the study of ecosystems and ecological processes, natural settings, and non-motorized uses with the exception of motorized uses shown on the MVUM in the Monument Canyon RNA. Management direction includes standards for various management activities that would not be appropriate within an RNA such as stipulating no surface occupancy for minerals, geothermal, or oil and gas development, prohibiting vegetation manipulation or removal of forest projects for commercial purposes unless it is necessary to maintain the natural characteristics for which an area was established, prohibiting new trail and road construction or opening closed roads, prohibiting campfires, and excluding utility corridors. Cañada Bonita Proposed RNA is a management area with plan components aligned with the established RNA plan components. The comprehensive direction would result in further protection and enhancement of the natural features for which an RNA was established than alternative 1 (***RNA1***).

3.18.3.4.2 Cumulative Effects

The cumulative environmental consequences analysis area is the regional network of RNAs in the National Forest System lands in New Mexico and Arizona. It is reasonably foreseeable that the other Arizona and New Mexico national forests would propose RNAs during their plan revision efforts for unique natural features, ecosystems, or other ecological features.

Because the RNAs are located within the interior of the forests, activities occurring off-forest should have no or extremely limited impacts. Establishment of RNAs in the national forests should contribute to the vegetation communities within the existing RNAs system and provide a potential scientific basis for climate change research. The Santa Fe NF RNAs would also be complementary to those on the Carson, Cibola, Lincoln, and Gila National Forests. Cumulatively, the regional network of RNAs ***would provide opportunities for non-manipulative research and education opportunities across a diversity of landscapes, high quality examples of unique ecosystems and ecological features and rare or sensitive special of plants and animals and their habitat***[RNA2].

3.18.4 Wild and Scenic Rivers

Congress passed the National Wild and Scenic Rivers System Act in 1968 (Public Law 90-542: 16 U.S.C. 1271-1287, October 2, 1968) for the purpose of preserving rivers with outstanding natural, cultural and recreation values in a free-flowing condition. Wild and scenic rivers (WSR) are designated by Congress and are to be protected for the benefit and enjoyment of present and future generations.

Wild and scenic rivers that are eligible for designation must meet the basic criteria for inclusion in the National Wild and Scenic Rivers System. Eligible rivers must be free-flowing and possess at least one value that is outstandingly remarkable on a regional or national level. Outstandingly remarkable values (ORVs) categories include: scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values that are a unique, rare, or exemplary feature that is significant when compared with similar values from other rivers at a regional or national scale (FSH 1909.12; 82.73). Designation into the National Wild and Scenic Rivers System preserves rivers in free-flowing condition, and protects water quality, ORVs, and the river's immediate environment for the benefit of present and future generations. The Wild and Scenic Rivers Act defines river classifications on a variety of elements: accessibility, developments along the shoreline, presence or absence of impoundments, and water quality. For management purposes, river segments are classified as wild, scenic, or recreational.

- **Wild Rivers** – Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and water unpolluted.
- **Scenic Rivers** – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped but accessible in places by roads.
- **Recreational Rivers** – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

3.18.4.1 Affected Environment

The Santa Fe NF has designated and eligible wild and scenic rivers.

3.18.4.1.1 Designated Wild and Scenic Rivers

The Santa Fe NF has three designated wild and scenic rivers totaling 44.9 miles. During the 1987 Santa Fe Forest Plan development, an evaluation was conducted of six rivers on the Santa Fe NF that were listed in the Nationwide Rivers Inventory and were free-flowing, making them potentially suitable for wild and scenic rivers status. During the suitability analysis, the river segments were classified into multiple segments based on criteria outlined in the Wild and Scenic Rivers Act.

Three of the six suitable Nationwide Rivers Inventory rivers on the Santa Fe NF were recommended, and each of these segments were later given congressional designation as wild and scenic rivers. Those designated in the Forest include the Rio Chama on the Coyote Ranger District, East Fork of the Jemez River on the Jemez Ranger District, and Pecos River on the Pecos/Las Vegas Ranger District (figure 15).

The Santa Fe NF has followed existing management guidance that directs protection of the designated wild and scenic rivers' outstandingly remarkable values in accordance with the Wild and Scenic Rivers Act. Each designated wild and scenic river on the Santa Fe NF also has comprehensive river management plan that provides more specific guidance for management of each river**.** Table 20 identifies each designated river, the designated ORVs, and wild and scenic rivers classification.

Table 20. Designated wild and scenic rivers on the Santa Fe NF

River	Outstandingly Remarkable Values (ORVs)	Classification
Rio Chama	Scenic, Recreational, Geologic, Fish and Wildlife, Cultural, Ecological	Wild – 10.4 miles Scenic – 3.0 miles
East Fork Jemez	Scenic, Recreational, Geologic, Fish and Wildlife, Ecological	Wild – 4.0 miles Scenic – 5.0 miles Recreational – 2.0 miles
Pecos	Scenic, Recreational, Historic, Cultural	Wild – 13.5 miles Recreational – 7.0 miles

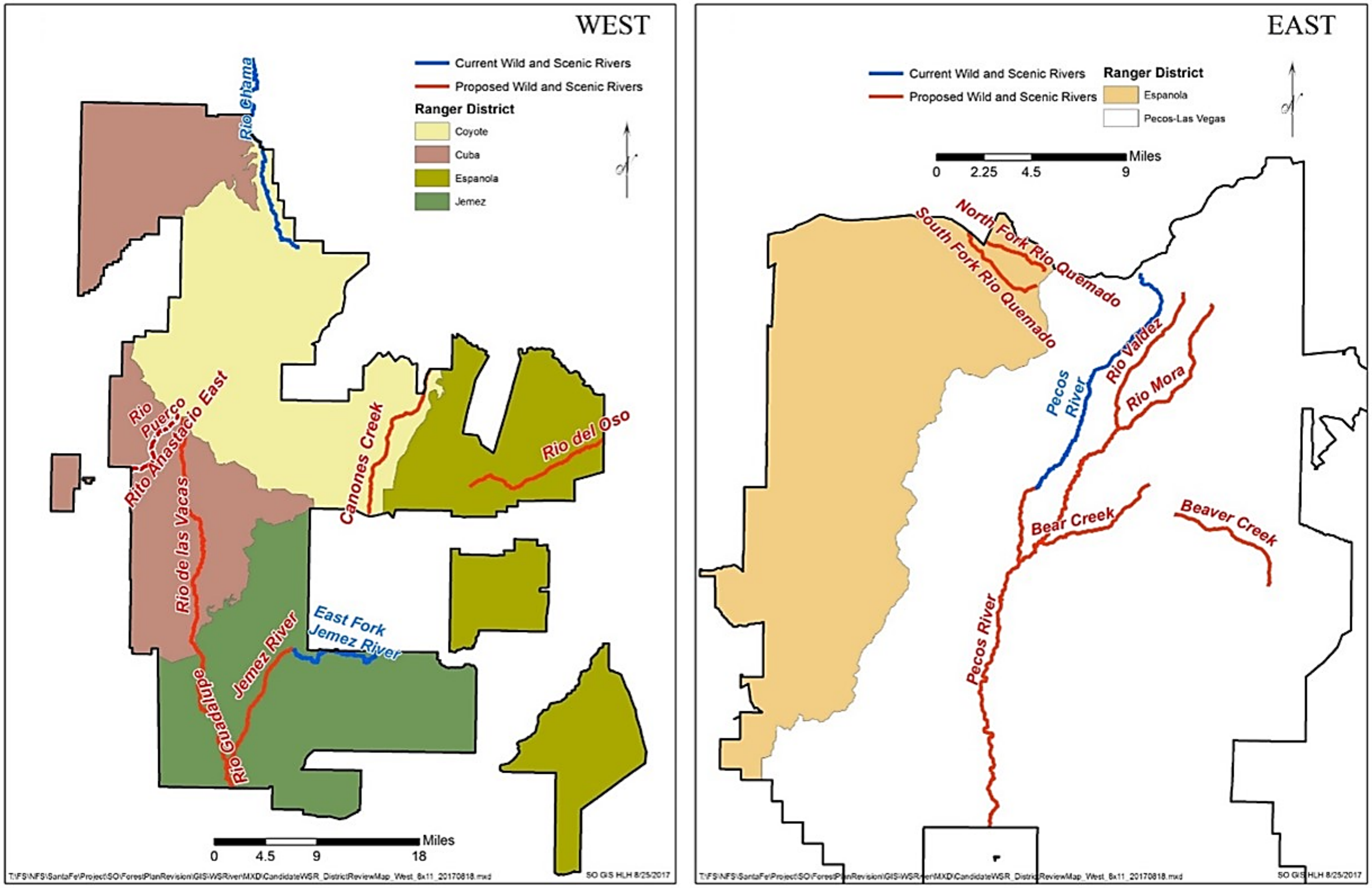

Figure 15. Designated and eligible wild and scenic rivers in the Santa Fe NF

3.18.4.1.1.1.1 Rio Chama Wild and Scenic River

The Rio Chama is about 120 miles long, beginning in the southern San Juan Mountains of south-central Colorado and ending at the confluence with the Rio Grande near Española, New Mexico (figure 15). In 1977, the state of New Mexico designated the Rio Chama as a State Scenic and Pastoral River (NM Stat § 16-4-4 (2017)) Approximately 30 miles of the river were later designated as a Federal Wild and Scenic River in 1988. The designated area begins at the El Vado launch site approximately 1 mile below El Vado Dam and extends downstream to just below Big Eddy takeout above Abiquiu Reservoir.

The upper reach of the Rio Chama flows through Bureau of Land Management (BLM) lands (11.2 miles) before reaching the Santa Fe NF. In the Santa Fe NF, 10.4 miles of the Rio Chama are classified as Wild and 3.0 miles are classified as Scenic. In the same corridor, nearly 4 miles remain listed as a WSR Study Area, and 1.8 undesignated miles are jointly managed with the U.S. Army Corps of Engineers (USDA Forest Service et al. 1990). A comprehensive river management plan for the Rio Chama, and an accompanying forest plan amendment were completed and signed in October 1990.

A float down the river offers access to many interesting side canyons with trails leading to peaks and mesa tops. This is the country of brightly colored cliffs and fascinating badlands made famous by artist Georgia O'Keeffe. Four small sections of the river are managed as no camping zones to protect identified resources. There are six ORVs identified for the Rio Chama: scenic, recreational, geologic, fish and wildlife, cultural and ecological.

Private boaters may float the Scenic portion of the Rio Chama without a permit by putting in at Chavez Canyon; commercial outfitters must obtain a special use permit from the Santa Fe NF to take customers on this reach of the river. Overnight float trips through the Wild portion of the Rio Chama between May 1 and Labor Day are required to have a permit from the Bureau of Land Management, Taos Field Office. Friday and Saturday launch permits are issued by BLM lottery. To better protect cultural resources and riparian areas, as well as to improve wildlife security and public safety, group size is limited to 16 people.

3.18.4.1.1.1.2 East Fork Jemez Wild and Scenic River

The East Fork Jemez Wild and Scenic River is located in Sandoval County in the Jemez Mountains (figure 15). This river was designated for five categories of ORVs: scenery, recreation, geologic, fish and wildlife, and ecologic. The high diversity of vegetation along the wild and scenic river corridor appears to be quite rare in the national system; it includes a botanical special interest area for the bunchberry dogwood (*Cornus canadensis*) and habitat for the giant helleborine (*Epipactis gigantea*), which has a scattered distribution in riparian areas. Diversity in wildlife values, with the many vegetative edges and ecotones, includes three notable birds, a rare bat, and the federally threatened Jemez Mountain salamander (*Plethodon neomexicanus*).

The East Fork Jemez Wild and Scenic River corridor is entirely within lands managed by the Santa Fe NF and is within the congressionally designated Jemez National Recreation Area (PL 103-104, 1993). The wild and scenic river is 11 miles long with a corridor averaging 320 acres per mile. The East Fork Jemez comprehensive river management plan, and subsequent forest amendments were completed in 2002 and 2003.

The East Fork Jemez Wild and Scenic River begins at the boundary of the Valles Caldera National Preserve (Preserve) where the East Fork exits the Preserve. The designation of the first 2 miles of the wild and scenic river from the preserve boundary to the second highway crossing of New Mexico

Highway 4 is classified as Recreational. This segment is characterized by low stream gradients and easy access for recreational activities. The next 4.7 miles extending to the third highway crossing is designated as the Wild segment. The Wild segment includes a tight box canyon with moderate stream gradient, big boulders, and difficult access. The last 5 miles, ending where the East Fork joins San Antonio Creek to form the Jemez River, is designated as a Scenic segment. The Scenic segment is characterized by a steeper gradient, including Jemez Falls, dropping into a narrow canyon with limited access. The reach of the East Fork before joining San Antonio Creek has numerous boulders, pools, and eddies creating some suitable fish habitat and attractive pools for swimming.

3.18.4.1.1.1.3 Pecos Wild and Scenic River

The Pecos Wild and Scenic River is located in San Miguel and Mora Counties in the Sangre de Cristo Mountains. The Pecos Wild and Scenic River is 20.5 miles long beginning at the headwaters in the Pecos Wilderness and continuing downstream past the junction with Willow Creek. The comprehensive river management plan and subsequent forest plan amendments for the Pecos Wild and Scenic River were completed in 2003.

The Pecos Wild and Scenic River has two designated sections—a 13.5-mile Wild segment and a 7-mile Recreational segment. The wild reach is entirely within the Pecos Wilderness. It flows through a variety of terrain, from steep canyons of large boulders to meadows. The shoreline is primitive, and the water is unpolluted. This segment is accessible only by trail. The Recreational reach is outside the wilderness and is characterized by lower stream gradients and easier accessibility. Cabins and other modifications along the shoreline are rustic. The paved road (NM Highway 63) that generally parallels the river throughout this segment provides easy access for recreational activities.

The Pecos Wild and Scenic River is free of impoundments that would restrict its free-flowing character, and with headwaters in the Pecos Wilderness, it runs clear, cold water. The ORVs identified for the river include scenery, recreation and cultural/historic. Dramatic landscape contrasts are provided by canyons, mountain meadows and waterfalls. Trout fishing along this river draws people from near and far. Cultural attributes derive from pre-historic artifacts, remnants of Spanish prospecting from the 1600s, the mountain man-Beatty's home, and early 20th-century acequias, cemeteries, and Civilian Conservation Corps campsites (USDA Forest Service 2003).

3.18.4.1.2 Eligible Wild and Scenic Rivers

As part of the forest plan revision process, the Forest Service is directed to conduct a comprehensive inventory and evaluation to determine which rivers on the forest are eligible for inclusion in the National Wild and Scenic River System (FSH 1909.12, ch.80). When evaluating streams and rivers, two categories are evaluated: (1) whether the stream possesses any ORVs; and (2) whether the stream is free flowing without impoundment, diversion, or modifications. Criteria for ORVs and all analysis documentation and maps are included in the Wild and Scenic River Eligibility Analysis in appendix K.

All named streams and rivers on the Santa Fe NF were evaluated to determine their eligibility, and the land immediately surrounding a potentially eligible river (river corridor) was taken into consideration. River corridors include all lands within one-quarter mile of each side of the eligible river. Each river found to be eligible was assigned a preliminary classification, based on the condition and development level in and around the river at the time it was deemed eligible.

This evaluation resulted in about 74 miles of 12 rivers as eligible for inclusion in the National Wild and Scenic Rivers System on the Santa Fe NF (table 21). These 12 rivers are associated with approximately 24,143 acres of river corridors. The total river miles for each preliminary classification are as follows: 10 miles Recreational, 20 miles Scenic, and 44 miles Wild. The outstandingly remarkable values and preliminary classifications for the 12 eligible wild and scenic rivers on the Santa Fe NF are identified in table 21.

Table 21. Santa Fe NF eligible wild and scenic rivers and their district location, ORVs, WSR Classification, and river lengths

Stream Name	District	Outstandingly Remarkable Values (ORVs)	Classification	Miles
Canoñes Creek	Coyote	Recreation, Scenery, Prehistory, Botanical, Fish	Wild	9.98
Rio Guadalupe	Jemez	Scenery, Prehistory, Recreation	Scenic	13.23
Rio del Oso	Espanola	History, Prehistory	Recreational	10.22
Rito Anastacio East	Cuba	Scenery, Botanical, Fish	Wild	2.07
Rio Puerco	Cuba	Scenery, Botanical, Fish	Wild	8.33
Jemez River	Jemez	Prehistory	Wild	4.34
Pecos River	Pecos-Las Vegas	History	Scenic	6.75
Rio de las Vacas	Cuba	Scenery, Botanical, Fish	Wild	7.20
Rio Molino	Espanola	Fish	Wild	4.45
Rio Valdez	Pecos-Las Vegas	Fish	Wild	2.25
Beaver Creek	Pecos-Las Vegas	Fish, Scenery	Wild	3.05
Bear Creek	Pecos-Las Vegas	Fish	Wild	2.36

Once identified, eligible wild and scenic rivers must be managed and protected to maintain their free-flowing nature and outstandingly remarkable values until a suitability determination for inclusion into the National Wild and Scenic Rivers System has been made. If an eligible river is designated as a wild and scenic river by Congress, the designation would not affect existing water rights or the existing jurisdiction of State and Federal Governments as determined by established laws.

3.18.4.2 Methodology and Analysis process

The analysis in this section evaluates the rivers on the Santa Fe NF that are currently designated as wild and scenic rivers and the 12 river segments determined to be eligible for inclusion into the National Wild and Scenic River System. It also describes the potential environmental consequences on the wild and scenic river resource that may result with the adoption of different alternatives in the draft forest plan.

3.18.4.2.1 Analysis Assumptions

- Management of wild and scenic river resources complies with the 1968 Wild and Scenic Rivers Act. The act was passed to preserve the beauty and free-flowing nature of some of the most precious waterways in America. To be designated, rivers or sections of rivers must be free-flowing and possess at least one outstandingly remarkable value, such as scenic, recreational, geologic, fish, wildlife, historic, cultural, or other feature identified under the act. Additionally, each designated river has a specific comprehensive river management plan that sets forth specific management prescriptions to protect the outstandingly remarkable values. Any proposed water resources project, including management activities within the streambed and banks, and below the ordinary high water mark of the river, shall trigger a Section 7 free flow analysis as directed by the Wild and Scenic Rivers Act.

- The number and miles of eligible rivers do not vary by alternative.
- All eligible river segments and associated corridors are managed in compliance with Forest Service Handbook 1909.12, Chapter 84.3 – Interim Protection Measures for Eligible or Suitable Rivers. These guidelines are specific to water resources projects, hydroelectric power, minerals, transportation system, utility proposals, recreation development, motorized travel, wildlife and fish projects, vegetation management, and domestic livestock grazing.

3.18.4.2.2 Issues and Indicators

During public scoping, no issues were developed surrounding designated wild and scenic rivers. Additionally, there were no need for change statements identified in the final assessment regarding management direction of designated wild and scenic rivers. Protection of ORVs and the free-flowing condition of designated rivers is the primary evaluation focus for designated wild and scenic rivers.

Two indicators were used in this analysis:

- Protection of ORVs
- Maintaining free-flowing conditions

Identifying and addressing appropriate eligible wild and scenic rivers was identified as an issue during the scoping process of Plan revision. The final assessment identified a need for change to the current forest plan direction to identify and evaluate eligibility of additional rivers or river segments on the Santa Fe NF for inclusion in the National Wild and Scenic Rivers System. The process for evaluating river eligibility is established in FSH 1909.12 Chapter 80. Effects to eligible wild and scenic rivers will be evaluated similar to designated wild and scenic rivers with a focus on the protection of ORVs and free flowing condition. The following indicator will be used to analyze the eligible wild and scenic rivers per alternative:

- Miles of eligible river corridor overlapping other management or designated areas.

3.18.4.3 Environmental Consequences

3.18.4.3.1 Designated Wild and Scenic Rivers

3.18.4.3.1.1 Effects Common to All Alternatives

The three designated wild and scenic rivers on the Santa Fe NF would not change by alternative and would continue to be managed according to Forest Service policy, direction from the Wild and Scenic Rivers Act, the current or draft forest plan, and comprehensive river management plan direction. The draft forest plan states that management of designated wild, scenic, and recreational rivers must comply with the most recent version of their individual comprehensive river management plan. The comprehensive river management plan and any future versions of it must be incorporated by reference and would become part of the forest plan; although, best available science can be used in lieu of the comprehensive river management plan if the Plan is out of date with science. All alternatives would include management direction to protect the free-flowing condition of designated wild and scenic rivers and preserve and enhance the ORVs for which they were established. ***Maintaining the conditions that characterize WSRs upholds the standards set forth in the National Wild and Scenic Rivers System Act and benefits present and future generations through the enjoyment of these areas*** [WSR1]. Moreover, ***managing these areas to maintain their free-flowing***

nature and ORV's would help to protect water quality, scenic integrity, areas of cultural or historic significance, and improve riparian habitats, aquatic species health and diversity, especially within the areas designated as Wild or Scenic [WSR2]. There are no other anticipated effects to designated wild and scenic rivers.

3.18.4.3.2 Eligible Wild and Scenic Rivers

3.18.4.3.2.1 Effects Common to All Alternatives

The number and miles of eligible rivers defined in the forest plan do not vary by alternative. In all alternatives, the identified eligible wild and scenic rivers and their corridors (one-quarter mile on either side of the river) would be managed in accordance with Forest Service Handbook 1909.12, Chapter 82.5. The presence of an eligible river constrains the type of activities that may be conducted within the river corridor. Three constraints would apply to activities proposed under any alternative in all eligible river corridors: (1) the protection of the free-flowing river character; (2) the protection of the identified outstandingly remarkable values; and (3) the maintenance of the preliminary river classification (wild, scenic, or recreational) unless a completed suitability study recommends a less restrictive classification.

Application of the management guidelines found in the Forest Service Handbook (FSH 1909.12_80) would also constrain the management of other resources within the river corridor, thereby ***minimizing the effects of management activities on the free flow characteristics, water quality, and ORVs identified for the river segments, which would include minimized effects of reduced scenic value, degraded water quality, interference with water flow, reduction in recreation opportunities, or threats to cultural and historic values from management activities*** [WSR3]. Management constraints defined in the Forest Service Handbook are specific to water resources projects, hydroelectric power, minerals, transportation system, utility proposals, recreation development, motorized travel, wildlife and fish projects, vegetation management, and domestic livestock grazing. Plan guidelines vary by river classification, with the most restrictions on wild river corridors and the least restrictions on recreational river corridors. For example, the cutting of trees is not allowed in Wild river corridors unless it is necessary for human safety or to protect a cultural value at risk, but is acceptable within Recreational areas to meet resource objectives. Additionally, fire (either natural or planned) is acceptable in all wild and scenic rivers areas to provide for better wildlife habitat or to restore conditions within the natural range of variability. Some activities or infrastructure may be limited (e.g., roads, vegetation management, minerals) or restricted (e.g., hydroelectric power, utility corridors) within wild and scenic rivers areas to maintain, protect, or enhance river characteristics and outstandingly remarkable values (***WSR1-2***).

The presence of these river corridors may result in increased public interest and awareness of river resources, especially in the arid Southwest, leading to increased visitation and potential impacts to the area. ***As populations increase and more people visit the Santa Fe NF, the value of managing these areas in their relatively natural condition would increase user satisfaction and contribute to the increased well-being of visitors from spending time in these special areas*** [WSR4]. The peacefulness of the more untrammeled Wild and Scenic areas could reduce stress and allow for sightseeing or wildlife viewing opportunities, while Recreation segments provide increased opportunity for sport and leisure activities. ***An increase in visitation to WSR areas would generate increased economic revenue within the surrounding communities through the sale of food, lodging, bait and tackle, guide services, or other river-based revenue sources*** [WSR5]***.*** Conversely, ***increased visitation to WSR areas could have some detrimental ecological impacts, such as***

ground disturbance, increased trash or discarded items, nonnative species introductions or spread, reduced fish populations (through increased fishing pressure), or aquatic habitat degradation WSR6.

3.18.4.3.3 Consequences of Management Areas for Wild and Scenic Rivers

3.18.4.3.3.1 Alternative 1 – 1987 Forest Plan

The 1987 Forest Plan includes little to no forestwide management direction for eligible wild and scenic rivers. Thus, management of eligible wild and scenic rivers would defer to Forest Service Handbook 1909.12, Chapter 84.3 – Interim Protection Measures for Eligible or Suitable Rivers for directives in Alternative 1. The location of an eligible river corridor may overlap an area having either divergent or similar management directives. For this alternative (having unique management areas from other alternatives), eligible WSR corridors predominantly overlap with Wilderness (39 percent), Jemez National Recreation Area (22 percent), Sensitive Soils and Species (15 percent), and Semi-Primitive Non-Motorized Recreation areas (11 percent) (table 22). Because the interim management guidelines for each preliminary river classification do not always match the directives for a particular management area, eligible wild and scenic rivers corridors are managed by the more restrictive management area or river corridor direction and are supplemented by the proposed wild and scenic rivers management plan direction, especially with regard to identified ORVs. By managing for the most restrictive management directives, the criteria guiding the eligibility (or designation) of wild and scenic rivers would be upheld (***WSR1-3***).

Table 22. Eligible wild and scenic river corridor acres by classification and management area for alternative 1

Management Area	Wild Classification Acres	Scenic Classification Acres	Recreational Classification Acres
A – Timber/Wildlife	342	0	0
B – Wildlife/Timber	127	0	0
C – Recreation, Visual, Wildlife/Timber	0	193	0
D – Recreation, Visual/Timber	0	0	17
E – Dispersed Recreation, Visual/Timber	366	0	184
F – Wild and Scenic River	22	0	0
G – Wildlife, Range, Firewood	212	138	243
H – Wilderness	9,468	0	0
J – Sustained Water Yield, Water Quality Maintenance/ Enhancement	65	0	0
K – Sensitive Soils and Species	0	856	2,736
L – Semi-Primitive Non-Motorized Recreation	2,651	0	0
X – Jemez NRA	1,453	3,936	0
Other ownership	69	991	64
Total	14,784	6,115	3,244

3.18.4.3.3.2 Effects Common to Alternatives 2, 3 and 4

For alternatives 2, 3, and 4, all eligible river corridors are included in the eligible Wild and Scenic Rivers Management Area. Similar to alternative 1, the Wild and Scenic Rivers Management Area may overlap other designated areas or management areas with more restrictive management (table 23). Regardless of which management area or designated area each eligible river overlays, the river characteristics and ORV would be protected through application of the Plan components and interim management guidelines given in the Forest Service Handbook 1909.12_80 (***WSR1-3***). Therefore, the effects of management of other Forest resources (e.g., grazing, vegetation, forest products, wildlife, etc.) are not expected to directly affect wild and scenic rivers. Other effects may occur for some alternatives and are discussed below.

Table 23. Eligible wild and scenic river corridor by classification and overlapping designated area or potentially more restrictive management area for action alternatives

Stream Name	Classification	Overlapping Designated Area or Management Area
Canoñes Creek	Wild	Canoñes Creek IRA, Canoñes National Recreation Trail
Rio Guadalupe	Scenic	Jemez National Recreation Area, Virgin Mesa IRA, Recommended Wilderness Management Area in alternative 3 (1,112 acres overlapping)
Rio del Oso	Recreational	Lemitas IRA
Rito Anastacio East	Wild	San Pedro Parks Wilderness
Rio Puerco	Wild	San Pedro Parks Wilderness, San Pedro Parks IRA, Recommended Wilderness Management Area in alternative 3 (318 acres overlapping)
Jemez River	Wild	Jemez National Recreation Area
Pecos River	Scenic	none
Rio de las Vacas	Wild	San Pedro Parks Wilderness
Rio Molino	Wild	Pecos Wilderness
Rio Valdez	Wild	Pecos Wilderness
Beaver Creek	Wild	Pecos Wilderness
Bear Creek	Wild	Pecos Wilderness

3.18.4.3.3.3 Alternative 3 – Natural Processes Emphasis

Under alternative 3, 4,309 acres of eligible Scenic and Wild classification river corridors would be managed under the more restrictive guidelines for wilderness management, with the recommendation of +270,000 acres of additional recommended wilderness in this alterative. ***Following the guidelines of recommended wilderness management in eligible WSR corridors would provide greater protection to the river characteristics and ORVs through non-motorized recreational use emphasis, unsuitability for timber production, and very high scenic integrity objective*** [WSR7] ***and other associated effects (WSR1-3)***.

3.18.4.3.3.4 Effects common to alternatives 2 and 4

Eligible wild and scenic rivers areas would be managed primarily under the Plan standards and guidelines for the eligible Wild and Scenic Rivers Management Area in the forest plan. By following the restrictive management of wild and scenic rivers, detrimental effects to river corridors from management activities that would otherwise be implemented under these alternatives are avoided (***WSR3***).

3.18.4.3.4 Cumulative Effects

The cumulative effects analysis area for wild and scenic rivers consists of the aggregate of watersheds that contain them. As most of the eligible and designated rivers are completely within the Forest boundary, the cumulative effects area is predominantly on Federal lands. Plan revision efforts on the Carson NF, will also identify eligible rivers, increasing the overall amount of eligible river corridors in the cumulative effects analysis area. As a national forest to the north of the Santa Fe, wild and scenic river management enacted on the Carson NF could have trickle down effects to the Santa Fe, especially areas that share water resources, such as in the Pecos Wilderness (***WSR7***). The combined efforts of both forests would lead to increased quality of water, riparian areas, and wildlife habitat, and provide opportunities for forest users to enjoy both primitive and more mainstream water-based activities (***WSR1-5***). Eligible river corridors with mixed non-Federal ownership may have cumulative consequences because interim management and forest plan direction only applies to Federal lands. Land use practices on these surrounding lands could pose negative consequences to wild and scenic river areas if water resources are shared, such as increased sedimentation in water from ground-disturbing activities (e.g., tree harvesting, grazing, tilling, agriculture, road maintenance or development), or impact outstandingly remarkable values like cultural or historic resources, scenery, geologic formations, recreation access, or fish and wildlife needs near the national forest boundary. Ultimately, cumulative effects to the WSR in the forest are likely to be minimal, as the management guidelines for these areas should be sufficient to buffer these areas from most detrimental effects.

3.18.5 Jemez National Recreation Area

National recreation areas are designated by Congress. The Jemez National Recreation Area (JNRA), was designated in 1993, and encompasses 57,650 acres including 48,300 acres of NFS lands and 9,350 acres of private lands (USDA Forest Service 2002). The private lands are not subject to Forest Service management. The Jemez National Recreation Area is located within the Jemez Mountains in Sandoval County and includes two river corridors. The western boundary of the Jemez National Recreation Area follows the Rio Guadalupe corridor, the southeastern portion includes the Jemez River corridor and San Diego Canyon, and the northeastern portion follows the southern edge of the Valles Caldera National Preserve. Elevations range from around 5,800 feet along the lower Jemez River near the community of Cañon to over 10,100 feet at Los Griegos, a mountain peak just north of Cerro Pelado Lookout.

The management plan for the Jemez National Recreation Area (USDA Forest Service 2002) was incorporated into the 1987 Forest Plan by amendment in January 2003. In accordance with the 1993 Jemez National Recreation Area Act (Pub. Law 103-104 107 Stat. 1025), the plan was developed to “conserve, protect, and restore the recreational, ecological, cultural, religious, and wildlife resource values for which the Jemez National Recreation Area was designated.” In addition to programmatic-level management direction, the management plan includes a monitoring plan.

3.18.5.1 Affected Environment

With its proximity to the Albuquerque metro area, the area is popular and receives many visitors each year. The Rio Guadalupe and Jemez River corridors receive the most recreational use within the Jemez National Recreation Area, and the area as a whole receives a high level of visitation relative to its size (USDA Forest Service 2002).

Recreation opportunities in the Jemez National Recreation Area include an assortment of dispersed and developed activities. Camping, viewing wildlife and scenery, fishing, hunting, hiking, swimming, soaking in hot and warm springs, picnicking, rock climbing, horseback riding, cross-country skiing, and driving for pleasure are some of the more popular activities. Four developed campgrounds and four picnic areas are located within the recreation area. The East Fork Jemez Wild and Scenic River is located within the Jemez National Recreation Area, and the portion of New

Mexico Highway 4 within the recreation area is part of the Jemez Mountain Trail National Scenic Byway. Dramatic landscapes created by eons of gradual and cataclysmic geologic events provide breathtaking views. Sheer cliff faces, pock-marked tuff exposures, flat-topped mesas, lush canyon bottoms, the Valle Grande, and the domed peak of Redondo provide for a varied and vibrantly colored visual experience (USDA Forest Service 2002).

The Jemez National Recreation Area provides more than outstanding scenic features and recreation opportunities. From a natural resource standpoint, the Jemez National Recreation Area contains habitat for many wildlife and plant species, including some listed as threatened, endangered, or sensitive. From a social perspective, the landscapes and resources of the Jemez Mountains are a necessary part of some people's identity and existence. Ancestral homes of living pueblo cultures are present on lands within the Jemez National Recreation Area. Traditional Native American and northern New Mexico communities rely on resources within the area. The ability to graze cattle, hunt for subsistence, collect medicinal plants, and cut timber to build homes and firewood to heat them are just a few of the activities important to long-time inhabitants of the Jemez Mountains area (USDA Forest Service 2002).

3.18.5.2 Methodology and Analysis process

Effects of the proposed action, no action, and other alternatives were determined by comparing the plan direction of each alternative ability to conserve, protect and restore the resource values—recreational, ecological, cultural, religious, and wildlife—for which the Jemez National Recreation Area was designated.

3.18.5.2.1 Analysis Assumptions

Jemez National Recreation Area will continue to be managed consistent with the Jemez National Recreation Area Management Plan and East Fork Jemez River Comprehensive River Management Plan.

3.18.5.2.2 Issues and Indicators

The following indicators were used in this evaluation:

- protecting the resource values of the Jemez National Recreation Area through plan direction, including management area allocations within the Jemez National Recreation Area for each alternative

3.18.5.3 Environmental Consequences

3.18.5.3.1 Indicator: Protecting the resource values of the Jemez National Recreation Area through plan direction

3.18.5.3.1.1 Alternative 1 – 1987 Forest Plan

Under alternative 1, management of the Jemez National Recreation Area would not change. Management direction would continue unaltered as described in the 1987 Forest Plan, 2003 Forest Plan amendment 11, Jemez National Recreation Area Act (1993), Jemez National Recreation Area Management Plan (2002), and East Fork Jemez River Management Plan (2002). Many projects described in the JNRA management plan to provide quality recreation opportunities in these busy corridors have been implemented. Regulations combined with visitor contact efforts and law enforcement presence continue to protect both resources and visitor safety.

Management Area X in the 1987 Forest Plan establishes direction for the Jemez National Recreation Area. For two specially designated areas within the Jemez National Recreation Area, direction for Management Area X is in addition to the existing management area direction for the Monument Canyon Research Natural Area in Management Area M and for the East Fork Jemez Wild and Scenic River in Management Area F as well as in this river's comprehensive river management plan.

Plan components within all of the above management direction would conserve, protect and restore the resource values for which the Jemez National Recreation Area was designated (recreational, ecological, cultural, religious, and wildlife). The Jemez National Recreation Area would ***provide cultural and supporting ecosystems services through diverse recreation opportunities with both developed and dispersed activities, high quality scenery and outstanding scenic features, and habitat for wildlife and plant species which benefits present and future generations through the enjoyment of this area*** [JNRA1]. The Jemez National Recreation Area would also ***continue to provide tourism and economic benefits for the region and communities and social benefits to long-time inhabitants of the Jemez Mountains area who view the landscapes and use the resources within the Jemez Mountains providing opportunities to connect with nature through all of the resource values for which the area is managed***[JNRA2].

3.18.5.3.1.2 Effects Common to Alternatives 2, 3, and 4

Management of the Jemez National Recreation Area in alternatives 2, 3, or 4 would continue under direction provided in the Jemez National Recreation Area Act, current Jemez National Recreation Area Management Plan, East Fork Jemez River Comprehensive River Management Plan, and the designated area plan components for these alternatives. The comprehensive plan components would maintain and enhance the resource values for which the Jemez National Recreation Area was designated and have associated effects (***JRNA 1-2)***. A standard for the area to be managed consistent with the most recent Jemez National Recreation Area Management Plan allows the forest plan to be adaptive to any updated management plans when compared to alternative 1. Alternatives 2, 3, and 4 include eligible wild and scenic rivers that may overlap with the recreation area in portions of the Rio Guadalupe and the Jemez River that is not already a designated wild and scenic river. Plan components for these management areas complement the management emphasis of the Jemez National Recreation Area with associated effects (***JNRA1-2***).

3.18.5.3.1.3 Alternative 3 – Natural Processes Emphasis

Plan direction for alternative 3 would be similar to other alternatives and their associated effects (***JNRA1-2***) with some differences in management area allocations. Alternative 3 proposes about 7,440 acres of the Jemez National Recreation Area as recommended wilderness, ***providing opportunities for primitive recreation and very high scenic integrity consistent with the recommended wilderness management plan components***[JNRA3]. A wetland jewel management area in the Rio Cebolla area also overlaps the Jemez National Recreation Area in alternative 3, which promotes restoration projects that move areas toward desired conditions for riparian vegetation types and ***results in improved watershed conditions***[JNRA4]. Alternative 3 also includes a geothermal leasing management area that overlaps the Jemez National Recreation Area. With this alternative, all lands within the geothermal leasing management area would be closed to geothermal leasing, so there would be no consequences for the Jemez National Recreation Area.

3.18.5.3.1.4 Alternative 4 – Human Uses Emphasis

Plan direction for alternative 4 would be similar to other alternatives and their associated effects (***JNRA1-2***) with some differences in management area allocations. Alternative 4 includes a geothermal leasing management area that overlaps the Jemez National Recreation Area. With this alternative, all lands within the recreation area would be closed to geothermal leasing, so there would be no consequences for the Jemez National Recreation Area.

3.18.5.3.2 Cumulative Effects

National recreation areas are a unique resource within Arizona and New Mexico. The designation and resource values for which the area is designated may cause increased visitation and recreation use as populations increase, especially due to the proximity to urban areas like Santa Fe and Albuquerque. The resource values of the Jemez National Recreation Area would be maintained under the Jemez National Recreation Area Act and Jemez National Recreation Area Management Plan. Ultimately, cumulative effects to the recreation area in the forest are likely to be minimal, as the management direction and plans for these areas should be sufficient to address any cumulative effects and conserve, protect and restore the resource values for which the Jemez National Recreation Area was designated (***JNRA1-2***).

3.18.6 Caja del Rio Wild Horse Territory

The Wild Free-Roaming Horses and Burros Act of 1971, as amended by the Federal Land Policy and Management Act of 1976 and the Public Rangeland Improvement Act of 1978, directs the protection and management of wild horses and burros on public lands. The Forest Service, by authority of the Secretary of Agriculture, is responsible for managing the Nation's wild horses and burros on NFS lands.

3.18.6.1 Affected Environment

The Santa Fe NF has one active designated wild horse territory (WHT), the Caja del Rio Wild Horse Territory. Two wild horse territories and one burro territory on the Santa Fe NF have their appropriate management level set to zero through the NEPA process, therefore the Plan and this analysis only extends to the Caja del Rio Wild Horse Territory.

3.18.6.1.1 Caja del Rio Wild Horse Territory

After passage of the Wild Free-Roaming Horse and Burro Act of 1971, the Caja del Rio Wild Horse Territory was officially recognized and listed. The territory consists of about 8,728 acres of NFS lands on the Caja Plateau administered by the Española Ranger District. Topography of the plateau is characterized by rolling hills and swales dotted by cone-like peaks. Vegetation is primarily steppe grasslands and piñon-juniper woodlands (USDA Forest Service 2018e).

Wild horses have been known to frequent the Caja Plateau since at least 1934, but the herd history is not well known. It is suspected that the herd is quite old, since it is close to early Spanish settlements. Ranches and Pueblos adjacent to the territory could have been the source of quarter horse bloodlines, and domestic horses may have been released onto the territory in the past (USDA Forest Service 2018e).

Past informational studies conducted on the Caja del Rio herd show a relatively stable population from the 1970s through the 1980s. In 1975, 1978, and 1988, studies were conducted to obtain information on the herd. The 1975 study estimated a population of 55 horses; the 1978 study estimated a population of 37 horses; and the 1988 study estimated a population of 45 horses. No herd supplementation or reduction has occurred since the herd was designated in 1971. There is only speculation to account for the relatively stable herd numbers: lion predation, illegal shooting and capture, or disease (USDA Forest Service 2018e).

Currently, the horse herd range is limited to the Caja Plateau, constrained by residential development within unincorporated Santa Fe County to the east and the Rio Grande to the west. Domestic livestock grazing is permitted within the wild horse territory, but competition for forage between livestock and horses is limited due to different areas of use (USDA Forest Service 2018e). The appropriate management level for the Caja del Rio herd has not yet been established (USDA Forest Service 2018e).

The Caja Plateau is currently managed under the 1987 Forest Plan direction for Management Area G (wildlife, range, firewood emphasis) including the following standard: "The Caja Wild Horse Territory will be managed to protect wild horse habitat and to maintain a thriving ecological balance." (USDA Forest Service 2010).

3.18.6.2 Methodology and Analysis process

Effects from the alternatives to wild horse territories will be evaluated by comparing the plan direction of each alternative toward the protection and management of wild horses and burros.

3.18.6.2.1 Indicators

The protection and management of wild horses and burros is used as the indicator for this evaluation.

3.18.6.3 Environmental Consequences

3.18.6.3.1 Indicator: protection and management of wild horses and burros through plan direction

3.18.6.3.1.1 Effects Common to All Alternatives

No new wild horse territories are proposed for any alternative. All alternatives would continue to manage the Caja del Rio Wild Horse Territory according to the individual management plans and as provided by law and Forest Service policy. All alternatives would provide plan direction through various plan components (desired conditions, standards, or guidelines) on managing wild horse territories. Under all alternatives the combined management direction would protect and manage wild horse and burro territories***, benefitting local communities and those who have an emotional attachment to wild horses as cultural symbols while protecting and preserving the cultural traditions and values surrounding wild horses***[WHT1].

Vegetation restoration activities would occur with all alternatives. Restoration activities may be either mechanical treatments or prescribed fire and naturally ignited wildfire. The restoration activities are focused on frequent fire conifer systems, but some treatments may occur in non-forested vegetation to reduce encroachment into meadows and increase grass and forb abundance. Restoration treatments under all alternatives may ***indirectly affect the wild horse territories by improving conditions of the range resource and providing increased forage for livestock grazing as well as wild horses and burros in designated territories***[WHT2]. Objectives to remove, improve, or reconstruct range infrastructure for alternatives 2, 3 and 4 may ***indirectly affect wild horse territories by managing or changing the areas of use of both livestock and wild horses and burros. If these changes reduce competition for forage, wild horse territories are protected and***

enhanced[WHT3]. Other management direction would still apply to designated wild horse territory to protect and manage the territories with the associated effects (***WHT1***).

3.18.6.3.1.2 Alternative 1 – 1987 Forest Plan

With alternative 1, current management actions to protect wild horse habitat and to maintain a thriving ecological balance in the Caja Wild Horse Territory would continue to be implemented as directed by the standard in Management Area G (wildlife, range, firewood emphasis) with associated effects (***WHT1***).

3.18.6.3.1.3 Effects Common to Alternatives 2, 3, and 4

The Caja del Rio Wild Horse Territory is included in the forest plan as a designated area with specific plan components for alternatives 2, 3, and 4. Desired conditions emphasize biologically sound and genetically viable horse populations, healthy ecosystems, resilient rangelands, and healthy, persistent forage, browse and cover needs for wild horses, wildlife and authorized livestock. A standard for any of these three alternatives would require humane methods be used to gather animals when acceptable management levels have been exceeded. A guideline to align horse numbers within active territories to wild horse territory management plan are included, making the plan direction more adaptive to the most current management plan. Alternative 2, 3, or 4 would provide more comprehensive direction that would result in the best management and protection of wild horse and burro territories with associated effects (***WHT1***).

3.18.6.3.1.4 Alternative 2 –Forest Plan

Alternative 2 would remove, improve, or reconstruct range infrastructure providing at levels between alternatives 3 and 4. This may improve wild horse territories and animal distribution across the territory with associated effects (***WHT3***).

3.18.6.3.1.5 Alternative 3 – Natural Processes Emphasis

Alternative 3 proposes to remove a percentage of infrastructure that is no longer necessary. With alternative 3, a reduction in fences and maintenance or installation of water features may improve wild horse territories and animal distribution across the territory with associated effects (***WHT3***).

3.18.6.3.1.6 Alternative 4 – Human Uses Emphasis

Alternative 4 emphasizes the improvement or reconstruction of infrastructure. With alternative 4, increased fencing and water features would maximize distribution and use of forage across allotments as well as wild horse territories with associated effects (***WHT2, WHT3***).

3.18.6.3.2 Cumulative Effects

In addition to the Caja del Rio Wild Horse Territory on the Santa Fe NF, the Carson NF manages two other wild horse territories—Jarita Mesa and Jicarilla. Within New Mexico, the BLM also manages the Carracas Mesa Herd Area Herd Management Area, located adjacent to and managed jointly with the Carson's Jicarilla Wild Horse Territory, and the Bordo Atravesado Herd Management Area located in Socorro County. Since the last of these is more geographically separated, it is not considered in this cumulative effects analysis.

Plan components for managing wild horse territories in the Carson NF's forest plan are similar to that of the Santa Fe NF. And since management between the BLM's Carracas Mesa Herd Area Herd Management Area and Jicarilla wild horse territories are so closely tied, we can expect that management of wild horses will be consistent across all of these areas. As a result, across northern

New Mexico, it can be expected that wild horse populations are managed so that wild horses are present for future generations and continued cultural appreciation (***WHT1***). In addition, management of vegetation will continue to provide forage, which will support these populations (***WHT3***).

3.18.7 Nationally Designated Trails

The National Trails System is the network of scenic, historic, and recreation trails created by the National Trails System Act of 1968. These trails provide for outdoor recreation needs, promote the enjoyment, appreciation, and preservation of open-air, outdoor areas and historic resources, and encourage public access and citizen involvement (National Trails System Act 1968).

The National Trails System Act identifies three categories of trails as part of the national trails system:

- **Recreation –** Trails that provide a variety of outdoor recreation uses in or reasonably accessible to urban areas. Recreation trails are designated by the Secretary of the Interior or the Secretary of Agriculture.
- **Scenic –** Extended trails located to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass. Scenic trails are designated by Congress.
- **Historic –** Extended trails which follow as closely as possible and practicable the original trails or routes of travel of national historic significance. National historic trails shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment. Historic trails are designated by Congress.

3.18.7.1 Affected Environment

The Santa Fe NF is home to two national recreation trails and portions of one national scenic and three national historic trails.

3.18.7.1.1 Cañones Creek National Recreation Trail

Cañones Creek National Recreation Trail, located on the Coyote Ranger District, was established in 1979, and is about 11 miles long. The southern terminus is at the Cerro Pavo Trailhead, and the northern terminus is about 3.5 miles south of the village of Cañones. This trail offers spectacular views of the Cañones Canyon cliffs. The canyon provides habitat for a variety of wildlife. Difficulty rating of Cañones Creek National Recreation Trail is medium to arduous. The trail is open for hiking, fishing access, horseback riding, and other non-motorized uses.

3.18.7.1.2 Winsor National Recreation Trail

Winsor National Recreation Trail was established in 1979, and is 9 miles long, connecting two points on NM Highway 475. The northern/eastern terminus of the Winsor National Recreation Trail is the Winsor Trailhead at the Santa Fe Ski Basin. The designated National Recreation Trail continues southwest to the intersection with the Chamisa Trail (#183) and then follows the Chamisa Trail to NM Highway 475. The trail is open for all non-motorized uses.

3.18.7.1.3 Continental Divide National Scenic Trail (CDNST)

Designated by an Act of Congress in 1978, the Continental Divide National Scenic Trail traverses 3,100 miles from Mexico to Canada. Within the Santa Fe NF, the Continental Divide National Scenic

Trail includes approximately 40.4 miles on the Coyote and Cuba Ranger Districts. In 2005, the Santa Fe NF, Cuba Ranger District, and the Department of Interior Bureau of Land Management (BLM), Rio Puerco Field Office, initiated a joint planning effort for relocating a section of the Continental Divide National Scenic Trail to ensure consistency with the original vision of the trail. Currently, building a Continental Divide National Scenic Trail re-route south of San Pedro Parks Wilderness is in progress. The Continental Divide National Scenic Trail has a comprehensive management plan that guides management of the entire trail, not just portion on the Santa Fe NF (USDA Forest Service 2009).

3.18.7.1.4 El Camino Real de Tierra Adentro National Historic Trail

The El Camino Real de Tierra Adentro, or the Royal Road of the Interior Lands, is one of the longest, oldest, and most historic trails in the Americas. El Camino Real de Tierra Adentro National Historic Trail traverses more than 400 miles through New Mexico and Texas. During the Spanish colonial period, the trail connected Mexico City with the northern frontier capital of Santa Fe and the many mining communities, haciendas, fortresses, and pueblos of New Spain. When Mexico won its independence from Spain in 1821, the trail was renamed the El Camino Nacional, the National Road. In 1846, when the United States and Mexico went to war against each other, the El Camino Nacional served as the invasion route for the American troops into Mexico.

The El Camino Real de Tierra Adentro (El Camino Real) was added to the National Trails System in 2000 (cite Pub. L. 106-307). The El Camino Real Comprehensive Management Plan provides a framework for managing and allocating uses along the trail in New Mexico (USDOI: National Park Service, Bureau of Land Management, 2004). On the Santa Fe NF, about 7.7 miles of the El Camino Real National Historic Trail pass through the La Bajada Mesa section of the Espanola Ranger District. About 4.6 of these miles are considered high potential routes, as visitors are able to view wagon ruts from the original trail. High-potential route segments are those segments of a trail which would afford high quality recreation experience in a portion of the route having greater than average scenic values or affording an opportunity to vicariously share the experience of the original users of a historic route (USDOI: National Park Service, Bureau of Land Management, 2004). The trail also passes closely to the eastern Santa Fe NF boundary of Caja del Rio Plateau of the Española Ranger District. The Santa Fe NF, BLM, and Santa Fe County have a memorandum of understanding for managing portions of this trail and a connector to it.

3.18.7.1.5 Santa Fe National Historic Trail

The Santa Fe Trail was the first of America's great trans-Mississippi routes. The trail crossed over 1,200 miles of the central and southwestern United States (USDOI National Park Service 1990). The identified period of significance for the Santa Fe National Historic Trail is from 1821 to 1880, when the trail played a critical role in the westward expansion of the United States between Franklin, Missouri, and Santa Fe, New Mexico. During the United States Territorial Period, beginning in 1848, the trail provided military support of trade caravans, settlers, and the construction of forts.

In 1987, the Santa Fe Trail was added to the National Trails System (cite Pub. L. 100-35). The national historic trail extends 1,203 miles across the Great Plains through Missouri, Kansas, Oklahoma, Colorado, and New Mexico. About 8 miles of the Santa Fe National Historic Trail cross the Santa Fe NF. The most traveled section of this trail lies between Glorieta Pass and the Santa Fe NF in the Pecos Ranger District. The remaining miles are smaller segments of the trail and secondary connector trails.

The Santa Fe National Historic Trail comprehensive management plan focuses on the protection, historical interpretation, recreation use, and management of the trail corridor and is administered by the National Park Service (USDOI National Park Service 1990).

3.18.7.1.6 Old Spanish National Historic Trail

The Old Spanish Trail was the principal overland route between California and New Mexico, stretching between Los Angeles and Santa Fe. The designation of the trail commemorates the commercial trading activities between New Mexico and California that began in 1829, and ended around 1848. New Mexico traders loaded mules with local merchandise such as blankets and clothing, then crossed extremely rugged terrain to California to trade for mules, horses, and other merchandise, and then went back across the deserts to New Mexico. These trade routes, as well as the sites and segments along the trail, are associated with events that made significant contributions to broad patterns of the nation's history (USDOI National Park Service 2017). Commercial use of the 2,700-mile trail started in 1829 and supported commercial ventures for the following 20 years. The trail served as a route for immigrants and trade goods moving west to California. Use of the rugged trail declined with the start of United States Territorial Period in 1848 as more passable trails became available.

The 2,700-mile Old Spanish National Historic Trail was added to the National Trails System in 2002 (Pub. L. 107-325). The trail extends through New Mexico, Colorado, Utah, Nevada, and Arizona, ending in California. Approximately 23.5 miles of the trail cross the Espanola, Coyote, and Cuba Ranger Districts of the Santa Fe NF. Two routes included in the trail can be found on the forest: the Northern Route and the Armijo Route. The Northern Route follows U.S. Highway 84 north of Santa Fe, while the Armijo Route breaks from U.S. Highway 84 and continues west along State Highway 96.

The Old Spanish National Historic Trail Comprehensive Administration Strategy prioritizes resource identification including protection, monitoring, and mapping of resource inventory, and trail user experience, including interpretation, recreation, and health and safety (USDOI National Park Service 2017).

3.18.7.2 Methodology and Analysis Process

Effects of the alternatives to nationally-designated trails were evaluated by comparing the plan direction of each alternative toward meeting the nature and purpose of these routes and protecting their historic, recreation and scenic qualities. The most important management tool and metric associated with designated trails is the National Trails System Act of 1968. There are numerous requirements in the National Trails System Act that must be met to comply with the intent of the law. Scenic and historic trails are required to have a comprehensive trail management plan (Pub. L. 90-543, as amended through Pub. L. 111-11, 2009). These plans are developed by the trail's administrating agency and provide a framework for managing and allocating uses along the trails. Additional management tools and metrics used to manage designated trails include the scenery management system and recreation opportunity spectrum.

3.18.7.2.1 Analysis Assumptions

- Management under all alternatives would be consistent with a designated trail's comprehensive management plan.

- ROS classes may vary considerably depending on the alignment of the trail and its proximity to roads. However, trails are primarily non-motorized and most often classified as Semi-Primitive Non-Motorized or Primitive.
- For alternative 1, the visual quality objectives identified in the 1987 Forest Plan and other Plan direction would be used to manage scenery. Similar to the scenery section, to describe and compare consequences, this analysis uses Scenery Management System (SMS) terminology (scenic integrity objectives or SIOs) for all alternatives.
- Retention visual quality objective is equivalent to high SIO; preservation visual quality objective is equivalent to very high SIO.

3.18.7.2.2 Issues and Indicators

A subpart of one of the four major issues identified during the public involvement period included the desire to manage national scenic trails and national historic trails to meet desired visitor experiences. This includes reducing conflicting uses along trail corridors.

Effects of the alternatives to designated trails are indicated by evaluating the plan direction for the trails that guide future management. The following indicators will be used in this evaluation:

- meeting the nature and purpose of the trail through plan direction;
- scenic integrity objective allocations within each designated trail corridor; and
- a qualitative discussion of the potential effects to scenic resources from vegetation management activities.

3.18.7.3 Stressors and Drivers

Stressors and drivers for designated trails would be similar those for any resource associated with the nature and purpose of the trail such as historic, recreational, or scenic qualities. Common stressors and drivers that may affect these intrinsic qualities include, but are not limited to: atypical temperatures and rainfall patterns from climate change, drought, wildfires, or insect and disease activity. The consequences of these stressors could result in long-term effects to the natural or scenic resources of the designated trail corridors and recreational use and patterns within them. Consequences of climate change or prolonged drought include stressed native vegetation and access to water sources. Seasons and patterns of use may change, especially on the long-distance trails, to coincide with water access and to avoid higher temperatures. Uncharacteristic natural disturbances such as wildfire or insect and disease activity can cause changes to vegetation that dominates views from designated trails. All of these potential changes to vegetation can diminish the visitor satisfaction or experience along designated trails. Visitors may be displaced if the historic, scenic, or recreational qualities of a trail corridor are affected by these stressors, causing them to seek out desired experiences on other trails. This in turn may affect the social and economic benefits designated trails are meant to provide.

3.18.7.4 Environmental Consequences

3.18.7.4.1 Indicator: meeting the nature and purpose of the trail through plan direction

3.18.7.4.1.1 Effects common to all alternatives

No new nationally designated trails are proposed in any alternative. The most current comprehensive plans for the Continental Divide National Scenic Trail and national historic trails would guide management for these trails under all alternatives. Establishment reports for national recreation trails would continue to guide management under all alternatives. The current nationally designated trails would continue to be managed to protect the values for which they were designated and ***provide opportunities to view natural features and scenery, recreational opportunities in a variety of ROS settings, and public use and enjoyment of historic routes and associated historic remnants resulting in opportunities for the public to connect with nature and enjoy the nature and purposes for which the trails were designated***[NDT1].

3.18.7.4.1.2 Alternative 1 – 1987 Forest Plan

Current management direction under the 1987 Forest Plan would continue. Nationally designated trails pass through a variety of management areas with varying emphasis as listed below

- Cañones Creek National Recreation Trail – L (Semi-primitive Non-motorized Recreation)
- Winsor National Recreation Trail – D (Recreation, Visual/Timber), L (Semi-primitive Non-motorized Recreation), H (Wilderness)
- Continental Divide National Scenic Trail – A (Timber/Wildlife) with management area direction specific to the Continental Divide National Scenic Trail to retain scenic qualities, D (Recreation, Visual/Timber), E (Dispersed Recreation, Visual/Timber with management area direction specific to the Continental Divide National Scenic Trail to retain scenic qualities, F (Wild and Scenic River), H (Wilderness)
- El Camino Real de Tierra Adentro National Historic Trail – D (Recreation, Visual/Timber), G (Wildlife, Range, Firewood)
- Santa Fe National Historic Trail – E (Dispersed Recreation, Visual/Timber), G (Wildlife, Range, Firewood)
- Old Spanish National Historic Trail – D (Recreation, Visual/Timber)

The 1987 Forest Plan includes plan components for the Continental Divide National Scenic Trail to protect the scenic qualities along the trail and implement standards of trail signing and maintenance along the route corridor. No other designated trail is specified in the 1987 Forest Plan.

For most trails, the management area emphasis along with other plan components provide sufficient direction to protect the nature and purpose of the trail with associated effects (***NDT1***). More site-specific project planning and mitigation may be needed where the emphasis of the management area and the nature and purpose of the trail are not aligned (such as a timber-emphasis management area and a national scenic trail). There would be no change in current direction for any designated trail under alternative 1 and some trails are not specifically mentioned in the 1987 Forest Plan (such as the national historic trails). Alternative 1 provides the least comprehensive management of any alternative.

3.18.7.4.1.3 Effects common to Alternatives 2, 3, and 4

Each nationally designated trail is included in the draft plan as a designated area with specific plan components in alternatives 2, 3, and 4, including desired conditions that conflicts among users are rare and easily resolved. Alternatives 2, 3, and 4 include specific plan components for each type of trail designation to align with the nature and purpose of the trail. Designated area plan components include comprehensive direction for: Continental Divide National Scenic Trail, national historic trails, and national recreation trails. Desired conditions, objectives, standards, and guidelines align management direction with the nature and purpose of each trail and any applicable comprehensive plans and establishment reports for national recreation trails. Alternatives 2, 3, and 4 provide more comprehensive direction than alternative 1. The management direction causes the best management and protection of the scenic, recreation, cultural and historic qualities of the nationally designated trails and the associated effects (***NDT1***).

3.18.7.4.1.4 Alternative 4 – Human Uses Emphasis

Alternative 4 includes a geothermal leasing management area. A Plan standard for this alternative would specify that surface occupancy for geothermal energy leasing activities would not occur within the Continental Divide National Scenic Trail corridor protecting the scenic qualities of the trail corridor and associated effects (***NDT1***).

3.18.7.4.2 Indicator: Scenic integrity objective allocations within each designated trail corridor.

3.18.7.4.2.1 Alternative 1 – 1987 Forest Plan

Scenic quality would continue to be managed as indicated for the current management areas along the trail. Management area specific plan components for scenic resources include different SIOs for each trail varying among, very high, high, and moderate SIOs.

- Cañones Creek National Recreation Trail – L (Semi-primitive Non-motorized Recreation---High SIO)
- Winsor National Recreation Trail – D (Recreation, Visual/Timber---High SIO), L (Semi-primitive Non-motorized Recreation---High SIO), H (Wilderness---Very High SIO
- Continental Divide National Scenic Trail – A (Timber/Wildlife---retain scenic qualities of Continental Divide National Scenic Trail by managing for High SIO in the foreground), D (Recreation, Visual/Timber---High SIO), E (Dispersed Recreation, Visual/Timber---retain scenic qualities of Continental Divide National Scenic Trail by managing for High SIO in the foreground), F (Wild and Scenic River---High SIO), H (Wilderness---Very High SIO)
- El Camino Real de Tierra Adentro National Historic Trail – D (Recreation, Visual/Timber---High SIO), G (Wildlife, Range, Firewood---Manage for SIOs according to the levels identified in the Forest Visual Resource Inventory-High and Moderate SIO)
- Santa Fe National Historic Trail – E (Dispersed Recreation, Visual/Timber---Foreground and middleground of I-25 as High SIO), G (Wildlife, Range, Firewood---Manage for SIOs according to the levels identified in the Forest Visual Resource Inventory-no visual resource inventory maps for this area)
- Old Spanish National Historic Trail – D (Recreation, Visual/Timber---High SIO)

Landscapes managed for Very High SIO ***would be unaltered with a naturally evolving scenic character; few deviations from the natural character occur, such as non-motorized trails or trail signs***[NDT2]. Landscapes managed for High SIO ***would have a predominately natural appearance or appear unaltered, even though some deviations to the scenic character are present. Deviations in the scenic character in "high" SIO borrow from elements in the landscape, such as form, line, color, texture and pattern***[NDT3]**.** Managing foreground viewsheds of national designated trails for Very High and High SIO ***would meet public expectation for natural appearing scenery by protecting and enhancing the scenic qualities for which they were designated***[NDT4]. Landscapes managed for Moderate SIO ***would have scenic character that appears slightly altered but noticeable deviations remain visually subordinate, resulting in a mostly natural-appearing***

landscape, but less than Very High and High SIOs[NDT5]. Managing scenery at these levels also ***provides opportunities to connect with nature by maintaining or enhancing scenic character and enhances recreation settings***[NDT6].

3.18.7.4.2.2 Effects Common to Alternatives 2, 3, and 4

Desired conditions and guidelines in alternatives 2, 3, and 4 emphasize natural-appearing scenery, managing for natural-appearing scenery in foreground views including High or Very High SIOs and Moderate SIO in middleground views of national recreation trails (***NDT2-4, 6***). Very High SIOs occur when the trail passes through designated or recommended wilderness (***NDT2***). Forestwide guidelines include meeting scenery objectives as identified on the Scenic Integrity Objective Map (***NDT6***). With more comprehensive plan direction, opportunities to protect and enhance trail qualities are anticipated with beneficial effects of connecting people with nature and enhancing natural settings (***NDT4, 6***). A greater amount of beneficial effects (***NDT1, 4, 6***) occur in alternatives 2, 3, and 4, when compared to alternative 1 due to the comprehensive plan direction.

3.18.7.4.3 Indicator: Consequences of Vegetation Management on Nationally Designated Trails

3.18.7.4.3.1 Effects Common to All Alternatives

Multiple-use management activities affect scenic resources viewed from nationally designated trails. This section focuses on the consequences of vegetation management since that is the management activity trails users would notice the most. Effects of other multiple use management on scenic resources can be found in the Scenic Resources section of the FEIS.

There is potential to impact scenic integrity as viewed from designated trails as a result of proposed vegetation management activities, particularly activities with mechanical treatments, under all alternatives. In the short term, restoration activities completed with mechanical treatments ***may alter scenic resources visible from the designated trails resulting in evident management activities changing forest stands from closed forests to more open forests and from residual stumps and soil disturbance***[NDT7]. In the long term, vegetation treatments ***may improve scenery by creating vistas, promoting healthy vegetation and improving ecosystem resilience to uncharacteristic disturbances***[NDT8]. Prescribed fire activities typically have effects in the short term (***NDT7***) with benefits occurring within a few years (***NDT8***). While some short-term impacts may occur (***NDT7***), scenic integrity objectives would still be met, particularly in the long term (***NDT2-6***). More detailed effects can be found in the Scenic Resources section of the FEIS.

3.18.7.4.3.2 Alternative 1 – 1987 Forest Plan

The 1987 Forest Plan does not include any objectives that direct specific amounts of vegetation treatment, either mechanically or with prescribed fire. Vegetation management both mechanically or with prescribed fire would continue within the views of designated trails with both short-term effects (***NDT7***) and long-term benefits (***NDT4,6,8***) to meet the High and Very High SIOs in foreground views (***NDT2,3,4,6***) and Moderate SIO in some foreground views (***NDT5***).

3.18.7.4.3.3 Alternative 2 –Forest Plan

Alterative 2 has objectives to accomplish vegetation treatments using both mechanical treatments and prescribed fire. Stretches of these trails lie within designated wilderness, where mechanical treatment is prohibited; no mechanical treatments are anticipated in Very High SIO areas

(***NDT2***).Vegetation management both mechanically or with prescribed fire would continue within the views of designated trails with both short term effects (***NDT7***) and long-term benefits (***NDT4, 6, 8***) to meet the High SIO in foreground views (***NDT3, 4, 6***). Alternative 2 has a guideline that visual impacts from management activities and infrastructure should meet scenery objectives as identified on the Scenic Integrity Objective Map. Where High SIO is assigned beyond the foreground distance, the benefits of implementing vegetation management to meet the Scenic Integrity Objective Map would occur throughout a trail corridor viewshed (***NDT4, 6, 8***)

3.18.7.4.3.4 Alternative 3 – Natural Processes Emphasis

Effects of alternative 3 would be similar to alternative 2. Alternative 3 would have the least amount of mechanical treatment, per vegetation management objectives, and therefore, the least amount of short-term impact for these types of activities (***NDT7***). Alternative 3 would have more prescribed fire treatments with more short-term impacts (***NDT7***) and benefits occurring within a few years (***NDT8***) since landscapes typically recover quickly with the effects of prescribed fire being less noticeable than the effects of mechanical treatments.

3.18.7.4.3.5 Alternative 4 – Human Uses Emphasis

Effects of alternative 4 would be similar to alternative 2. Alternative 4 would treat the most acres mechanically, per vegetation management objectives, and potentially have the most amount of short-term impact for these types of activities (***NDT7***) if restoration treatments occur in trail corridor viewsheds. However, visual impacts of management activities would be designed to meet the Scenic Integrity Objective Map (***NDT4, 6, 8***).

3.18.7.4.4 Cumulative Effects

The cumulative effects analysis timeframe is the next 10 to 15 years and the area is the Santa Fe National forest, the lands adjacent to and lands within the Santa Fe NF under other ownership within about 10 miles. National recreation trails may experience increased visitation and recreation use as populations increase, especially due to their proximity to urban areas like Santa Fe. The longer distance designated trails (Continental Divide National Scenic Trail and national historic trails) pass in and out of NFS lands and settings and landscapes may change rather abruptly from undeveloped, natural settings to developed, rural or urban settings. Since most private lands and other ownerships do not have the same regulations for natural resource management, ***the effects of ongoing developments or activities next to or within NFS land boundaries can sometimes be quite noticeable when viewing the continuous landscape potentially affecting the visitor's satisfaction and quality of the their experience on a long-distance designated trail*** [NDT9].

Comprehensive management plans for nationally designated scenic and historic trails are developed to guide management along the entire length of a trail to protect and enhance the nature and purpose for which the trail was designated including historic, scenic and recreational qualities across ownership boundaries, reducing any negative cumulative consequences (***NDT9***). The cumulative environmental consequences of proposed management efforts in the context of the larger cumulative effects analysis area though comprehensive management plans would contribute to the movement of designated trail values toward desired conditions. Ultimately, movement toward desired conditions for designated trails would provide tourism benefits for the region and communities which they traverse (***NDT1***) and ***contributes to sustainable social and economic systems***[NDT10]**.**

3.18.8 Scenic Byways

The National Scenic Byways Program is administered by the U.S. Department of Transportation, Federal Highway Administration. The program was established to help recognize, preserve, and enhance selected roads throughout the nation. The U.S. Secretary of Transportation recognizes roads designated as a national scenic byway through this program based on one or more intrinsic qualities—archaeological, cultural, historic, natural, recreational, or scenic (US DOT 1995). National scenic byways provide tourism benefits for the region and communities which they traverse.

In addition to the National Scenic Byways Program described above, the Chief of the Forest Service, U.S. Department of Agriculture, can designate routes traversing National Forest System lands as national forest scenic byways. National forest scenic byways connect the American public to some of this country's most spectacular landscapes within public lands. They are the gateways to access attractions such as hiking trails, overlooks, historic sites, and wilderness areas (USDA Forest Service 2008b).

3.18.8.1 Affected Environment

Four national scenic byways and one national forest scenic byway are wholly or partially located within the boundaries of the Santa Fe NF. A description of each scenic byway is included in the Santa Fe National Forest Assessment Report: Volume II: Socioeconomic Resources USDA Forest Service 2016b, pages 212-214). National scenic byways within the Santa Fe NF are:

- Route 66 (pre-1937 alignment) National Scenic Byway;
- El Camino Real National Scenic Byway;
- Jemez Mountain Trail National Scenic Byway;
- Santa Fe Trail National Scenic Byway; and
- Santa Fe National Forest Scenic Byway

Scenic byways pass through multiple ownerships with settings, through diverse landscapes, all of which contribute to one or more of a scenic byway's intrinsic qualities—archaeological, cultural, historic, natural, recreational, or scenic. The National Scenic Byways Program requires a corridor management plans for scenic byway designation. A corridor management plan is a written plan developed by the communities along a scenic byway that outlines how to protect and enhance the byway's intrinsic qualities and character that define the byway corridor. Plans are usually flexible "living documents" that outline the goals, strategies, and responsibilities for preserving and promoting the byway. The Santa Fe National Forest Scenic Byway has an Interpretive Master Plan available to help guide managers and is a useful resource to visitors (USDA Forest Service no date)

The Santa Fe NF provides landscapes and settings for one or more of the intrinsic qualities along a scenic byway in the immediate vicinity when byways pass through the forest and in further views and vistas when the byway is located off-forest. Scenic byways are an important component for Santa Fe NF visitors. Visitor use surveys conducted in 2014 identified viewing natural features as the second most popular activity on the Santa Fe NF and driving for pleasure as the sixth most popular activity, and about 47 percent of forest visitors reported using a scenic byway (USDA Forest Service 2016c).

3.18.8.2 Methodology and Analysis process

Effects of the various alternatives to scenic byways were evaluated by comparing the plan direction of each alternative toward protecting the intrinsic qualities of these routes. The primary management tool and metric associated with scenic byways is the scenery management system (see Chapter 3.16 Scenic Resources) to manage, maintain, and improve the viewshed associated with the byway (see the Scenery section for more on the scenery management system).

3.18.8.2.1 Analysis Assumptions

- Scenic byways are designated to showcase the intrinsic qualities intrinsic qualities—archaeological, cultural, historic, natural, recreational, or scenic—of the area while adding to its economic well-being.
- Management under all alternatives would be consistent with the scenic byway corridor management plan or interpretive master plan.
- The 1987 Forest Plan does not have specific direction on how to manage scenic byways, so this assumption was developed based on the information found in the 1987 Plan. Under alternative 1, it is assumed that the foreground of scenic byways would be managed for retention visual quality objective, since they are a "high use road." Areas viewed in the foreground from communities, recreation areas, and high-use roads and waterbodies, as well as scenic backdrops from these areas, will have an objective of Retention. There, management activities will not be visually evident within one year of project completion (USDA Forest Service 2010, page 7). Regardless of the management area emphasis in alternative 1, it is assumed the views from scenic byways would be managed with a scenery emphasis.
- For alternative 1, the visual quality objectives identified in the 1987 Forest Plan and other Plan direction would be used to manage scenery. Similar to the scenery section, to describe and compare consequences, this analysis uses scenery management system terminology (SIOs) for all alternatives.
- Retention visual quality objective is equivalent to high scenic integrity objective.

3.18.8.2.2 Indicators

The following indicators were used in this evaluation:

- protecting the intrinsic qualities of scenic byways through plan direction;
- scenic integrity objective allocations within each scenic byway corridor (see Scenery section for more on the scenery management system); and
- a qualitative discussion of the potential effects to scenic resources from vegetation management activities.

3.18.8.3 Stressors and Drivers

Stressors and drivers for scenic byways would be similar to those for any resource associated with one or more of a scenic byway's intrinsic qualities—archaeological, cultural, historic, natural, recreational, or scenic. Common stressors and drivers that may affect these intrinsic qualities include but are not limited to atypical temperatures and rainfall patterns from climate change, drought, wildfires, or insect and disease activity. The consequences of these stressors could result in long-term effects to scenic byways and the natural or scenic resources of the byway corridors and recreational use and patterns within them. Consequences of climate change or prolonged drought include stressed native vegetation. Uncharacteristic natural disturbances such as wildfire or insect and disease activity can cause changes to vegetation that dominates views from scenic byways. All of these potential changes to vegetation can diminish the visitor satisfaction or experience along scenic byways. Visitors may be displaced if the intrinsic qualities of a scenic byway corridor are affected by these stressors, causing them to seek out desired experiences in other travel corridors. This in turn may affect the tourism benefits scenic byways are meant to provide.

3.18.8.4 Environmental Consequences

3.18.8.4.1 Indicator: Protecting the intrinsic qualities of scenic byways through plan direction

3.18.8.4.1.1 Effects common to all alternatives

No new scenic byways are proposed for any alternative. Corridor management plans and the interpretive plan for the national forest scenic byway would also guide management of scenic byways under all alternatives. The current scenic byways ***would continue to be managed to protect the values for which they were designated (scenic byway intrinsic qualities — archaeological, cultural, historic, natural, recreational, or scenic) and provide opportunities to drive for pleasure and view natural features and scenery***[SB1]. Scenic byways ***would continue to provide tourism and economic benefits for the region and communities which they traverse***[SB2].

3.18.8.4.1.2 Alternative 1 – 1987 Forest Plan

Alternative 1 does not include specific plan components for scenic byways, provides the least direction for scenic byway management of all the alternatives. Scenic byway corridor management plans and interpretative plans would provide management guidance for scenic byways with associated effects (***SB1-2***).

3.18.8.4.1.3 Effects Common to Alternatives 2, 3 and 4

Scenic byways are included in the draft plan as a designated area with specific plan components in alternatives 2, 3, and 4. Alternatives 2, 3, and 4 provide more comprehensive direction than alternative 1. The management direction causes the best management and protection of scenic byways and the associated effects (***SB1-2***).

3.18.8.4.2 Indicator: Scenic integrity objective allocations within each scenic byway corridor

3.18.8.4.2.1 Alternative 1 – 1987 Forest Plan

Scenic quality would be managed in accordance with the high scenic integrity objective using the analysis assumption that the foreground from high-use roads would be managed for high scenic integrity objective. Current visual resource maps or management area direction may not accurately show these areas as High SIO if the scenic byway designation occurred after the release of the 1987 Forest Plan.

Landscapes managed for High SIO ***would have a predominately natural appearance or appear unaltered, even though some deviations to the scenic character are present. Deviations in the scenic character in "high" SIO borrow from elements in the landscape, such as form, line, color, texture and pattern***[SB3]. Managing foreground viewsheds of scenic byways for High SIO ***would meet public expectation for natural appearing scenery by preserving and enhancing the intrinsic scenic qualities for which they were designated***[SB4]***.*** Managing scenery as this level also ***provides opportunities to connect with nature by maintaining or enhancing scenic character and enhances recreation settings***[SB5].

3.18.8.4.2.2 Effects Common to Alternatives 2, 3, and 4

Desired conditions and guidelines in alternatives 2, 3, and 4 emphasize natural appearing scenery, managing for high scenic integrity objective, and meeting scenery objectives as identified on the Scenic Integrity Objective Map (***SB3-5***). Management approaches emphasize working with other agencies, highway departments, and communities to improve scenery, services, and interpretive opportunities. With more comprehensive plan direction, opportunities to preserve and enhance scenic byway intrinsic qualities are anticipated with beneficial effects of connecting people with nature and enhancing natural settings (***SB4-5***). A greater amount of beneficial effects (***SB1-5***) occur in alternatives 2, 3, and 4 when compared to alternative 1 due to the comprehensive plan direction.

3.18.8.4.3 Indicator: Consequences of Vegetation Management on Scenic Byways

3.18.8.4.3.1 Effects Common to All Alternatives

Multiple-use management activities affect scenic resources viewed from scenic byways. This section focuses on the consequences of vegetation management since that is the management activity scenic byway users would notice the most. Effects of other multiple use management on scenic resources can be found in the Scenic Resources section of the FEIS.

There is potential to impact scenic integrity as viewed from scenic byways as a result of proposed vegetation management activities, particularly activities with mechanical treatments, under all alternatives. In the short term, restoration activities completed with mechanical treatments ***may alter scenic resources visible from the scenic byways through changing forest stands from closed forests to more open forests and from residual stumps and soil disturbance***[SB6]. In the long term, vegetation treatments ***may improve scenery by creating vistas, promoting healthy vegetation and improving ecosystem resilience to uncharacteristic disturbances***[SB7]***.*** Prescribed fire activities typically have effects in the short term (***SB6***) with benefits occurring within a few years (***SB7***). While some short-term impacts may occur (***SB6***), scenic integrity objectives would still be met, particularly in the long term (***SB3-5, 7***). More detailed effects can be found in the Scenic Resources section of the FEIS.

3.18.8.4.3.2 Alternative 1 – 1987 Forest Plan

The 1987 Forest Plan does not include any objectives that direct specific amounts of vegetation treatment, either mechanically or with prescribed fire. Vegetation management both mechanically or with prescribed fire would continue within the views of scenic byways with both short-term effects (***SB6***) and long-term benefits (***SB4, 5, 7***) to meet the high scenic integrity objective in foreground views (***SB3-5***).

3.18.8.4.3.3 Alternative 2 – Draft Forest Plan

Alterative 2 has objectives to accomplish vegetation treatments using both mechanical treatments and prescribed fire. Vegetation management both mechanically or with prescribed fire would continue within the views of scenic byways with both short term effects (***SB6***) and long-term benefits (***SB4, 5, 7***) to meet the High SIO in foreground views (***SB3-4***). Alternative 2 has a guideline that visual impacts from management activities and infrastructure should meet scenery objectives as identified on the Scenic Integrity Objective Map. Where High SIO is assigned beyond the foreground distance, the benefits of implementing vegetation management to meet the Scenic Integrity Objective Map would occur throughout a scenic byway viewshed (***SB3-5, 7***)

3.18.8.4.3.4 Alternative 3 – Natural Processes Emphasis

Effects of alternative 3 would be similar to alternative 2. Alternative 3 would have the least amount of mechanical treatment, per vegetation management objectives, and therefore, the least amount of short-term impact for these types of activities (***SB6)***. Alternative 3 would have more prescribed fire treatments with more short-term impacts (***SB6***) and benefits occurring within a few years (***SB7***) since landscapes typically recover quickly with the effects of prescribed fire being less noticeable than the effects of mechanical treatments.

3.18.8.4.3.5 Alternative 4 – Human Uses Emphasis

Effects of alternative 4 would be similar to alternative 2. Alternative 4 would treat the most acres mechanically, per vegetation management objectives, and potentially have the most amount of short-term impact for these types of activities (***SB6***) if restoration treatments occur in scenic byway viewsheds. However, visual impacts of management activities would be designed to meet the Scenic Integrity Objective Map (***SB3-5, 7***).

3.18.8.4.4 Cumulative Effects

The cumulative effects analysis timeframe is the next 10 to 15 years. The spatial extent of the cumulative effects analysis for scenic byways is the Santa Fe NF, private inholdings, and lands adjacent to the Santa Fe NF within about 10 miles. Scenic byways pass in and out of NFS lands and settings may change rather abruptly from undeveloped, natural settings to developed, rural or urban settings. Since most private lands and other ownerships do not have the same regulations for natural resource management, ***the effects of ongoing developments or activities next to or within NFS land boundaries can sometimes be quite noticeable when viewing the continuous landscape potentially affecting the visitor's satisfaction and quality of the their experience on a scenic byway***[SB8]. Forest visitors often view natural resources as a continuous landscape with little discernment regarding the land ownership being viewed. If activities on other ownerships and private lands ***are designed to lessen impacts to natural resources, including scenery, the difference between private lands, other ownerships, and NFS lands are less apparent***[SB9].

Corridor management plans for scenic byways are developed to protect and enhance the byway's intrinsic qualities and character that define the byway corridor, helping promote the management and value of a scenic byway's intrinsic qualities across ownership boundaries, reducing any negative cumulative consequences (***SB8-9***). The cumulative environmental consequences of proposed management efforts in the context of the larger cumulative effects analysis area though corridor management plans would contribute to the movement of scenic byway values toward desired conditions. Ultimately, movement toward desired conditions for scenic byways would provide tourism benefits for the region and communities they traverse (***SB2***) and ***contributes to sustainable social and economic systems***[SB10].

Short-Term Uses and Long-Term Productivity

The National Environmental Policy Act requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The draft forest plan would govern management of the Santa Fe NF's resources for the next 10 to 15 years. The FEIS discloses the analysis of effects for a range of alternatives, including no action. It considers effects on the significant issues and other resources for this timeframe. Overall, under all alternatives, design and implementation of projects and activities consistent with the direction in this forest plan would ensure the short-term uses, long-term productivity, ecological integrity, and ecological diversity of NFS lands within the Santa Fe NF.

Unavoidable Adverse Effects

The forest plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carry out any project or activity. Before any management actions take place, they must be authorized in a subsequent site-specific environmental analysis. Therefore, none of the alternatives cause unavoidable adverse impacts.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

The forest plan provides a programmatic framework that guides site specific actions but does not authorize, fund, or carryout any project or activity. Before any management actions take place, they must be authorized in a subsequent site-specific environmental analysis. Therefore, none of the alternatives cause an irreversible or irretrievable commitment of resources.

Other Required Disclosures

The regulations for implementing the National Environmental Policy Act at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." As a proposed Federal project, the proposed plan decisions are subject to compliance with other Federal and State laws. Determinations and decisions made in the proposed plan have been evaluated in the context of relevant laws and executive orders. Various State and Federal agencies collaborated throughout the development of the proposed plan. The following actions have been taken to document and ensure compliance with laws that require consultation and/or concurrence with other Federal agencies.

- Endangered Species Act, Section 7: Consultation with the U.S. Fish and Wildlife Service, regarding federally listed threatened, endangered, and proposed species, and designated and proposed critical habitat was completed as part of the forest plan revision process. A biological assessment for federally listed species has been prepared and submitted to the U.S. Fish and Wildlife Service for consultation according to the Endangered Species Act and we have received a biological opinion from the Service.

- National Historic Preservation Act: Consultation with the New Mexico State Historic Preservation Officer is mandated by section 106 of the National Historic Preservation Act. The First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities among the New Mexico State Historic Preservation Officer, and the Arizona State Historic Preservation Officer, and the Texas State Historic Preservation Officer, and the Oklahoma State Historic Preservation Officer, and the Advisory Council on Historic Preservation, and United States Department of Agriculture, Forest Service Region 3 was executed in December 2003. This programmatic agreement prescribes the manner in which Region 3 and the State historic preservation officer shall cooperatively implement this programmatic agreement in New Mexico, Arizona, and portions of Texas and Oklahoma. It is intended to ensure that Region 3 organizes its programs to operate efficiently and effectively in accordance with the intent and requirements of the National Historic Preservation Act and that Region 3 integrates its historic preservation planning and management decisions with other policy and program requirements. The programmatic agreement streamlines the National Historic Preservation Act section 106 process by eliminating case-by-case consultation with the State historic preservation officer on undertakings for which there is no or little potential to affect historic properties and for undertakings that either culminate in no historic properties affected or no historic properties adversely affected with approved standard protection measures (36 CFR 800.4(d)(1) and 800.5(d)(1).
- Government-to-government consultation was completed with federally recognized tribes and pueblos who have aboriginal territory within the lands now part of the Santa Fe National Forest, as required by the National Historic Preservation Act; Executive Orders 13007 and 13175; and the programmatic agreement cited above. More information on this consultation can be found in the "Public Participation" section of chapter 1 and in the "Traditional Communities and Uses" section of chapter 3 of the FEIS.

4 Preparers and Contributors

The following list of preparers is limited to those people who were members of the interdisciplinary team working on the final documents or who made significant contributions during the draft environmental impact statement. Preparation of these documents could not have been completed without the support and assistance of numerous employees on the Santa Fe NF, past employees who have retired or moved to other positions, and colleagues in the regional office. We also recognize the regional and forest leadership teams as providing guidance during this process.

An * indicates that this person's name and title reflect their current position, which is different from their position when they contributed on the environmental impact statement. An + indicates that this person is no longer working with the Forest Service.

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Name and Title	Involvement with EIS	Qualifications
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List of Agencies, Organizations, and Persons to Whom Copies of the Environmental Impact Statement are Sent

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments, and organizations representing a wide range of views.

The following agencies, organizations, and individuals have been sent copies of the final environmental impact statement or have been directed to the Santa Fe National Forest Plan Revision Internet page where the document has been posted. They are either required by regulation to be sent the environmental impact statement or have asked to be sent the document. The final environmental impact statement will also be sent to anyone else who requests it.

Federal Government

- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- USDA Animal and Plant Health Inspection Service
- Rural Utilities Service
- USDA Office of Civil Rights
- National Agricultural Library, Acquisitions and Serials Branch
- NOAA Fisheries Services, Habitat Conservation Division
- Deputy Assistant Secretary of Defense (Environment)
- Air Force Civil Engineer
- Chief of Naval Operations (N45)
- U.S. Coast Guard, Commandant CG-47
- U.S. Army Corps of Engineers
- U.S. Department of Energy, NEPA Policy and Compliance
- U.S.D.O.I Office of Environmental Policy and Compliance
- Federal Highway Administration
- Federal Aviation Administration

State Government

- New Mexico Department of Agriculture
- New Mexico Department of Agriculture, Agricultural Programs and Resources Division
- New Mexico Department of Game and Fish
- New Mexico Economic Development Department
- New Mexico Energy, Minerals and Natural Resources Dept., State Forestry Division
- New Mexico Environment Department

- New Mexico Land Grant Council; Mexicano Land Education and Conservation Trust

Local Agencies and others

- East Rio Arriba Soil and Water Conservation District
- La Jara Ditch Association
- Nacimiento Community Ditch Association
- Tierra y Montes Soil and Water Conservation District

Tribal Government

- All Pueblo Council of Governors
- Apache Indian Tribe of Oklahoma
- Canoncito Navajo Chapter House
- Cheyenne-Arapaho Tribes of Oklahoma
- Comanche Nation
- Counselor Navajo Chapter House
- Crownpoint Navajo Chapter House
- Eight Northern Indian Pueblo Council
- Five Sandoval Indian Pueblos
- Ft. Sill Chiricahua-Warm Springs Apache Tribe
- Jicarilla Apache Nation
- Kewa Pueblo (Pueblo of Santa Domingo)
- Kiowa Tribe of Oklahoma
- Mescalero Apache Tribe
- Ohkay Owingeh
- Ojo Encino Navajo Chapter House
- Pueblo of Acoma
- Pueblo of Cochiti
- Pueblo of Isleta
- Pueblo of Jemez
- Pueblo of Laguna
- Pueblo of Nambé
- Pueblo of Picuris
- Pueblo of Pojoaque
- Pueblo of San Felipe
- Pueblo of San Ildefonso
- Pueblo of Sandia
- Pueblo of Santa Ana
- Pueblo of Santa Clara
- Pueblo of Taos
- Pueblo of Tesuque
- Pueblo of Zia
- Pueblo of Zuni
- Pueblo Pintado Navajo Chapter House
- Ramah Navajo Chapter House
- Southern Ute Tribe
- Ten Southern Pueblo Governor's Council
- The Hopi Tribe
- The Navajo Nation
- Torreon Navajo Chapter House
- Ute Mountain Ute Tribe
- Whitehorse Lake Navajo Chapter House
- Wichita and Affiliated Tribes

Individuals

Individuals who registered for updates online on the Santa Fe National Forest Plan Revision website (www.fs.usda.gov/goto/santafeforestplan) or joined the mailing list at tabling events or public meetings were notified of the availability of the final environmental impact statement.

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Glossary

Acequia or community ditch. A historical community ditch in New Mexico that carries snow runoff, spring flows, or river water to irrigate fields and is administered by a governing board.

Adaptation. Adjustment in natural or human systems to a new or changing environment. Adaptation includes, but is not limited to, maintaining primary productivity and basic ecological functions, such as energy flow; nutrient cycling and retention; soil development and retention; predation and herbivory; and natural disturbances. Adaptation occurs primarily by organisms altering their interactions with the physical environment and other organisms.

Adaptive capacity. The ability of ecosystems to respond, cope, or adapt to disturbances and stressors, including environmental change, to maintain options for future generations. As applied to ecological systems, adaptive capacity is determined by:

1. Genetic diversity within species in ecosystems, allowing for selection of individuals with traits adapted to changing environmental conditions.
2. Biodiversity within the ecosystem, both in terms of species richness and relative abundance, which contributes to functional redundancies.
3. The heterogeneity and integrity of ecosystems occurring as mosaics within broader-scaled landscapes or biomes, making it more likely that some areas will escape disturbance and serve as source areas for re-colonization.

Adaptive management. Adaptive management is the general framework encompassing the three phases of planning: assessment, plan development, and monitoring (36 CFR 219.5). This framework supports decision-making that meets management objectives while simultaneously accruing information to improve future management by adjusting the plan or plan implementation. Adaptive management is a structured, cyclical process for planning and decision-making in the face of uncertainty and changing conditions with feedback from monitoring, which includes using the planning process to actively test assumptions, track relevant conditions over time, and measure management effectiveness.

Airshed. A geographic area that, because of topography, meteorology, and/or climate is frequently affected by the same air mass.

Assessment. For the purposes of the land management planning regulation at 36 CFR part 219, an assessment is the identification and evaluation of existing information to support land management planning. Assessments are not decision-making documents, but provide current information on select topics relevant to the plan area, in the context of the broader landscape (36 CFR 219.19).

At-risk species. A term used in land management planning to refer to, collectively, the federally recognized threatened, endangered, proposed, and candidate species and species of conservation concern within a plan area.

Authorized livestock numbers. Year to year actual stocking of livestock on a grazing allotment, based on forage and water availability, condition of range improvements, climatic conditions, personal convenience for the permittee, or resource protection. Authorized numbers are not necessarily the number on the permit.

Basal area**.** The cross-sectional area at breast height (4.5 feet above the ground) of trees measured in square feet. Basal area is a way to measure how much of a site is occupied by trees. The cross-sectional area is determined by calculating the tree's radius from its diameter (diameter/2 = radius) and using the formula for the area of a circle (π x radius^2 = cross-sectional area). Basal area per acre is the summation of the cross-sectional area of all trees in an acre or in a smaller plot used to estimate basal area per acre. Diameter at root collar (defined below) is used to calculate the cross-sectional area of multi-stemmed trees such as juniper and oak.

Base area. The main area at the bottom of a winter/summer resort.

Best management practices (BMPs). Methods, measures, or practices selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (36 CFR 219.19).

Biological soil crusts**.** Crusts of soil particles formed by living organisms (such as algae, mosses, lichens) in arid areas. They hold soil in place, help retain moisture, and improve soil nutrients by fixing atmospheric nitrogen.

Broader landscape. For land management planning pursuant to 36 CFR 219, the plan area and the lands surrounding the plan area. The spatial scale of the broader landscape varies depending upon the social, economic, and ecological issues under consideration.

Candidate species (36 CFR 219.19).

> For species under the purview of the U.S. Fish and Wildlife Service (USFWS), a species for which the USFWS possesses sufficient information on vulnerability and threats to support a proposal to list as endangered or threatened, but for which no proposed rule has yet been published by the USFWS.
>
> For species under the purview of the National Marine Fisheries Service (NMFS), a species that is:
>
>> The subject of a petition to list as a threatened or endangered species and for which the (NMFS) has determined that listing may be warranted, pursuant to section 4(b)(3)(A) of the Endangered Species Act (16 U.S.C. 1533(b)(3)(A)), or
>>
>> Not the subject of a petition but for which the (NMFS) has announced in the Federal Register the initiation of a status review.

Canopy Cover. The proportion of the forest floor covered by the vertical projection of the tree crowns (Jennings et al. 1999). Canopy cover is measured using a variety of methods including spherical densiometers, funnels, moose horns, aerial photographs, and hemispherical images. Canopy cover is also known as forest canopy cover; crown cover.

Catastrophic fire. Catastrophic fire can be defined from three different perspectives: economic (the cost of damage), social (how it is viewed by the public), and ecological (biological effects of the fire) (Carey and Schumann 2003). Covington and Moore (1994) defined catastrophic fire as a fire that kills a majority of the trees in the canopy in the ponderosa pine type or in any dry forest that was, in presettlement times, subject to frequent surface fires.

Chaining. Uprooting of trees and shrubs to create a seedbed by pulling a chain behind two tractors traveling parallel to each other.

Climate change. A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Climate variability. Refers to shorter term (daily, seasonal, annual, inter-annual, several years) variations in climate, including the fluctuations associated with El Niño (wet) or La Niña (dry) events.

Climax condition (seral stages). The stage where an ecosystem has reached a steady state. Through the process of ecological succession, an equilibrium is reached in which the biological community is best adapted to the average conditions in that area.

Coarse woody debris (CWD). Fallen dead trees and the remains of large branches on the ground in forests and in rivers or wetlands.

Collaboration or collaborative process. A structured manner in which a collection of people with diverse interests share knowledge, ideas, and resources, while working together in an inclusive and cooperative manner toward a common purpose. Collaboration, in the context of the land management planning regulation at 36 CFR part 219, falls within the full spectrum of public engagement described in the Council on Environmental Quality's publication of October, 2007: Collaboration in NEPA— A Handbook for NEPA Practitioners (36 CFR 219.19).

Community Wildfire Protection Plan (CWPP). A comprehensive community-based planning and prioritization approach for protection of life, property, and critical infrastructure in the wildland-urban interface. Protection plans may take a variety of forms based on the needs of the community, but must be collaboratively developed, identify and prioritize areas for hazardous fuel reduction treatments, recommend treatment types and methods, and recommend measures that homeowners and communities can take to reduce the ignitability of structures. The planning process may also identify management options and implications in the surrounding landscape. The Healthy Forests Restoration Act (HFRA) of 2003 instructed the Forest Service to give consideration of community priorities as outlined in a CWPP during planning and implementation of hazardous fuel reduction projects.

Connectivity. Ecological conditions that exist at several spatial and temporal scales that provide landscape linkages that permit the exchange of flow, sediments, and nutrients; the daily and seasonal movements of animals within home ranges; the dispersal and genetic interchange between populations; and the long distance range shifts of species, such as in response to climate change (36 CFR 219.19).

Conservation. The protection, preservation, management, or restoration of natural environments, ecological communities, and species (36 CFR 219.19).

Conserve. For meeting the requirements of 36 CFR 219.9, to protect, preserve, manage, or restore natural environments and ecological communities to potentially avoid federally listing of proposed and candidate species (36 CFR 219.19).

Critical habitat. For a threatened or endangered species, (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act (ESA) (16 U.S.C. 1533), on which are found those physical or biological features (a) essential to the conservation of the species, and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the ESA (16 U.S.C. 1533), upon a determination by the Secretary that such areas are essential for the conservation of the species. ESA, sec. 3 (5)(A), (16 U.S.C. 1532 (3)(5)(A)). Critical habitat is designated through rulemaking by the Secretary of the Interior or Commerce. ESA, sec. 4 (a)(3) and (b)(2) (16 U.S.C. 1533 (a)(3) and (b)(2)).

Cultural resources. The remains of sites, structures, or objects used by humans in the past, historic or prehistoric. More recently referred to as heritage resources.

Cumulative effects or impacts. The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions, taken place over a period of time.

Decision document. A record of decision, decision notice, or decision memo (36 CFR 220.3).

Decommission. Treated in such a manner so as to no longer function as intended. Usually in reference to decommissioning of a road so that it no longer is apparent on the landscape.

Defensible space. An area either natural or manmade where material capable of allowing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and property or resources. In practice, “defensible space” is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

Departure. The degree to which the current condition of a key ecosystem characteristic is unlike the reference condition.

Designated area. An area or feature identified and managed to maintain its unique special character or purpose. Some categories of designated areas may be designated only by statute and some categories may be established administratively in the land management planning process or by other administrative processes of the Federal executive branch. Examples of statutorily designated areas are national heritage areas, national recreational areas, national scenic trails, wild and scenic rivers, wilderness areas, and wilderness study areas. Examples of administratively designated areas are experimental forests, research natural areas, scenic byways, botanical areas, and significant caves (36 CFR 219.19).

Designated road, trail, or area. A National Forest System road, a National Forest System trail, or an area on National Forest System lands that is designated for motor vehicle use pursuant to 36 CFR 212.51 on a motor vehicle use map (36 CFR 212.1).

Desirable nonnative. Nonnative species that were intentionally released into the wild to establish self-sustaining populations of wildlife that meet public demands for recreation or other purposes (e.g., sport fishes). These desirable nonnative species are not likely to cause ecosystem disruption.

Desired conditions. For the purposes of the land management planning regulation at 36 CFR 219, a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined, but do not include completion dates (36 CFR 219.7(e)(1)(i)). Desired conditions are achievable, and may reflect social, economic, or ecological attributes, including ecosystem processes and functions.

Diameter. The diameter of a tree species, usually measured by two primary methods:

- Diameter at breast height (d.b.h.): The diameter of a tree at the bole (or trunk) typically measured at 4.5 feet above ground level.
- Diameter at root collar (d.r.c.): The diameter of a woodland tree species typically measured at the root collar (the part of the tree where the main roots join the trunk, usually at or near ground level) or at the natural ground line, whichever is higher.

Dispersed motorized camping. Camping with motorized vehicles outside of developed campsites.

Dispersed recreation. Outdoor recreation in which visitors are spread over relatively large areas outside developed recreation sites. Where facilities or developments are provided, they are more for access and protection of the environment than for the comfort or convenience of the visitors.

Disturbance. Any relatively discrete event in time that disrupts ecosystem, watershed, community, or species population structure and/or function and changes resources, substrate availability, or the physical environment (36 CFR 219.19).

Disturbance regime. A description of the characteristic types of disturbance on a given landscape; the frequency, severity, and size distribution of these characteristic disturbance types; and their interactions (36 CFR 219.19).

Diversity. An expression of community structure; high if there are many equally abundant species; low if there are only a few equally abundant species. The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Easement. A type of special use authorization (usually granted for linear rights-of-way) that is utilized in those situations where a conveyance of a limited and transferable interest in National Forest System land is necessary or desirable to serve or facilitate authorized long-term uses, and that may be compensable according to its terms (36 CFR 251.51).

Ecological conditions. The biological and physical environment that can affect the diversity of plant and animal communities, the persistence of native species, and the productive capacity of ecological systems. Ecological conditions include habitat and other influences on species and the environment. Examples of ecological conditions include the abundance and distribution of aquatic and terrestrial habitats, connectivity, roads and other structural developments, human uses, and invasive species (36 CFR 219.19).

Ecological integrity. The quality or condition of an ecosystem when its dominant ecological characteristics (e.g., composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence (36 CFR 219.19).

Ecological process. The physical, chemical, and biological actions or events that link organisms and their environment including decomposition, production (of plant matter), nutrient cycling, and fluxes of nutrients and energy.

Ecological response unit (ERU). A classification of a unit of land that groups sites by similar plant species composition, succession patterns, and disturbance regimes, such that similar units will respond in a similar way to disturbance, biological processes, or manipulation. Each ERU characterizes sites with similar composition, structure, function, and connectivity, and defines their spatial distribution on the landscape.

Ecological sustainability. See sustainability.

Ecological system. See ecosystem.

Economic sustainability. See sustainability.

Ecosystem. (36 CFR 219.19) A spatially explicit, relatively homogeneous unit of the Earth that includes all interacting organisms and elements of the abiotic environment within its boundaries. An ecosystem is commonly described in terms of its:

1. Composition. The biological elements within the different levels of biological organization, from genes and species to communities and ecosystems.
2. Structure. The organization and physical arrangement of biological elements, such as, snags and down woody debris, vertical and horizontal distribution of vegetation, stream habitat complexity, landscape pattern, and connectivity.
3. Function. Ecological processes that sustain composition and structure, such as energy flow, nutrient cycling and retention, soil development and retention, predation and herbivory, and natural disturbances, such as wind, fire, and floods.
4. Connectivity. See connectivity above.

Ecosystem diversity. The variety and relative extent of ecosystems (36 CFR 219.19).

Ecosystem integrity. See ecological integrity.

Ecosystem services. Benefits people obtain from ecosystems, including:

1. Provisioning services, such as clean air and fresh water, energy, food, fuel, forage, wood products or fiber, and minerals;
2. Regulating services, such as long-term storage of carbon; climate regulation; water filtration, purification, and storage; soil stabilization; flood and drought control; and disease regulation;
3. Supporting services, such as pollination, seed dispersal, soil formation, and nutrient cycling; and
4. Cultural services, such as educational, aesthetic, spiritual, and cultural heritage values, recreational experiences, and tourism opportunities.

Ecotone. The transition zone between two adjoining ecological communities.

Effect. Environmental change resulting from a proposed action. Direct effects are caused by the action and occur at the same time and place, while indirect effects are caused by the action, but are later in time or further removed in distance, although still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effect and impact are synonymous as used in this document.

Encroachment. An increase in the density and cover of trees or shrubs in grasslands that reduces grass biomass, density, and cover.

Endangered species. Any species that the Secretary of the Interior or the Secretary of Commerce has determined is in danger of extinction throughout all or a significant portion of its range. Endangered species are listed at 50 CFR sections 17.11, 17.12, and 224.101.

Endemic. (1) Describes a population that has unique genetic characteristics and likely exists in a very limited geographic area. (2) Describes a population of native insects, diseases, plants, or animals which perform a functional role in the ecosystem when they are present at low levels, or constantly attack just a few hosts throughout an area but can become potentially injurious when they increase or spread to reach outbreak (epidemic) levels.

Environmental impacts. Possible adverse effects caused by a development, industrial, or infrastructural project or by the release of a substance in the environment.

Ephemeral stream. A stream that flows only in direct response to precipitation in the immediate locality (watershed or catchment basin), and whose channel is at all other times above the zone of saturation.

Even-aged stand. A stand of trees composed of a single age class (36 CFR 219.19).

Federally listed species. Threatened or Endangered species listed under the Endangered Species Act, as amended. Candidate and proposed species are species which are being considered for Federal listing.

Federally recognized tribe. An Indian or Alaska Native Tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian Tribe under the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 479a (36 CFR 219.19).

Fire intensity. The product of the available heat of combustion per unit of ground and the rate of spread of the fire, interpreted as the heat released per unit of time for each unit length of fire edge. The primary unit is British thermal unit per second per foot (Btu/sec/ft.) of fire front. See also fire severity.

Fire regime. The patterns, frequency, and severity of fire that occur over a long period of time across a landscape and its immediate effects on the ecosystem in which it occurs. There are five fire regimes that are classified based on frequency (average number of years between fires) and severity (amount of replacement of the dominant overstory vegetation) of the fire. These five regimes are:

- Fire regime I – 0 to 35-year frequency and low (surface fires most common, isolated torching can occur) to mixed severity (less than 75 percent of dominant overstory vegetation replaced).
- Fire regime II – 0 to 35-year frequency and high severity (greater than 75 percent of dominant overstory vegetation replaced).
- Fire regime III – 35 to 100+ year frequency and mixed severity.
- Fire regime IV – 35 to 100+ year frequency and high severity.
- Fire regime V – 200+ year frequency and high severity.

Fire risk. The chance of fire starting, as determined by the presence and activity of causative agents.

Fire severity. Degree to which a site has been altered or disrupted by fire; also used to describe the product of fire intensity and residence time; usually defined by the degree of soil heating or mortality of vegetation.

Fire suppression. The work of extinguishing a fire or confining fire spread.

Forage is (1) (noun) browse and herbage that is available and can provide food for animals or be harvested for feeding; or (2) (verb) to search for or consume forage.

Forested land. Land that is at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and power line clearing of any width.

Free-flowing. Existing or flowing in natural conditions without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway.

Frequent fire-dependent ecosystem. A vegetation community that requires a fire regime I (greater than 35-year fire frequency) to maintain its natural function, structure, and species composition.

Functional ecosystem. A system with intact abiotic and biotic processes. Function focuses on the underlying processes that may be degraded, regardless of the structural condition of the ecosystem. Functionally restored ecosystems may have a different structure and composition than the historical reference condition. As contrasted with ecological restoration that tends to seek historical reference condition, function refers to the dynamic processes that drive structural and compositional patterns. Functional restoration is the manipulation of interactions among process, structure, and composition in a degraded ecosystem to improve its operations. Functional restoration aims to restore functions and improve structures with a long-term goal of restoring interactions between function and structure. It may be, however, that a functionally restored system will look quite different than the reference condition in terms of structure and composition and these disparities cannot be easily corrected because some threshold of degradation has been crossed or the environmental drivers, such as climate, that influenced structural and (especially) compositional development have changed.

Gap. The space occurring in a forested area as a result of individual or group tree mortality from small disturbance events or from local site factors such as soil properties that influence vegetation growth patterns.

Goshawk foraging areas. The areas that surround the PFAs (see definition below) that northern goshawks use to hunt for prey. They are approximately 5,400 acres in size.

Goshawk nest areas. The areas immediately around a nest that are used by northern goshawks in relation to courtship and breeding activities. They are approximately 30 acres in size and contain multiple groups of large, old trees with interlocking crowns.

Goshawk post-fledging family areas (PFAs). The areas that surround northern goshawk nest areas. They represent an area of concentrated use by the northern goshawk family until the time the young are no longer dependent on adults for food. PFAs are approximately 420 acres in size (not including the nest area acres).

Groundcover. The layer of dead and living vegetation that provides protection of the topsoil from erosion and drought.

Groundwater-dependent ecosystem. Community of plants, animals, and other organisms whose extent and life processes depend on groundwater. Examples include many wetlands, groundwater-fed lakes and streams, cave and karst systems, aquifer systems, springs, and seeps.

Group. A cluster of two or more trees with interlocking or nearly interlocking crowns at maturity surrounded by an opening. Size of tree groups is typically variable depending on forested PNVT and site conditions and can range from fractions of an acre (a two-tree group) (i.e., ponderosa pine, dry mixed conifer) to many acres (i.e., wet mixed conifer, spruce-fir). Trees within groups are typically non-uniformly spaced, some of which may be tightly clumped.

Group selection. An uneven-aged management method in which trees are removed and new age classes are established in groups, adjacent to other groups of different age classes. Group cut size is determined by the reproduction requirements of the species desired and by the number or total acreage of different age classes desired across the stand.

Habitat. The physical location or type of environment in which an organism or biological population lives or occurs.

Habitat fragmentation. The process by which habitat loss results in the division of large, continuous habitats in smaller more isolated remnants.

Habitat type. A land or aquatic unit, consisting of an aggregation of habitats having equivalent structure, function, and responses to disturbance.

Herbaceous. Grass, grass-like, and forb vegetation.

Herbivory. Loss of vegetation due to consumption by another organism.

Hydrologic function. The behavioral characteristics of a watershed described in terms of ability to sustain favorable conditions of waterflow. Favorable conditions of waterflow are defined in terms of water quality, quantity, and timing.

Hydrologic unit code (HUC). A unique hierarchical hydrologic unit based on the area of land that drains to a single stream mouth or outlet at each level, and nested levels are identified by successively longer codes. A HUC 8 sub-basin is 700 square miles or larger and is divided into multiple HUC 10 watersheds that range from 62 to 390 square miles. HUC 12 subwatersheds are 15 to 62 square miles and nest inside HUC 10 watersheds.

Impaired waters. Polluted or degraded waterbodies (e.g., lakes, streams, segments of streams) which do not meet state water quality standards.

Infill. An increase in trees per acre in forests and woodlands, resulting in a decrease in the quality and size of interspaces.

Information. For information collection from the public pursuant to 5 CFR part 1320, any statement or estimate of fact or opinion, regardless of form or format, whether in numerical, graphic, or narrative form, and whether oral or maintained on paper, electronic or other media. “Information” does not generally include items in the following categories; however, OMB may determine that any specific item constitutes “information.”

1. Affidavits, oaths, affirmations, certifications, receipts, changes of address, consents, or acknowledgments; provided that they entail no burden other than that necessary to identify the respondent, the date, the respondent's address, and the nature of the instrument (by contrast, a certification would likely involve the collection of “information” if an agency conducted or sponsored it as a substitute for a collection of information to collect evidence of, or to monitor, compliance with regulatory standards, because such a certification would generally entail burden in addition to that necessary to identify the respondent, the date, the respondent's address, and the nature of the instrument);
2. Samples of products or of any other physical objects;
3. Facts or opinions obtained through direct observation by an employee or agent of the sponsoring agency or through nonstandardized oral communication in connection with such direct observations;
4. Facts or opinions submitted in response to general solicitations of comments from the public, published in the Federal Register or other publications, regardless of the form or format thereof, provided that no person is required to supply specific information pertaining to the commenter, other than that necessary for self-identification, as a condition of the agency's full consideration of the comment;
5. Facts or opinions obtained initially or in follow-on requests, from individuals (including individuals in control groups) under treatment or clinical examination in connection with research on or prophylaxis to prevent a clinical disorder, direct treatment of that disorder, or the interpretation of biological analyses of body fluids, tissues, or other specimens, or the identification or classification of such specimens;
6. A request for facts or opinions addressed to a single person;
7. Examinations designed to test the aptitude, abilities, or knowledge of the persons tested and the collection of information for identification or classification in connection with such examinations;
8. Facts or opinions obtained or solicited at or in connection with public hearings or meetings;
9. Facts or opinions obtained or solicited through nonstandardized follow-up questions designed to clarify responses to approved collections of information; and
10. Like items so designated by the Office of Management and Budget (5 CFR 1320.3(h)).

Infrastructure. Infrastructure the forest manages includes all vertical and horizontal constructed structures. Infrastructure is broken into three categories:

1. Transportation infrastructure includes both the road and trail systems. The road system infrastructure is all forest roads, drainage ditches, culverts, signage, and bridges. The trail system includes all motorized and non-motorized trails, signage, and bridges.
2. Facilities infrastructure includes administrative and recreation building and sites (e.g., driveways, parking, landscaping); support utilities (e.g., electrical, water, wastewater); dams, and other support buildings.
3. Other infrastructure directly supports natural resources, which includes fish barriers, wildlife drinkers, and range infrastructure (e.g., fencing, trick tanks, water gaps, cattleguards).

Inherent capability of the forest. The ecological capacity or ecological potential of an area characterized by the interrelationship of its physical elements, its climatic regime, and natural disturbances (36 CFR 219.19).

Integrated resource management. Multiple-use management that recognizes the interdependence of ecological resources and is based on the need for integrated consideration of ecological, social, and economic factors (36 CFR 219.19).

Intermittent stream. A stream or reach of stream channel that flows, in its natural condition, only during certain times of the year or in several years, and is characterized by interspersed, permanent surface water areas containing aquatic flora and fauna adapted to the relatively harsh environmental conditions found in these types of environments. Intermittent streams are identified as dashed blue lines on USGS 7 1/2-inch quadrangle maps.

Interspaces. Open space between tree groups intended to be managed for grass-forb-shrub vegetation over the long term.

Invasive species. An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. A species that causes, or is likely to cause, harm and that is exotic to the ecosystem it has infested. Invasive species infest both aquatic and terrestrial areas and can be identified within any of the following four taxonomic categories: Plants, Vertebrates, Invertebrates, and Pathogens (Executive Order 13112). Sometimes referred to as nonnative invasive or exotic species.

Jackstrawing. Groups of fallen trees usually resulting from blowdown, avalanche, flood, or insect or disease mortality.

Land grant-merced. A grant of land made by the Government of Spain or of Mexico to a community, town, colony, pueblo, or person for the purpose of founding or establishing a community, town, colony, or pueblo.

Land grant-merced governing body. A community land grant-merced recognized under a State of New Mexico law, statute, or code, with a duly elected or appointed governance body charged with management, care and protection of land grant-merced common lands.

Landscape. A defined area irrespective of ownership or other artificial boundaries, such as a spatial mosaic of terrestrial and aquatic ecosystems, landforms, and plant communities, repeated in similar form throughout such a defined area (36 CFR 219.19).

Leave No Trace. Guidelines that help protect the land and lessen the sights and sounds of forest visitors. Refer to Leave No Trace website.

Line officer. A Forest Service official who serves in a direct line of command from the Chief (36 CFR 219.62).

Linked disturbance. Instances where one disturbance can alter the severity, extent, or occurrence probability of a subsequent disturbance (Hart et al. 2015).

Litter. Litter consists of dead, unattached organic material on the soil surface that is effective in protecting the soil surface from raindrop splash, sheet, and rill erosion and is at least ½ inch thick. Litter is composed of leaves, needles, cones, and woody vegetative debris including twigs, branches, and trunks.

Livestock grazing. Foraging by permitted livestock (domestic foraging animals of any kind).

Maintain. In reference to an ecological condition: To keep in existence or continuance of the desired ecological condition in terms of its desired composition, structure, and processes. Depending upon the circumstance, ecological conditions may be maintained by active or passive management or both (36 CFR 219.19).

Management actions. Any alterations to ecosystems or activities that the Forest Service conducts or authorizes on NFS lands. These may include prescribed cutting, prescribed burning, permitted grazing, permitted fuelwood gathering, vehicular access, stream restoration treatments, seeding, trail construction, fencing, among others.

Management area. A land area identified within the planning area that has the same set of applicable plan components. A management area does not have to be spatially contiguous (36 CFR 219.19).

Management system. For the purposes of the land management planning regulation at 36 CFR 219, a timber management system including even aged management and uneven-aged management (36 CFR 219.19).

Mechanical treatment. For the purposes of this plan, mechanical treatments include most vegetation treatments except fire. They may include mechanized cutting, hand thinning, and other silvicultural treatments.

Memorandum of understanding (MOU). Describes a bilateral or multilateral agreement between two or more parties. It expresses a convergence of will between the parties, indicating an intended common line of action. It is often used in cases where parties either do not imply a legal commitment or in situations where the parties cannot create a legally enforceable agreement. It is a more formal alternative to a gentlemen's agreement.

Minimum requirements analysis. Required by law whenever land managers are considering a use prohibited by Section 4(c) of the Wilderness Act of 1964, and is a process that was developed by the Arthur Carhart National Wilderness Training Center to help land managers make informed, defensible decisions that comply with the Wilderness Act.

Mitigate. To avoid, minimize, rectify, reduce, or compensate the adverse environmental impacts associated with an action.

Mollisol. A soil of an order comprising temperate grassland soils with dark, humus-rich surface layer containing high concentration of calcium and magnesium.

Monitoring. A systematic process of collecting information to evaluate effects of actions or changes in conditions or relationships (36 CFR 219.19).

Mosaic. Mix of recurring patterns of forested and non-forested areas at the identified scale (e.g., landscape, watershed, mid-scale). Patterns are variable and may change over time.

Motor Vehicle. Any vehicle that is self-propelled, other than:

1. A vehicle operated on rails; and
2. Any wheelchair or mobility device, including one that is battery-powered, that is designed solely for use by a mobility-impaired person for locomotion, and that is suitable for use in an indoor pedestrian area (36 CFR 212.1, 36 CFR 261.2).

Motor Vehicle Use Map (MVUM). A map reflecting designated roads, trails, and areas on an administrative unit or a ranger district of the National Forest System (36 CFR 212.1).

Multiple use. The management of all the various renewable surface resources of the NFS so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output, consistent with the Multiple-Use Sustained-Yield Act of 1960 (16 U.S.C. 528–531) (36 CFR 219.19).

National Environmental Policy Act (NEPA). A United States environmental law (42 U.S.C. 4321 et seq.), enacted January 1, 1970 that established a U.S. national policy promoting the enhancement of the environment. Additionally, it established the President's Council on Environmental Quality (CEQ).

National Forest System. Includes National Forests, National Grasslands, and the National Tallgrass Prairie (36 CFR 219.62).

National Forest System Road. A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county or other local public road authority (36 CFR 212.1, 36 CFR 251.51, 36 CFR 261.2).

National Forest System Trail. A forest trail other than a trail authorized by a legally documented right-of-way held by a state, county, or other local public road authority (36 CFR 212.1).

Native species. An organism that was historically or is present in a particular ecosystem as a result of natural migratory or evolutionary processes and not as a result of an accidental or deliberate introduction into that ecosystem. An organism's presence and evolution (adaptation) in an area are determined by climate, soil, and other biotic and abiotic factors (36 CFR 219.19).

Natural disturbance regime. The historic patterns (frequency and extent) of fire, insects, wind, landslides, floods, and other natural processes in an area.

Natural fire regime. The fire regime that existed prior to human-facilitated interruption of frequency, extent, or severity.

Natural variability. A reference to past conditions and processes that provide important context and guidance relevant to the environments and habitats in which native species evolved. Disturbance-driven spatial and temporal variability is vital to ecological systems. Biologically appropriate disturbances provide for heterogeneous conditions and subsequent diversity. Conversely, "uncharacteristic disturbance," such as high-intensity fire in plant communities that historically had a frequent low-intensity fire regime can have the effect of reducing diversity, increasing homogeneity, and may result in permanently altered conditions.

Neonate ungulate. Offspring of a hoofed animal (e.g., fawn or calf).

Nonindustrial wood (species). Includes aspen, junipers, piñon pines, oaks, and any industrial species cut from non-suitable timberlands. Wood cut as nonindustrial may be used as firewood or biomass.

Nutrient cycling. The circulation or exchange of elements such as nitrogen and carbon between non-living and living portions of the environment.

Objective. A concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets.

Off-highway vehicle (OHV). Any motorized vehicle designed for or capable of cross county travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain; except that term excludes (a) any registered motorboat; (b) any fire, military, emergency or law enforcement vehicle when used for emergency purposes, and any combat or combat support vehicle when used for national defense purposes; and (c) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract (EO 116-44 as amended by EO 11989). See also FSM 2355. 01 - Exhibit 01.

Old-growth characteristics. Old-growth forests are forests that have accumulated specific characteristics related to tree size, canopy structure, snags and woody debris and plant associations. Ecological characteristics of old-growth forests emerge through the processes of succession. Certain features—presence of large, old trees, multilayered canopies, forest gaps, snags, woody debris, and a particular set of species that occur primarily in old-growth forests - do not appear simultaneously, nor at a fixed time in stand development. Old-growth forests support assemblages of plants and animals, environmental conditions, and ecological processes that are not found in younger forests (younger than 150 years) or in small patches of large, old trees. Specific attributes of old-growth forests develop through forest succession until the collective properties of an older forest are evident.

Online. Refers to the appropriate Forest Service website or future electronic equivalent (36 CFR 219.62).

Openings. Generally persistent treeless areas having a fairly distinct shape or size, occurring naturally due to differences in soil types as compared to sites that support forests or woodlands. Openings include meadows, grasslands, rock outcroppings, and wetlands. In contrast, created openings result from disturbances like severe fire or windthrow, or management activities to intentionally create space for new tree regeneration. Natural and created openings are not the same as interspaces found in the frequent-fire forests or woodlands. See interspaces.

Outstanding natural resource water (ONRW). Streams, lakes, and wetlands that receive special protection against degradation under New Mexico's water quality standards and the Federal Clean Water Act. They are designated by the Water Quality Control Commission. Waters eligible for ONRW designation include waters that are part of a national or state park, wildlife refuge or wilderness areas, special trout waters, waters with exceptional recreational or ecological significance, and high quality waters that have not been significantly modified by human activities (NMED 2015).

Participation. Activities that include a wide range of public involvement tools and processes, such as collaboration, public meetings, open houses, workshops, and comment periods (36 CFR 219.19).

Patches. Areas larger than tree groups in which the vegetation composition and structure are relatively homogeneous. Patches compose the mid-scale; thus, they range in size from 100 to 1,000 acres.

Perennial stream. A stream or reach of a channel that flows continuously or nearly so throughout the year and whose upper surface is generally lower than the top of the zone of saturation in areas adjacent to the stream. These streams are identified as solid blue on the USGS 7 1/2-inch quadrangle maps.

Permit area. Area where an activity is authorized through a special use permit.

Persistence. Continued existence (36 CFR 219.19).

Plan or land management plan. A document or set of documents that provide management direction for an administrative unit of the National Forest System developed under the requirements of the land management planning regulation at 36 CFR part 219 or a prior planning rule (36 CFR 219.19).

Plan area. The National Forest System lands covered by a plan (36 CFR 219.19), specifically lands managed by the Forest Service as the Santa Fe NF.

Plan components. The parts of a land management plan that guide future project and activity decision-making. Specific plan components may apply to the entire plan area, to specific management areas or geographic areas, or to other areas as identified in the plan. Every plan must include the following plan components: Desired conditions; Objectives; Standards; Guidelines; Suitability of Lands. A plan may also include Goals as an optional component.

Plan development. The second phase in the forest plan revision process. Plan development follows the NEPA process and plan revision requires preparation of an environmental impact statement. It is grounded in the information developed during the assessment phase and other information relevant to the plan area, it addresses needs for change, and it involves the public. Every plan must have management areas or geographic areas or both and may identify designated or recommended designated areas (36 CFR 219.7).

Plan monitoring program. An essential part of the land management plan that sets out the plan monitoring questions and associated indicators, based on plan components. The plan monitoring program informs management of resources on the plan area and enables the responsible official to determine if a change in plan components or other plan content that guide management of resources on the plan area may be needed.

Planned ignition. The intentional initiation of a wildland fire by hand-held, mechanical, or aerial device where the distance and timing between ignition lines or points and the sequence of igniting them is determined by environmental conditions (e.g., weather, fuel, topography), firing technique, and other factors which influence fire behavior and fire effects. See prescribed fire.

Plant and animal community. A naturally occurring assemblage of plant and animal species living within a defined area or habitat (36 CFR 219.19).

Potential natural vegetation (PNVT) types comprise the “climax” vegetation that will occupy a site without disturbance or climatic change. PNV is an expression of environmental factors such as topography, soils, and climate across an area.

Prescribed fire. A wildland fire originating from a planned ignition to meet specific objectives identified in a written, approved, prescribed fire plan for which NEPA requirements have been met prior to ignition.

Primitive recreation. Reliance on personal skills and non-motorized and non-mechanized means to travel and camp in an area, rather than reliance on facilities or outside help.

Productivity. The capacity of National Forest System lands and their ecological systems to provide the various renewable resources in certain amounts in perpetuity. For the purposes of the land management planning regulation at 36 CFR part 219, productivity is an ecological term, not an economic term (36 CFR 219.19).

Project. An organized effort to achieve an outcome on National Forest System lands identified by location, tasks, outputs, effects, times, and responsibilities for execution (36 CFR 219.19).

Projected Timber Sale Quantity (PTSQ) and Projected Wood Sale Quantity (PWSQ). The PTSQ and the PWSQ are estimated amounts of timber and other wood products that are expected to be produced under the plan's direction, based on objectives. Thus, the estimation of these two quantities must be consistent with the plan components of the final plan or the unique mix of plan components in each alternative, and the fiscal and organizational capability of the unit. The planned management objectives for PTSQ and PWSQ are also limited based upon constraints described in FSH 1909.12, Chapter 60, section 64.32.

Proper functioning condition (PFC). PFC is a methodology for assessing the physical functioning of riparian and wetland areas. The term PFC is used to describe both the assessment process, and a defined, on-the-ground condition of a riparian-wetland area. In either case, PFC defines a minimum or starting point.

Proposed species. Any species of fish, wildlife, or plant that is proposed by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service in the Federal Register to be listed under Section 4 of the Endangered Species Act (36 CFR 219.19).

Range condition is a subjective expression of the status or health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community. (USDA Forest Service, Southwestern Region, Record of Decision for Amendment of Forest Plans, Arizona, and New Mexico). It is evaluated relative to desired conditions.

Rangelands. Forage-producing forested and non-forested lands.

Recommended wilderness. An area within the National Forest System recommended for official designation by the regional forester to the Chief of the Forest Service. The Chief may elect to forward the recommendation with wording for a congressional bill to the Secretary of Agriculture, who may then elect to transmit the proposed bill to Congress. It takes an act of Congress to designate a wilderness area.

Recovery. For the purposes of the land management planning regulation at 36 CFR part 219 and with respect to threatened or endangered species: The improvement in the status of a listed species to the point at which listing as federally endangered or threatened is no longer appropriate (36 CFR 219.19).

Recreation opportunity. An opportunity to participate in a specific recreation activity in a particular recreation setting to enjoy desired recreation experiences and other benefits that accrue. Recreation opportunities include non-motorized, motorized, developed, and dispersed recreation on land, water, and in the air (36 CFR 219.19).

Recreation setting. The social, managerial, and physical attributes of a place that, when combined, provides a distinct set of recreation opportunities. The Forest Service uses the recreation opportunity spectrum to define recreation settings and categorize them into six distinct classes: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban (36 CFR 219.19).

Redundancy. The presence of multiple occurrences of ecological conditions such that not all occurrences may be eliminated by a catastrophic event.

Reference conditions. Environmental conditions that infer ecological sustainability. When available, reference conditions are represented by the characteristic natural range of variation (NRV) (not the total range of variation), prior to European settlement and under the current climatic period. For many ecosystems, NRV also reflects human-caused disturbance and effects prior to settlement. It may also be necessary to refine reference conditions according to contemporary factors (e.g., invasive species) or projected conditions (e.g., climate change). Reference conditions are most useful as an inference of sustainability when they have been quantified by amount, condition, spatial distribution, and temporal variation.

Regulated timber harvest. Tree harvest for the purposes of timber production, as opposed to tree harvest for other purposes, such as habitat and watershed improvement or fuelwood.

Representativeness. The presence of a full array of ecosystem types and successional states based on the physical environment and characteristic disturbance processes.

Research natural areas. A physical or biological unit in which current natural conditions are maintained insofar as possible. These conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention. Research natural areas are principally for non-manipulative research, observation, and study. They are designated to maintain a wide spectrum of high quality representative areas that represent the major forms of variability found in forest, shrubland, grassland, alpine, and natural situations that have scientific interest and importance that, in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity.

Resilience. The ability of an ecosystem and its component parts to absorb, or recover from the effects of disturbances through preservation, restoration, or improvement of its essential structures and functions and redundancy of ecological patterns across the landscape.

Responsible official. The official with the authority and responsibility to oversee the planning process and to approve a plan, plan amendment, and plan revision (36 CFR 219.62).

Restoration, ecological. The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. Ecological restoration focuses on reestablishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystems sustainability, resilience, and health under current and future conditions (36 CFR 219.19).

Restore. To renew by the process of restoration. See restoration (36 CFR 219.19).

Riparian areas. Three-dimensional ecotones [the transition zone between two adjoining communities] of interaction that include terrestrial and aquatic ecosystems that extend down into the groundwater, up above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the water course at variable widths (36 CFR 219.19).

Riparian management zone. The interface between land and a river or stream. Plant habitats and communities along the river margins and banks are called riparian vegetation, characterized by hydrophilic plants.

Risk. A combination of the likelihood that a negative outcome will occur and the severity of the subsequent negative consequences (36 CFR 219.19).

Road. A motor vehicle route over 50 inches wide, unless identified and managed as a trail (36 CFR 212.1).

Road decommissioning. Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1). It includes a range of activities from ripping and seeding to full reclamation by restoring the original topography. Road decommissioning results in the removal of a National Forest System road from the forest transportation atlas.

Road Maintenance Levels (ML):

- ML1. Roads that are closed to vehicular traffic intermittently for periods that exceed 1 year. Can be operated at any other maintenance level during periods of use.
- ML2. Roads that are open and maintained for use by high-clearance vehicles; surface smoothness is not a consideration. Most have native material surface (not paved and no aggregate surface).
- ML3. Roads that are open and maintained for use by standard passenger cars. Most have gravel surface.
- ML4. Roads that are open and maintained for use by standard passenger cars and to provide a moderate degree of user comfort and convenience at moderate travel speeds. Most are paved or have an aggregate surface.
- ML5. Roads that are open and maintained for use by standard passenger cars

Routine maintenance. Work that is planned to be accomplished on a continuing basis, generally annually or more frequently (FSH 7709.58, 13.41).

Scale. Desired conditions are described at multiple scales where appropriate. Descriptions at various scales are sometimes necessary to provide adequate detail and guidance for the design of future projects and activities that will help achieve the desired conditions over time. The three scales used in this plan are:

Fine scale is an area 10 acres or less in size at which the distribution of individual trees (single, grouped, or aggregates of groups) is described. Fine-scale desired conditions provide the view that can be observed standing in one location on the ground. Fine-scale desired conditions typically contain greater variability, which is desirable for providing heterogeneity at smaller spatial scales.

Mid-scale desired conditions are composed of assemblages of fine-scale units and have descriptions that would be averaged across areas of 100- to 1,000-acre units.

Landscape scale is an assemblage of 10 or more mid-scale units, typically totaling more than 10,000 acres, composed of variable elevations, slopes, aspects, soils, plant associations, and disturbance processes. Landscape scale desired conditions provide the big picture overview with resolution that would, for example, be observable from an airplane or from a zoomed-out Google

Earth view. The landscape scale is also appropriate scale for describing less common components that would not necessarily occur on every mid-scale unit within the landscape.

Scenery Management System (SMS). A classification system that recognizes scenery as the visible expression of dynamic ecosystems functioning within "places" that have unique aesthetic and social values. It recognizes that in addition to naturally occurring features, positive scenery attributes associated with social, cultural, historical, and spiritual values, including human presence and the built environment, can also be valued elements of the scenery. The SMS also allows for "seamless" analysis and conservation beyond National Forest System lands into adjacent communities and other jurisdictions, through the application of varying scenery "themes" within a single analysis. It is structured to emphasize "natural appearing" scenery.

Scenic character. A combination of the physical, biological, and cultural images that gives an area its scenic identity and contributes to its sense of place. Scenic character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity (36 CFR 219.19).

Scenic integrity objective. A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations to the valued attributes of the characteristic landscape. Objectives include Very High, High, Moderate, and Low.

Seral stage (seral state). One of a series of transitional plant communities that develop during gradual successive change following disturbance.

Silviculture. The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands using species silvics to meet the diverse needs and values of landowners and society on a sustainable basis. Under this definition, silvicultural treatments include all management activities that control the establishment, growth, composition, health, and quality of forested lands to achieve stated land management objectives. The use of prescribed fire on forested lands qualifies as a silvicultural treatment in the context of this definition.

Snags are standing dead or partially dead trees (snag-topped), often missing many or all limbs. They provide essential wildlife habitat for many species and are important for forest ecosystem function.

Soil condition rating. A qualitative rating developed within the Southwestern Region of the Forest Service that provides an overall picture of soil condition vital in sustaining ecosystems. It is based on three soil functions: the ability of soil to resist erosion, infiltrate water, and recycle nutrients. There are four soil condition ratings:

Satisfactory. Soil function is being sustained and soil is functioning properly and normally.

Impaired. The ability of the soil to function properly and normally has been reduced or there exists an increased vulnerability to degradation.

Unsatisfactory. Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs or recover from impacts.

Inherently unstable. These soils are eroding faster than they are renewing themselves.

Soil disturbance. When the soil no longer functions because of the loss of surface organic material (affecting nutrient cycling), compaction (affecting regulation and partitioning of water and air flow), and severe burn (affecting nutrient cycling and biology), then soil disturbance has occurred.

Soil productivity. The inherent capacity of the soil to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses.

Species of conservation concern. A species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the Regional Forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area (36 CFR 219.9(c)).

Species diversity. Abundance of different species (both plant and animal) on the Santa Fe NF and adjoining lands; species richness. NFMA requires that land management plans provide for diversity of plant and animal communities.

Stand. A contiguous group of trees generally uniform in age class distribution, composition, condition, and structure, and growing on a site of generally uniform quality, to be a distinguishable unit, such as mixed, pure, even-aged, and uneven-aged stands. A stand is the fundamental unit of silviculture reporting and record keeping.

Standard. A mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Stressors. For the purposes of the land management planning regulation at 36 CFR part 219, factors that may directly or indirectly degrade or impair ecosystem composition, structure, or ecological process in a manner that may impair its ecological integrity, such as an invasive species, loss of connectivity, or the disruption of a natural disturbance regime (36 CFR 219.19).

Sub-watershed. A HUC 12 hydrologic unit, the smallest subdivision considered in this assessment.

Suitable timberlands. Land to be managed for timber production on a regulated basis. Such lands are those determined to meet the following criteria: (a) are available for timber production (i.e., not withdrawn for wilderness or other official designation by Congress, the Secretary of Agriculture, or Chief of the Forest Service); (b) are physically capable of producing crops of industrial wood without irreversible resource damage to soils productivity or watershed conditions; (c) adequate tree restocking within 5 years of final harvest is reasonably assured; (d) adequate information exists about responses to timber management activities; (e) timber management is cost efficient over the planning horizon in meeting forest objectives that include timber production; (f) timber production is consistent with meeting the management requirements and multiple use objectives specified in the forest plan or plan alternative; and (g) other management objectives do not limit timber production activities to the point where it is impossible to meet management requirements set forth in 36 CFR § 129.27 (per FSH 2409.13, WO Amendment 2409.13-92-1, O Code and Chapter 20).

Sustainability. The capability to meet the needs of the present generation without compromising the ability of future generations to meet their needs. For the purposes of the land management planning regulation at 36 CFR part 219 ‘‘ecological sustainability’’ refers to the capability of ecosystems to maintain ecological integrity; ‘‘economic sustainability’’ refers to the capability of society to produce and consume or otherwise benefit from goods and services including contributions to jobs and market and nonmarket benefits; and ‘‘social sustainability’’ refers to the capability of society to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another, and support vibrant communities (36 CFR 219.19).

Sustainable recreation. The set of recreation settings and opportunities on the National Forest System that is ecologically, economically, and socially sustainable for present and future generations (36 CFR 219.19).

Sustainable yield limit (SYL). The sustained yield limit is an estimate of the amount of commercial wood products that may be sustainably harvested over a long period of time.

Temporary road or trail. A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas (36 CFR 212.1).

Terrestrial ecosystem. All interacting organisms and elements of the abiotic environment in those vegetation and soil types, which are neither aquatic nor riparian.

Terrestrial ecosystem survey (TES). An inventory of soil types or terrestrial ecosystem units (TEUs) on the Santa Fe NF. It contains predictions and limitations of soil and vegetation behavior for selected land uses. This survey also highlights hazards or capabilities inherent in the soil and the impact of selected uses on the environment. At the context scale, upland ecological response units are derived from the Santa Fe NF Terrestrial Ecosystem Survey (USDA FS Santa Fe 1987).

Terrestrial ecosystem unit (TEU). The classification unit used in the Terrestrial Ecosystem Survey (TES). A spatially explicit area with a similar combination of soils, land types, and vegetation c Threatened species. Any species that the Secretary of the Interior or the Secretary of Commerce has determined is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are listed at 50 CFR sections 17.11, 17.12, and 223.102.

Thinning. An intermediate treatment made to reduce the stand density of trees primarily to improve growth, enhance forest health, recover potential mortality, emphasize desired tree species, and/or emphasize desired forest structure. Thinning methods include:

> Single tree selection is used in uneven-aged silvicultural systems in which scattered individual trees of multiple size and/or age classes are removed throughout the stand to achieve desired structural characteristics.
>
> Group selection is a method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups. Small openings provide micro-environments suitable for tolerant regeneration and the larger openings provide conditions suitable for more intolerant regeneration. In the group selection system, the management unit or stand in which regeneration, growth, and yield are regulated consists of a landscape containing an aggregation of groups.
>
> Sanitation cutting is the removal of dead, dying, or damaged trees to prevent or interrupt the spread of insects or disease.
>
> Salvage cutting is the removal of trees that have been killed or damaged by wildland fire, severe wind, insects or disease, or other natural disturbances.
>
> Even-aged regeneration is a cutting method by which a new stand with a single age class is created.

Matrix thinning is the thinning of the "matrix" of trees outside of a regeneration area. The matrix is generally thinned from below to some specified density in order to increase stand vigor and resiliency.

All-size free thinning is the removal of trees to control stand spacing and favor desired trees, using a combination of thinning criteria without regard to crown position.

Thinning from below is the removal of trees from lower canopy positions while retaining the largest and most vigorous trees with the best-developed crowns.

Timber harvest. The removal of trees for wood fiber use and other multiple use purposes (36 CFR 219.19).

Timber production. The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use (36 CFR 219.19).

Traditional community. A land-based rural community that has a long-standing history in and around the lands managed by the Forest Service.

Traditional cultural property (TCP). A property that is eligible for inclusion in the National Register of Historic Places (NRHP) based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community.

Tribal consultation. The timely, meaningful, and substantive dialogue between Forest Service officials who have delegated authority to consult, and the official leadership of federally recognized Indian Tribes, or their designated representatives, pertaining to USDA Forest Service policies that may have tribal implications.

Tree Size. The diameter of the bole of a tree measured at breast height (d.b.h.).

- Seedling/Sapling: 0.0 to 4.9 inches diameter
- Small tree: 5.0 to 9.9 inches diameter
- Medium tree: 10 to 19.9 inches diameter
- Large tree: 20.0 inches or greater diameter

Uncharacteristic wildfire. An increase in wildfire size, severity, and resistance to control compared to reference conditions that occurred historically. These fires result as a consequence of more continuous canopy cover, ladder fuels, and accumulated live and dead woody material. Uncharacteristic wildfires burn with more intensity; cause higher tree mortality; degrade watersheds; sterilize soils; and threaten adjacent communities, forest infrastructure, and wildlife habitat. See reference conditions.

Uneven-aged forests. Forests composed of three or more distinct age classes of trees, either intimately mixed or in small groups.

Uneven-aged management. is the application of a combination of actions needed to simultaneously maintain continuous high forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

Ungulate. A hooved animal, which includes wildlife (e.g., pronghorn, deer, and elk) and domestic livestock (e.g., sheep, cattle, and horses).

Unplanned ignition. The initiation of a wildland fire by lightning or unauthorized and accidental human-caused fires. See wildfire.

Upland. May refer to areas, species, systems, or conditions that are characteristic of terrestrial ecosystems, as opposed to riparian or aquatic ecosystems.

Values to be protected (values at risk). Includes property; structures; physical improvements; natural and culture resources; community infrastructure; and economic, environmental, and social values.

Vegetation Dynamics Development Tool (VDDT) is a software program that provides a state and transition (STM) modeling framework to examine the role of various transition agents and the effects of management actions that alter vegetative communities (ESSA Technologies Ltd. 2007).

Vegetation state refers to a combination of the dominant plan canopy cover class and (for forest and woodland) size class and density class within a potential natural vegetation type. See also seral state.

Vegetation structure. Structure includes both the vertical and horizontal dimensions of a vegetation type or plant community. The horizontal structure refers to spatial patterns of individual and groups of plants and openings, as well as plant size and species composition. The vertical component refers to the layers of vegetation between the forest floor and the top of the canopy. Each vegetation type has its own structure. For example, forests have greater vertical structure than a grassland or woodland based on the height of the dominant species.

Viable population. A population of a species that continues to persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future environments.

Vigor. Relates to the relative robustness of a plant in comparison to other individuals of the same species. It is reflected primarily by the size of a plant (i.e., height, weight) and its parts in relation to its age and the environment in which it is growing.

Watershed. A region or land area drained by a single stream, river, or drainage network; a drainage basin (36 CFR 219.19). Specifically, a HUC 10 hydrologic unit, larger than a subwatershed, and nested in a sub-basin.

Watershed condition. The state of a watershed based on physical and biogeochemical characteristics and processes (36 CFR 219.19).

Wetlands. A specific subtype within the Wetland Riparian group of vegetation communities. In wetlands saturation with water is the dominant factor determining the nature of soil development and plant and animal communities. "For regulatory purposes under the Clean Water Act, the term wetlands means 'those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.' [taken from the EPA Regulations listed at 40 CFR 230.3(t)]." (USEPA 2015) The Wetland

Riparian vegetation community as defined in this plan is slightly more inclusive and includes open water wetlands and cienegas that may not be considered wetlands for regulatory purposes.

Wild and Scenic River. A river designated by Congress as part of the National Wild and Scenic Rivers System that was established in the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 (note), 1271–1287) (36 CFR 219.19).

- Wild – Those rivers or segments of rivers free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive, and waters unpolluted. These represent vestiges of primitive America.
- Scenic – Those rivers or segments of rivers free of impoundments, with shorelines or watersheds still largely primitive, and shorelines largely undeveloped but accessible in places by roads.
- Recreational – Those rivers or segments of rivers readily accessible by road or railroad that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Wilderness. Any area of land designated by Congress as part of the National Wilderness Preservation System that was established in the Wilderness Act of 1964 (16 U.S.C. 1131–1136) (36 CFR 219.19).

Wildfire. Unplanned ignition of a wildland fire (e.g., fires caused by lightning or unauthorized and accidental human-caused fires) and escaped prescribed fires. See unplanned ignition.

Wildfire hazard. A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree or ease of ignition and of resistance to control.

Wildland. An area in which development is essentially nonexistent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

Wildling. A native plant growing uncultivated in the wild: specifically, the collection or transplant of such whole live plants.

Wildland fire. A general term describing any non-structure fire that occurs in the vegetation and/or natural fuels. The two types of wildland fire are wildfires and prescribed fires. Other terms such as "fire-use fires," "resource benefit fires," or "suppression fires" are not used in this plan.

Wildland-urban interface (WUI). That area where human development adjoins public or private natural areas, or an intermix of rural and urban land uses. From a natural resource perspective, the wildland-urban interface is an area where increased human influence and land-use conversion are changing natural resource goods, services, and management techniques (Hermansen-Baez et al. 2009).

Windthrow. Trees susceptible to wind damage (e.g., uprooting, toppling, bole breakage).

Woodland. Lands with over 10 percent tree canopy cover where the majority of the trees are non-timber species (e.g., piñon pine and juniper) not traditionally used for industrial wood products.

Woody biomass. The trees and woody plants, including limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, or grassland environment that are the byproducts of forest management used to produce bioenergy and the full range of bio-based products.

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Appendix A. Changes Made Between Draft and Final

Comments on the draft environmental impact statement, new information and additional analyses resulted in updates to the final environmental impact statement and the final plan (alternative 2). For both the Plan and EIS, changes were largely based on three elements: editorial and technical changes (e.g., spelling, verb agreement, punctuation, document consistency, number corrections, etc.), internal reviews, and public comments received during the 90-day public comment period (August 9 through November 7, 2019). Excluding minor editorial changes, clarifications, and typographical errors, modifications are summarized here:

- Modify vegetation elevation ranges to match the Terrestrial ecological unit inventory (TEUI) and define patch-size estimates.
- Define the wildland-urban interface (WUI) in a more flexible manner to be better able to adapt to on-the-ground conditions.
- Address ecological integrity in terrestrial and aquatic systems, as in the draft plan, with slight modifications based on public comment. For instance, language was added on headwater wetlands and direction on non-native species was clarified.
- Clarify the definitions of riparian vegetation and the riparian management zone (RMZ), and added reference to the current regional riparian strategy to direct management activities.
- Clarify that direction in the At-Risk Species section applies to plants as well as wildlife.
- Clarify the use of desired ROS and SIO to address confusion in the draft plan. Changes include adding desired conditions referencing the desired ROS and SIO maps in Appendix A of the Plan, and changing all references to “ROS” to “desired ROS.”
- Add a map of the ½ mile Continental Divide Scenic Trail corridor to Appendix A.
- Recommend the same wilderness and eligible WSR as the draft plan, but corrected miles of designated WSR and corrected ROS setting standards for eligible WSR.
- Clarify standards regarding mechanized and motorized use within recommended wilderness management areas.
- Remove subjective language about values.
- Modify monitoring questions to better track ecosystem health within the capacity of the Forest, and added monitoring frequencies for each resource.
- Switch the focal species for piñon-juniper woodlands from gray vireo to juniper titmouse.
- Add definitions to the glossary for canopy cover, catastrophic fire, national trail, ROS, RMZ, Soil and Water Conservation Districts, traditional knowledge, and user conflict.
- Improve consistency between the Santa Fe Plan, the Carson Plan, and the Cibola Plan, particularly pertaining to language regarding traditional and cultural uses.

- Modifying the analysis of ground disturbances with relation to at-risk species to acknowledge adverse impacts related to grazing.
- Eight management approaches were added:
  - FW-RWE-MA-5: Consider working with partners to develop wetland action plans for headwater wetland restoration projects to addresses wetland stressors by identifying and prioritizing mitigation and restoration actions. -- *Added based on public comment concerned that we did not include the Wetland Jewels Management Area in the Forest Plan and to maintain consistency with the Carson National Forest*.
  - FW-AQUASH-MA-6: Consider constructing beaver dam analogues to create similar beneficial conditions for aquatic and riparian habitats as reintroducing beavers while avoiding potential conflicts with adjacent land management. – *Added based on public comment concerned with conflicts over introduced beavers.*
  - FW-TERRASH-MA-8: Work with partners to develop and implement conservation strategies beneficial to terrestrial habitats (e.g., the State Wildlife Action Plan, etc.). – *Added based on public comment asking us to recognize the SWAP as a conservation strategy we should work with.*
  - FW-AIR-MA-3: Consider design features, best management practices, or mitigation measures to reduce fugitive dust where needed. – *Added based on public comment*.
  - FW-AIR-MA-4: When possible, consider using non-potable water for dust abatement strategies. – *Added based on public comment concerned about water conservation*.
  - FW-RANGE-MA-13: Consider grazing aspen groves early in the season and resting in the fall, and doing a rest rotation every 2 consecutive years out of every 5 years. – *Added based on public comment and internal review.*
  - FW-MINERALS-MA-2: Collaborate with the New Mexico Department of Game and Fish on pre-closure inspections of underground mines to determine if cave-dependent species are present, and if so, to determine how to design and implement a closure that addresses the needs of resident or historically occurring wildlife within the constraints of meeting public safety concerns. – *Added based on public comments received.*
  - MA-OGLEASE-MA-1: Consider working with the New Mexico Department of Game and Fish to identify where and when timing limitations are implemented pertaining to deer and elk winter range and deer and elk fawning and calving habitat. – *Added based on public comments received.*
- Three plan components were removed – two due to redundancy with another plan component and one to ensure compliance with law, regulation, and policy.
  - FW-FIRE-DC-5: Wildland fires in the WUI are predominantly low- to moderate-intensity fires – *This plan component was redundant with FW-WUI-DC-2*
  - MA-RECWILD-S-2d: Development of existing mining claims (e.g., hard rock mining) within a recommended wilderness area shall be subject to valid existing rights. – *The*

legal term "valid existing rights" was determined to be misused in this context after internal review.

- MA-RECWILD-G-2b: Mechanized uses for management activities (e.g., chainsaws or wheelbarrows) should be allowed in recommended wilderness areas if they do not permanently degrade wilderness characteristics of the area. – *This plan component was removed as it was considered redundant with the modified MA-RECWILD-S-2e.*
  - *Modified MA-RECWILD-S-2e:*

    2. The following projects or activities shall not be authorized in recommended wilderness management areas:

    e. Motor vehicles, motorized equipment (e.g., chainsaws or wheelbarrows), and mechanical transport, with the following exceptions:

    i. unless specifically authorized for emergency use,

    ii. for management activities that move the area toward desired conditions while protecting existing wilderness characteristics over the long term, or

    iii. for the limited needs required for authorized management of a grazing allotment or acequia access, which will not result in long-term degradation to wilderness characteristics.

- Five plan components were added – Two to comply with regional direction, one based on public comments, and two to respond to both public comment and emerging regional direction.
  - FW-VEG-DC-1f: Seral state proportions (per the 'Seral State Proportions for the Southwestern Region' supplement) are applied at the landscape scale, where contributions from all seral stages and low overall departure from reference proportions are positive indicators of ecosystem condition. -- *Added regional desired conditions so vegetation section is strengthened to be more objective, consistent, and comprehensive*.
  - FW-VEG-DC-1g: At the scale of the plan unit, overall plant composition similarity to site potential (FSH 2090.11) averages greater than 66 percent but can vary considerably at the mid- and fine- scales owing to a diversity of seral conditions. -- *Added regional desired conditions so vegetation section is strengthened to be more objective, consistent, and comprehensive.*
  - FW-VEG-DC-3c: Habitats and refugia for rare, endemic, and culturally important species, are resilient to stressors and support species' persistence or recovery. – *Added based on comments received, and to improve consistency with the Carson National Forest.*
  - FW-REC-DC-7: Desired ROS settings serve as the desired conditions for recreation (see Appendix A, Fig. 9-west and Fig. 9-east). -- *Added based on public comments and regulations that we need to indicate that desired ROS is a desired condition. Also based on discussions among the three northern New Mexico forests and the Region 3 Regional*

Office to ensure that it is clear that desired ROS maps are not plan components and can be changed administratively.

  - FW-SCENIC-DC-6: Scenic Integrity Objectives serve as the desired conditions for scenery (see Appendix A, Fig. 8-west and Fig. 8-east). -- *Added based on public comments and regulations that we need to indicate that desired SIO is a desired condition. Also based on discussions among the three northern New Mexico forests and the Region 3 Regional Office to ensure that it is clear that desired SIO maps are not plan components and can be changed administratively.*

- Other plan components and management approaches were modified based on public comment and internal reviews, largely to improve clarity or correct a technical error.

A detailed accounting of changes is recorded in the project record.

Appendix B. Description of the Analysis Process

This appendix provides details about methods, assumptions, and indicators used in the effects analyses disclosed in this final environmental impact statement. This document supplements more detailed descriptions of methods and assumptions described for individual resources in chapter 3 or filed in the administrative project record of this National Environmental Policy Act review.

Summary of All Resources

Resource Analyses

Resource analyses were conducted for each resource outlined within the forest plan by resource specialists in the Santa Fe National Forest or the Washington Office Enterprise Program, and with input from partnering agencies. These analyses were conducted using the best available science and the expertise and experience of the resource specialists.

Assumptions

Certain assumptions common to all resource analyses include the following:

- No direct environmental effects will result from the administrative action of developing or revising the forest plan. Proposed actions will not be approved or otherwise authorized based on the content of the forest plan; however, they must be consistent with plan components, which include desired conditions, objectives, standards, guidelines, designation of management areas, suitability determinations, and monitoring requirements.
- Components of the forest plan reflect current Federal, State, and local laws and regulations, and USDA and Forest Service policy.
- Effects analyses are applicable for the expected life of the forest plan, which is estimated to be from 10 to 15 years, unless otherwise noted in chapter 3.
- Individual proposed actions are not evaluated in this final environmental impact statement nor are they defined by specific location, design, and extent. Rather, the effects described are generic and are used to compare the relative effects of alternatives on a forestwide basis.
- Monitoring during the life of the plan will be used to measure the continued applicability of plan components and the need for future amendments.
- There may be minor, but acceptable discrepancies between the surveyed acres from the Santa Fe NF administrative boundary and the GIS layer used to delineate ERU boundaries.
- For additional resource-specific assumptions, please see the individual resource of interest within this document.

Indicators

Indicators were needed to measure the effectiveness of plan components at addressing the issues that arose during the need for change assessment. Effects indicators are measures of an action’s impact on the environment (beneficial and adverse; direct, indirect, and cumulative). Appropriate effects indicators are the indicators that will best reflect how the plan-guided management actions will likely affect individual resource areas function, or may be factors that can translate into measurable quantities that may be incorporated into specific projects proposed in the future to accomplish the forest plan’s guidance and objectives. Thus, for the environmental impact analyses, each resource determined specific indicators that could serve as a basis for comparisons between the current forest plan (alternative 1) and all action alternatives (2, 3 and 4) (Table B-1).

Table B-1. Effects indicators by resource (alphabetical order) used for environmental impact statement (EIS) analyses

Resource	Indicator	Description
Air	PM 2.5	Fine Particulate Matter (FPM) represents the particulate matter emissions sized at or below 2.5 microns in diameter. These small particles pose the largest risk for impacts to human health.
	CO_2 emissions	Carbon dioxide released as emissions through smoke or other factors that adversely affect air quality.
Cultural Resources and Archaeology	Activities associated with vegetation management	Vegetation management practices outlined in the forest plan predominantly use mechanical treatments and fire (prescribed and natural ignitions) to restore proper structure, composition, and function to the ecosystems within the Santa Fe NF. These practices have the potential to impact cultural resources and archaeological sites.
	Visitation or access	Visitation describes the number of people that come to the forest for a multitude of purposes and access describes the process by which they arrive.
Socioeconomics	Recreation; timber and forest products; grazing; minerals; wildlife and fish	Plan components for the management of each of the resources (listed left) would alter the economic revenue or impact to the forest to a degree dependent upon which alternative is selected.
	Payments to states and counties; and Forest Service expenditures	These Forest Service expenditures were analyzed according to alternatives within the EIS document.
	Quality of life	Plan components for the management of resources would alter the quality of life of forest users as it relates to forest ecosystem services (both market, listed above-left, and non-market) to a degree dependent upon which alternative is selected.
Energy and Minerals	Leasable minerals	Minerals that may be available for oil and gas or geothermal leasing, including coal, oil, oil shale, sulfur, potassium, etc.
	Locatable minerals	Locatable minerals are the hardrock minerals mined and processed for metals (e.g., silver, gold, copper, uranium, etc.). All public domain lands are available for locatable mineral entry under the 1872 Mining Law unless the lands are withdrawn from mineral entry.
	Renewable energy	An energy source that is not depleted when used (e.g., wind or solar power).
	Salable minerals	The class of minerals that can be sold under a mineral material contract, and are common (e.g., sand, gravel, boulders, etc.)

Resource	Indicator	Description
Forest Products	Acres suited for timber production	Lands determined to be suitable for timber production are areas identified as capable of producing a regular, periodic output of timber, maintained in perpetuity, without impairment of the productivity of the land or inconsistency with other land management direction.
	Sustained yield limit (SYL), projected timber and wood sale quantities (PTSQ; PWSQ)	The SYL reflects the quantity of wood products that could be sustainably removed from the Forest in perpetuity. PTSQ and PWSQ are the quantities of timber and other forest products that can be expected to be sold during the first two decades of the revised plan, based on projected vegetation treatments outlined in plan objectives.
	Fire	Analysis focuses on the likelihood of uncharacteristic fire occurrence (large, high-severity fire) and the impacts that would have on the availability of forest products.
Lands and Realty	Access and management	Lands and special uses programs emphasize streamlining management and ensuring access for the public and for Forest Service administrators. The two concepts are combined into one indicator because one often heavily influences the other.
	Ecological effects	An umbrella term for how the natural environment is impacted by cross-boundary management, land status, and special uses.
Rangelands and Livestock	Range condition	Range condition is the state of health of the range and is determined by comparing the apparent hydrologic condition, soil condition, and vegetative condition when compared to the potential of the site.
	Herbaceous production	Herbaceous production is defined as the number of pounds of herbaceous vegetation produced in a given growing season, and is a major factor in determining how many head of cattle can be stocked in the forest.
	Animal unit months (AUM)	One AUM is the amount of forage needed by an “animal unit” (AU) grazing (in this case cow) for one month. The quantity of forage needed is based on the cow’s metabolic weight, and the animal unit is defined as one mature 1,000-pound cow and her nursing calf.
	Range infrastructure condition	Range infrastructure across the forest includes fences, cattle guards, water tanks and troughs, and corrals. Infrastructure helps keep cattle evenly distributed across the forest.
	Invasive species	The presence, absence, or number of acres of invasive species across the forest is a measure of the known invasive species populations. Invasive plants have the potential to create changes in the site’s fire return interval, potential fire severity, nutrient cycling and decrease the quality and quantity of available native forage.
	Recreation opportunities	Recreation opportunities represent the range and diversity of recreation activities that occur in the Santa Fe NF.

Resource	Indicator	Description
Recreation	Sustainable recreation	To sustain the benefits of outdoor recreation for present and future generations, the recreation program must address and work toward a sustainable balance among the three spheres of environmental, social, and economic conditions (2012 Planning Rule).
	User conflicts	User conflicts exist when people's experiences or needs are diminished by other forest users.
Riparian Management Zone	Vegetation structure and composition	Vegetation structure is the arrangement and density of woody or herbaceous species within an ecosystem. Composition denotes plant species assemblages.
	Proper functioning condition	A methodology for assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil or landform attributes.
Roads and Infrastructure	Access: Public and administrative	Access denotes the multiple ways that one may enter the forest.
	Ecological effects	An umbrella term for how the natural environment is impacted through roads and infrastructure in the forest.
Scenic Resources	Scenic integrity	Desired conditions in the plan call for a landscape with high-quality scenery to sustain scenic character in ways that contribute to visitors' sense of place and connection with nature.
	Systems	Visual Management System (VMS) and Scenery Management System (SMS) provide analysis tools to base comparisons between alternatives. VMS and SMS identify important scenic areas with a focus on "natural appearing" scenery.
	Plan resources	This analysis looks at all applicable forest resources and determines the effects of plan components on scenic resources.
Soil Resources	Soil condition	Soil condition is based on three soil functions including (1) the ability of the soil to resist erosion, (2) the ability of the soil to infiltrate water, and (3) the ability of the soil to recycle nutrients.
	Vegetative ground cover	The amount and type of ground cover play a large role in determining soil condition. Ground cover affects soil functional elements by providing resistance to soil erosion, and enhancing nutrient cycling and water infiltration by decreasing overland flow rates.
Traditional Communities and Uses	Access and resource procurement	Access refers to physically entering forest property through a multitude of ways, to obtain resources that serve traditional or cultural purposes and uses.
	Confidentiality and privacy	The condition of being free from being observed or disturbed by other people.
	Forest communication	Indicates how the forest communicates with partners, tribes, and the public during plan revision and during the management phases that follow.
	Preservation and protection	Keeping values that are important for traditional and cultural uses in the forest available and sustainable for the future.
	Seral state	Seral state proportion is the percent of an ERU in each seral state (sere) or stage of secondary successional development, where seres describe ecological process of progressive change in a plant community after a stand-initiating disturbance (Hall et al. 1995).

Resource	Indicator	Description
Vegetation	Canopy closure	Canopy closure indicates the degree of space available between dominant vegetation canopies. The greater degree of closure there is, the less light is available to infiltrate to the lower vegetation layers. Thus, the degree of canopy closure within ecosystems largely determines the structure and composition of understory vegetation.
	Ground cover	Ground cover is the combined percent of basal vegetation, bare soil, litter, and rock fragment cover on the ground surface.
	Old growth	Old-growth forests are ecosystems distinguished by old trees and related structural attributes including a multi-layered forest structure with large trees, snags, and coarse woody debris in varied stages of decay.
	Snags	Snags are standing dead trees that provide structural complexity to a forest and provide habitat for avian or wildlife species.
	Coarse woody debris	Dead trees and other woody pieces distributed upon the ground surface, which contribute to fuel loadings and nutrient cycling, and provide habitat for ground-dwelling organisms.
	Fire and fuels	Includes fire frequency, fire severity, fire regime (and associated condition classes), and fuel loading (see glossary for individual definitions).
Water Resources	Livestock grazing activities	Livestock grazing can adversely impact hydrologic processes and water quality (e.g., compaction, erosion, sedimentation, stream shade, etc.) when animals gather in riparian areas.
	Motorized route density	Road density impacts hydrologic function because roads disrupt infiltration and can cause erosion and sedimentation.
	Recreation activities	Recreational activities can impact watershed function, potentially having adverse effects on hydrologic processes and water quality through soil compaction or water pollution.
	Restoration activities	Plan components for restoration activities (e.g., mechanical thinning, planting, fire, stream channel restoration, etc.) within some ERUs in the forest may have short-term adverse effects (e.g., soil compaction, erosion, sedimentation) on water resources.
Wildlife, Fish and Plants	At-risk wildlife	In addition to the coarse filter habitat conditions for habitat ratings, species-specific ecological conditions are analyzed for at-risk species (species that are in danger of extinction or may disappear from a particular environment).
	Habitat ratings	ERU-specific vegetative conditions compose wildlife habitat and are a tool to determine the impact of each alternative on all wildlife. These ERU vegetative conditions include seral state proportion, snag density, patch size, site potential, ground cover, coarse woody debris, and fire regime and characteristics.
	Wildlife habitat connectivity	The capacity for individual species to move between areas of habitat via corridors or intact areas.

Resource	Indicator	Description
Designated Areas		
Inventoried Roadless Areas (IRA)	Protecting roadless character	IRAs would continue to be reference areas to measure the effects of development on other parts of the landscape and a variety of ecosystem services such as undisturbed landscapes that are important to biological diversity, clean drinking water, and opportunities for dispersed outdoor recreation, reference areas for study and research, and high scenic quality.
	Acres of IRA overlapping recommended wilderness	In some alternatives, IRAs overlap with recommended wilderness areas. Since the most restrictive management direction would apply, these overlapping areas would also be managed to protect the wilderness character present at the time of recommendation, which would protect roadless characteristics present in overlapping areas.
Jemez National Recreation Area (JNRA)	Protecting the resource values of the JNRA	Congress designated the JNRA in 1993. JNRA covers 57,650 acres, 48,300 of which are located in the Santa Fe NF. The JNRA is valued for its recreational opportunities, scenic beauty, biodiversity, wildlife, and for ecological, cultural, religious resources.
Nationally Designated Trails	Scenic integrity	The degree to which visual quality or scenic integrity is unaltered from desired conditions that call for natural appearing landscapes.
	Meeting the nature and purpose of the trail	National historic trails (NHT) were created through an amendment to the National Trails System Act in 1978. They are extended trails that follow the original routes of historically significant trails or roads, with the purpose of identifying and protecting the historic quality of the route and its remnants and artifacts. National Recreation Trails (NRT) are local or regionally significant trails that represent outstanding recreation opportunities for diverse communities. They provide day-use or extended trail experience for a variety of recreation opportunities accessible from urban areas (FSM 2350).
	Effects of vegetation management	Plan objectives for vegetation management propose the treatment of highly departed ERUs using mechanical treatments and fire. These activities have the potential to impact important characteristics of nationally designated trails and are analyzed in the EIS.
Research Natural Areas (RNAs)	Effects to the natural features for which an RNA was established	When evaluating effects to RNAs, the primary focus is on the direction provided in each alternative guiding the management and protection of the critical resources identified in each of these areas.
Santa Fe Municipal Watershed	Santa Fe Municipal Watershed protection	Protection of the watershed through limited access and treatments in nearby areas to reduce the risk of uncharacteristic fire.
	Water resource management	To maintain water quality and protect water resources.

Resource	Indicator	Description
Scenic Byways	Scenic integrity objective allocations within each scenic byway corridor	Analyzes the degree to which visual quality or scenic integrity is unaltered from desired conditions that call for naturally appearing landscapes.
	Protection of scenic qualities	Scenic byways provide the important cultural ecosystem service of access to and experience of natural settings. Scenic qualities include access to the forest and its accompanying cultural, historical, and social values and traditions via motorized recreation on scenic byways. Scenic views can also contribute to psychological and emotional health, which are important cultural services.
	Effects of vegetation management	Plan objectives for vegetation management propose the treatment of highly departed ERUs using mechanical treatments and fire. These activities have the potential to impact important characteristics of scenic byways and are analyzed in the EIS.
Wild and Scenic Rivers (WSR)	Protection of outstandingly remarkable values (ORVs)	How do plan components under each alternative affect ORVs?
	Maintaining free-flowing conditions	How do plan components under each alternative affect the free-flowing conditions of waterways in the plan area?
	Miles of eligible river corridor overlapping other management or designated areas.	Length of eligible river segments as determined through the WSR eligibility analysis process.
Wilderness	Acres of designated wilderness	The Santa Fe NF manages four designated wilderness areas totaling approximately 291,669 acres, or 18.7 percent of the forest. This indicator assesses any potential impacts from plan alternatives on these designated areas.
	Protection of wilderness character	The Wilderness Act (1964) sets forth guidelines for the management of wilderness areas by maintaining four attributes used to describe wilderness character: untrammeled; naturalness; undeveloped; and outstanding opportunities for solitude or primitive and unconfined recreation.
	Acres of recommended wilderness	Each alternative offers a different acreage for recommended wilderness, spanning from zero to over 200,000 acres. This indicator compares these acreages and analyzes the impacts of recommending additional or no additional wilderness.
	Protection of wilderness characteristics	Desired conditions express that the public values wilderness for the variety of ecosystem services and values it provides, including clean air and water, enhancing wildlife habitat, primitive recreation opportunities, and other qualities of wilderness character.
Wild Horse Territories	Protection and management of wild horses and burros	Plan components for all alternatives protect and manage wild horse and burro territories to provide social and cultural ecosystem services including benefits to local communities and others who have an emotional attachment to wild horses as cultural symbols and protecting and preserving the cultural traditions and values surrounding wild horses.

Drivers and Stressors

Drivers and stressors influence Forest resources on a broad scale. Drivers and stressors were not analyzed in detail by alternative for any resource as they generally occur widely, and their effects and impacts are largely independent of management at the plan level. A few drivers and stressors affecting all resources forestwide include drought, climate change, and human population increases. For more detailed descriptions of drivers and stressors see the individual resource sections within this document.

Analysis Processes by Resource

Vegetation

Vegetation State and Transition Models

Projecting changes in vegetation structure and composition over time is an important part of landscape-level analyses. Vegetation can change for a variety of reasons such as human activity, fire, insects, pathogens, mammals, weather, or growth and competition. The interaction of these factors can be complex, and it can be difficult to project the combined effects over long periods of time (ESSA Technologies Ltd. 2006).

In response to the USDA Forest Service Southwestern Region's need for landscape-scale planning tools, broad-scale state and transition models for several ecological response units (ERUs) in the Santa Fe NF have been developed based on a comprehensive literature review. ERUs have been defined for most vegetation communities on the Santa Fe NF. Published scientific information was used to define vegetation model states (Table B-2), identify parameter values for these models, and run quantitative scenario analysis using Vegetation Dynamics Development Tool (VDDT) software (ESSA Technologies Ltd. 2006) to determine relative proportions of model states on the landscape. Models were originally developed by LANDFIRE, The Nature Conservancy, and the Integrated Landscape Assessment Project and have been further refined using regional mapping and ecosystem data by the Forest Service Southwestern Region, with input from forest specialists. Most state and transition destinations and probabilities used in this document are derived from Forest Vegetation Simulator modeling (Dixon 2002) using information from resident FIA plots (Moeur and Vandendriesche 2010, Vandendriesche and Boehning 2014). Weisz (2011) describes the background of state and transition models while Weisz et al. (2012) describes the process of developing the FVS models used for forest planning efforts in Region 3. Reference fire regime condition classes (FRCC) and burn severity information was compiled during the assessment phase from data given in the LANDFIRE (2010) database and from monitoring trends in burn severity records. Fire regime groups and fire return intervals were compiled from several sources considered best available science relevant to the ERUs of the Santa Fe NF (see SFNF Plan Assessment Volume 1, Table 9, pg. 32). Other inputs came directly from forest records of management actions, insect and disease surveys, and fire data. The bristlecone pine, Gambel oak shrubland, mixed-grass prairie, and shortgrass prairie ERUs were not included in the vegetation analysis, because they each cover less than 1 percent of the total acres in the Santa Fe NF. Since they are relatively rare within the forest, these ERUs were not further analyzed during the plan revision process.

VDDT software is a non-spatial model that allows the user to model vegetation change over time as a series of vegetation states that differ in size class, canopy cover, dominance type, and storiedness, and movement of vegetation among states (transitions) (ESSA Technologies Ltd. 2006). Various disturbance agents affecting the transitions are incorporated (e.g., surface fire, stand-replacing fire, grazing, insect outbreaks). By varying the types and rates of disturbance in the model, the effects on vegetation of different disturbance regimes, such as current and historic fire regimes, or different management treatments, such as fire suppression, prescribed burning, and mechanical fuels treatments, can be tested. These models summarize and synthesize the current state of scientific knowledge for vegetation dynamics. Additionally, they provide forest planners and managers with powerful tools for understanding, investigating, and demonstrating the effects of alternative scenarios for the management of vegetation in the Santa Fe NF.

State and transition models for each vegetation community were calibrated to reflect the anticipated management under each alternative. Initial seral state proportions were assigned according to actual measurements of current conditions in the Santa Fe NF based on Midscale Vegetation Mapping (Mellin et al. 2008). Existing vegetation was assigned to an ERU and then to the appropriate state class within that ERU according to state class descriptions that were developed by the Forest Service Southwestern Region (Youtz and Vandendriesche 2015 and USDA Forest Service 2018b). Some management factors affected model parameters under different alternatives. For instance, the amount of fire and mechanical treatment each varied by alternative based on the objectives for the mixed conifer-frequent fire and ponderosa pine forest ERUs, and therefore, affected the amount of disturbance in those two models under different alternatives (see Determining Vegetation Treatment Objectives, mixed conifer frequent fire, and ponderosa pine forest).

Table B-2. State class definitions

Size Class	Seedling/ sapling	Small	Medium	Large	Very large
Value	0–5 inches	5–10 inches	10–20 inches	20–30 inches	30+ inches
Code	ss	s	m	l	v
Canopy Cover	**Non-tree**	**Open**	**Closed**		
Value	<10% tree canopy cover	10–29.9% tree canopy cover	30%+ tree canopy cover		
Code	GFB/SHR	o	c		
Storiedness	**Single storied**	**Multi storied**			
Value	1 level	2 or more levels			
Code	s	m			

Determining Treatment Objectives for Action Alternatives

The existing forest plan (1987) did not include forestwide direction for vegetation management; instead, the plan divided the forest into management areas according to resource emphases, where some of the management areas were delineated for timber management, but specific objectives by ERU were not specified. Alternative 1 identified in the plan revision process is to continue under the direction of the existing 1987 plan with minimal changes to update it in accordance to the 2012 Planning Rule. If the existing plan is continued into the next 10 to 15 years, it is assumed that vegetation treatments would continue in the future as they have in the past under the direction of this plan. To provide an alternative to this style of forest and vegetation management, the plan revision process identified a need for a plan with focused and specific management objectives to increase ecosystem function and resiliency of the forest for the future.

According to the 2012 Planning Rule, not all ERUs are required to have plan objectives. Thus, plan objectives for vegetation treatments were only developed for highly departed ERUs where management needs are greatest (see: “Needs for Change” document) (Table B-3). More specifically, plan objectives were developed primarily for frequent-fire ecosystems such as the mixed conifer-frequent fire and ponderosa pine forest ERUs, as well as for non-forested ERUs experiencing increased woody species encroachment and loss of native grass and herbaceous cover (includes grasslands and woodlands).

Table B-3. Scales of departure for vegetation analysis

Departure	Range (%)
LOW	0-33%
MODERATE	33-66%
HIGH	66-100%

In addition to the option for continuing under the direction of the existing forest plan with minor amendments (alternative 1), the plan revision process has identified three action alternatives. The ecological health and multiple uses alternative (alternative 2) incorporates a mix of mechanical vegetation treatments along with the reestablishment of natural processes, primarily burning (both planned and unplanned ignitions), to move ERUs toward desired conditions and toward resilient and healthy ecosystems across the landscape. Alternative 2 also maintains forest access for multiple uses including the acquisition of forest products, to sustain traditional and cultural uses, and to provide recreational opportunities. Alternative 3 emphasizes natural processes where restoration goals focus on the use of fire (natural and planned ignitions) to move ERUs toward desired conditions and only implements mechanical thinning in select situations, such as to mitigate high fire risk. Conversely, alternative 4 aims to accomplish restoration goals primarily using mechanical thinning, with a strong focus on providing forest products to support local economies and traditional and cultural uses. Wildland fire would still be managed for resource benefit when appropriate in this alternative, but prescribed fire is minimized.

Table B-4 displays the ERUs identified in the needs for change assessment, and outlines by alternative, current and future departure (based on current management/alternative 1), current conditions, and which ERUs have treatment objectives. Frequent-fire ERUs (mixed conifer-frequent fire, and ponderosa pine forest) and woodland ERUs: piñon juniper grass and juniper grass have plan objectives for treatment in all action alternatives. There are no objectives for departed grassland ERUs (montane subalpine and Colorado Plateau/Great Basin) in alternative 4 (though plan objectives exist in alternatives 2 and 3), because this alternative focuses primarily on restoration through mechanical treatments and emphasizes utilization and supply of forest products (e.g., commercial timber harvest, firewood, etc.).

Developing treatment ranges

Acknowledging the need to treat a larger landscape and implement restoration at a greater scale, average annual treatment targets to maintain the historical fire return intervals for all vegetation types were estimated. These estimates were made by taking the acreage of each ERU for the forest and dividing it by the fire return interval for each ecosystem type (Table B-5). Treating on the low end of the fire return interval (least frequent fire return interval) would be considered the minimum amount of restoration needed to maintain current conditions and return fire regimes to where they fit within the natural range of variability. Alternately, treating at the mid or high end of fire return intervals (mid; most frequent fire return interval) is more likely to improve highly departed conditions and increase ecological integrity at a much faster rate than at lower fire return interval. Although mechanical treatments and fire are completely different disturbances, we assume here that 1 acre of mechanical restoration is equivalent to 1 acre restored through fire (prescribed or wildfire). The fire return interval values given in Table B-5 were used as a starting point, and were then further refined based on feedback from resource specialists in the Santa Fe NF.

Table B-4. Current conditions, treatment priority based on needs for change, and ERUs with treatment objectives by alternative

System Type	ERU	Current departure	Future departure (current management)	Treatment priority based on needs for change	Current conditions	ERUs that have treatment objectives by alternative			
						1	2	3	4
Forest	Mixed conifer-frequent fire	74 (High)	64 (Mod)	High	High departure; closed canopy states, high fuel loads.		**X**	**X**	**X**
Forest	Ponderosa pine forest	97 (High)	89 (High)	High	High departure; closed canopy states, high fuel loads.		**X**	**X**	**X**
Forest	Wet-mixed conifer	47 (Mod)	36 (Mod)	Low	Generally, low in departure and conditions are projected to improve.				
Forest	Spruce fir forest	54 (Mod)	60 (Mod)	Low	Naturally long fire return interval – less affected by past fire suppression and exclusion.				
Woodland	Piñon juniper woodland	28 (Low)	19 (Low)	Low	Trending toward low departure				
Woodland	Juniper grass	45 (Mod)	46 (Mod)	Moderate	Closed canopy states, reduced cover of herbaceous understory		**X**	**X**	**X**
Woodland	Piñon juniper grass	45 (Mod)	41 (Mod)	Moderate	Closed canopy states, reduced cover of herbaceous understory		**X**	**X**	**X**
Woodland	Piñon juniper sagebrush	46 (Mod)	28 (Low)	Low	Trending toward low departure				
Shrubland	Alpine tundra	--	--	Low	Trending toward low departure				
Shrubland	Sagebrush shrubland	41 (Mod)	83 (High)	High	Woody species encroachment, low site productivity (impaired soils)		**X**	**X**	
Grassland	Colorado Plateau/Great Basin grassland	93 (High)	--	High	Woody species encroachment (shrub and tree), low site productivity		**X**	**X**	
Grassland	Montane subalpine grassland	60 (Mod)	78 (High)	High	Woody species encroachment, low site productivity (reduced native grass cover)		**X**	**X**	

Table B-5. Estimated yearly treatment acres to restore natural fire regimes* and ecological integrity

ERU	Forest Acres	Least frequent fire return interval		Mid frequency fire return interval		Most frequent fire return interval	
		Fire Return Interval (years)	Treatment Acres	Fire Return Interval (years)	Treatment Acres	Fire Return Interval (years)	Treatment Acres
Mixed conifer-frequent fire	429,967	21	20,475	13	33,074	5	85,993
Ponderosa pine forest	403,915	30	13,464	17	23,760	4	100,979
Juniper grass	97,470	30	3,249	19	5,130	8	12,184
Colorado Plateau/Great Basin grassland	41,639	30	1,388	20	2,082	10	4,164
Piñon juniper grass	43,356	36	1,204	22	1,971	8	5,420
Montane subalpine grassland	17,707	22	805	12	1,476	2	8,854
Piñon juniper woodland	231,508	400	579	215	1,077	30	7,717
Sagebrush shrubland	37,457	70	535	41	914	12	3,121
Spruce fir forest	250,481	400	626	300	835	200	1,252
Piñon juniper sagebrush	30,449	100	304	75	406	50	609
Wet-mixed conifer	40,174	500	80	275	146	50	803
Totals:	**1,624,123**	N/A	**42,710**	N/A	**70,870**	N/A	**231,096**

* Natural fire regimes found in: Wright and Bailey 1982, Swetnam and Dietrich 1985, Allen 1989, Baisan and Swetnam 1990 and 1995, Dick-Peddie 1993, Gottfried et al. 1995, Grissino-Mayer et al. 1995, Floyd et al. 2000, Miller and Tausch 2000, White 2002, Muldavin et al. 2003, Floyd et al. 2004, Gruell et al. 2004, Heinlein et al. 2005, Hauser 2007, Poulos et al. 2009, Romme et al. 2009, Margolis 2014, and O'Connor et al. 2014.

In addition to the fire return intervals, data from past management activity (Table B-6) and from recent wildfire records in the forest (Table B-7) were used along with input from Santa Fe NF resource specialists to inform the range of plan objectives for treatment by alternative (Table B-7).

Table B-6. Annual averages (in acres) for mechanical and fire treatments based off last 10 years (2007 through 2017) pulled from the FACTs database

ERU	Fire (prescribed burning)	Mechanical	Mechanical and fire
Mixed conifer - frequent fire	2,258	2,047	4,305
Ponderosa pine forest	4,572	2,484	7,056
Spruce-fir forest	1,355	325	1,680
Total forested	**8,185**	**4,856**	**13,041**
Colorado Plateau / Great Basin Grassland	313	305	618
Gambel oak shrubland	136	0	136
Juniper grass	560	13	573
Montane subalpine grassland	146	27	173

ERU	Fire (prescribed burning)	Mechanical	Mechanical and fire
Piñon juniper grass	56	0	56
Piñon juniper sagebrush	0	12	12
Piñon juniper woodland	846	216	1,062
Sagebrush shrubland	76	71	147
Total non-forested	**2,133**	**644**	**2,777**
Grand Total	**10,318**	**5,500**	**15,818**

Table B-7. Wildfire data for Santa Fe NF from 1992 to 2013

Year[1]	All wildfire	Managed wildfire[2]	Fire burned with full suppression
1992	582.3	77	506
2008	1,496	404	1,091
2009	2,315	419	1,896
2010	33,922	22,854	11,068
2011	138,605	1,660	136,945
2012	913	363	550
2013	46,783	12,362	34,421
Averages	**32,088**	**5,448**	**26,640**

[1] These years were selected to obtain an estimate of managed wildfire for objectives and is the same time period for the initial condition models (developed during the assessment phase).
[2] These acres represent wildfire managed for resource benefit.

Alternative 2

Initially, the low ranges for treatment objectives were based on the 10-year averages of acres treated within each ERU (Table B-6). In mixed conifer-frequent fire and ponderosa pine, acres treated by fire (including 50 percent of treated acres for both prescribed fire and managed natural fire) were then adjusted to be higher than the recorded 10-year averages to depict current fire targets that the agency deems necessary and feasible according to organizational and budgetary constraints. In non-forest ERUs, low acreage targets closely resemble 10-year averages to ensure a base level of work is implemented in these areas, with regard to organizational and budgetary constraints. The high end of the ranges for all ERUs represent the amount of treatment needed to be able to meet the desired conditions outlined in the forest plan. For fire-specific treatments, the high end of the range represents the least frequent fire return interval for both forested and non-forested ERUs (acres of the ERU in the forest per least frequent fire return interval) given in Table B-5. An exception to this was made for ponderosa pine forest, where the mid-frequency fire return interval (warrants treatment of 23,760 acres per year to meet a fire return interval of 17 years) was used as the basis for the high end of the fire treatment objectives range. The exception for ponderosa pine forest was made because ponderosa pine typically occurs at lower elevations, is the most departed ERU forestwide from desired conditions, and science-based research has shown ponderosa pine forest to have a more frequent fire return interval than mixed conifer-frequent fire (Baison and Swetnam 1990).

Determining the treatment acres needed for plan objectives to meet desired conditions for ERUs in the other action alternatives (3 and 4) generally followed the same process as for alternative 2, with a few notable exceptions:

Alternative 3

Since alternative 3 uses fire as the primary restoration tool, the low ends of the objective ranges for acres treated by fire are based on mid-frequency fire return intervals and the high end of the ranges are based on the most frequent fire return intervals. While alternative 3 uses natural and planned fire ignitions as the primary tool in restoration, some mechanical treatment is still expected to occur (e.g., treating WUI areas). The average acres claimed as fuels treatment in FACTS for forest and woodland ERUs, were used to develop the minimum amount of fuels reduction and mechanical treatments needed (e.g., treating WUI areas) to move toward or meet desired conditions under this alternative. The minimum number of mechanically treated acres per year needed to meet the objectives according to ERU can be seen in Table B-8.

Alternative 4

Alternative 4 emphasizes the use of mechanical treatments as the primary vegetation restoration tool. Under alternative 4, it was acknowledged that some amount of wildfire would still be managed to meet resource objectives and desired conditions for vegetation, as many ERUs are fire-adapted and rely on that type of disturbance. Acres claimed as undifferentiated wildfire in FACTS were used to determine the averages that define the objective treatment acres (by ERU) for alternative 4. The fire objectives in alternative 4 represent the minimum amount of wildfire (natural ignitions) needed to be managed for resource benefit (Table B-8).

All Alternatives- Non Forest ERUs

There is only a single range of treatment acres for the all non-forested ERUs in plan objectives to allow the flexibility to allocate treatment acres based on priority areas outlined during project planning over the 10- to 15-year planning cycle. For this reason, these acres are not split out by treatment type (e.g., fire, mechanical) in the revised plan. Restoration activities for some of these ERUs may require more planning and adaptive management to determine the appropriate treatment (e.g., reseeding following shrub encroachment in grasslands; restoring fire in invasive species-invaded grasslands; efficacy of fire in sagebrush shrubland restoration). However, acres (fire versus mechanical) were analyzed separately (based on 10-year averages) for each non-forested ERU to conduct the vegetation analysis for the FEIS in order to compare alternatives. The following non-forested ERUs were modeled: piñon juniper grass, juniper grass, montane subalpine grassland, Colorado Plateau/Great Basin grassland, and the sagebrush shrubland. Modeling was not conducted for: Gambel oak shrubland, piñon juniper woodland, piñon juniper sagebrush, or alpine tundra).

Table B-8. Annual treatment objectives (in acres) for ERUs by alternative

ERU	Treatment	Alternative 1 (10-year average 2003-2013)[1]			Alternative 2 - mix of mechanical and burning			Alternative 3 - natural processes, more burning			Alternative 4 - utilization, more mechanical, less burning		
		Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High
ERUs Modeled in VDDT[2]													
Mixed conifer-frequent fire **429,967 acres**	Mechanically	--	***3,257***	--	1,000	***4,500***	8,000	2,000	***2,000***	2,000	5,000	***12,500***	20,000
	Fire	--	***1,249***	--	5,000	***12,500***	20,000	10,000	***47,500***	85,000	2,500	***2,500***	2,500
	Total acres treated	--	***4,506***	--	6,000	***17,000***	28,000	12,000	***49,500***	87,000	7,500	***15,000***	22,500
Ponderosa pine forest **403,915 acres**	Mechanically	--	***3,461***	--	1,500	***5,750***	10,000	2,200	***2,200***	2,200	8,000	***15,500***	23,000
	Fire	--	***1,671***	--	15,000	***20,000***	25,000	25,000	***62,500***	100,000	2,300	***2,300***	2,300
	Total acres treated	--	***5,132***	--	16,500	***25,750***	35,000	27,200	***64,700***	102,200	10,300	***17,800***	25,300
Juniper grass **97,470 acres**	Mechanically	--	***14***	--	25	***637***	1,250	3	***3***	3	5,000	***7,500***	10,000
	Fire	--	***352***	--	325	***1,788***	3,250	5,000	***8,500***	12,000	550	***550***	550
	Total acres treated	--	***366***	--	350	***2,425***	4,500	5,003	***8,503***	12,003	5,550	***8,050***	10,550
Piñon juniper grass **43,356 acres**	Mechanically	--	***42***	--	50	***275***	500	12	***12***	12	1,000	***1,500***	2,000
	Fire	--	***47***	--	50	***625***	1,200	2,000	***3,750***	5,500	250	***250***	250
	Total acres treated	--	***89***	--	100	***900***	1,700	2,012	***3,762***	5,512	1,250	***1,750***	2,250
ERUs Semi-Modeled^ in VDDT[2]													
Montane/subalpine grassland **17,705 acres**	Acres treated*	--	***124***	--	100	***450***	800	1,500	***5,000***	8,500	0	***0***	0
Colorado Plateau/Great Basin grassland **41,639 acres**	Acres treated*	--	***147***	--	100	***550***	1,200	2,000	***3,000***	4,000	0	***0***	0
Sagebrush shrubland **34,457 acres**	Acres treated*	--	***140***	--	100	***300***	500	1,000	***2,000***	3,000	0	***0***	0

[1] These averages, from years 2003-2013, were pulled during the assessment phase and were the values used in the state-and-transition models to analyze current conditions and alternative 1 in the EIS.

[2] State-and-transition modeling was used in the vegetation analysis (assessment and EIS phases).

* Acres treated for non-forest ERUs (Montane subalpine grassland, Colorado Plateau/Great Basin grassland, and sagebrush shrubland) are not defined by treatment method.

^ Use term "semi-modeled" because inputs were put into models and run, but the VDDT models used were not truly designed for ERUs not dominated by trees, so the outputs could not be considered conclusive and were not used in FEIS analyses.

Modeling by ERU

We used VDDT with model inputs based on plan objectives for the **average** vegetation treatment acres (Table B-8) for each (modeled) ERU. Below, for each modeled ERU we show the initial conditions of the model, followed by the state transition pathways, and the model output: seral state class distribution across 50 years. Since the draft forest plan spans only an expected 10 to 15 years, a more detailed model output is also given for alternative 2 for the predominant ERUs with plan objectives for treatment (ponderosa pine forest, mixed-conifer frequent fire, piñon juniper grass, and juniper grass). Initial conditions and state transitions are consistent across all alternatives, while the seral state class distributions (model outputs) change by alternative (Table B-9).

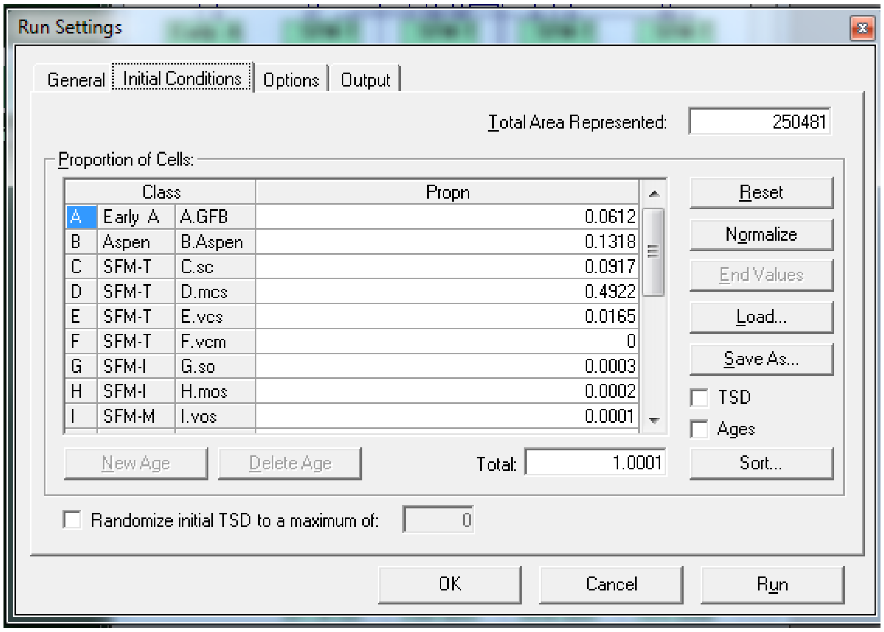
Spruce-Fir Forest (SFF)

Management related to prescribed fire and mechanical treatment does not vary among alternatives. Future wildfire and insect and disease frequency and severity are likely to differ from levels in the recent past, though in unpredictable ways. Therefore, they were modeled using recent averages under all alternatives.

Table B-9. Seral state class descriptions for spruce-fir forest and mixed conifer-frequent fire

State	Description
A, K	Non-tree, recently burned, grass, forb, and shrub types
B, T	All aspen, deciduous tree mix, and evergreen-deciduous mix tree types
C, G, P, L	Seedling/sapling and small trees (5-9.9”), all cover classes
D, M, H, Q	Medium trees (10 -19.9” d.b.h.), all cover classes
E, N, F, O	Large trees (≥ 20”), closed canopy
I, R, J, S	Large trees (≥ 20”), open canopy [2]

[2] Contemporary landscapes only; historically rare or localized.



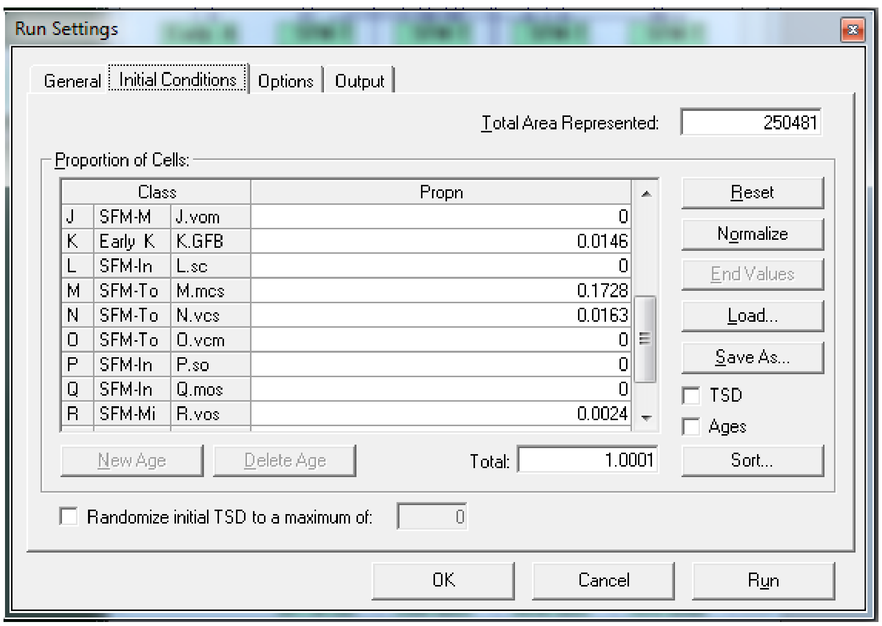


Figure B-1. Spruce fir-forest initial conditions

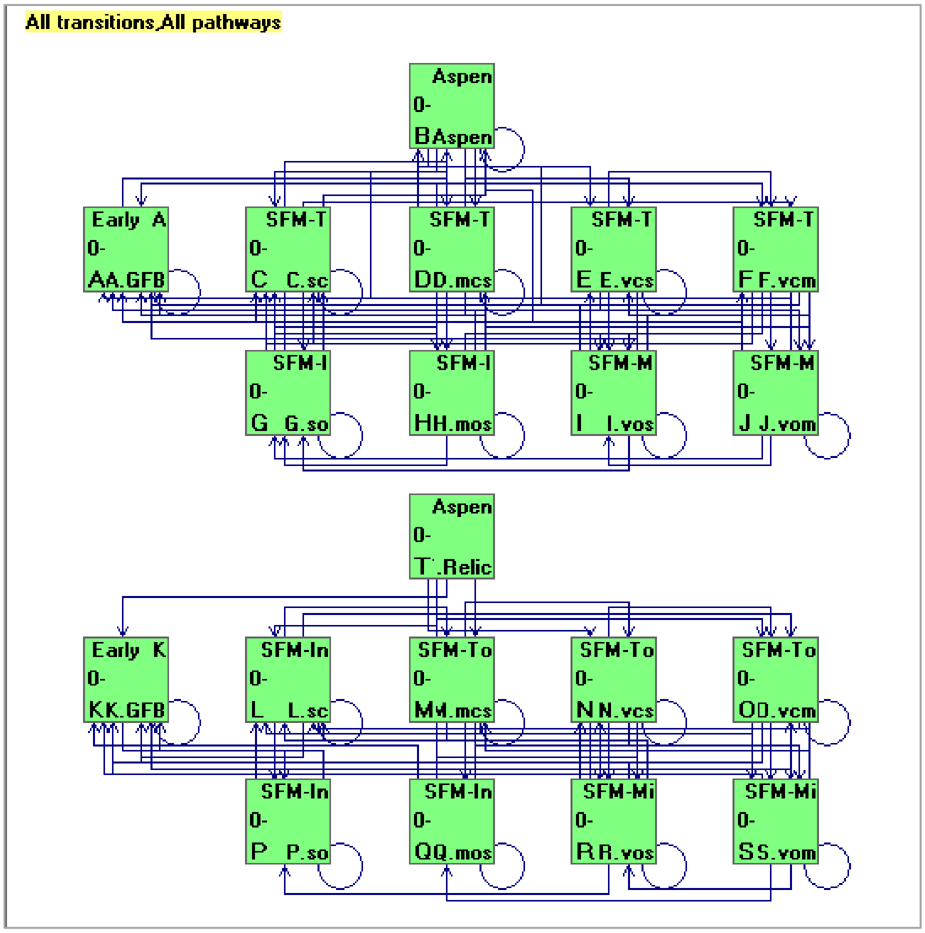


Figure B-2. Transition pathways for spruce-fir forest

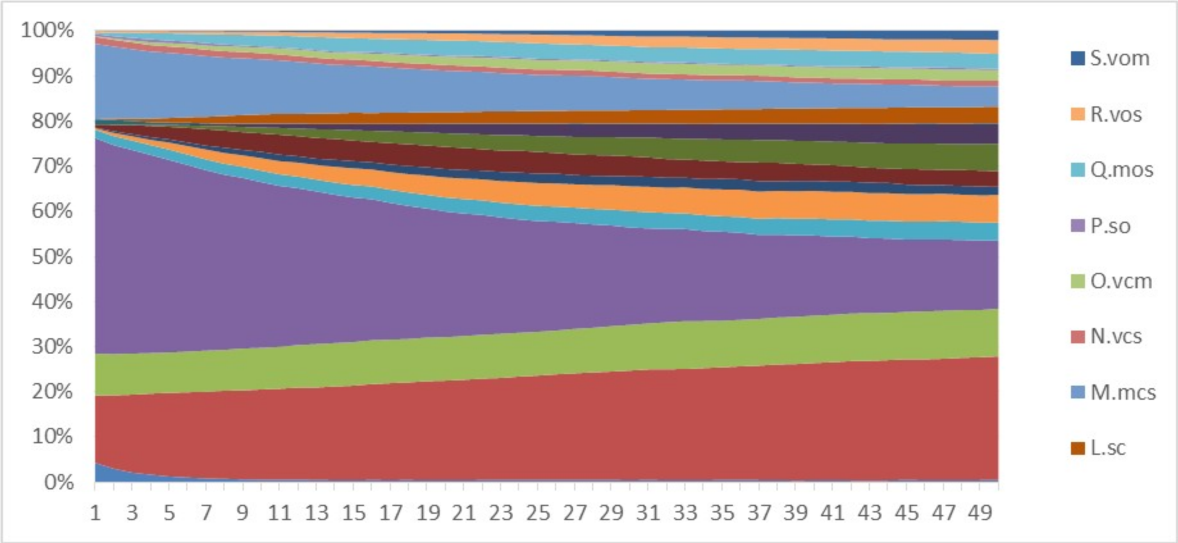


Figure B-3. Seral state class distribution for spruce-fir forest- all alternatives

Wet-Mixed Conifer (MCW)

Management related to prescribed fire and mechanical treatment does not vary among alternatives. Future wildfire and insect and disease frequency and severity are likely to differ from levels in the recent past, though in unpredictable ways. Therefore, they were modeled using recent averages under all alternatives.

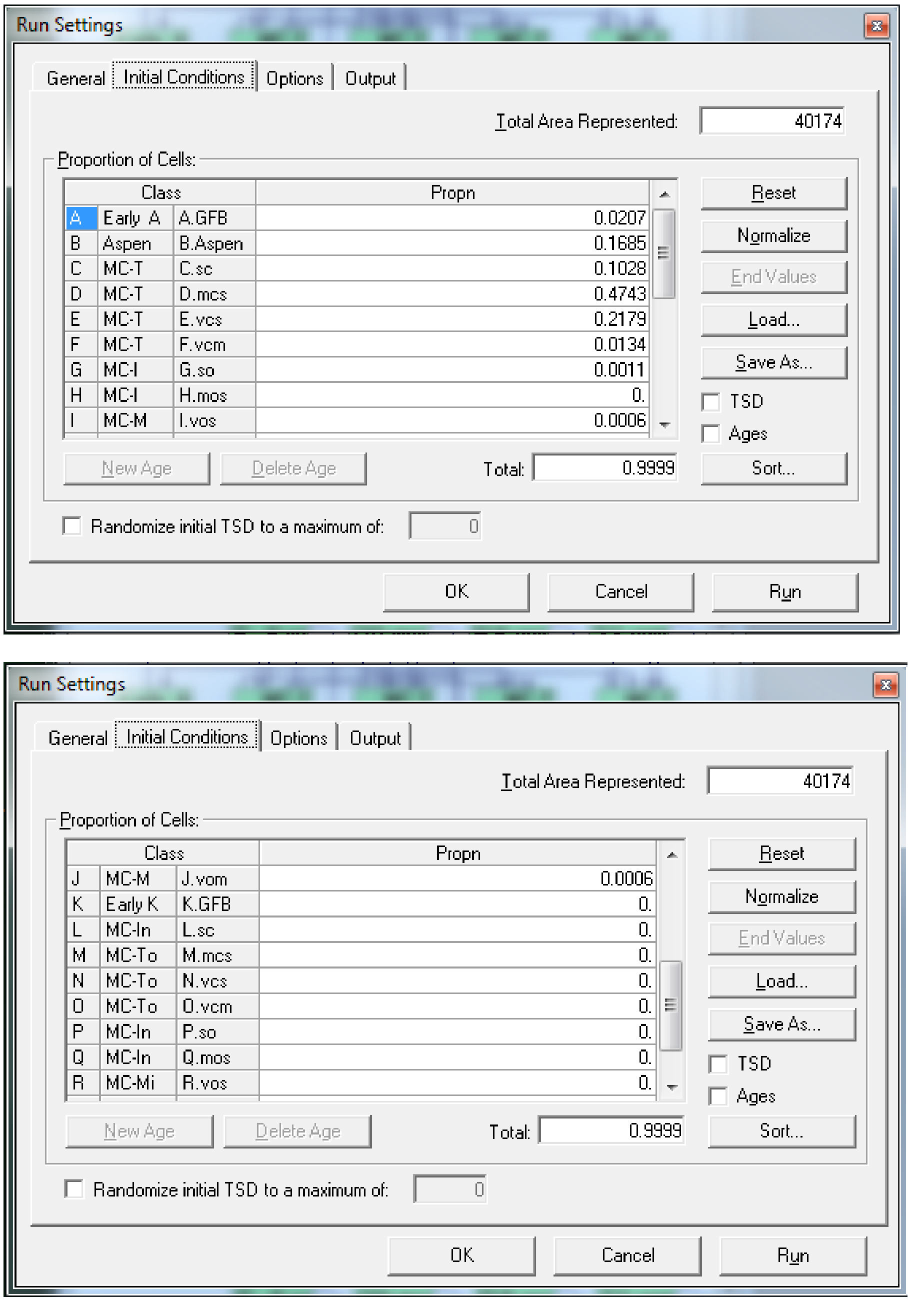


Figure B-4. Wet-mixed conifer initial conditions

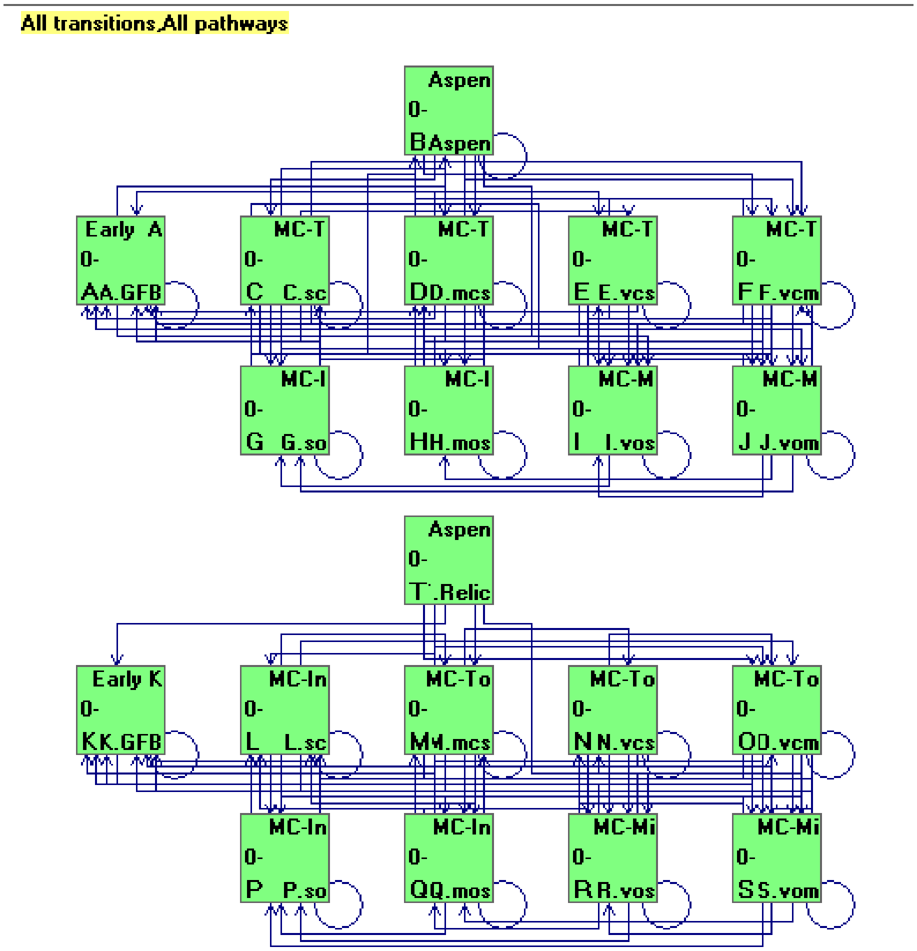


Figure B-5. Transitional pathways wet-mixed conifer

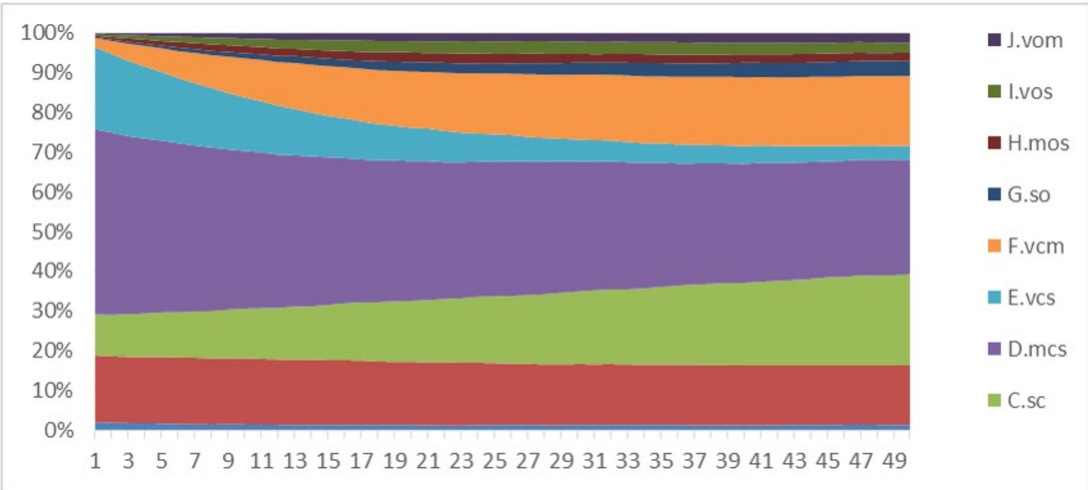


Figure B-6. Seral state class distribution for wet-mixed conifer - all alternatives

Ponderosa Pine Forest (PPF)

Management related to prescribed fire and mechanical treatment varies among alternatives, where the average treatment objective for each alternative was used for model inputs (Table B-10). Future wildfire and insect and disease frequency and severity are likely to differ from levels in the recent past, though in unpredictable ways. Therefore, these disturbance agents were modeled using recent averages under all alternatives.

Table B-10. Treatment inputs* (average acres) for ponderosa pine forest

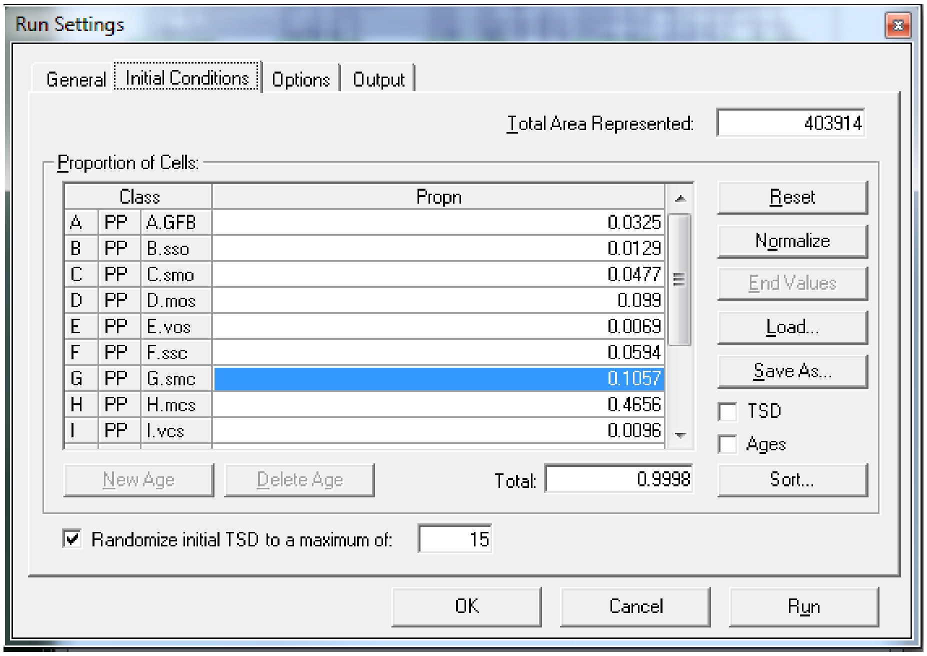
Treatment Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4
B - Free thin, all sizes to target basal area	0	0	0	0
C - Thin-from-below to target basal area	661	1,098	420	2,960
D - Thin under a 16" diameter cap to target basal area	188	312	119	842
E - Group selection with matrix thin to target basal area	82	137	52	369
F - Shelterwood seed cut to target basal area	158	263	100	708
G - Clearcut with non-regeneration objective legacy trees	0	0	0	0
H - Clearcut/ coppice for hardwood regeneration	0	0	0	0
I - Planting	338	338	338	338
J- Fire, Low Conditions	835	9,997	28,740	1,150
K- Fire, Moderate Conditions	589	7,051	20,273	811
L- Fire, High Conditions	247	2,952	8,487	339
M - Thin under a 9" diameter cap	2,371	3,939	1,507	10,619

*Note these letters are independent from seral state letter codes (Table B-9) though the same letters are used.

Table B-11 gives a description of the seral state classes that are referenced in the inputs and outputs below for mixed conifer-frequent fire and ponderosa pine.

Table B-11. Description of model states for ponderosa pine and dry mixed conifer

State	Description
A	Grass, forb, shrubland; <10% canopy cover
B	Seeding/sapling, open; <10% canopy cover
C	Small trees, open; 10–30% canopy cover; 5–10 inches diameter class
D	Medium trees, open, single story; 10-30% canopy cover; 10–20 inches diameter class
E	Very large trees, open, single story; 10-30% canopy cover; 20+ inches diameter class
F	Seeding/sapling, closed; >30% canopy closure; 0–5 inches diameter class
G	Small trees, closed; >30% canopy closure; 5–10 inches diameter class
H	Medium trees, closed, single story; >30% canopy closure; 10–20 inches diameter class
I	Very large trees, closed, single story; >30% canopy closure; 20+ inches diameter class
J	Medium trees, open, multistory; 10-30% canopy closure; 10–20 inches diameter class
K	Very large trees, open, multistory; 10-30% canopy closure; 20+ inches diameter class
L	Medium trees, closed, multistory; >30% canopy closure; 10–20 inches diameter class
M	Very large trees, closed, multistory; >30% canopy closure; 20+ inches diameter class
N	Uncharacteristic state; <10% canopy cover; large openings unlikely to regenerate in a timely fashion



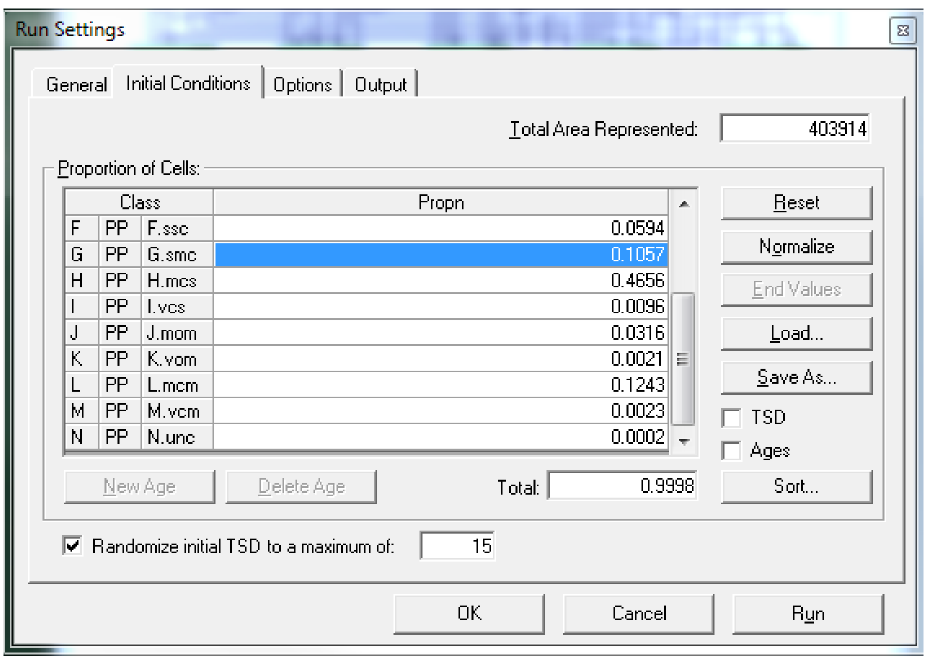


Figure B-7. Ponderosa pine forest initial conditions

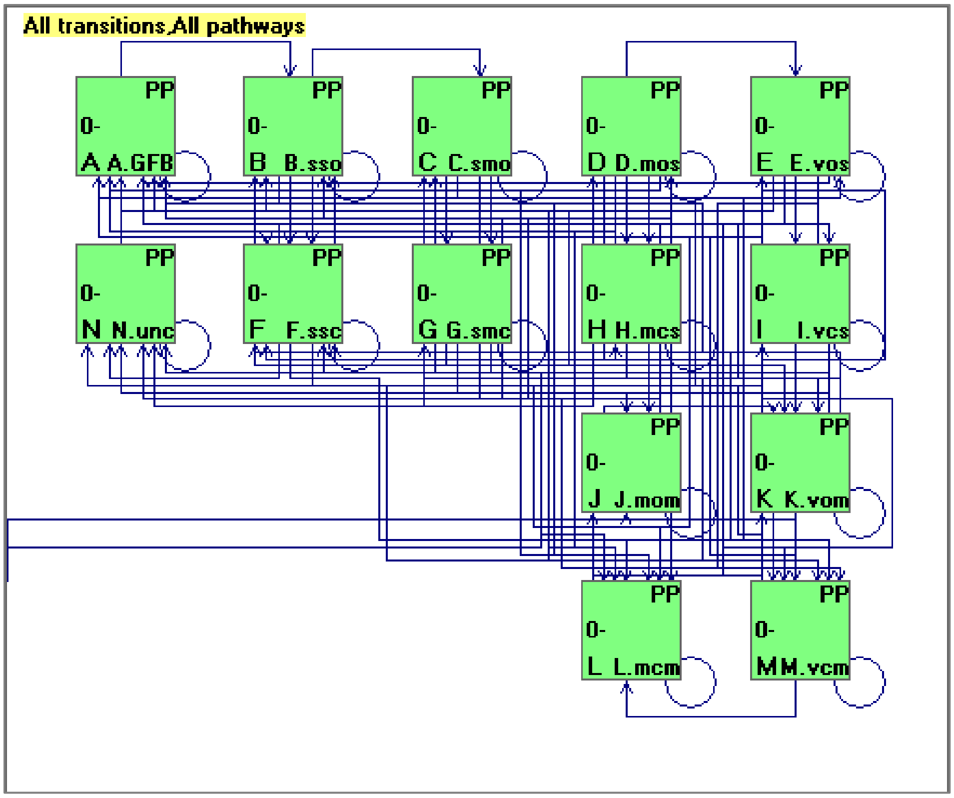


Figure B-8. Transitional pathways for ponderosa pine forest

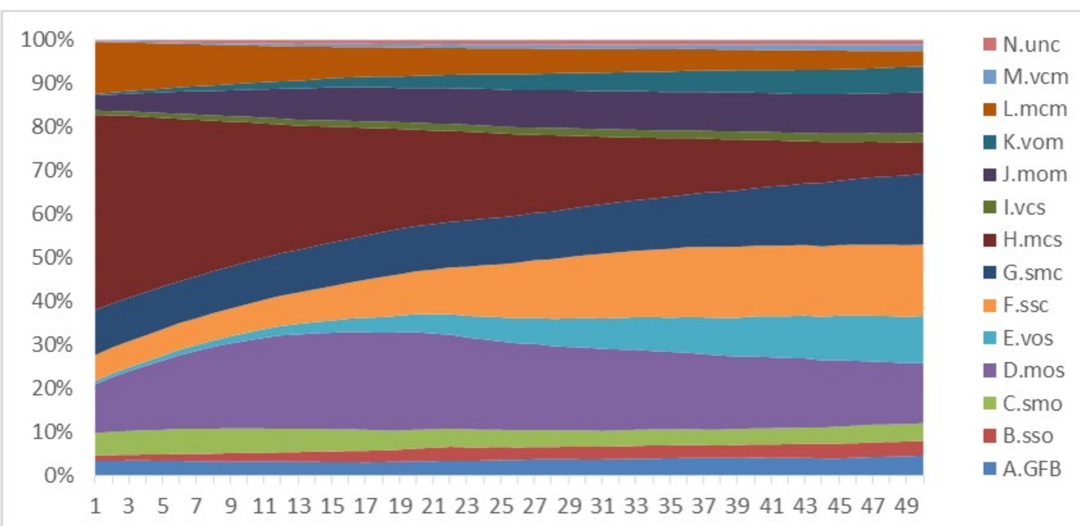


Figure B-9. Seral state class distribution results for ponderosa pine forest across 50 years, alternative 1

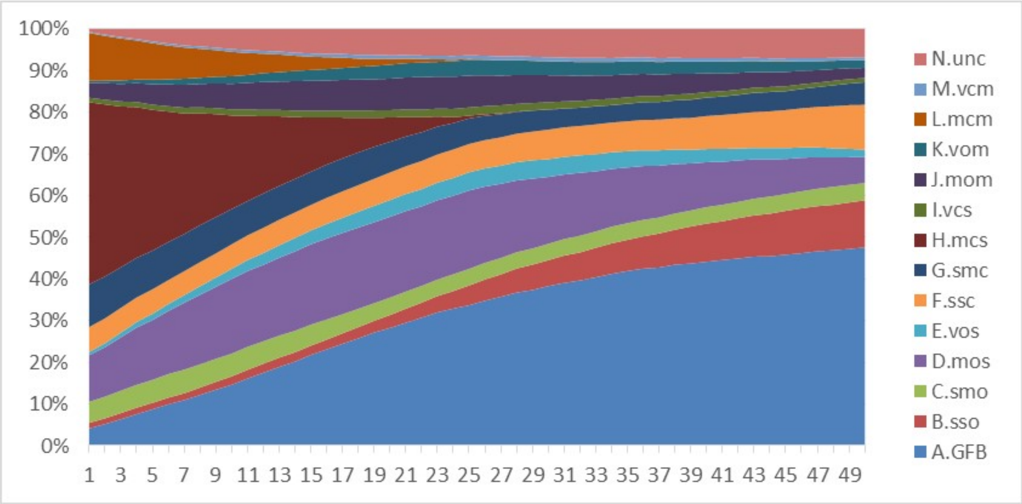


Figure B-10. Seral state class distribution results for ponderosa pine forest across 50 years, alternative 2

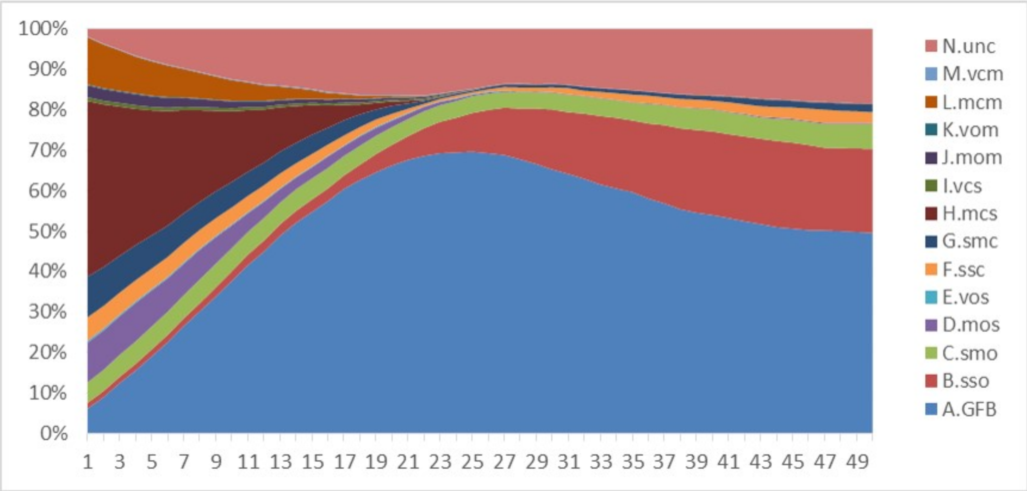


Figure B-11. Seral state class distribution results for ponderosa pine forest across 50 years, alternative 3

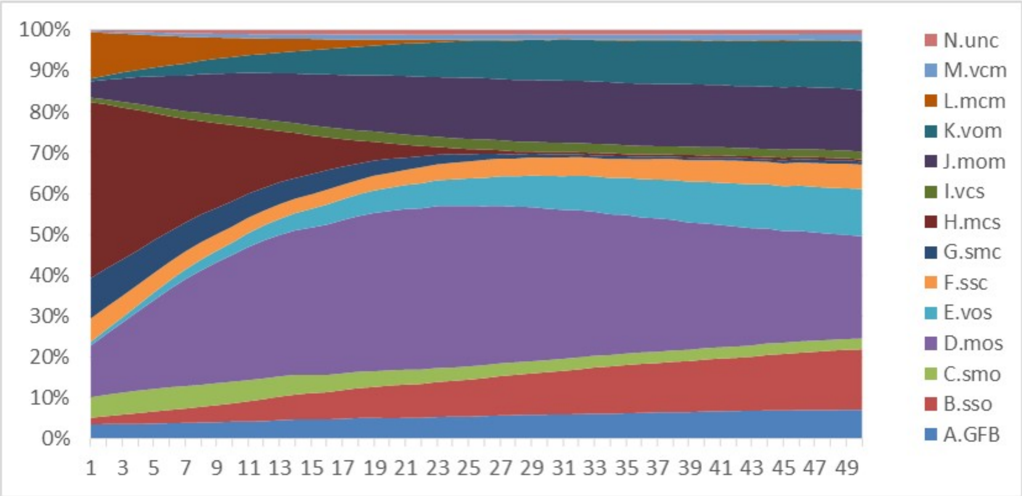


Figure B-12. Seral state class distribution results for ponderosa pine forest across 50 years, alternative 4

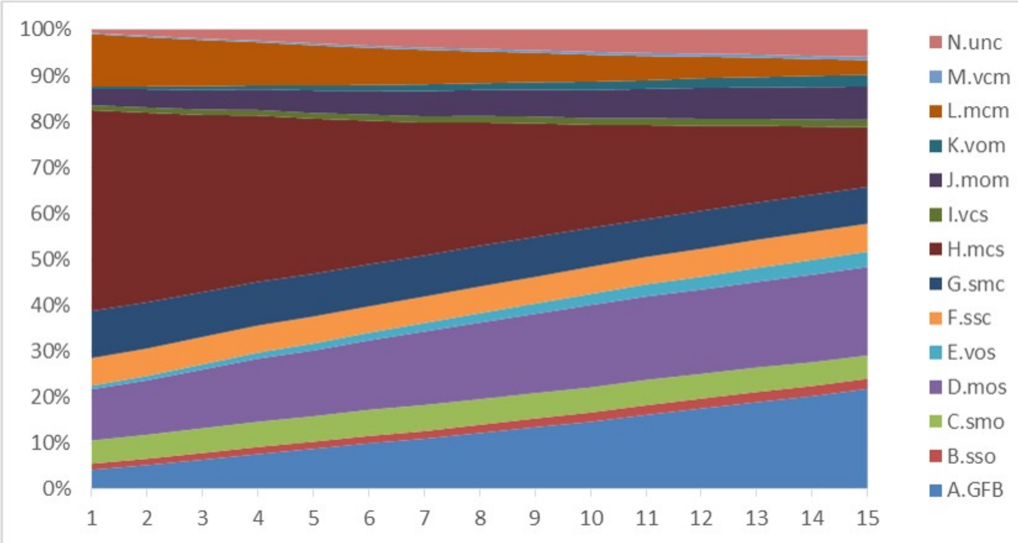


Figure B-13. Seral state class distribution results for ponderosa pine forest across 15 years, alternative 2

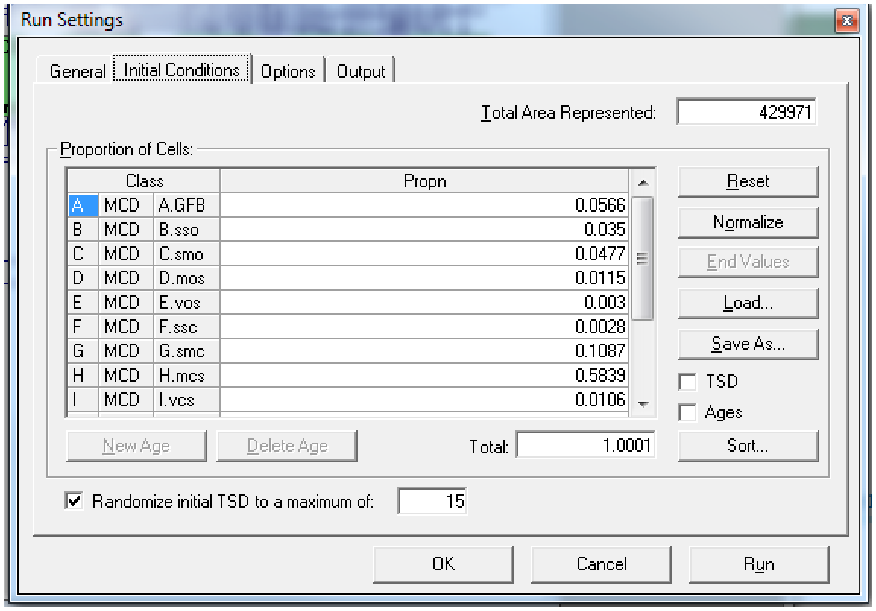
Mixed Conifer – Frequent Fire (MCD)

Management related to prescribed fire and mechanical treatment varies among alternatives, where the average treatment objective for each alternative was used for model inputs (Table B-12). Future wildfire and insect and disease frequency and severity are likely to differ from levels in the recent past, though unpredictable ways. Therefore, these disturbance agents were modeled using recent averages under all alternatives.

Table B-12. Treatment inputs* (average acres) for mixed conifer – frequent fire

Treatment Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4
B - Free thin, all sizes to target basal area	0	0	0	0
C - Thin-from-below to target basal area	644	890	396	2,473
D - Thin under a 16" diameter cap to target basal area	172	238	106	660
E - Group selection with matrix thin to target basal area	85	117	52	326
F - Shelterwood seed cut to target basal area	204	283	126	785
G - Clearcut with non-regeneration objective legacy trees	0	0	0	0
H - Clearcut/ coppice for hardwood regeneration	0	0	0	0
I - Planting	470	470	470	470
J- Fire, Low Conditions	684	6,857	24,648	1,369
K- Fire, Moderate Conditions	440	4,404	15,856	881
L- Fire, High Conditions	125	1,251	4,504	250
M - Thin under a 9" diameter cap	2,143	2,961	1316	8,226

*Note these letters are independent from seral state letter codes (Table B-9) though the same letters are used.



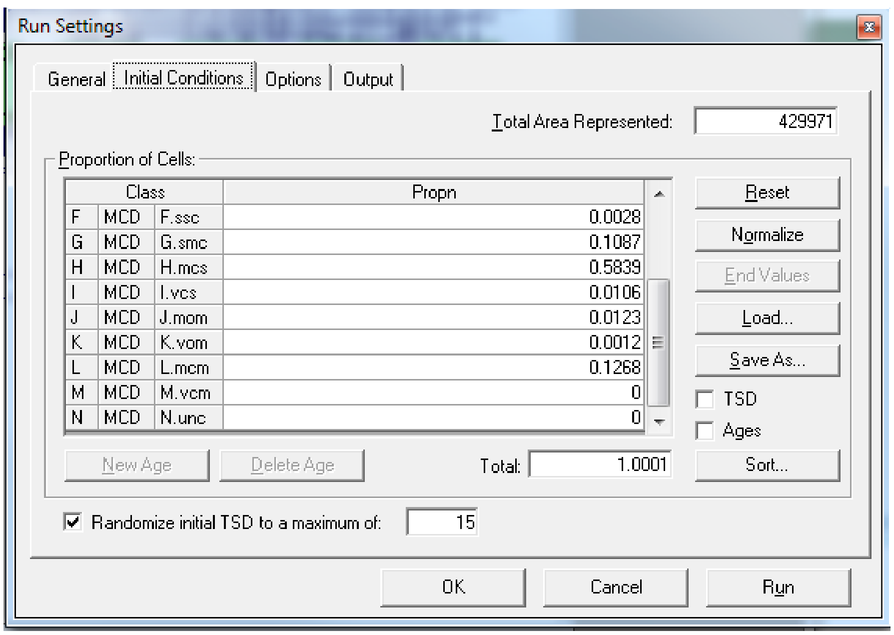


Figure B-14. Mixed conifer – frequent fire initial conditions

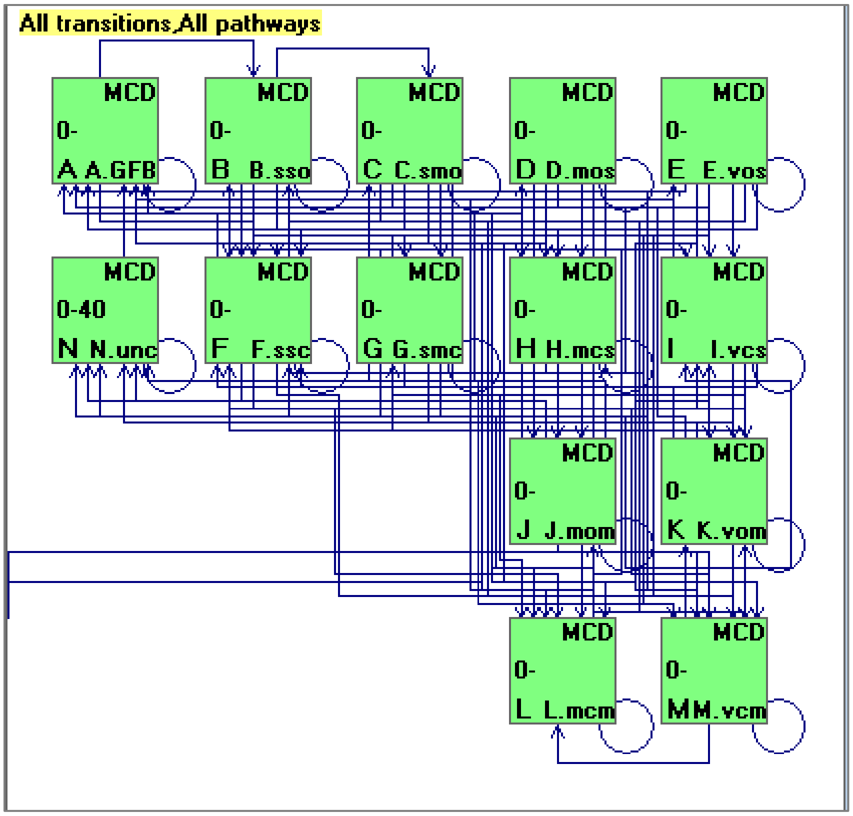


Figure B-15. Mixed conifer – frequent fire transition pathways

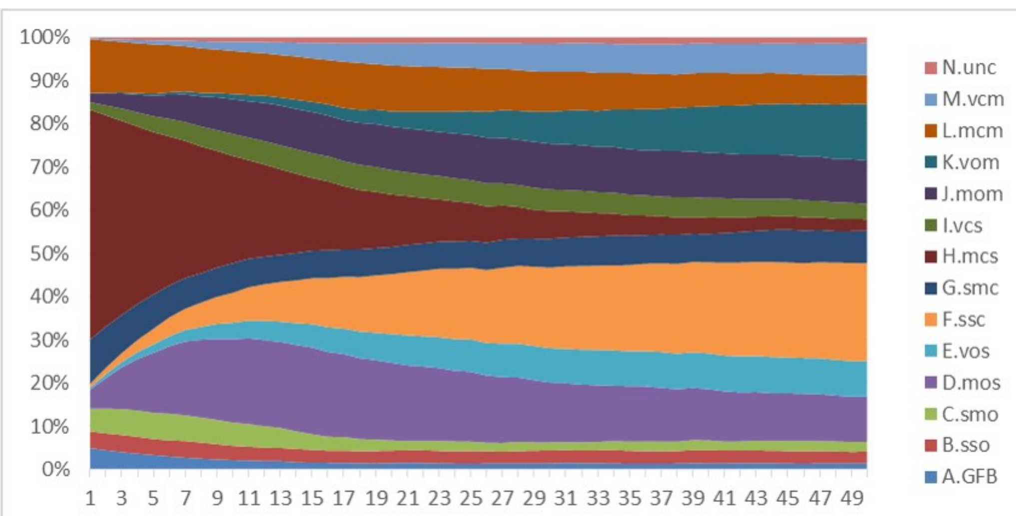


Figure B-16. Seral state class distribution results for mixed conifer – frequent fire across 50 years, alternative 1

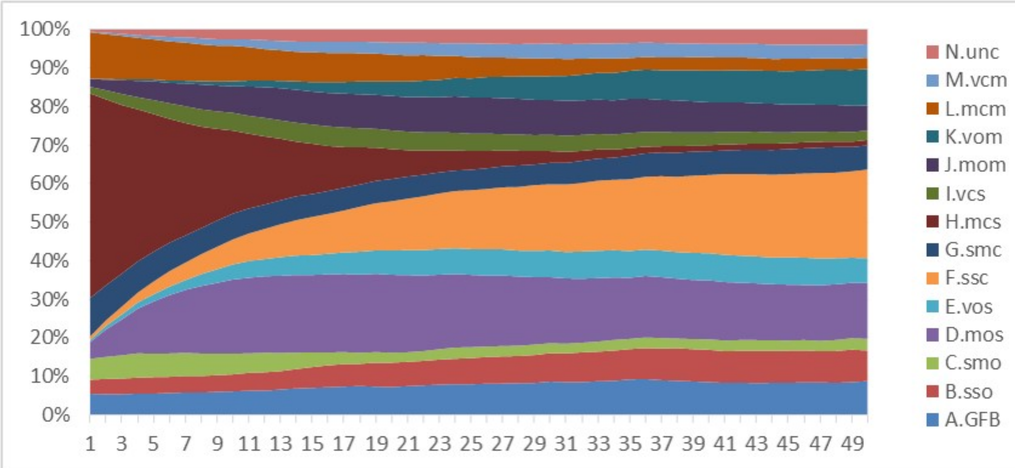


Figure B-17. Seral state class distribution results for mixed conifer – frequent fire across 50 years, alternative 2

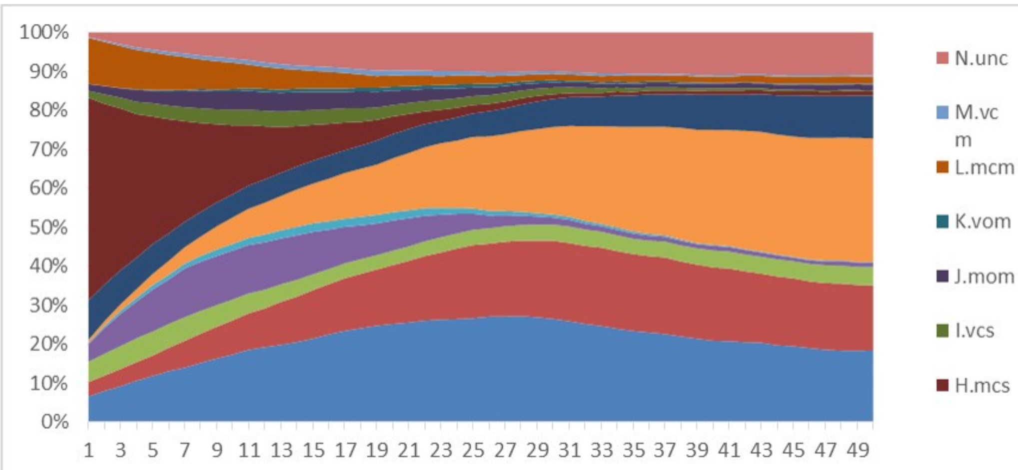


Figure B-18. Seral state class distribution results for mixed conifer – frequent fire across 50 years, alternative 3

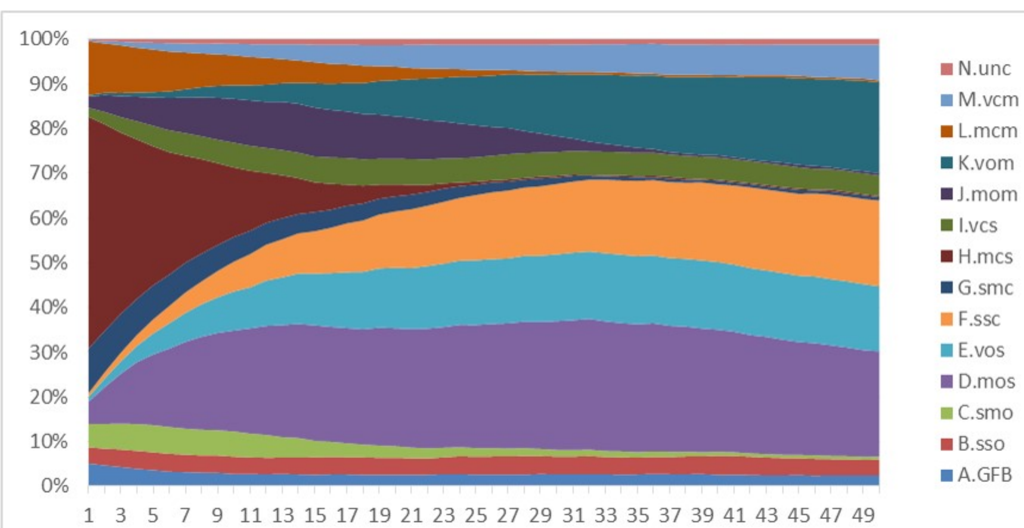


Figure B-19. Seral state class distribution results for mixed conifer – frequent fire across 50 years, alternative 4

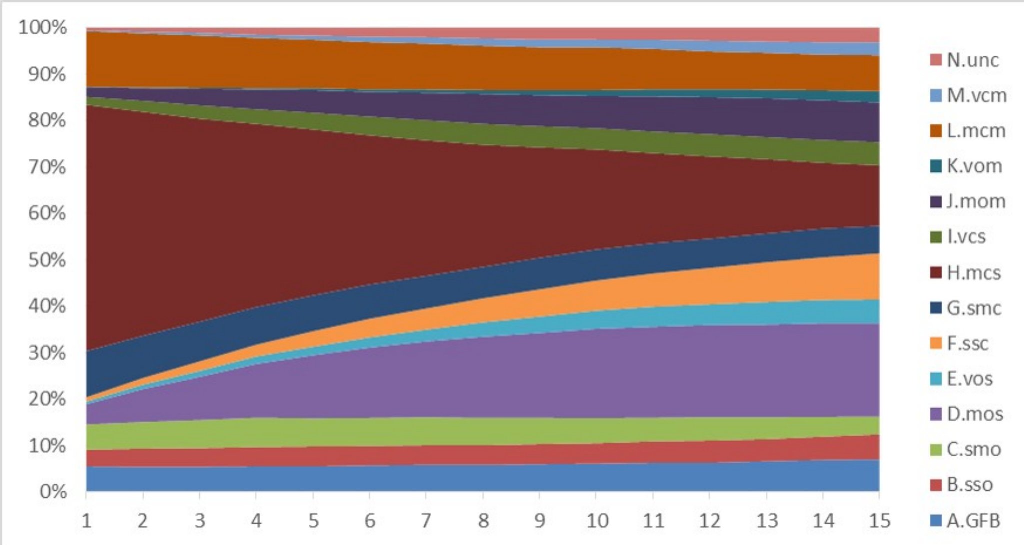


Figure B-20. Seral state class distribution results for mixed conifer – frequent fire across 15 years, alternative 2

Juniper Grass (JUG)

Management related to prescribed fire and mechanical treatment varies among alternatives, where the average treatment objective for each alternative was used for model inputs (Table B-13). Future wildfire and insect and disease frequency and severity are likely to differ from levels in the recent past, though in unpredictable ways. Therefore, they were modeled using recent averages under all alternatives.

Table B-13. Treatment inputs (average acres) for juniper grass

Treatment Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Thin-from-below to target basal area	13	1,300	3	7,500
RX Fire, Low Conditions	176	688	3,753	275
RX Fire, Moderate Conditions	176	688	3,753	275

Table B-14. Seral state class descriptions for juniper grass and piñon-juniper grass

State	Description
A	Recently burned, grass, forb, and shrub types
B, C, E	All seedling/sapling; small trees (5-9.9”), open canopy
D	Medium to large trees (≥10”), open canopy
F	Small trees (5-9.9”), closed canopy
G	Medium to large trees (≥10”), closed canopy

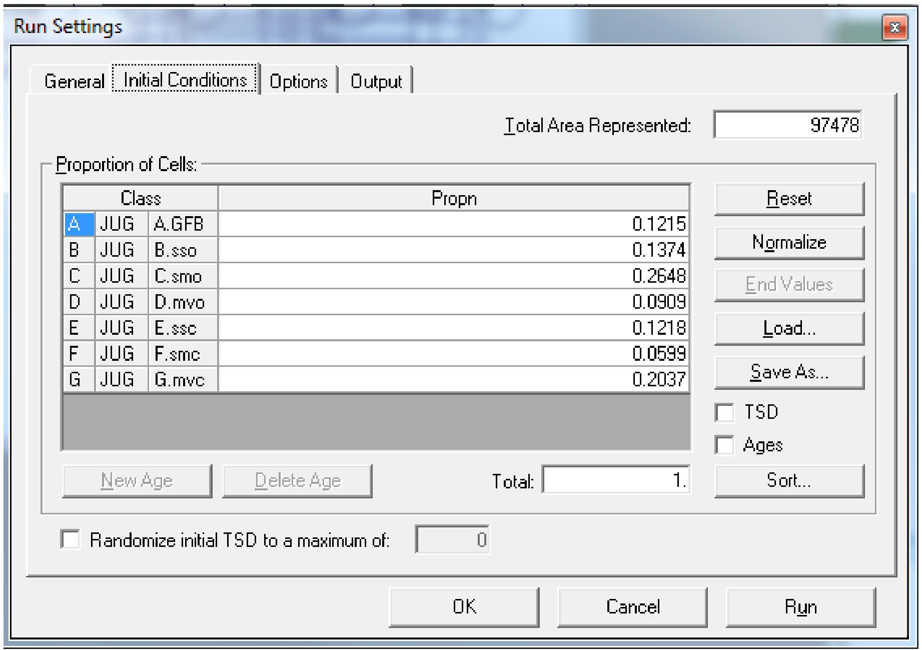


Figure B-21. Juniper grass initial conditions

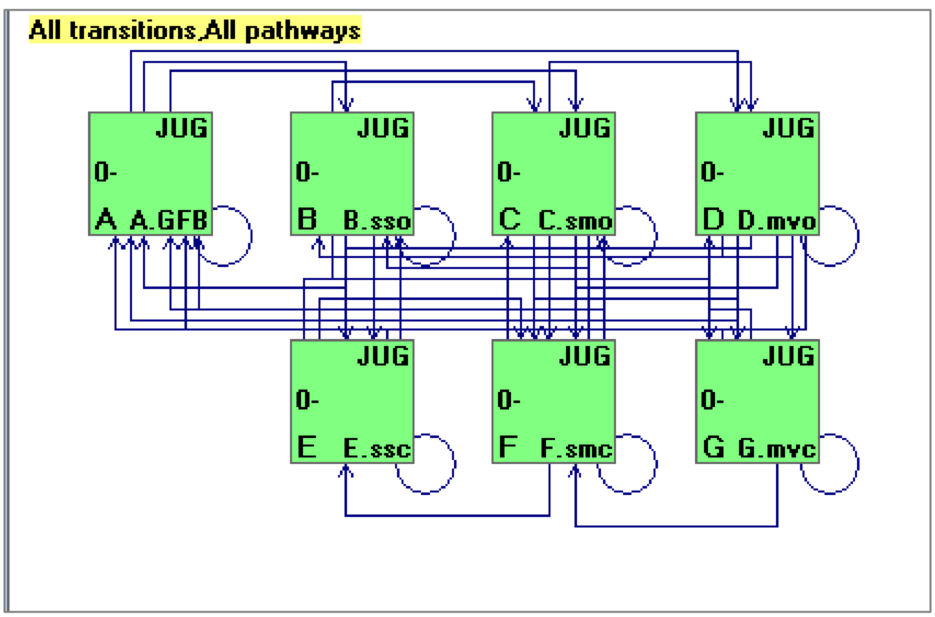


Figure B-22. Juniper grass transition pathways

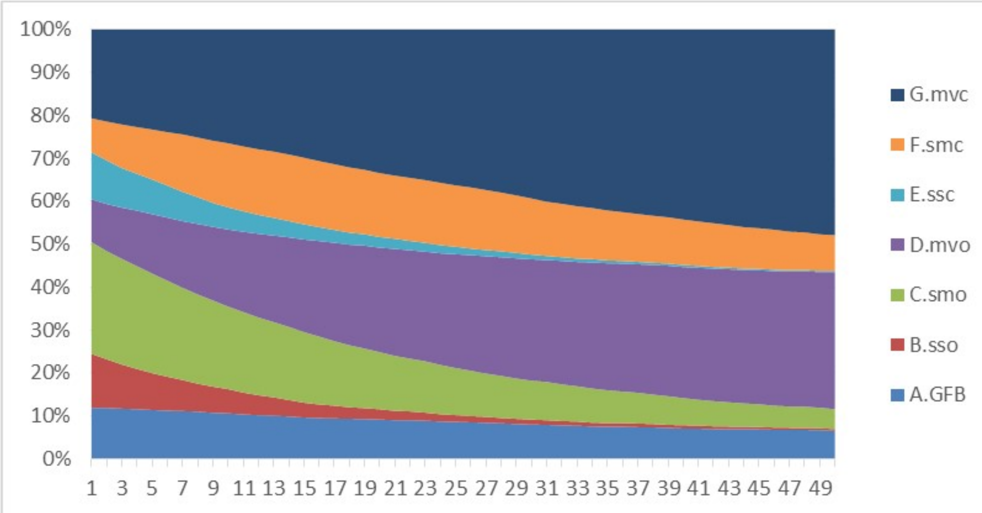


Figure B-23. Seral state class distribution results for juniper grass across 50 years, alternative 1

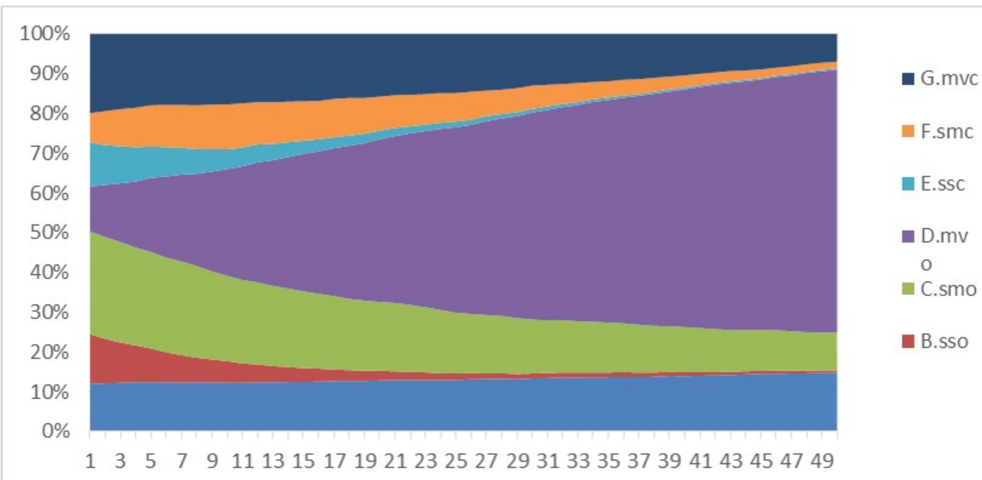


Figure B-24. Seral state class distribution results for juniper grass across 50 years, alternative 2

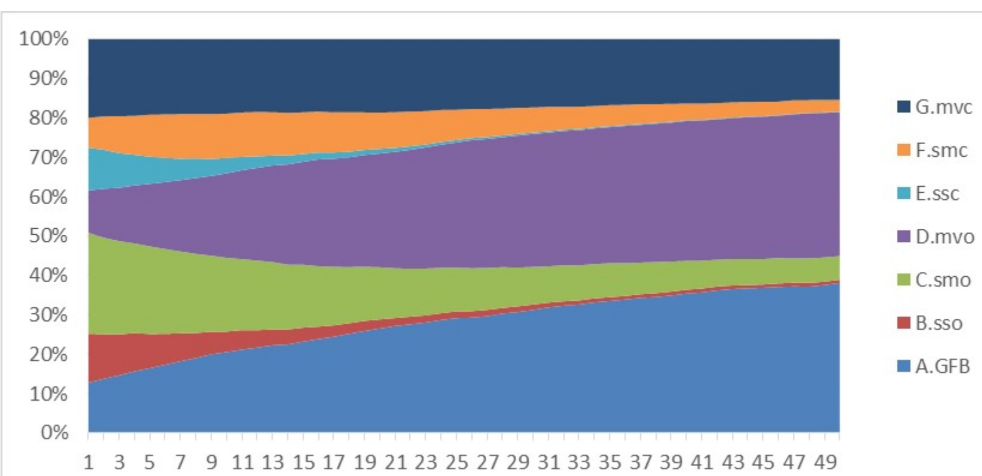


Figure B-25. Seral state class distribution results for juniper grass across 50 years, alternative 3

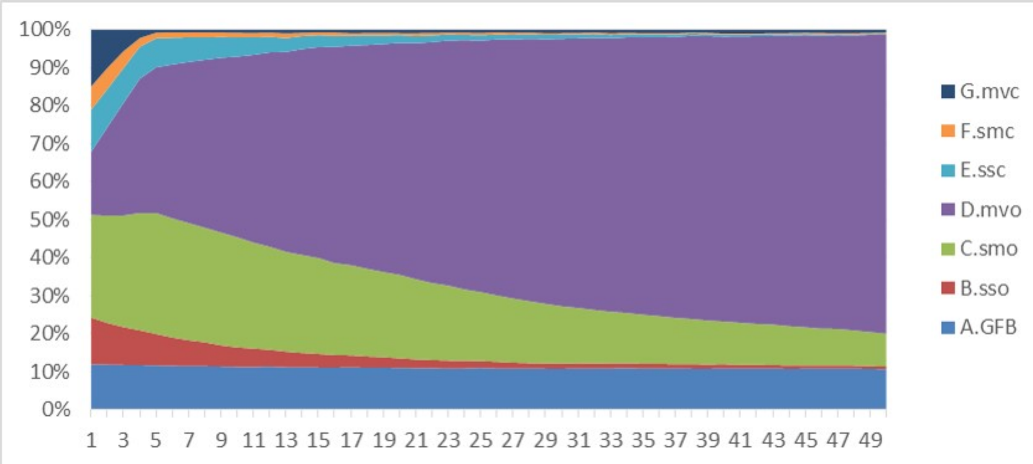


Figure B-26. Seral state class distribution results for juniper grass across 50 years, alternative 4

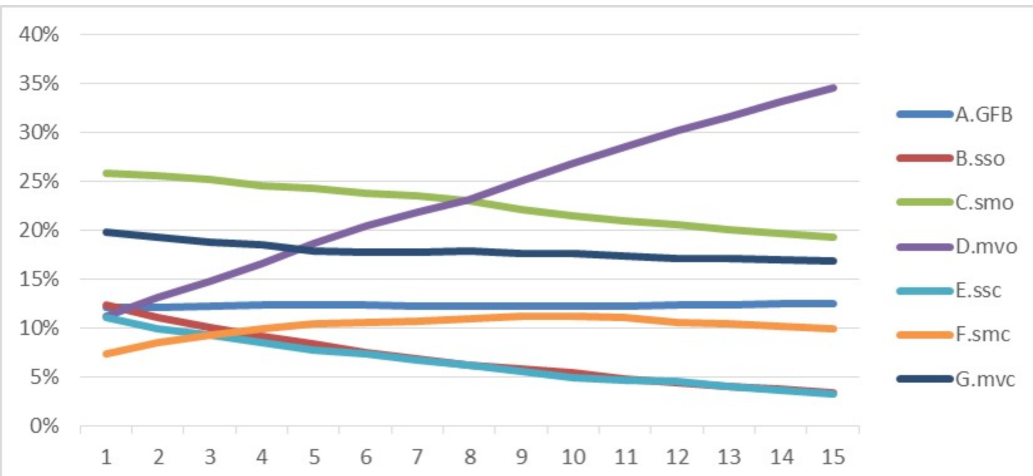


Figure B-27. Seral state class distribution results for juniper grass across 15 years, alternative 2

Piñon-Juniper Grass (PJG)

Management related to prescribed fire and mechanical treatment varies among alternatives, where the average treatment objective for each alternative was used for model inputs (Table B-15). Future wildfire and insect and disease frequency and severity are likely to differ from levels in the recent past, though in unpredictable ways. Therefore, they were modeled using recent averages under all alternatives.

Table B-15. Treatment inputs (average acres) for piñon-juniper grass

Treatment Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Thin-from-below to target basal area	18	206	4	599
Group selection with matrix thin to target basal area	25	313	7	902
RX Fire, Low Conditions	20	221	638	106
RX Fire, Moderate Conditions	20	221	638	106
RX Fire, High Conditions	7	77	223	37

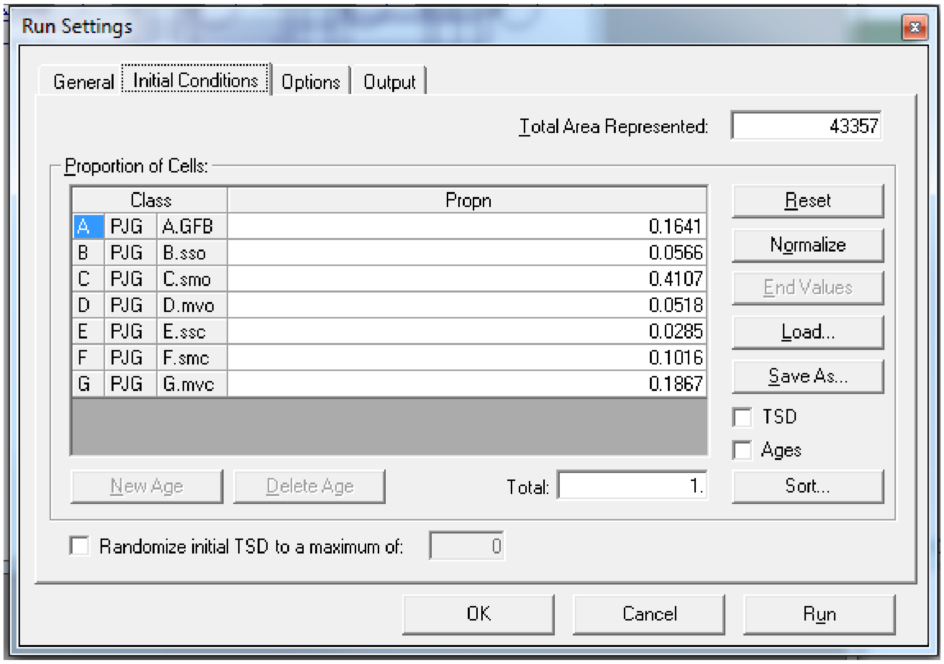


Figure B-28. Piñon-juniper grass initial conditions

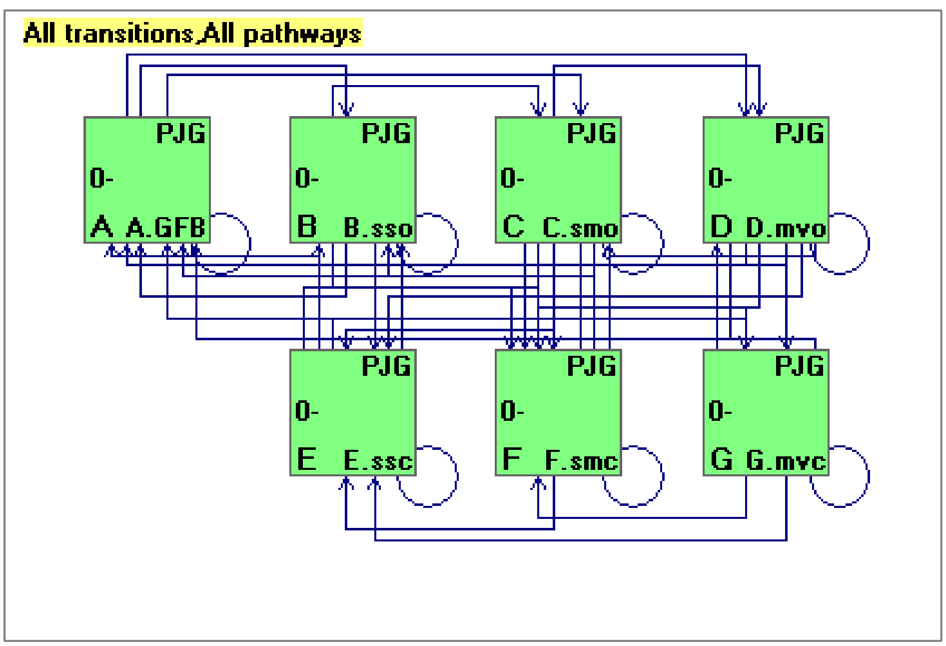


Figure B-29. Piñon-juniper grass transition pathways

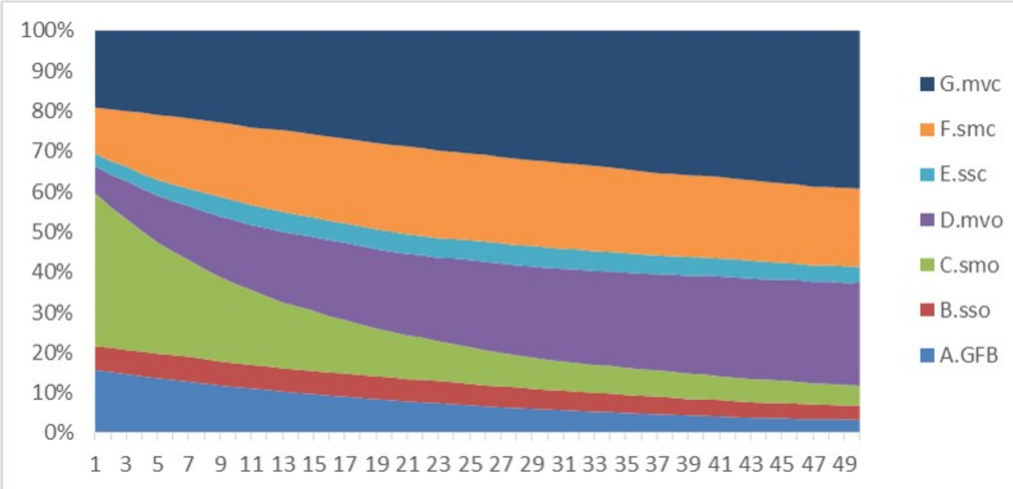


Figure B-30. Seral state class distribution results for piñon-juniper grass across 50 years, alternative 1

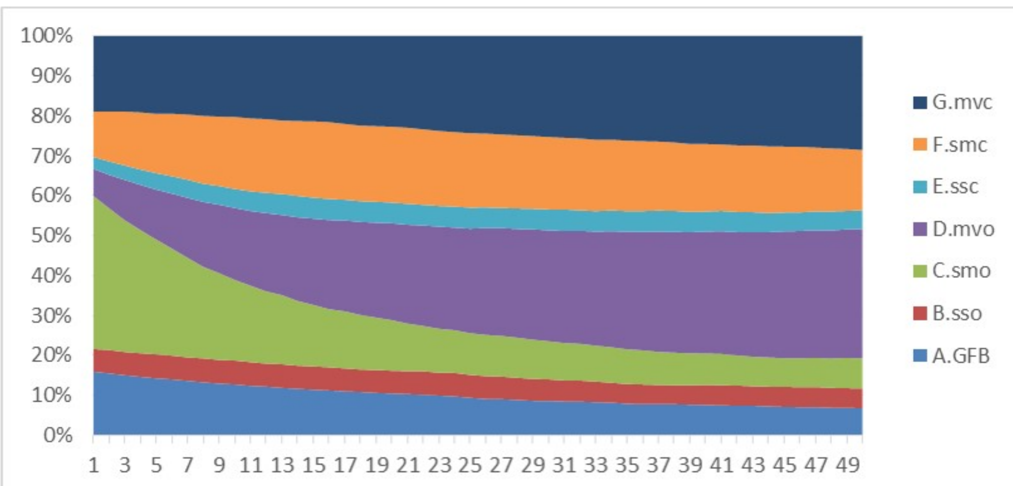


Figure B-31. Seral state class distribution results for piñon-juniper grass across 50 years, alternative 2

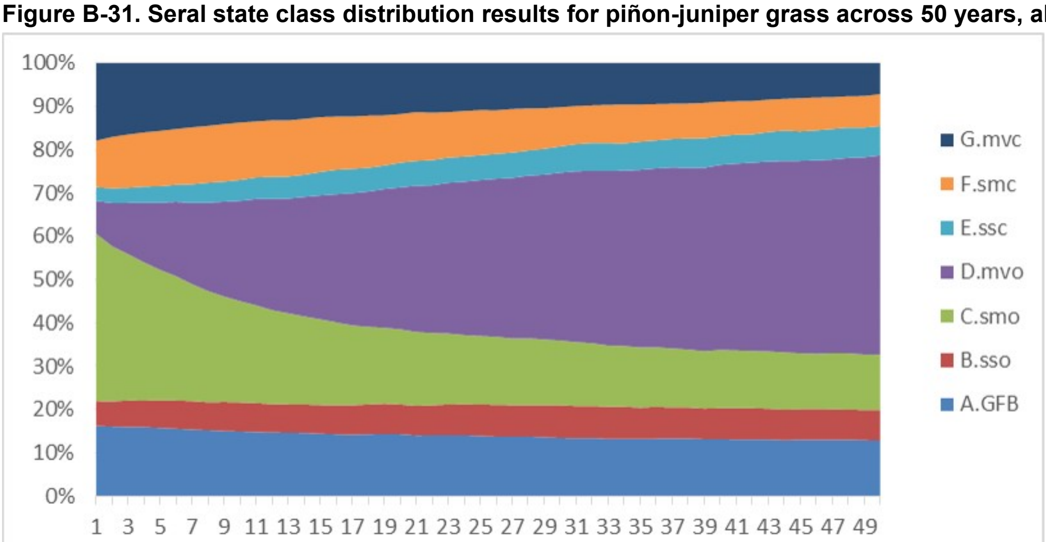


Figure B-32. Seral state class distribution results for piñon-juniper grass across 50 years, alternative 3

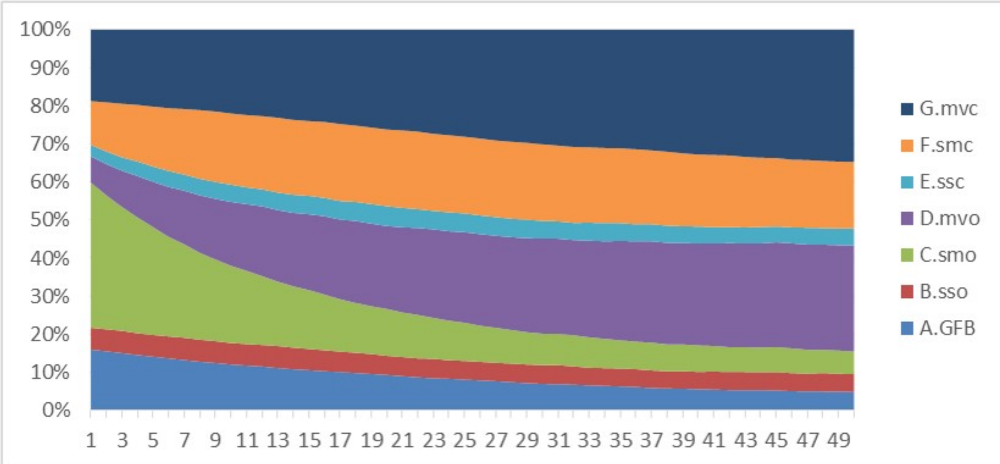


Figure B-33. Seral state class distribution results for piñon-juniper grass across 50 years, alternative 4

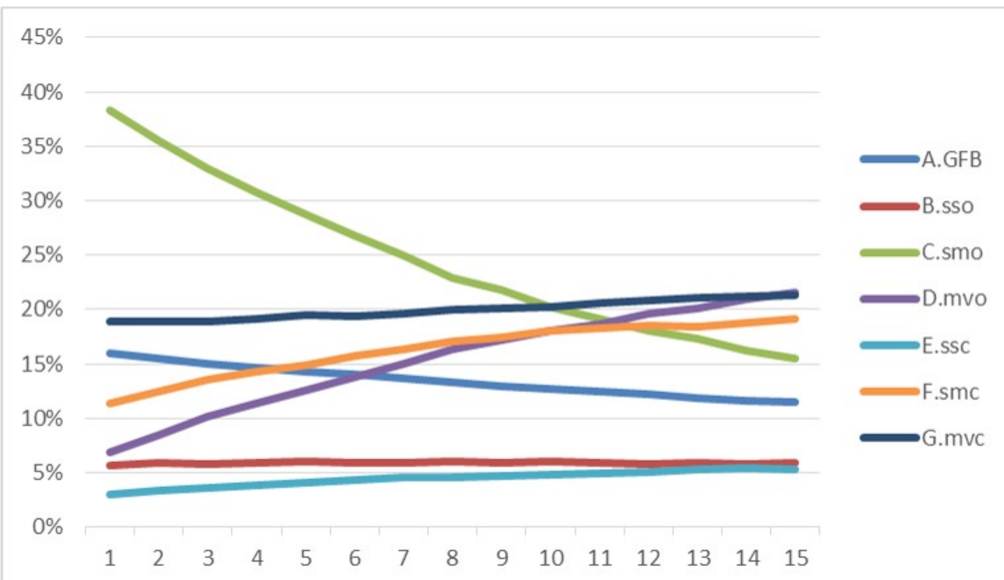


Figure B-34. Seral state class distribution results for piñon-juniper grass across 15 years, alternative 2

Colorado Plateau/Great Basin Grassland (CPGB), Montane Subalpine Grassland (MSG), and Sagegrass Shrubland (SAGE)

Table B-16 shows the acres used as inputs to run the VDDT models for these ERUs; however, the model we used lacked the ability to reliably predict state changes in vegetation types that are not dominated by trees. Therefore, these data were not used in the FEIS analysis of alternatives. Still, the initial conditions, transitional pathways, and outputs are shown below for reference purposes.

Table B-16. Treatment inputs (average acres) for Colorado Plateau/Great Basin grassland, montane subalpine grassland, and sagebrush shrubland

ERU	Treatment Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4**
Colorado Plateau/Great Basin Grassland	All Fuels	17	505	10	0
	RX Burning	130	505	1,500	0
Montane Subalpine Grassland *	Lopping	129	129	129	0
	RX Burning	27	27	27	0
Sagebrush Shrubland	Mowing and Seeding	72	72	72	0
	Thinning	140	240	12	0
	Mixed Fire	0	79	561	0
	Replacement Fire	0	82	578	0

* Montane subalpine grassland represents 1 percent of forest land area—numbers kept the same for all alternatives with objectives or treatment.

**Alternative 4 has zero acres of treatment objectives for Colorado Plateau/Great Basin Grassland, Montane Subalpine Grassland, and Sagebrush Shrubland.

Colorado Plateau/Great Basin Grassland (CPGB)

Table B-17. Seral state class descriptions for Colorado Plateau/Great Basin grassland

State	Description
A	High seral: perennial grasses, shrub/tree cover <10%, grass cover >30%
B	Mid-seral; perennial mixed grasses, tree/shrub cover <10%, grass cover <10%, includes post-fire plant communities previously high seral
C	Low-mid seral; perennial mixed grasses, shrub/tree cover ≥10%, grass cover ≥10%
D, E, F	Low-seral; ruderal/exotic grasses and forbs; Shrub and tree invaded[2]

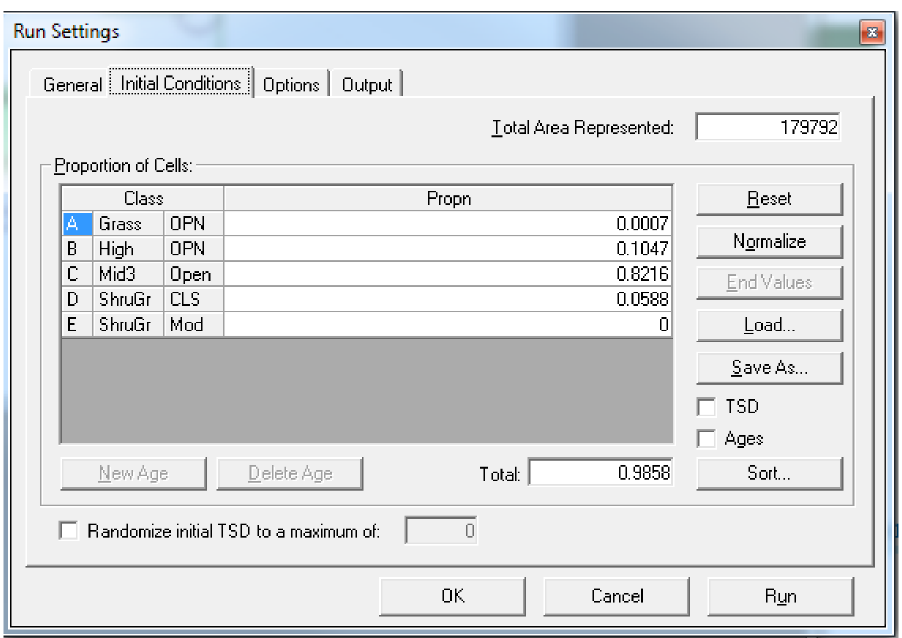


Figure B-35. Colorado Plateau/Great Basin grassland initial conditions

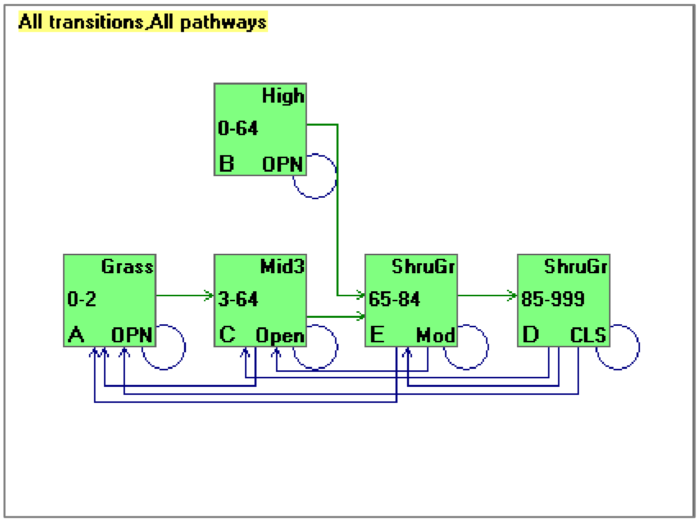


Figure B-36. Colorado Plateau/Great Basin grassland transition pathways

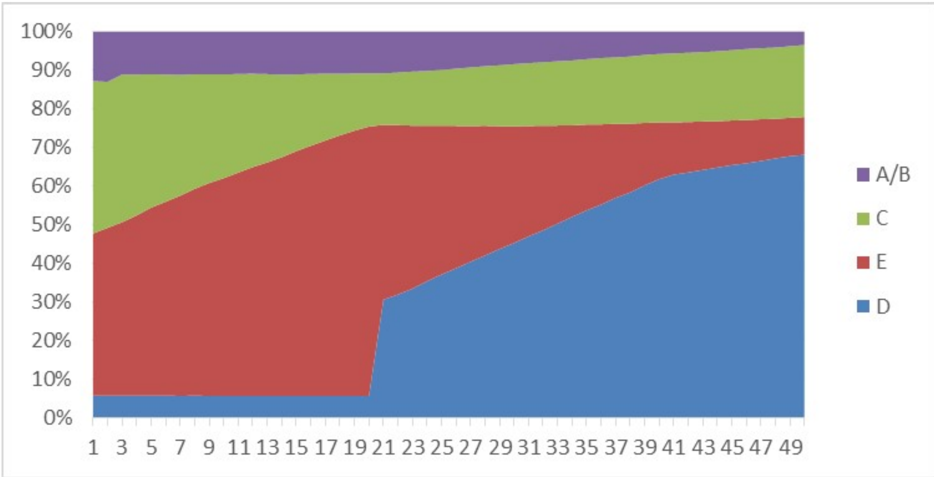


Figure B-37. Model output for Colorado Plateau/Great Basin grassland, alternative 1

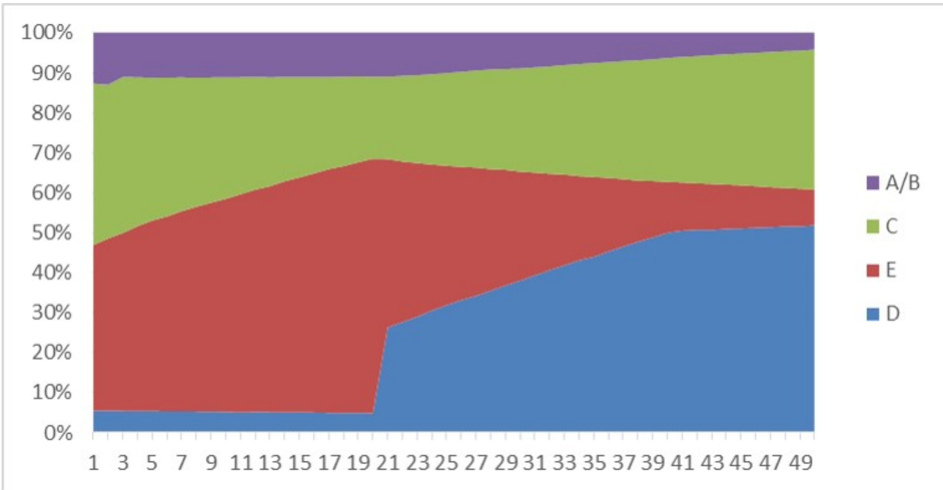


Figure B-38. Model output for Colorado Plateau/Great Basin grassland, alternative 2

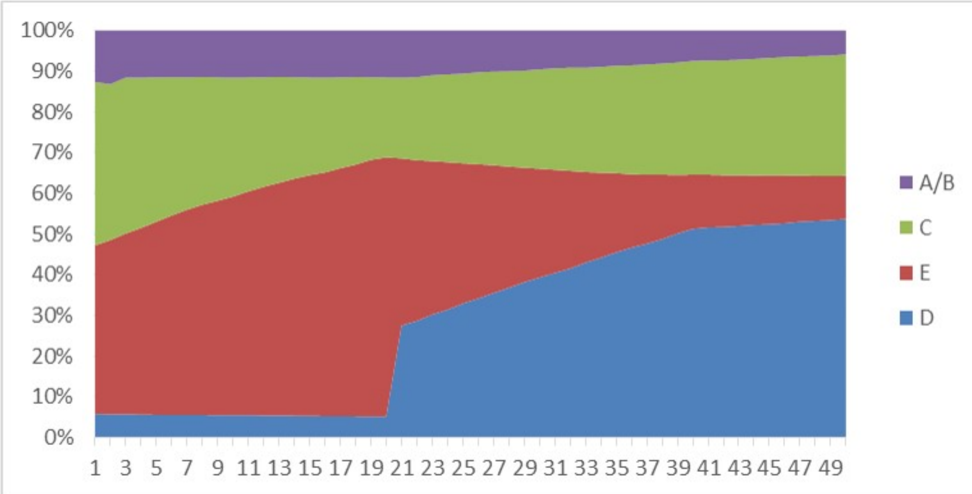


Figure B-39. Model output for Colorado Plateau/Great Basin grassland, alternative 3

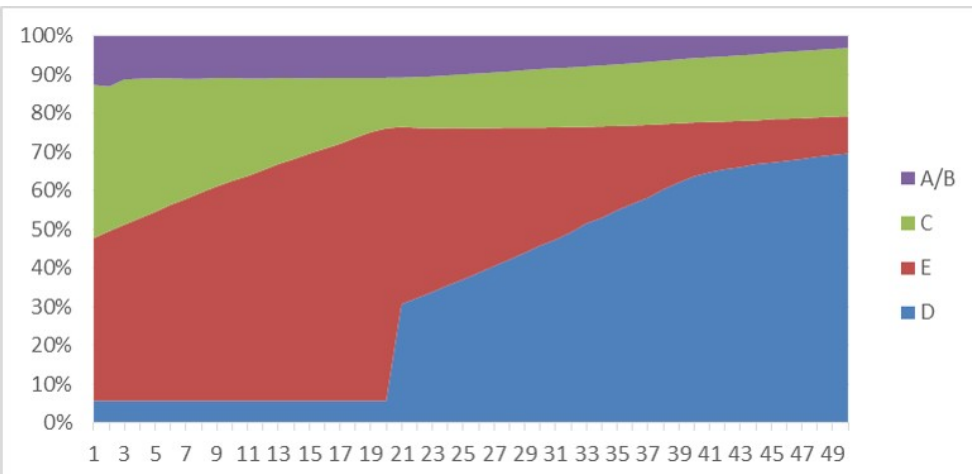


Figure B-40. Model output for Colorado Plateau/Great Basin grassland, alternative 4

Montane Subalpine Grassland (MSG)

Table B-18. Seral state class descriptions for montane subalpine grassland

State	Description
A	Low-seral - recently burned; sparsely vegetated; grass cover <10%
B, C	Mid and High seral - all grass and forb types; shrub & tree cover <10%, grass cover >10%
D*	Tree and/or shrub invaded
E*	Ruderal, Kentucky Bluegrass

* Contemporary landscapes only; historically rare or localized.

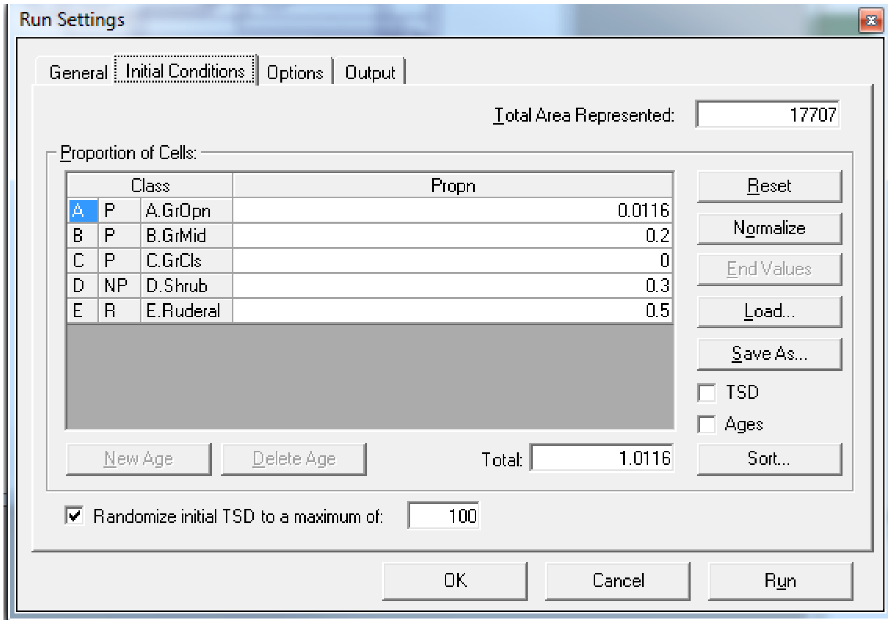


Figure B-41. Montane subalpine grassland initial conditions

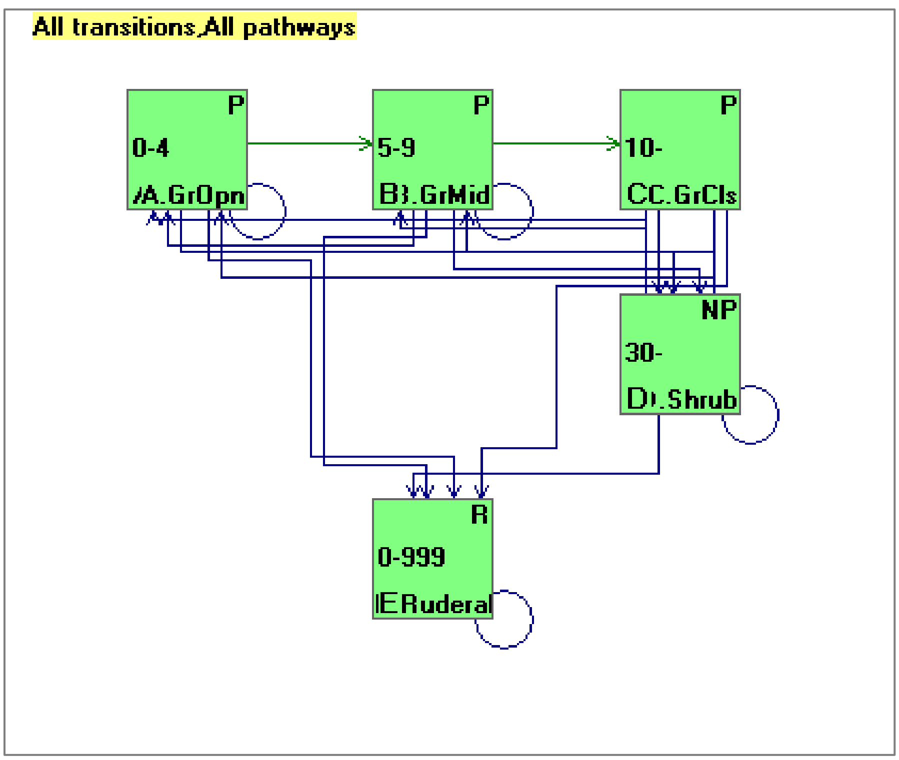


Figure B-42. Montane subalpine grassland transition pathways

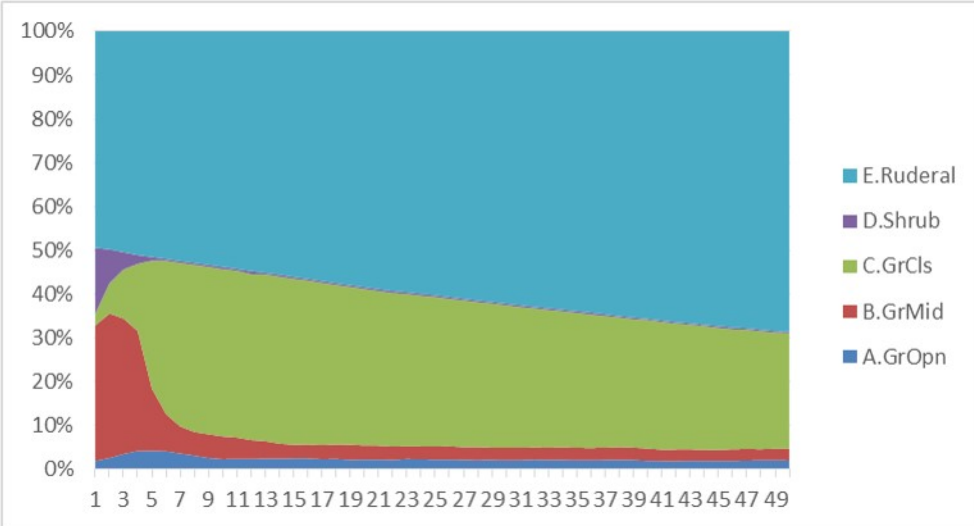


Figure B-43. Model output for montane subalpine grassland seral state class distribution for all alternatives

Sagebrush Shrubland (SAGE)

Table B-19. Seral state class descriptions for sagebrush shrubland

State	Description
A	Recently burned; All grass and forb types; sparsely vegetated
B	All closed cover shrub types
C D	Mid open cover shrub types Late open cover shrub types
E*	Tree invaded

* Contemporary landscapes only; historically rare or localized.

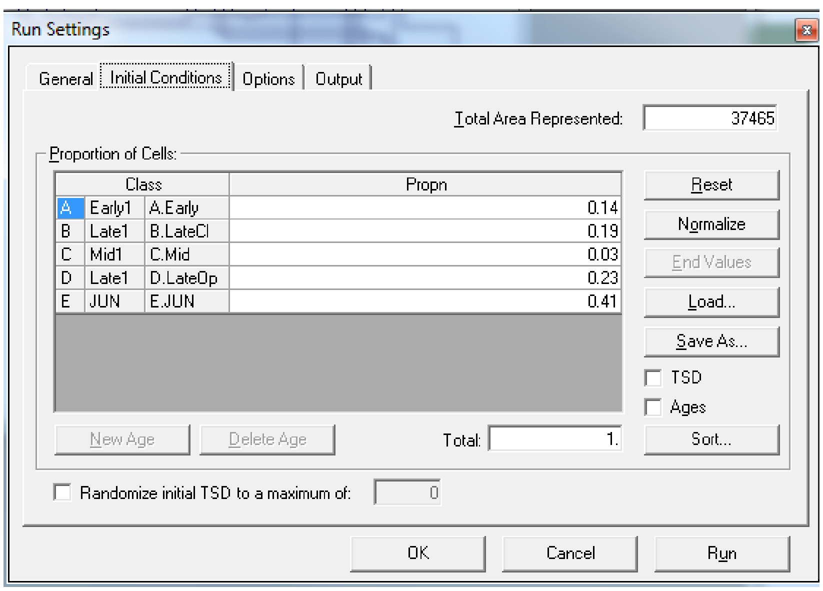


Figure B-44. Sagebrush shrubland initial conditions

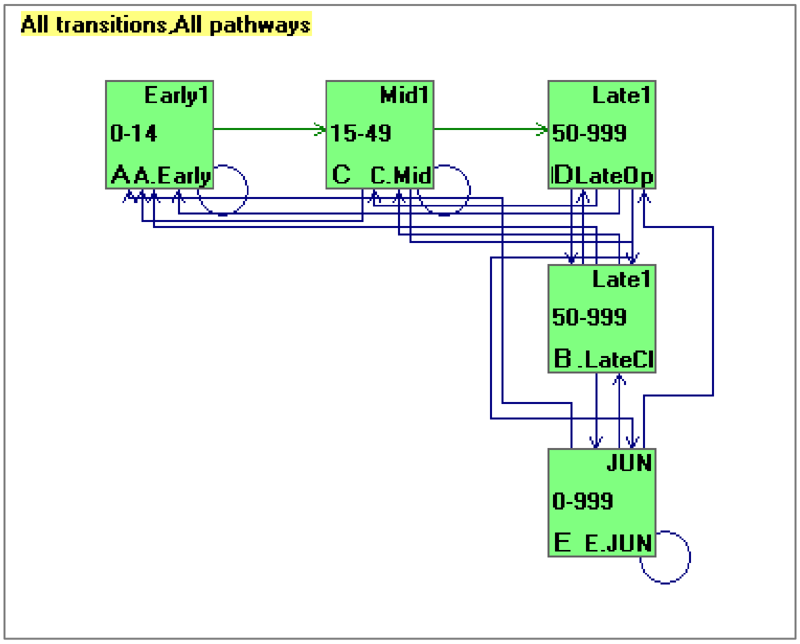


Figure B-45. Sagebrush shrubland transition pathways

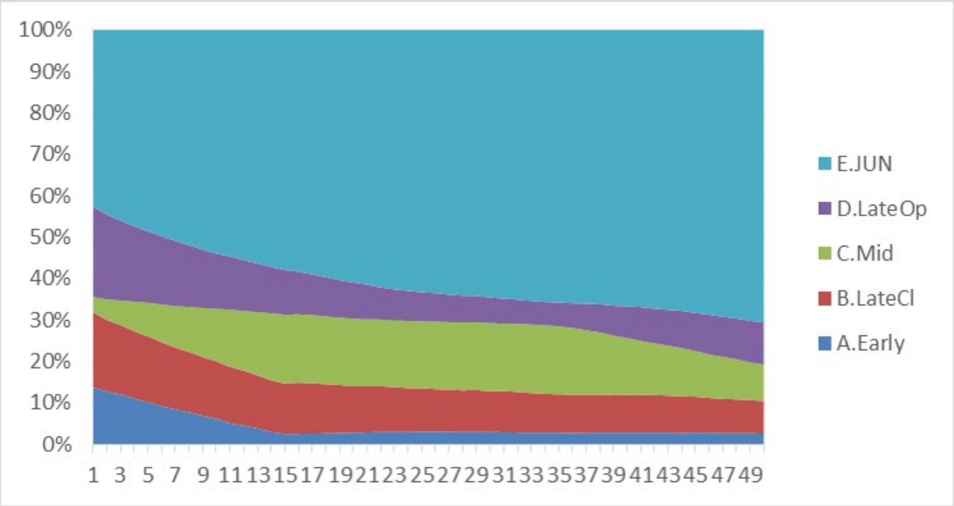


Figure B-46. Model output for sagebrush shrubland seral state class distribution, alternative 1

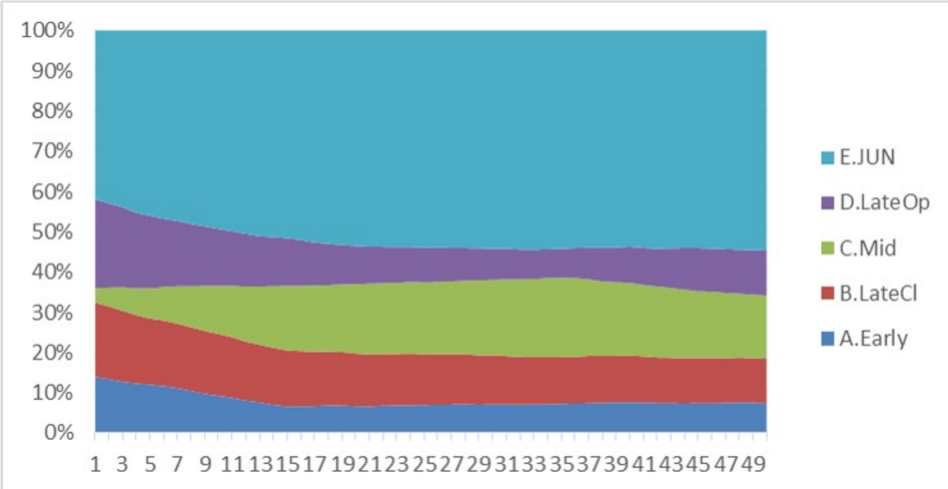


Figure B-47. Model output for sagebrush shrubland seral state class distribution, alternative 2

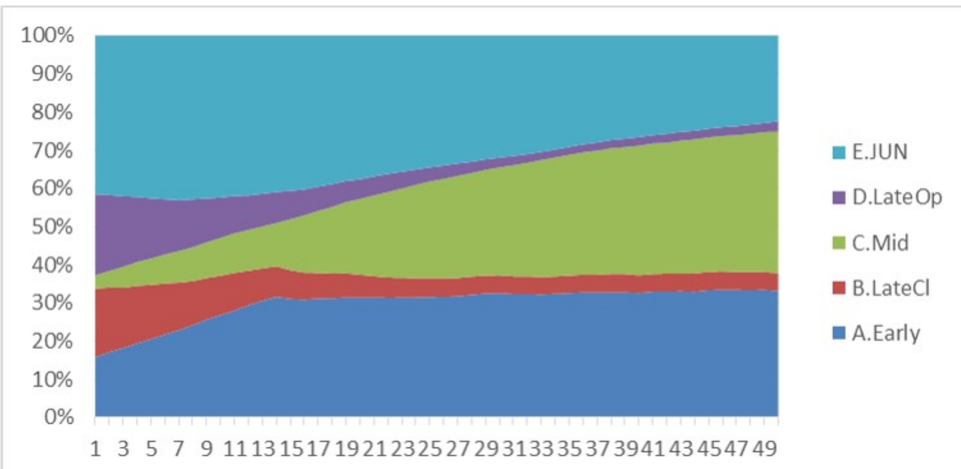


Figure B-48. Model output for sagebrush shrubland seral state class distribution, alternative 3

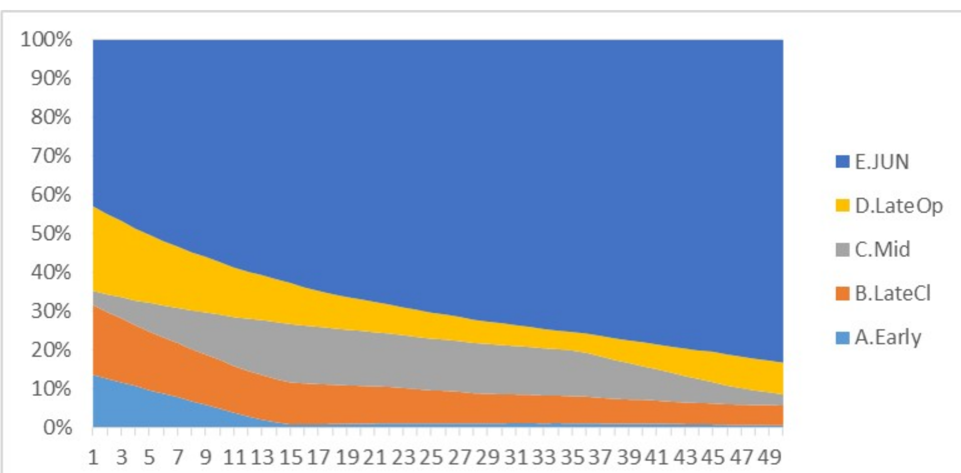


Figure B-49. Model output for sagebrush shrubland seral state class distribution, alternative 4

Watersheds and Water Resources

Watersheds and subwatersheds

Throughout the Watersheds and Water Resources section, the term "subwatershed" is used to describe a particular watershed size (approximately 10,000 to 40,000 acres), defined by the national Watershed Boundary Dataset. Sub-watersheds are numbered with a unique 12-digit code and are nested within consecutively nested watersheds, sub-basins, basins, sub-regions and regions. Within the Watersheds and Water resources section, the term "watershed" is loosely used to refer to the concept of a watershed unit, of any size.

Percentages

Throughout the Watersheds and Water Resources section, the percentage of a watershed (by area) is used to convey the potential effect an activity or disturbance might have on the resource conditions within that watershed; the greater the percentage of watershed area affected, the more likely an effect will be significant. The percentage of a watershed affected is calculated by taking the area (in acres) of an activity within the watershed and dividing it by the area (in acres) of the entire watershed.

Several analyses describe the percentage of features (e.g., stream miles) within a specific category (e.g., properly functioning condition). These statistics were generated by taking the number within a category and dividing them by the total number in the forest, or the total number assessed. Each analysis should describe the specific units used to generate the statistic.

Datasets used include the following Forest Service corporate (Spatial Database Engine) ArcGIS feature classes:

- S_R03_SFE.Subwatershed
- S_R03_SFE.Water_Body
- S_R03_SFE.Road
- S_R03_SFE_TravelRoute_Ln
- S_R03_SFE.SurfaceOwnership
- WCC_WBDHU12_20160405 (Watershed Condition Classification)
- NHD_Flowline

Watershed Condition Framework

Watershed condition is the state of the physical and biological processes within a watershed; these processes affect soil condition and hydrologic function, which in turn support ecosystems. The watershed condition framework, an analysis methodology the Forest Service developed, classifies the state of all NFS watersheds and provides guidance to help national forests evaluate, prioritize, and measure the progress of restoration within watersheds (USDA Forest Service 2011a and 2011b; Potyondy and Geier 2011). The watershed condition classifications are defined as follows:

- Class 1 (properly functioning) – Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and they are functioning properly.
- Class 2 (functioning at risk) – Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and they are functioning, but at risk.
- Class 3 (impaired function) – Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and their function is impaired.

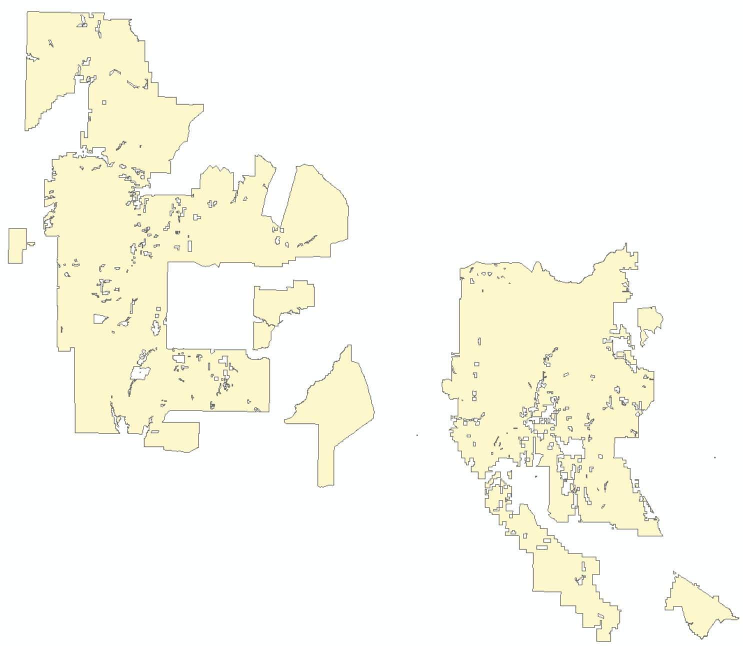
One hundred sixteen subwatersheds that overlap the Santa Fe NF were classified by the watershed condition framework in 2015; the other 26 subwatersheds contain relatively small portions of the forest and were, therefore, not classified.

Results of the 2015 watershed condition assessment show 6 percent of the forest's subwatersheds are considered to be functioning properly, 88 percent are functioning at risk, and 6 percent are considered impaired. These numbers were generated by dividing the number of subwatersheds in a classification (e.g., properly functioning) and dividing them by the number of analyzed watersheds (116).

Hydrologic Features in the Santa Fe NF

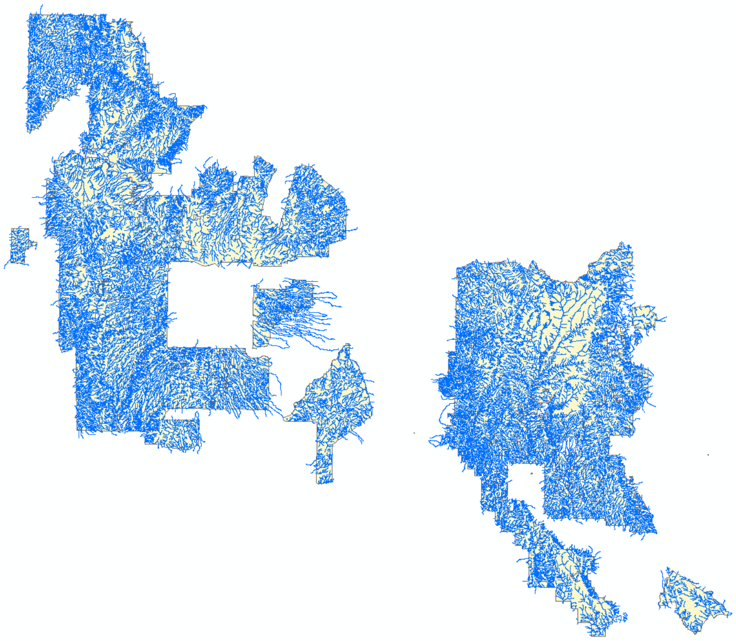
Miles of rivers and streams and number of water bodies were calculated using the forest's corporate hydrologic GIS data. Miles and numbers were calculated by clipping the appropriate GIS layer with the Santa Fe NF boundary and re-calculating the geometry and/or counting the number of features in the new layer.

The following shows how (GIS process) we determined the number of stream miles in the Santa Fe NF.

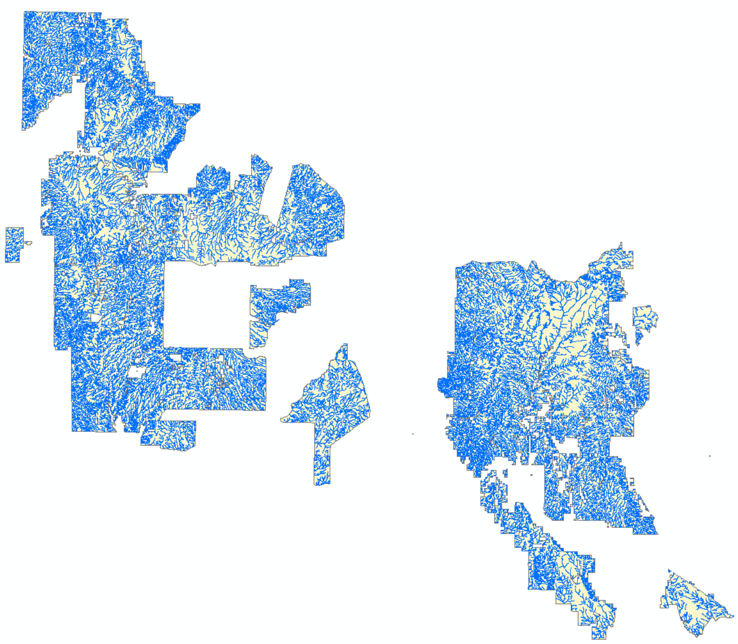


1. Use the Surface Ownership layer to select only the lands classified as Santa Fe NF. Export the selection to a new shapefile showing only lands managed by the Santa Fe NF.

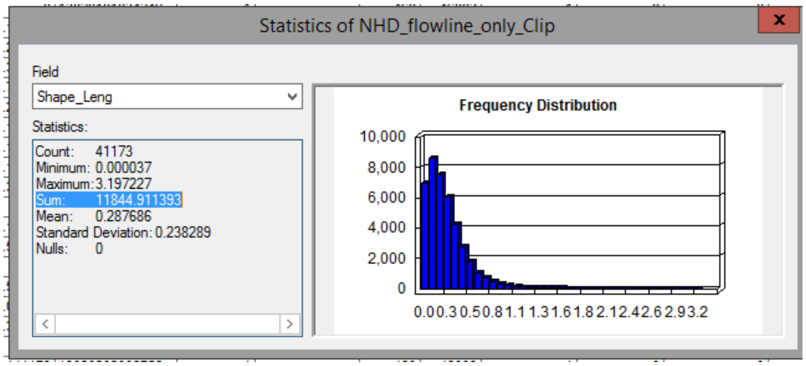
2. Take the NHD Flowline feature class, select all streamlines, and export the selection as a new shapefile.



3. Clip the new streamlines shapefile with the Santa Fe NF land.



4. Within the shapefile that represents only streams on Santa Fe NF land, calculate the geometry (length in miles) of each stream segment. Sum the miles calculated. There are 11,844.9 miles of stream channel (perennial, intermittent, and ephemeral) in the Santa Fe NF.



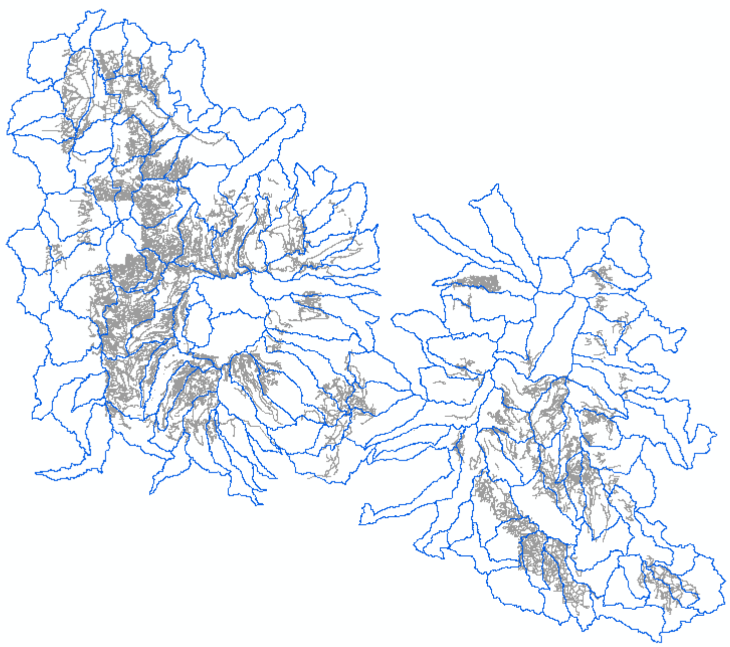
5. When one selects for major stream channels (excludes minor topographic crenulations), the number of miles of stream channel in the Santa Fe NF shrinks to 5,677.

Road Density

Road density is calculated by summing the miles of road within a subwatershed and dividing the sum by the total square miles of the watershed. Where road density is greater than 1 mile of road per square mile of watershed, water resources and watershed condition may be adversely affected.

The following shows how (GIS process) we calculated road density in the Santa Fe NF:

1. Overlay the Road feature class (displays all roads managed by the Santa Fe National Forest) on the layer of subwatersheds which overlap the Santa Fe NF.



2. Use the identity tool to attribute each road segment with the name of the subwatershed within which it is located.
3. Sum miles of road by watershed; to do this, calculate the clipped miles of road, export the attribute table to (as text) and import to Microsoft Excel; use a Pivot table to sum the miles of road by watershed.
4. To further summarize the results, road densities (mi/mi^2) were put into bins (<1, 1-2.4, 2.4-3, 3-4, 4-5, >5), and the number of subwatersheds per bin were counted (using the Histogram tool within

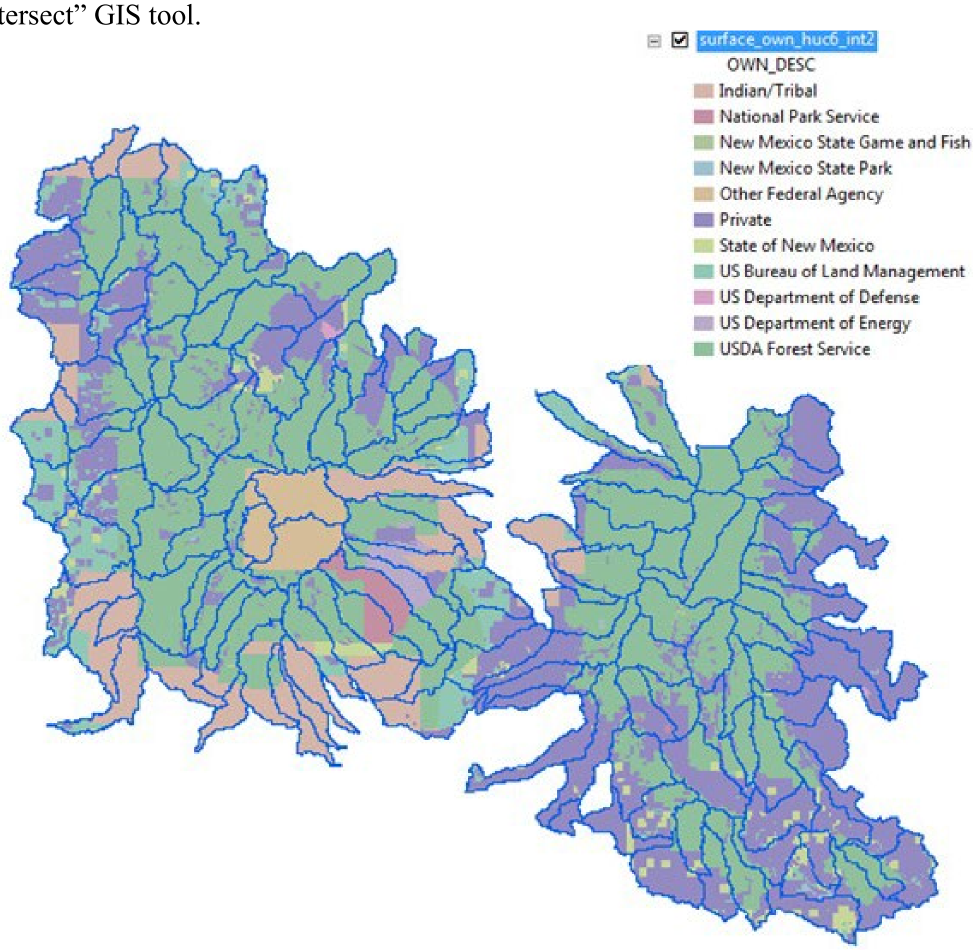
the Data Analysis add-in). Table 39 in the Watersheds and Water Resources "Affected Environment" section in FEIS volume 1 displays the results only for Forest Service maintenance level (ML) roads 2 through 5, meaning some road miles were excluded from the table. The process described above, however, is accurate.

Majority Land Managers within Sub-Watersheds

The cumulative effects analysis was given context through an assessment of the number of watersheds (that overlap the Santa Fe NF; 142) that are under majority management by a single entity (e.g., tribal, Federal, State, county, private). Watersheds managed predominantly by the Santa Fe NF are less likely to incur adverse cumulative effects by management actions occurring on lands of other ownership, while watersheds with little forest land, and those under mixed management are most likely to have adverse cumulative effects to water resources.

We completed the analysis as follows:

1. A subwatershed GIS layer and a regional surface ownership GIS layer were intersected using the "intersect" GIS tool.



2. The number of acres owned per group and subwatershed were then calculated by exporting the resulting "intersect" layer's data table into Microsoft Excel. A pivot table was used to sum land ownership by subwatershed.
3. The sum of owned acres by group (and subwatershed) were then divided by their respective total subwatershed acres to determine the percentage of ownership.

Ownership was categorized into three groups: subwatersheds in which 80 percent or more of the land is managed by a single owner, subwatershed in which the majority owner manages 50 to 80 percent of the land, and subwatersheds that lack a majority landowner (i.e., all owners manage less than 50 percent of the subwatershed area).

4. The number of subwatersheds, per owner, and per ownership category were counted and compared with the total number of subwatersheds (142) that overlap the Santa Fe NF; the purpose of which is to illuminate the number of watersheds in which the national forest has the most influence, and therefore, how likely other land managers are to contribute cumulative watershed effects. For example, the Santa Fe NF is the large majority land manager (>80 percent area) of only 26 percent of the watersheds it occupies.

Wildlife, Fish, and Plants

See appendix D: Documentation of the Analysis of At-Risk Species.

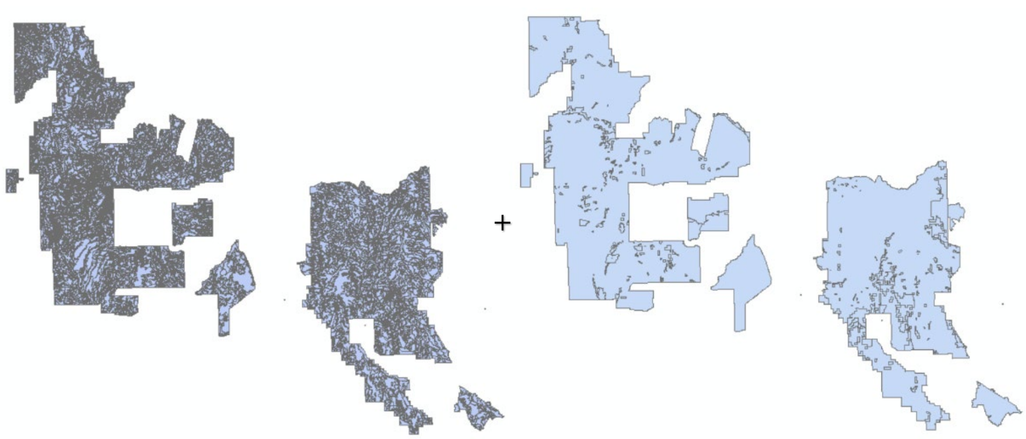
Soils

Terrestrial Ecosystem Survey

The Soils resource section used soil data and interpretations described in the Terrestrial Ecosystem Survey (TES) of the Santa Fe National Forest (Miller et al. 1993). The TES mapped 209 terrestrial ecosystems comprising various combinations of soils, miscellaneous areas, and vegetation communities. The first major TES component (0.1) was used in the soil analysis, except when the first component was a miscellaneous area (e.g., rock outcrop, badland, rubbleland, or riverwash). If the first major component of a TES map unit was a miscellaneous area, then the second major component (0.2) was analyzed. The TES map units were the primary source for developing the ERUs. Each ERU was analyzed to see whether soil condition would trend toward or away from desired conditions, or remain static with the implementation of treatments by alternatives. The analysis of each ERU was based on Vegetative Dynamic Digital Tracking (VDDT) modeling results for each vegetation type. The input was the range of acres proposed for treatment by alternative (low, middle, or high acreage).

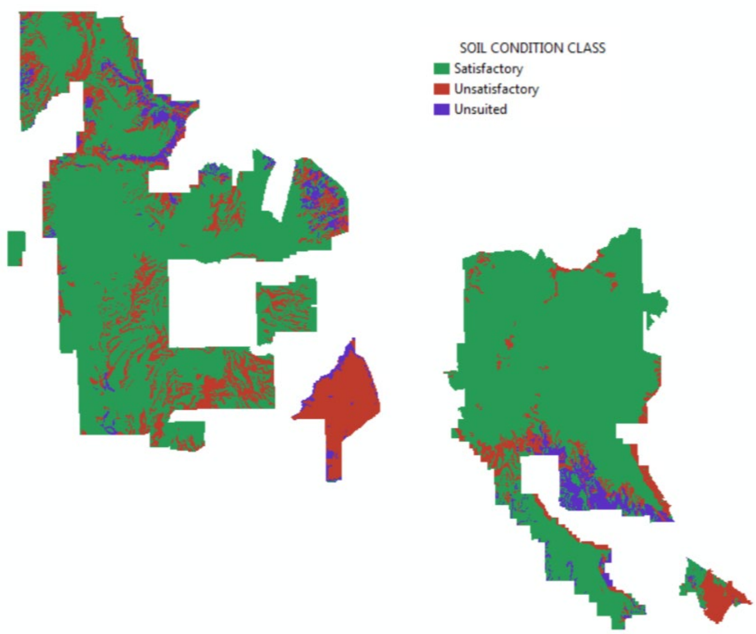
The GIS process for adding the TES soil properties layer to ERU layer:

1. These data represent an intersection between ERU_Subsection_ForestScale_UpdateAspen_UpdateRMAP_20150618 and SurfaceOwnershipDissolve to create the ERU_Ownership_Intersect_20180206:



The ERU_Ownership_Intersect_20180206 layer GIS Acres would have been recalculated to reflect the ownership layer.

2. The TEU_Interps_SoilProperties_NoVCNP layer contains soil condition class properties.



3. The ERU_Ownership_Intersect_20180206 and TEU_Interps_SoilProperties_NoVCNP layers were interested to create the ERU_TEU_SoilProperties_AllOwnership_intersect_20180206 used in soil analysis process.

Percentages

The soil condition and ground cover percentages are used to determine current condition and to recognize the potential effects from management activities or disturbances on the soil. The ERU layer was updated with the TES interpretation soil property layer (TEU_Interps_SoilProperties_NoVCNP) in GIS to get the acres of soil condition classes by ERU that are under Forest Service management. The percentage of each soil condition class (satisfactory, impaired, unsatisfactory, or unsuited) for each ERU at the plan scale were calculated using the following formula (an example of the calculation is shown in Table B-20):

$$Soil\ Condition\ class\ \% = \frac{TES\ Acres\ for\ soil\ condition\ class}{Total\ ERU\ Acres}$$

Table B-20. Example of GIS acres from a pivot table with the soil condition class percentages calculated for each ERU in the Santa Fe NF

ERU Code	ERU	Soil Condition Class	FS_OWN_CODE	Acres	Percentage
ALP	Alpine and Tundra	Satisfactory	USFS	954.605	16%
		Unsatisfactory	USFS	5,010.508	84%
	Alpine and Tundra Total			**5,965.113**	**100%**
CPGP	Colorado Plateau / Great Basin Grassland	Satisfactory	USFS	26,875.01	71%
		Unsatisfactory	USFS	10,956.58	29%
	Colorado Plateau / Great Basin Grassland Total			**37,831.59**	**100%**
R1900	Herbaceous (wetland)	Satisfactory	USFS	11,565.57	100%
		Unsatisfactory	USFS	28.3716	0%
	Herbaceous (wetland) Total			**11,593.95**	**100%**
JUG	**Juniper Grass**	Satisfactory	USFS	49,956.66	55%
		Unsatisfactory	USFS	6,788.058	7%
		Unsuited	USFS	34,225.29	38%
	Juniper Grass Total			**90,970.01**	**100%**

We derived the percentage of ground cover (rock fragment, bare soil, litter, and vegetation basal area) from TES map units for each ERU. Original results can be found in Table 7 on page 27 of the Assessment Volume 1, Ecological Report for the upland ERUs (USDA Forest Service 2016a). For the riparian ERUs, the map unit weighted average raw data were used at the plan scale. The current and natural ground cover percentages were used to calculate the departure rate from desired conditions. We calculated the departure rate for ground cover types using the following formula:

$$Departure\ Rate\ for\ each\ ground\ cover\ type = 1 - \left(\frac{Current\ Ground\ Cover}{Natural\ Ground\ Cover}\right)$$

We determined the current rate of departure from desired conditions by the average of bare soil and litter departure rates for each ERU (Table B-20). The scale of departure for the ground cover analysis is the same as the vegetation analysis (see Vegetation section above, page 192).

Table B-21. Current ground cover (bare soil and litter) departure from desired condition by ERU

ERU Code	ERU	Bare Soil and Litter Ave	Current Departure from Desired Conditions
	Upland ERUs		
ALP	Alpine and Tundra	42%	Moderate
CPGB	Colorado Plateau / Great Basin Grassland	40%	Moderate
JUG	Juniper Grass	19%	Low
MCD	Mixed Conifer - Frequent Fire	18%	Low
MCW	Mixed Conifer w/ Aspen	34%	Moderate
MSG	Montane / Subalpine Grassland	37%	Moderate
PJG	Pinyon Juniper Grass	48%	Moderate
PJS	Pinyon Juniper Sagebrush	50%	Moderate
PJO	Pinyon Juniper Woodland	30%	Low
PPF	Ponderosa Pine Forest	7%	Low
SAGE	Sagebrush Shrubland	74%	High
SFF	Spruce-Fir Forest	25%	Low
	Riparian ERUs		
R1900	RMAP Herbaceous	39%	Moderate
R2300	RMAP Narrowleaf Cottonwood / Shrub	21%	Low
R2600	RMAP Rio Grande Cottonwood / Shrub	33%	Low
R2800	RMAP Upper Montane Conifer / Willow	15%	Low
R2900	RMAP Willow - Thinleaf Alder	28%	Low
R3500	RMAP Ponderosa Pine / Willow	17%	Low

Predicting Trends

No models are currently available to predict trends and future foreseeable conditions for soil resources, in particular, soil condition, soil productivity, or soil organic matter. However, qualitative inferences can be made and estimated, which provide insight into future soil conditions primarily by using knowledge about present disturbances and their effect on erosion processes, soil compaction, and nutrient cycling. We based projected trends in soil condition on estimates of the relative change in soil erosion, soil compaction, and soil nutrient cycling by alternative combined with the projected future vegetation conditions derived from the VDDT models. These estimates use vegetative ground cover and herbaceous understory as indicators to determine the change in soil condition. Dominant vegetation, tree density, and canopy cover affect ground cover conditions. Where mechanical treatments are proposed, herbaceous understory would improve along with soil condition. Therefore, predicted improvements in soil condition from implementing treatments modeled by VDDT are made. We inferred future conditions and trend based on current knowledge of how canopy cover (and ecological state) presently affects these key soil components.

We have not quantified the biological soil crusts in any detail. However, a qualitative summary may be useful in describing existing conditions and the ecological role of crusts in disturbed ecosystems. Current composition and density of soil crusts have not been inventoried, trends can only be inferred based on current and projected management impacts that have been shown in research to alter populations of soil crusts.

Air

Consume, version 4.2, was used to model smoke emissions from the three alternatives and the no-action-current plan. Consume is a fuels model commonly used to estimate smoke emissions. The version of Consume used is included within a software application Fuel and Fire Tools v. 2.0, which integrates Fuel Characteristics Classification System (FCCS), Consume, Fire Emissions Production Simulator, Pile Calculator, and Digital Photo Series into a single user interface (USDA Forest Service 2015). Basic input data, such as fuel types, the type of fire (prescribed fire or wildfire), the condition of the unit (has it been mechanically treated), and environmental conditions (fuel moisture) are entered into the model. The model then estimates emissions for a variety of pollutants, such as $PM_{2.5}$ and carbon dioxide.

For this analysis, the alternatives were modeled based on median objectives for treatment among alternatives over 10 years, as well as the 10-year average of accomplishments for the no-action alternative (current plan). Median acres of three main fuel types: dry mixed conifer, ponderosa pine, and non-forested, were modeled for each alternative. Alternatives were varied by acres for prescribed fire and those acres that were harvested and then treated with prescribed fire, and wildfire. Fuel moistures were used consistent with conditions in which prescribed fire or wildfires would take place. For each fuel type, it was assumed that fire suppression and grazing had affected the fuel loads, by increasing the standing biomass in each fuel type, from a natural fire regime that would have reduced the biomass available to burn. A complete set of assumptions and outputs for all pollutants modeled are listed below.

Ecological Response Units Assumptions:

The following ERUs were modeled to represent common ERUs with treatment objectives. The fuel loadings were based on values in the Fuel Characteristics Classification System, which stores and classifies fuels data as fuelbeds and calculates fuel loadings, carbon and other summary fuel characteristics.

- **Dry Mixed Conifer was modeled as Fuel Characteristics Classification System #34- Interior Douglas Fir-Ponderosa Pine/Gambel Oak.** This fuelbed represents mixed Douglas-fir and ponderosa pine conifer forests of the Southwest. Fire exclusion has created hazardous fuel conditions.
- **Ponderosa Pine Forest was modeled as Fuel Characteristics Classification System Fuelbed #211- Interior Ponderosa Pine Forest.** Interior West ponderosa pine forest with dense thickets of ponderosa pine. This fuelbed was developed based on data from Grand Canyon National Park.
- **Non-Forest- includes Piñon Juniper Grassland and Mountain Mahogany Mixed Shrubland modeled as Fuel Characteristics Classification System Fuelbed #30- Turbinella oak-alderleaf mountain mahogany shrubland.** This fuelbed represents Arizona chaparral that exists on over 3 million acres of mid-elevation foothills, mountain slopes, and canyons in Nevada, Arizona, New Mexico, and Texas. It usually occurs at elevations of 3,000 to 6,000 feet and borders oak woodlands, piñon-juniper woodlands, and grasslands.

Table B-22. Fuel loading assumptions for FCCS Fuelbeds #34, #211, and #30

Fuels	Dry Mixed Conifer		Ponderosa Pine Forest		Non-Forested	
1-hr	0.1	Tons/acre	0.1	Tons/acre	0.1	Tons/acre
10-hr	1.5	Tons/acre	0.5	Tons/acre	0.3	Tons/acre
100-hr	4	Tons/acre	0.9	Tons/acre	0	Tons/acre
1,000-hr	2	Tons/acre	0.4	Tons/acre	0	Tons/acre
10,000-hr	3	Tons/acre	1.2	Tons/acre	0	Tons/acre
>10,000-hr	5	Tons/acre	0	Tons/acre	0	Tons/acre
Total Sound Woody	**15.6**	**Tons/acre**	**3.1**	**Tons/acre**	**0.4**	**Tons/acre**
Duff Depth	1	inch	0.5	inch	0.2	inch
Canopy	4.34	Tons/acre	7.24	Tons/acre	0	Tons/acre
Shrubs	0.88	Tons/acre	0.1	Tons/acre	2.03	Tons/acre
Grasses	0.14	Tons/acre	0.09	Tons/acre	0.08	Tons/acre
Litter	0.06	Tons/acre	0.02	Tons/acre	0.02	Tons/acre
Rotten	3.5	Tons/acre	0.7	Tons/acre	0	Tons/acre
Total Above Ground	**8.92**	**Tons/acre**	**8.15**	**Tons/acre**	**2.13**	**Tons/acre**
Total Fuel Loading	**36.64**	**Tons/acre**	**17.13**	**Tons/acre**	**4.95**	**Tons/acre**

Table B-23. Consume assumptions

Rx Only - this scenario includes areas that are only subject to prescribed fire, no previous mechanical treatments.			
Fuel Moisture	10-hr	1,000-hr	Duff
Dry Mixed Conifer	9%	15%	70%
Ponderosa Pine Forest	9%	15%	70%
Non-Forested	9%	15%	70%
Canopy Consumption	Canopy Consumption	Shrub Consumption	
Dry Mixed Conifer	15%	0%	
Ponderosa Pine Forest	15%	0%	
Non-Forested	0%	0%	
Rx and Mechanical Treatment - this scenario includes areas that are treated mechanically before they are burned.			
Fuel Moisture	10-hr	1,000-hr	Duff
Dry Mixed Conifer	9%	15%	70%
Ponderosa Pine Forest	9%	15%	70%
Non-Forested	9%	15%	70%
Canopy Consumption	Canopy Consumption	Shrub Consumption	
Dry Mixed Conifer	5%	0%	
Ponderosa Pine Forest	5%	0%	
Non-Forested	0%	0%	
Wildfire			
Fuel Moisture	10-hr	1,000-hr	Duff
Dry Mixed Conifer	6%	8%	25%
Ponderosa Pine Forest	6%	8%	25%
Non-Forested	6%	8%	25%
Canopy Consumption	Canopy Consumption	Shrub Consumption	
Dry Mixed Conifer	30%	30%	
Ponderosa Pine Forest	30%	30%	
Non-Forested			
Wildfire Severity			
ERU	% low severity	% moderate	% high
Dry Mixed Conifer	67%	20%	12%
Ponderosa Pine Forest	87%	9%	4%
Non-Forested	96%	4%	0%

Alternative Assumptions:

For this analysis, the alternatives were modeled based on median objectives for treatment between alternatives over 10 years, as well as the 10-year average of accomplishments for no action (current plan) (see table below). Median acres of three main fuel types: dry mixed conifer, ponderosa pine, and non-forested, were modeled for each alternative.

Assumptions:

- All alternatives – Average treatment over 10 years.
- Alternative 1 (no action) based on 10-year average from 2007 through 2017 (assuming 50/50 split between prescribed fire and wildfire).
- Alternatives 2 and 3 – it was assumed that there was a 50/50 split in acres treated between fire and prescribed fire.
- Alternative 4 assumed that there were no prescribed fire acres.
- All alternatives assumed that all mechanical acres are burned, except in alternative 4.

Table B-24. Median acres modeled for $PM_{2.5}$ and CO_2 emissions

Alternative 1	**No Action/Current Plan**		
	Mechanical	**Rx**	**Wildfire**
Dry Mixed Conifer	20,470	11,290	11,290
Ponderosa Pine	24,840	22,060	22,060
Non-Forest	4,160	11,510	11,510
Alternative 2	**Ecological health & multiple uses**		
	Mechanical	**Rx**	**Wildfire**
Dry Mixed Conifer	45,000	62,500	62,500
Ponderosa Pine	57,500	100,000	100,000
Non-Forest	26,250	13,450	13,450
Alternative 3	**Natural Forces Dominate**		
	Mechanical	**Rx**	**Wildfire**
Dry Mixed Conifer	20,000	225000	225000
Ponderosa Pine	22,000	287500	287500
Non-Forest	400	61250	61250
Alternative 4	**Human Uses Dominate**		
	Mechanical	**Rx**	**Wildfire**
Dry Mixed Conifer	200,000	-	25,000
Ponderosa Pine	155,000	-	23,000
Non-Forest	122,500	-	12,400

Livestock Emissions:

Emissions from livestock were found to be a relatively small source of emissions from the forest (an estimated equivalent to 0.04 percent of greenhouse gas emissions from fire over a 10-year average).

Table B-25. Livestock emissions by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
AUM min	64,339	66,229	61,429	63,877
AUM max	93,500	102,192	71,616	89,711
AUM avg	78,920	84,211	66,523	76,824
Tons CH4 min	383	394	366	380
Tons CH4 max	557	608	426	534
Tons CH4 avg	470	501	396	457
Equivalent Tons CO2 min	7,661	7,886	7,314	7,606
Equivalent Tons CO2 max	11,133	12,168	8,527	10,682
Equivalent Tons CO2 avg	9,397	10,027	7,921	9,147
10 year average % comp fire	0.04%	0.04%	0.03%	0.04%
Change from Current (Alt 1) in Equivalent Tons CO2 avg		*-630*	*1,476*	*250*

* assumed worst case scenario is that a cow grazing on grass produces approximately 300 g CH4/day (141±147 g CH4/day-cow). From: McGinn, S.M., Turner, D., Tomkins, N., Charmley, E., Bishop-Hurley, G. and Chen, D. (2011), Methane Emissions from Grazing Cattle Using Point-Source Dispersion. J. Environ. Qual., 40: 22-27. doi:10.2134/jeq2010.0239

Cultural Resources and Archaeology

Data Used in Analysis of Effects to Cultural Resources and Archaeology

Analysis of effects to cultural resources relies primarily on previous cultural resources compliance work and archaeological research conducted in the forest. The summary of the existing condition relied upon the description of resources presented in *A Study of Pre-Columbian and Historic Uses of the Santa Fe National Forest: Competition and Alliance in the Northern Rio Grande: The Archeological and Historical Cultural Resources* (Edited by C.L. Scheick 1996). This document provided the context for discussing the type, character, density, and number of cultural resources in the forest.

Since the initiation of the Heritage program in the Santa Fe NF, the program has maintained two datasets fundamental to managing cultural resources and archaeology in the forest. These include a dataset tracking and inventorying activities or projects in the forest and a dataset documenting cultural resources and archaeology or sites. Initially, these datasets were tracked as data layers on Mylar overlays. These data were converted in the early 2000s into a digital Geographic Information System (GIS) database. Since that time, the forest maintains a periodically updated tabular and spatial data in the Natural Resource Manager in the Heritage application as well as a corporate GIS database with layers for projects and cultural resources. The data for this analysis were current as of March 2018. Of the two corporate layers the effects analysis used the cultural resources layer maintained by the forest to analyze effects associated with vegetation treatments and visitation. The cultural resource data included in the analysis are the spatial data in the format of shapefiles that could be manipulated using ArcMap. The cultural resources layer is not a public layer and is not generally available for public distribution under the requirements of the Archaeological Resources Protection Act (36 CFR 296.18), the National Historic Preservation Act (36 CFR 800.11c and FSM 2368.1).

For the analysis of effects to cultural resources from vegetation management, the forest used the ERU, and a distinction was made between those ERUs associated objectives in the forest plan and those ERUs without objectives. The data used for the ERUs included the spatial data in the format of shapefiles that could be manipulated using ESRI ArcMap.

For the analysis of effects to cultural resources from visitation, the forest used the motor vehicle use map (MVUM) layer for motorized travel and state highways. The data used was the spatial data for Travel Management in the format of a shapefile that could be manipulated using ESRI ArcMap.

Methods

For determining effects to cultural resources associated with vegetation treatments, the first step was to create a map in ESRI ArcMap on the CITRIX server. The next step was to add the administrative boundary of the forest, the corporate cultural resource layer and the ERU layer from the GIS database in the forest. Once those layers were added to a base map of 1:24,000 quadrangle maps the Geoprocessing tool (Dissolve and Intersect) was used to summarize the GIS data with the intent to display the number of times cultural resources intersected with individual ERUs. In some cases, cultural resources overlapped one or more separate ERUs. For example, in an ecotone there might be a cultural resource that overlies both the ponderosa pine forest and piñon juniper grass ERUs. The tables in the effects analysis portray the summarization of these data for the intersection of cultural resources (sites) occurrences for each of the ERUs. Two separate layers were created including one for cultural resource intersections with ERUs with objective and one for cultural resource intersections with ERUs without objectives. Once the Geoprocessing was completed, the data in the attribute tables for the intersection of cultural resources and ERUs were summarized using the attribute table Summarize function. In the case of ERUs with objectives, the number of cultural resource and ERU intersections was 8,785 across the ERUs. In the case of ERUs without objectives, the number of cultural resource and ERU intersections was 2,851. The figures represented in the tables in the effects analysis were derived from the table that resulted from the Summarize exercise.

For determining effects to cultural resources associated with visitation, the first step was to create a map in ESRI ArcMap. The next step was to add the administrative boundary of the forest, the corporate cultural resource layer, and the MVUM layer for the forest. The Geoprocessing tool in ESRI ArcMap was used to create a 300-foot buffer around the road system portrayed in the MVUM. Once the buffering was completed for the transportation system, the Geoprocessing tool was used to intersect the cultural resource layer with the buffered MVUM layer to derive the number of times cultural resources and the buffered MVUM intersected for a total of 4,412 individual intersections. In some cases, depending on site size and the layout of roads, it is possible that single cultural resources could be intersected multiple times by a buffered route.

Forest Products

See appendix C: Timber Suitability and Forest Products Analyses Processes.

Socioeconomics

Economic effects to counties local to the Santa Fe NF were estimated with input-output analysis using the IMPLAN (Impact analysis for PLANning) modeling system (MIG 2016) and the Forest Economic Analysis Spreadsheet Tool (FEAST). The IMPLAN modeling system allows the user to build regional economic models of one or more counties for a particular year. FEAST is a spreadsheet modeling tool developed by the U.S. Forest Service Inventory and Monitoring Institute in Fort Collins, Colorado. This tool uses a Microsoft Excel workbook as an interface between user inputs and data generated using the IMPLAN input-output modeling system.

Input-output analyses represent linkages between sectors in an economy. By using Forest Service expenditure data, resource output data, and other economic information, IMPLAN can describe, among other things, the jobs and income that are supported by NFS management activities. The direct employment and labor income benefit employees and their families and therefore directly affect the local economy. Additional indirect and induced, multiplier effects (ripple effects) are generated by the direct activities. Together the direct and multiplier effects comprise the total economic impact to the local economy. For example, visitors to Santa Fe NF spend money on accommodation and food, which are direct effects. Accommodation and food service businesses buy supplies from other businesses, which are indirect contributions. The employees of these firms spend their earnings on a variety of goods and services, which are induced effects. These transactions result in direct, indirect, and induced effects, respectively, in the regional economy. Direct, indirect, and induced effects are combined in the discussion of effects within the environmental consequences.

The analysis conducted for the revised Santa Fe forest plan used six counties immediately surrounding the forest—Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, and Santa Fe Counties—due to their social and economic linkages between residents and the Santa Fe NF (USDA Forest Service 2016). These six counties make up the regional economy for the purposes of this economic impact analysis. The IMPLAN model represents the U.S. economy through 514 economic sectors, 286 of which were represented in the 6-county planning area. The model for this analysis used the 2016 IMPLAN data, which is the latest available dataset at the time of analysis.

Data and Assumptions

The economic effects analysis assesses the economic impacts of the resource outputs projected under each alternative. Resource outputs in this context are the amount of a resource (forest products, AUMs, recreation visits, etc.) that would be available for use under each alternative. Quantitative inputs (for example, animal unit months, recreation visits, and forest products) were obtained from Santa Fe NF program areas for this analysis, unless otherwise cited. The quantitative inputs are discussed in FEIS section 3.17.2.2. Socio-economic Indicators.

Timber

The timber analysis examined economic activity of stumpage flowing through logging companies, sawmills, firewood sales, and other wood products. Baseline information on the average annual volume (cubic feet) cut and estimates of harvests anticipated under the alternatives were provided by the Santa Fe's timber specialist. Details of how these numbers were developed may be found in the timber suitability appendix (appendix C). The direct effects were estimated using direct response coefficients developed from a national Timber Mill Survey conducted by the University of Montana's Bureau of Business and Economic Research (Sorenson et al. 2016). These timber response coefficients are broken into multi-state regions and are considered more accurate than those available from IMPLAN. The indirect and induced effects were generated by the IMPLAN model.

Recreation

Total annual recreation visits were obtained from the National Visitor Use Monitoring program. For this analysis, an estimated 1,013,051 recreational visits annually was assumed—an average of the results of each of the three rounds of monitoring (USDA Forest Service 2018c, 2018d, 2018e). The distribution of visitor type (i.e., local or non-local visitor), and use type (e.g., was the visit wildlife-related?) from the most recent round of monitoring are used to estimate visitor spending. Average visitor expenditures by type were obtained from the Forest Service's NVUM program (White 2017).

Rather than measuring economic impacts, the economic analysis for recreation examined the local economic significance of outdoor recreation in the Santa Fe NF. While both impact and significance analyses measure the amount of economic activity attributable to outdoor recreation within a defined area, impact analysis only includes spending by visitors who reside outside of the local region since their spending constitutes "new dollars" being injected into the local economy. A significance analysis, however, includes the effects of spending by all visitors, both those who reside in the planning area and those who do not. Since much of the spending by local recreationists would likely be shifted to other sectors of the local economy, the results of this analysis do not reflect the loss to the local economy if recreational opportunities on the Santa Fe NF were eliminated. Instead, the significance analysis shows the size and nature of economic activity associated with these recreational experiences to show how important they are to the local economy

Grazing

The baseline economic impact of grazing used an estimate, provided by the Santa Fe NF specialist, based on an average of authorized use over the last 10 years, during periods when the forest was experiencing drought. Changes across alternatives are estimated as changes from this baseline. Santa Fe NF provided a range of possible authorized uses for each alternative; however, the economic impact analysis used the midpoint of this provided range.

The economic impact analysis for grazing uses a methodology jointly developed by the Forest Service and Bureau of Land Management. This method draws on data from USDA's National Agricultural Statistics Service Census of Agriculture and county-level economic data from IMPLAN. To estimate employment directly associated with livestock grazing on the Santa Fe NF, animal unit months (AUM) are multiplied by a ratio of statewide cattle ranching and sheep farming employment over all AUMs required for cattle and calf and sheep inventory in New Mexico. This estimate of direct employment is then incorporated in IMPLAN to calculate indirect and induced effects. The chief advantage of the FS/BLM method is that it recognizes that public land grazing may look quite different from other activities in the cattle ranching or sheep farming sectors in IMPLAN (e.g., feedlots).

Social Indicators

We compiled social data using the Economic Profile System Toolkit (EPS; Headwaters Economics 2019) and previous work done through the forest assessment. Additional data sources include relevant scientific literature, County Health Rankings Reporting (UWPHI 2016), and the U.S. Census Bureau's (USCB) American Community Survey (ACS). These data were used to make qualitative assessments of how forest management actions may impact quality of life for forest beneficiaries.

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Appendix C. Timber Suitability and Forest Products Analyses Processes

Timber Suitability Analysis

Timber production is the purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use (36 CFR 219.19). Timber production activities can contribute to social, economic, and ecological sustainability. The National Forest Management Act (NFMA) requires that the agency determine the suitability of National Forest System lands for timber production and has specific requirements for timber suitability analysis in land management plans. Note that there is a distinction between timber harvest as a resource use (that is, timber production) and timber harvest as a management tool to achieve desired conditions, both of which may provide economic revenue through the sale of forest products. Localized, small-scale (e.g., single tree, hand-thinning), or other applicable timber harvesting practices on lands classified as not suitable for timber production may be used to remove hazard trees along trails or in campgrounds or remove heavily damaged timber as salvage, and may be used as a tool designed to achieve desired conditions such as restoring seral state proportions and species compositions (e.g., removing encroaching trees from grasslands), and encouraging old-growth development or protection.

Phase 1: Lands that may be suited for timber production

Identifying lands that may be suited for timber production is the first phase in the analysis process. This preliminary classification is made before considering objectives and desired conditions that are part of the forest plan revision process, and instead, is based on existing legal and technical factors. This phase of analysis excludes National Forest System lands that are not suitable for timber production based on the following criteria (FSM 1909.12, Chapter 60, sections 61 through 61.3):

A. Land that is not forested, identified by having less than 10 percent occupation by trees of any size or having a non-forest use (powerline clearings, residential or administrative sites, and improved pasture) (section 61.14 and 36 CFR 219.11 (a) (vi));

B. Known environmental factors (e.g., poor site conditions) exist that preclude reasonable assurance that restocking can be achieved within 5 years of final regeneration harvest (section 61.13 and 36 CFR 219.11 (a) (v));

C. Technology to harvest timber is not currently available without causing irreversible damage (section 61.12 and 36 CFR 219.11 (a)(iv));

D. Timber production is prohibited by statute, executive order, regulation, or where the Secretary of Agriculture or the Chief of the Forest Service has withdrawn the land from timber production. Examples include designated wilderness areas, designated wild river segments, research natural areas or other designated areas where timber production is specifically prohibited (section 61.11 and 36 CFR 219.11 (a)(i & ii)).

Forest lands that remain after this initial screening (following criteria A through D) are termed “lands that may be suited for timber production,” and do not vary across alternatives of the FEIS for the revised draft forest plan.

Forested and Non-forested Lands (Criterion A)

The Terrestrial Ecological Unit Inventory (TEUI) data for the Santa Fe NF was used to filter forested and non-forested areas and to assess the ecological capability for timber production on the forest. This was done by compiling a list of all TEUI units that intersect the forest boundary. Warm and dry climate classifications that represented marginal growth conditions for ponderosa pine TEUI map units with a climate class 5 (-1 and below) were considered non-forested, and therefore, are not suitable for timber production. While not always ideal conditions for preferred timber species, cool and wet climate classes (above 5 (-1)) were included because they have the potential to support other tree species and represented forested areas. Based on the plant community composition and canopy cover, TEUI map units that had less than 10 percent tree cover were removed from the analysis. Additionally, all non-forested areas (less than 10 percent tree cover) were clipped out using GIS.[12] In applying the above criteria, non-forested land in the Santa Fe NF totals 399,816 acres.

Lands Not Suited for Timber Production due to Technical Reasons (Criteria B and C)

Forest specialists evaluated the forested TEUI map units remaining after the first screening [13] to determine suitability based on soil and site productivity attributes and interpretations in the TEUI reports (Table C-1).

In general, the following conditions resulted in the exclusion of TEUI map units from the suitable timber base (most of the time through a combination of factors and conditions) (section 61.13 and 36 CFR 219.11 (a)(v)):

- The presence and dominance of lithic soils suggest lower restocking potential due to shallow soils.
- Site not easily reforested within 5 years following final regeneration harvest due to low reforestation potential, soil conditions, and climate factors.
- Low site indices (in general values lower than 60) suggest inadequate restocking potential and low site productivity.
- Severe erosion potential and mass wasting suggest timber harvest may cause irreversible damage.
- Irreversible damage to the site and soil productivity due to highly erosive or unstable soil conditions.
- Areas susceptible to irreversible damage; generally areas with sensitive soil types.

In applying the above criteria (B and C), acres of land removed based on technical reasons in the Santa Fe NF totals 265,937 acres.

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[12] Forest Service midscale vegetation data were used in the spatial analysis. Data are stored in the project record at the Santa Fe NF Supervisors Office.

[13] Timber suitability workshop for the Santa Fe NF and Carson NF was held on December 4, 2017. Participants and attendees: Greg Miller (Soil Scientist, Carson NF), Jim Arcineiga (Forester, Carson NF), Peter Rich (Ecological Lead and Assistant Forest Planner, Carson NF), Robert Madera (Ecologist, detail Santa Fe NF), Ken Reese (Forester, Santa Fe NF), and Estella Smith (Soil Scientist, detail Santa Fe NF).

Table C-1. Terrestrial Ecological Unit Inventory mapping units not suited for timber production

TEUI Mapping Unit	Inadequate restocking (criteria B)	Irreversible damage (criteria C)	Reason not suitable for timber production[2]
54	**Yes**	Yes	Low reforestation potential, high erodible stony soils
123	**Yes**	Yes	Thin and cobbly soils, cold end of the life zone
139	**No**	Yes	Highly erodible soils and steep slopes
149	**No**	Yes	Highly erodible soils and steep slopes
150	**No**	Yes	Highly erodible soils and steep slopes
151	**Yes**	Yes	Shallow soils, and low site productivity
165	**Yes**	Yes	Shallow soils, and low site productivity
169	**No**	Yes	Highly erodible soils and steep slopes
192	**Yes**	Yes	Shallow soils, and low site productivity
221	**No**	Yes	Steep slopes and cobbly soils
228	**No**	Yes	Steep slopes, cobbly soils, and high potential for mass wasting
229	**No**	Yes	High erosion and moderate windthrow
230	**No**	Yes	High erosion, moderate windthrow, steep slopes
234	**No**	Yes	Highly erodible soils
236	**No**	Yes	High erosion, moderate windthrow, steep slopes
237	**No**	Yes	Steep slopes, severe windthrow
262	**No**	Yes	Highly erodible soils and steep slopes
329	**No**	Yes	Highly erodible soils and steep slopes
331	**No**	Yes	Highly erodible soils and stony soils
332	**No**	Yes	Highly erodible soils and steep slopes
333	**No**	Yes	Highly erodible soils and stony soils
334	**No**	Yes	Too many boulders
335	**No**	Yes	Highly erodible soils and steep slopes
344	**No**	Yes	Rocky soils and steep slopes
345	**Yes**	Yes	Low site productivity, highly erodible soils, and steep slopes
352	**Yes**	Yes	Low site productivity and highly erodible soils
353	**Yes**	Yes	Low site productivity and highly erodible soils
359	**Yes**	Yes	Low site productivity, highly erodible soils, and steep slopes
615	**Yes**	Yes	Low site productivity and highly erodible soils
619	**Yes**	Yes	High erosion, moderate mass wasting, moderate reforestation potential
623	**Yes**	Yes	Low site productivity, highly erodible soils, and steep sloes
649	**Yes**	Yes	Low site productivity, highly erodible soils, and steep sloes
652	**Yes**	Yes	Low site productivity and highly erodible soils
659	**No**	Yes	Highly erodible soils and steep slopes
660	**Yes**	Yes	Low site productivity and highly erodible soils
666	**Yes**	Yes	Low reforestation potential, too cobbly, erosion hazard severe, windthrow is severe with low strength soils
667	**Yes**	Yes	Reforestation potential moderate, severe erosion, moderate windthrow
668	**No**	Yes	Steep slopes, moderate windthrow, severe erosion, moderate mass wasting
716	**No**	Yes	Highly erodible soils and steep slopes
723	**No**	Yes	Highly erodible soils and steep slopes

Lands Withdrawn from Timber Production (Criterion D)

Following criterion D (lands withdrawn from timber production), designated wilderness areas (Pecos, San Pedro Park, Dome, Chama River and Canyon), wild river classified corridors of designated wild and scenic rivers, designated or proposed research natural areas, and inventoried roadless areas were removed from the suitable timber base. In applying criterion D, acres of land removed based on legal reasons in designated areas in the Santa Fe NF totals 524,475 acres.

Lands that may be Suited for Timber Production

Based on this initial suitability analysis, the Santa Fe NF includes 356,943 acres that may be suited for timber production. These "may be suited" lands do not vary by alternative. The suitability analysis breakdown for phase 1 is shown in Table C-2.

Table C-2. Lands that may be suited for timber production: Phase 1 of the timber suitability analysis

Criteria	Lands	Acres
	Santa Fe National Forest	**1,545,310**
Criterion A	Lands with non-forest TEUI vegetation units	399,816
Criterion B	Lands with inadequate restocking potential	265,937*
Criterion C	Lands where irreversible damage could occur	
Criterion D	Designated Wilderness *(291,669 acres)*	524,475^
	Wild River Corridors *(approx. 28 miles)*	
	Designated and proposed Research Natural Areas *(1,440 acres)*	
	Inventoried Roadless Areas *(241,400 acres)*	
	Lands that may be suited for timber production	**356,943**

*Acreages in B and C criteria categories overlapped in several TEUI units, so total acreage was combined here to account for the overlap.

^Acreages in sections for Criterion D included overlap, so total acreage was combined here to account for the overlap. Actual acreages or mileage (WSR) shown in parenthesis).

Phase 2: Lands suited and not suited for timber production based on compatibility with desired conditions and objectives in the draft Forest Plan

The second and final phase of the timber suitability analysis determines which of the lands that ***may*** be suited for timber production (identified in phase 1) ***are*** actually suited for timber production based on the forest plan or an alternative. This is done by assessing the compatibility of timber production with desired conditions, objectives, and other management areas recommended by each alternative. Lands and areas that met the following criteria were defined as suitable for timber production (FSM 1909.12, Chapter 60, section 61.2):

- Timber production is a desired primary or secondary use of the land.
- Timber production is anticipated to continue after desired conditions have been achieved.
- A flow of timber can be planned and scheduled on a reasonably predictable basis.
- Regeneration of the stand is intended.
- Timber production is compatible with the desired conditions or objectives for the land.

On lands not identified as suited for timber production in this phase, harvests may still occur to protect multiple-use values other than timber production. Common examples include salvage and sanitation harvests, or cuttings to protect public health or safety. Harvests may also be a part of implementing restoration treatments. For example, meadow restoration may require cutting encroaching trees. While this activity may produce a small quantity of timber (merchantable trees) as a byproduct of treatment, the area treated would have objectives other than timber production (e.g., desired conditions for keeping the meadow open to support grass and forb growth characteristic of these areas) and would not be identified as part of the suited land base.

Of the designated areas with management specified by the laws associated with their enactment, the Jemez National Recreation Area, national scenic trails, and national historic trails are not removed from lands that may be suited for timber production because sustainable timber harvest is not inconsistent with the law, regulation, policy, or plan direction that directs management of these lands. For these areas, site-specific analyses during project planning will determine the appropriate timber harvest prescriptions to maintain desired conditions for these areas. Table C-3 shows lands and areas considered in at least one of the forest plan revision EIS alternatives and whether they are considered suited or not suited for timber production.

Since management areas can change by alternative, the resultant acres identified as suited for timber production vary by alternatives (Table C-4). Accessible and operable acres, or areas in which existing roads, slopes, and other conditions permit commercial harvesting activities, are not available for commercial timber production in alternative 3 because the alternative emphasizes natural processes (e.g., fire predominates; mechanical thinning limited to at-risk or WUI areas), and substantially increases (17 percent of national forest acres) acres (270,130 acres) proposed for wilderness designation. These factors are in addition to other restricted areas for commercial harvests seen in Table C-3. Therefore, due to the intentional design of the natural forces alternative (alternative 3), all 355,082 acres of "may be suited" lands are not appropriate for timber production and no further suitability analysis was needed. Although New Mexico meadow jumping mouse critical habitat was deemed suited for inclusion as a timber production area, analysis did not find any of the habitat to be suitable because the mice do not inhabit forested areas.

Table C-3. Lands and areas suited and not suited for timber production based on desired conditions or objectives in the draft forest plan

	Area	Suited	Not Suited
1987 Forest Plan Management Areas	*Alternative 1- Management areas not listed here are considered suited for timber production.*		
	Cultural resources (I)		X
	Wildlife – range – firewood (G)		X
	Wilderness (H)		X
	Sensitive soils –species (K)		X
	Semi-primitive non-motorized recreation (L)		X
	Research natural areas (M)		X
	Threatened and endangered species habitat (Management Area N)		X
	Cultural resources –wildlife –range –firewood (S)		X
Alternatives 1, 2, and 3	*Acreages differ among alternatives.*		
	Recommended wilderness areas		X
Designated and Management Areas	*and other areas common to alternatives 1, 2, and 4*		
	Eligible wild and scenic rivers with wild classifications		X
	Developed recreation sites and administrative sites		X
	Communication sites (buffer to 5 acres)		X
	Holy Ghost ipomopsis habitat (buffered occurrences)		X
	Geothermal no leasing area	X	
	Mexican spotted owl critical habitat and protected lands (except 100 acres core/nest)	X	
	Jemez Mountains salamander critical habitat	X	
	Proposed New Mexico meadow jumping mouse critical habitat	X	
	Goshawk management areas	X	
	Proposed yellow-billed cuckoo critical habitat	X	
	Peregrine falcon nesting areas	X	
	Jemez National Recreational Area	X	
	National scenic or historic trails	X	
Management Areas –	*Alternative 2 and/or 4*		
	Caja del Rio Management Area	X	
	Canada Bonita Proposed Research Natural Area		X
	Cultural interpretive management areas		X
	Oil and gas management area	X	
	Motorized recreation management areas	X	
	Greater Santa Fe Recreation Management Area	X	

Table C-4. Summary of lands suited for timber production across all alternatives for the Santa Fe NF

Land classification category	Acres			
A. Total National Forest System lands in the plan area	1,545,310			
B. Lands not suited for timber production due to legal or technical reasons (including non-forested lands)	1,187,958			
C. Lands that *may* be suited for timber production (A – B)	356,943			
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
D. Total Lands suited for timber production (compatible with desired conditions and objectives)	326,779	356,716	0	357,011*
E. Lands not suited for timber production (not compatible with desired conditions and objectives (C – D)	30,164	227	356,943	-68
F. Total Lands not suited for timber production (B+E)	1,218,078	1,187,942	1,545,310	1,187,890

*In alternative 4, 68 acres (which surround a reservoir) are recommended to be removed from designated wilderness. In the event that Congress were to remove the wilderness designation from these acres, the suitable timber base would increase by this margin (to 357,011 acres- line D) above the may be suited base (line C). The difference in the two quantities is noted as 0 in the table above instead of -68 as would be the result of direct calculation. However, until then these acres will remain designated wilderness and be managed according to all relevant laws, policies, and regulations.

The following detailed analysis tables (Table C-4, Table C-4ii, Table C-4iii, and Table C-4iv) and their associated maps (Figure C-1, Figure C-2, Figure C-3, and Figure C-4) show areas that are suited for timber production under each alternative corresponding with the acreages given in Table C-4. The summary table, analysis tables, and associated maps conclude the timber production suitability analysis as required by Title 36, Code of Federal Regulations, part 219 (36 CFR part 219); the NFMA, Title 16 U.S.C. 1604 and 1611; FSM 1900, and FSM 1920. This process document will help inform forest managers in locating areas with potential for future timber production in the Santa Fe NF for the next 15 to 20 years. This process document will remain in this role until new direction emerges that necessitates an update to the timber suitability analysis in the Santa Fe NF.

Table C-4i. Detailed suitability analysis for alternative 1

Phase of Analysis	Land classification category	Acres
1st phase	A. Total National Forest System lands in the plan area	1,545,310
	B. Lands not suited for timber production due to legal or technical reasons	790,412
	C. Non-forested lands	399,816
	D. Lands tentatively suitable for timber production	356,943
2nd phase *	E. Lands where management objectives limit timber harvest*	59,796
	This list denotes areas considered unsuitable for timber production under this alternative. *- Developed recreation sites and administrative sites* *- Communication sites (buffer to 5 acres)* *- All suitable and eligible wild segments of Wild and Scenic Rivers* *- Cultural resources (Management Area I)* - Wildlife – range – firewood (Management Area G) - Cultural resources – wildlife – range – firewood (Management Area S) - Sensitive soils – species (Management Area K) - Semi-primitive non-motorized recreation (Management Area L) - Threatened and endangered species habitat (Management Area N) - Recommended wilderness areas	
	F. Total lands not suitable for timber production (B+C+E) *	1,218,078
	G. Total lands suitable for timber production (D-E) *	326,779

*Due to overlapping features across land classification categories, numbers may not add up as indicated. However, acres represented are accurate because they were obtained through mapping appropriate lands suited and not suited using the Geographic Information System.

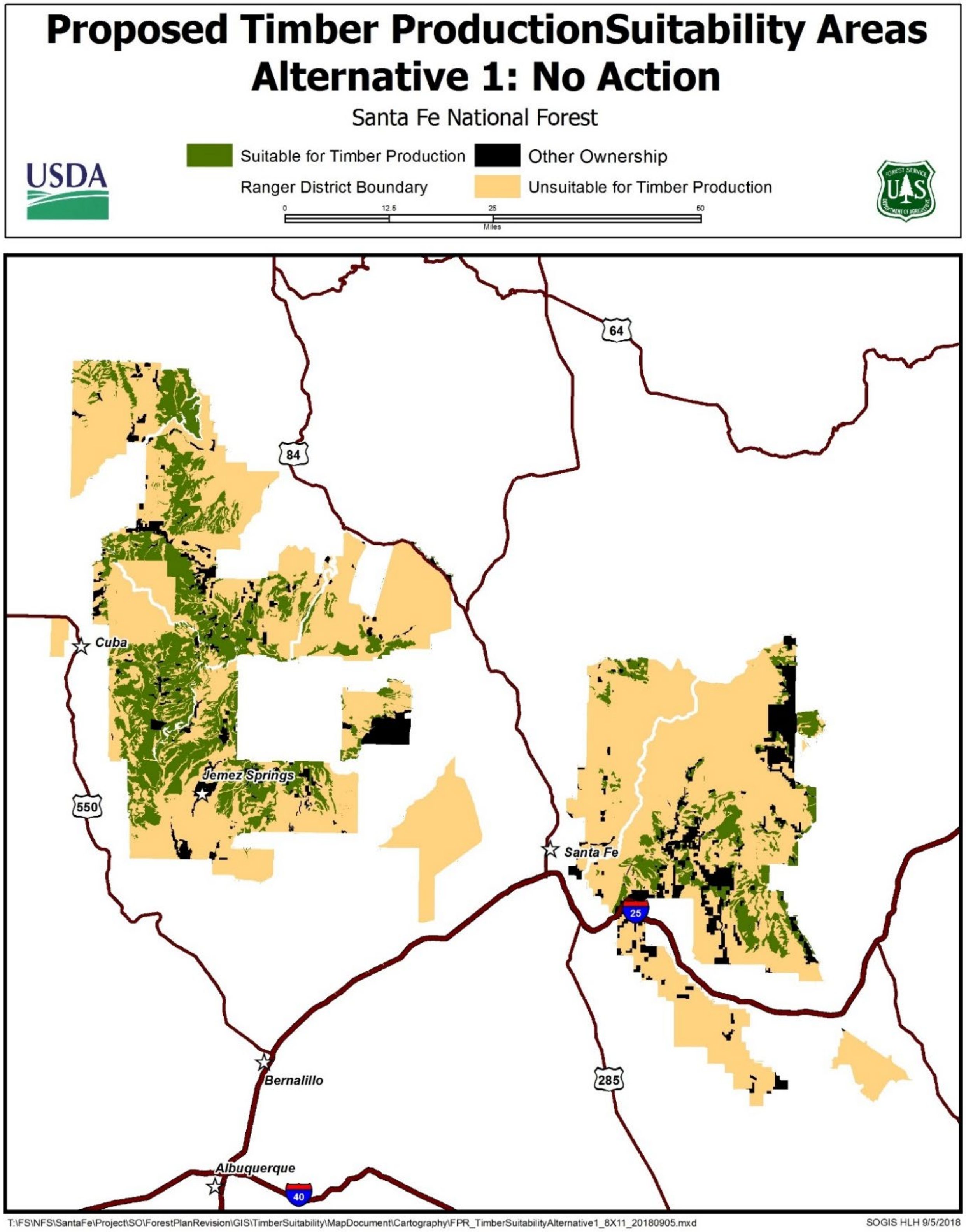

Figure C-1 Timber production suitability areas, alternative1

Table C-4ii. Detailed suitability analysis for alternative 2

Phase of Analysis	Land classification category	Acres
1st phase *	A. Total National Forest System lands in the plan area	1,545,310
	B. Lands not suited for timber production due to legal or technical reasons	790,412
	C. Non-forested lands	399,816
	D. Lands tentatively suitable for timber production	356,943
2nd phase	E. Lands where management objectives limit timber harvest	49,485
	This list denotes areas considered unsuitable for timber production under this alternative. *- Developed recreation sites and administrative sites* *- Communication sites (buffer to 5 acres)* *- All suitable and eligible wild segments of wild and scenic rivers* *- Recommended wilderness areas* *- Holy Ghost Ipomopsis (Ipomopsis sancti-spiritus) habitat (occurrences buffered 200 feet)* *- Cultural interpretive management areas*	
	F. Total lands not suitable for timber production (B+C+E)*	1,187,942
	G. Total lands suitable for timber production (D-E)*	356,716

*Due to overlapping features across land classification categories, numbers may not add up as indicated. However, acres represented are accurate because they were obtained through mapping appropriate lands suited and not suited using the Geographic Information System.

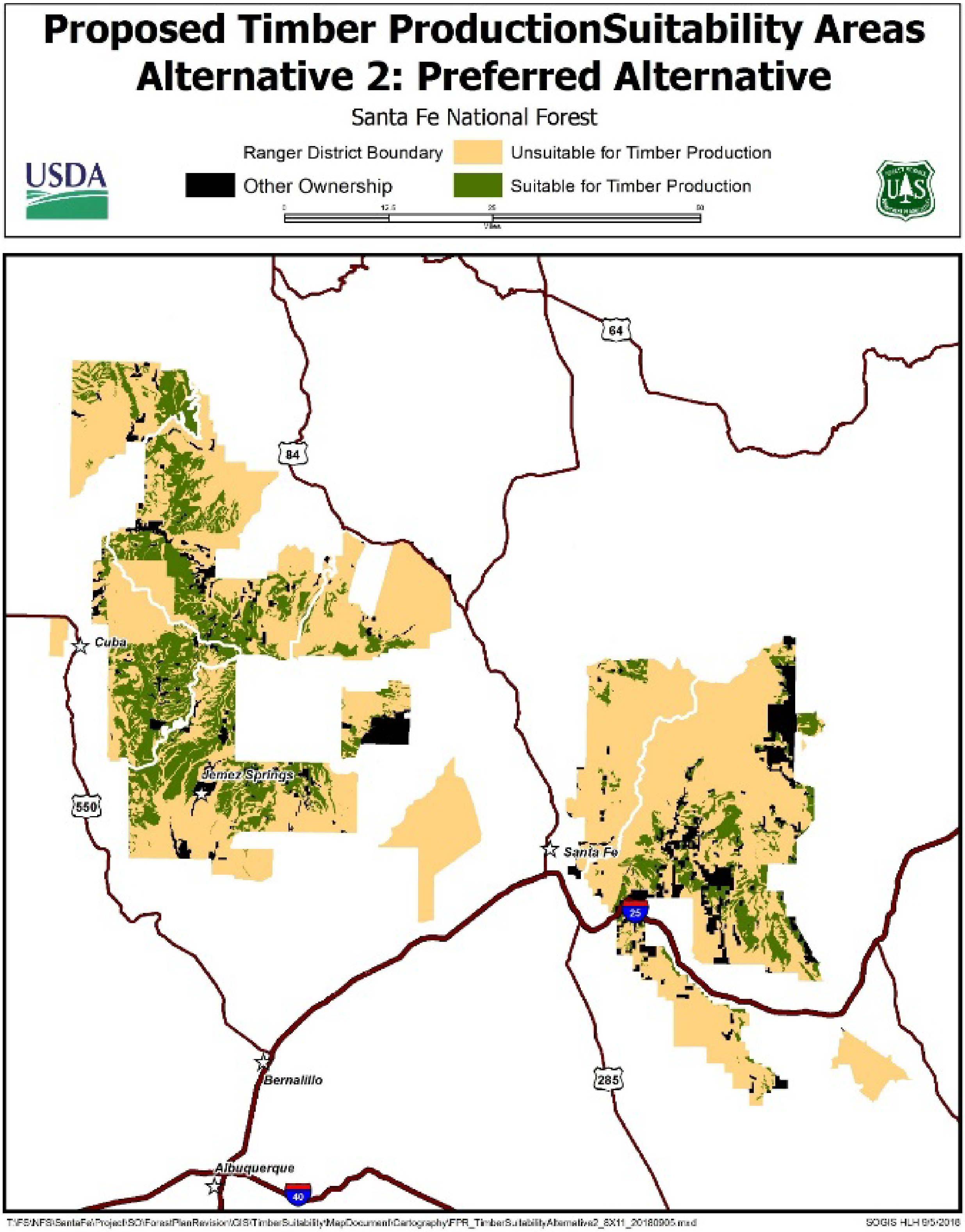

Figure C-2. Timber production suitability areas, alternative 2

Table C-4iii. Detailed suitability analysis for alternative 3

Phase of Analysis	Land classification category	Acres
1st phase *	A. Total National Forest System lands in the plan area	1,545,310
	B. Lands not suited for timber production due to legal or technical reasons	790,412
	C. Non-forested lands	399,816
	D. Lands tentatively suitable for timber production	356,943
2nd phase	E. Lands where management objectives limit timber harvest*	356,943
	F. Total lands not suitable for timber production*	1,545,310
	G. Total lands suitable for timber production	0

* This alternative eliminates the suitable timber base entirely due to a combination of pre-existing conditions (i.e., see alternative 2: acres of recreation, eligible wild and scenic river segments, Holy Ghost Ipomopsis, and cultural interpretive management areas) and new plan direction for this alternative (i.e., the recommendation of an additional 270,130 acres for wilderness designation, and cutting (mechanical) treatments limited to at-risk or WUI areas).

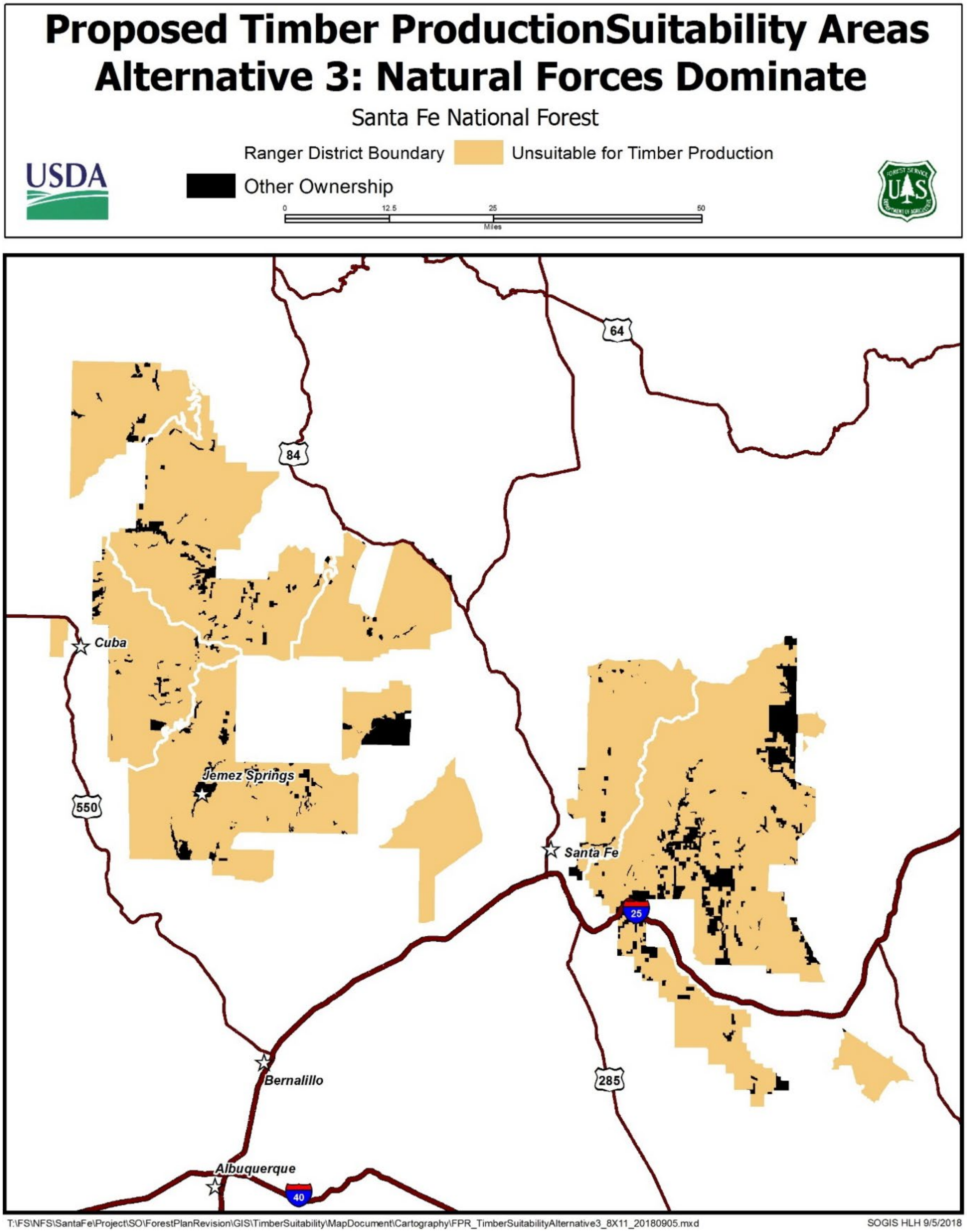

Figure C-3. Timber production suitability areas, alternative 3

Table C-4iv. Detailed suitability analysis for alternative 4

Phase of Analysis	Land classification category	Acres
1st phase *	A. Total National Forest System lands in the plan area	1,545,310
	B. Lands not suited for timber production due to legal or technical reasons	790,412
	C. Non-forested lands	399,816
	D. Lands tentatively suitable for timber production	356,943
2nd phase	E. Lands where management objectives limit timber harvest*	31,840
	This list denotes areas considered unsuitable for timber production under this alternative.	
	- Developed recreation sites and administrative sites *- Communication sites (buffer to 5 acres)* *- All suitable and eligible wild segments of Wild and Scenic Rivers* *- Remove San Gregorio Reservoir from current wilderness*┼ *- Holy Ghost Ipomopsis (Ipomopsis sancti-spiritus) habitat (buffered occurrences)* *- Cultural interpretive management areas*	
	F. Total lands not suitable for timber production (B+C+E)*	1,187,890
	G. Total lands suitable for timber production (D-E)*	357,011
	┼The 68 acres (which surround a reservoir) are recommended to be removed from designated wilderness under this alternative. In the event that Congress were to remove the wilderness designation from these acres, the suitable timber base would increase by this margin. However, until then these acres will remain as designated wilderness and be managed according to all relevant laws, policies, and regulations.	

*Due to overlapping features across land classification categories, numbers may not add up as indicated. However, acres represented are accurate because they were obtained through mapping appropriate lands suited and not suited using the Geographic Information System.

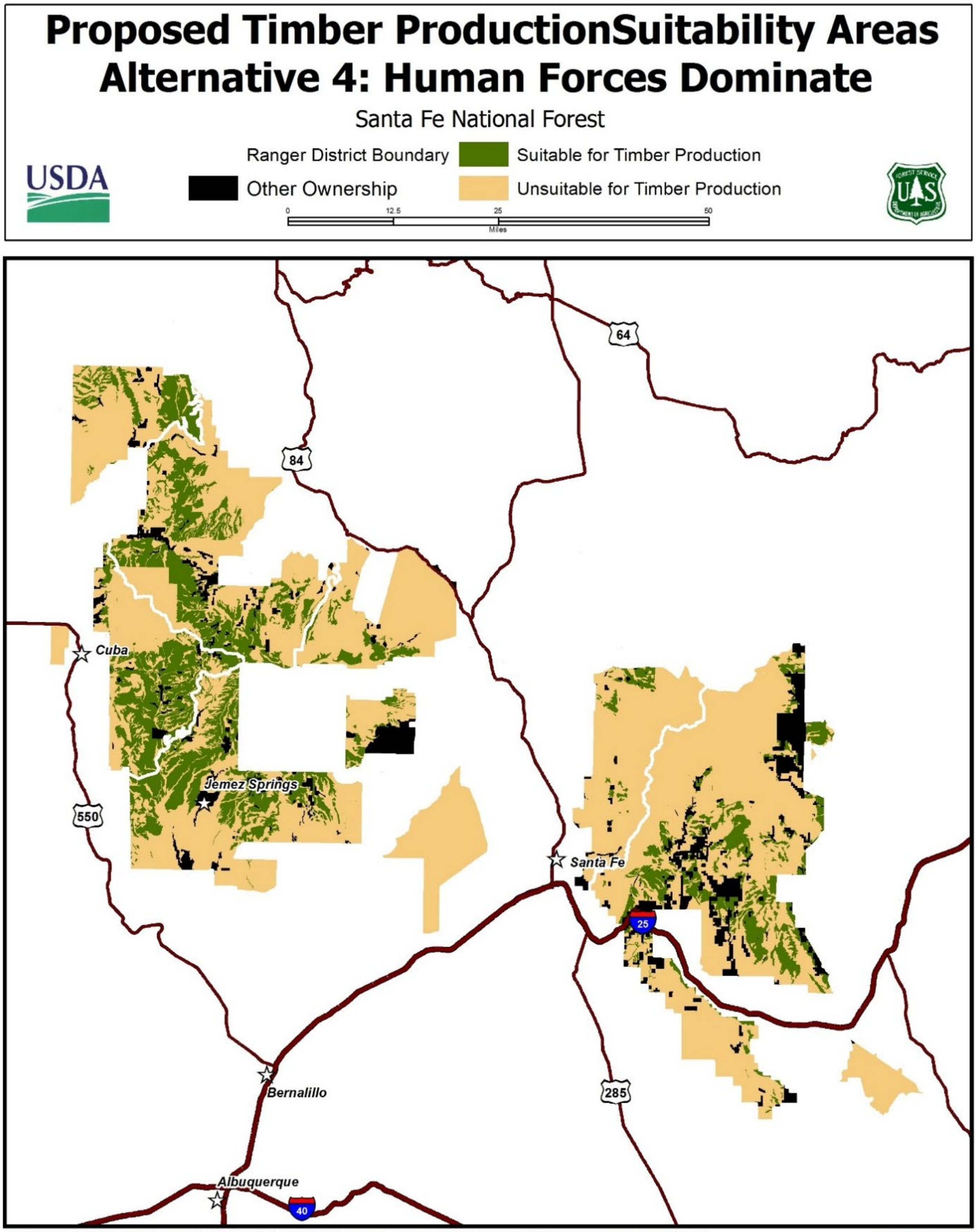

Figure C-4. Timber production suitability areas, alternative 4

Forest Products Analysis

Forest Plan Guidance: Forest Vegetation Management Practices

The vegetation management practices outlined in Table C-5 give an estimation of what types and the magnitude of management that would be needed to meet the desired conditions and objectives described in the Vegetation and Forest Products sections of the forest plan. However, these acreages do not necessitate a commitment to action. Furthermore, vegetation management practices must be in accordance with other resources in the forest plan and be within the fiscal capability of the forest. Revisions to the forest plan (and to the vegetation management practices within) are expected to be conducted every 15 years. As such, all numbers presented below are valid for approximately the next two decades, unless changes occur that require a more immediate revision.

In the draft forest plan, ERUs, groups of plant assemblages and their associated ecosystem characteristics, with high departure from reference conditions were selected as the focus for vegetative treatments occurring within the next two decades. The highly departed ERUs in the Santa Fe NF include ponderosa pine forest, dry mixed conifer forest, Colorado Plateau-Great Basin grasslands, and montane subalpine grasslands. Additionally, a few moderately departed ERUs were prioritized for treatment: piñon juniper grasslands, juniper grasslands, and sagebrush shrubland. Plan objectives propose the use of mechanical treatments and fire (both planned and natural ignitions) to reduce departure and improve ecosystem health, function, and resiliency.

The 1987 Forest Plan did not contain specific plan components for forestwide vegetation management. As a result, for alternative 1 (no action) the average of treatments that occurred over the past decade were used to estimate treatment amounts for the next 15 years (Table C-5). The average acres for treatments under all action alternatives (2, 3, and 4), were determined using the best available science and Santa Fe NF specialists. For example, fire treatment acres were derived from empirical studies involving fire return intervals and fire regimes of different fire-adapted ERUs found in the forest (see draft forest plan, appendix B). For all ERUs except ponderosa pine forest, the low end frequency of fire return intervals were used to determine the minimum amount of restoration needed to maintain current conditions and reduce future departure. For ponderosa pine, the mid-frequency fire return interval was used because this ERU covers a large portion of the forest (24 percent), is currently highly departed from desired conditions (see Vegetation and Fire sections in the FEIS), and science-based research has shown ponderosa pine to have a more frequent fire return interval than the mixed conifer-frequent fire ERU (Baison and Swetnam 1990). The mid-frequency range of treatment would allow for reducing ponderosa pine departure at a quicker rate, resulting in greater ecosystem benefits and reduced risk for uncharacteristic fire.

Table C-5. Average acres and types of forestwide vegetation management practices in the Santa Fe NF for the next 15 years

Forest Cover Types- Vegetation Management Practices	Annual Average Alternative 1	Alternative 2	Alternative 3	Alternative 4
Openings Maintenance Even Aged*				
Mechanical treatments	56	2,475	15	9,000
Fire (prescribed and natural ignitions)	399	4,725	12,750	800
Other treatments**	411	300	4,500	0
Ponderosa Pine Treatments				
Uneven-aged management***	3,461	5,750	2,200	15,500
Fire (prescribed and natural ignitions)	1,671	20,000	57,500	2,300
Mixed Conifer-Dry Treatments				
Uneven-aged management	3,257	4,500	2,000	12,500
Fire (prescribed and natural ignitions)	1,249	12,500	45,000	2,500
Total Treatments				
Mechanical treatments	6,774	12,725	4,215	37,000
Fire (prescribed and natural ignitions)	3,319	37,225	115,250	5,600
Other treatments**	411	300	4,500	0

* Even aged treatments—to increase openings—predominantly target piñon-juniper and juniper grassland ERUs.

**Other treatments predominantly include those used for restoration, such as the removal of encroaching trees or invasive species, planting or seeding, etc.

*** Uneven-aged management refers to mechanical thinning treatments that selectively remove trees to achieve uneven-aged stands that contain a range of sizes and stages of tree development.

Estimating Quantities of Timber and Other Forest Products for Two Decades

The timber suitability analysis detailed above provides a basis to calculate metrics of timber and forest products estimated to be present and potentially available on the Forest over the next 15 to 20 years. The details of these calculations are included in the following sections—Sustained Yield Limit and Projected Timber and Wood Sale Quantities.

Sustained Yield Limit

The sustained yield limit reflects the quantity of commercial wood products that could be sustainably harvested from the Santa Fe NF in perpetuity. Sustained yield limit was calculated using the number of acres calculated in “Lands that *may* be suitable for timber production,” (2012 rule (36 CFR 219.11(d)(6)) and FSH 1909.12, Chapter 60, section 64.31) as determined through the timber suitability analysis (refer to Phase 1- Timber suitability analysis). The result of phase 1 of the timber suitability analysis determined that 356,943 acres in the Santa Fe NF may be suited for timber production (Table C-6).

Assumptions

The following assumptions were used as the basis for sustained yield limit analysis (Youtz and Vandendriesche 2015):

Sustained yield limit calculations are based upon uneven-aged forest management systems for the following forest ERUs:

1. Ponderosa pine and its sub-types (ponderosa pine-grass, ponderosa pine-Gambel oak, ponderosa pine-evergreen oak) (assumes management favors dominance of ponderosa pine).

2. Mixed conifer dry (frequent-fire) (assumes management favors dominance of shade-intolerant species).
3. Mixed conifer wet (infrequent-fire) (assumes management favors dominance of wind-firm species; Douglas-fir, southwestern white pine).
4. Spruce-Fir Mix (assumes management favors dominance of wind-firm species; Douglas-fir, southwestern white pine).

Uneven-aged management analysis:

- Group selection cutting
- A 20- or 30-year cutting cycle, 6 age classes, group/patch sizes and density increase by ERU as forest conditions become progressively more mesic
- Some analysis strategies combine group selection cutting with mid-cycle intermediate thinning
- Target matrix density varies by ERU

Analysis methods:

- Region-wide Forest Inventory Analysis plot data, sorted by ERU and site index
- TEUI data, Santa Fe NF
- Forest Vegetation Simulator – Regionally calibrated:
  - Diameter growth
  - Stand density mortality
  - Tree senescence mortality
  - Seen tree defect
  - Merchantable cubic feet volumes (5+inches diameter at breast height (d.b.h.), 4 inches minimum top diameter in bark)*
  - Merchantable board feet volumes (9+ inches d.b.h., 6 inches minimum top diameter in bark)*
  - Natural tree regeneration

  **Utilization standards (i.e., merchantable diameter values) function to roughly quantify what volumes of merchantable timber and wood resources may exist on the landscape for use in forest planning models to analyze differences between alternatives.*

Sustained yield limit calculation

For sustained yield limit calculation, the "lands that may be suited for timber production" acreage was partitioned by ERU using GIS (Table C-6). According to regional guidance for calculation, ponderosa pine acres were further divided into high site index (greater than 70) and low site index sites using TEUI data. This dataset indicated that 30 percent of ponderosa pine in the forest is characterized with high site index and 70 percent with low site index.

Table C-6. Acres that may be suited for timber production by ERU in the Santa Fe NF

Forested ERUs	Acres
Ponderosa Pine	129,805
Dry Mixed Conifer	172,176
Wet Mixed Conifer	10,044
Spruce-fir	19,292
Total	331,317*

*These acres from forested ERUs represent 93 percent of all "may be suited" acres.

In the final step of the calculation, the "may be suited" acres for each ERU were multiplied by coefficients based on simulated growth models, as provided by Youtz and Vandendriesche (2015), to obtain total board feet or total cubic feet per year. These volume values were summed for all applicable ERUs, then adjusted by dividing by 100,000 to get a total value of sustained yield limit per decade in million board feet and million cubic feet (Table C-7).

Table C-7. Sustained yield limit calculation for the Santa Fe NF over several decades

Forest Type (ERU)	Uneven-aged yield Board feet (9"+ d.b.h.)	Uneven-aged yield Cubic feet (5"+ d.b.h.)	ERU Acres	Total Board feet per year	Total Cubic feet per year
Ponderosa pine-grass (low SI <70)	75.4	15.5	90,864	6,851,145.6	1,408,392
Ponderosa pine-grass (high SI >70 - 30-yr cut cycle)	115.9	23.6	38,941	4,513,261.9	919,007.6
Dry mixed conifer	93.8	22.9	172,176	16,150,108.8	3,942,830.4
Wet mixed conifer	89.6	24.7	10,044	899,942.4	248,086.8
Spruce-fir (mix)	99.6	27.9	19,292	1,921,483.2	538,246.8
			Sustained yield limit per year	30,335,941.9 **Board feet** (9"+ d.b.h.)	7,056,563.6 **Cubic feet** (5"+ d.b.h.)
			Sustained yield limit per decade (millions)	303.359419	70.565636

Projected Timber Sale Quantity (PTSQ) and Projected Wood Sale Quantity (PWSQ)

Projected timber sale quantity (PTSQ) and projected wood sale quantity (PWSQ) are the quantities of timber and other forest products that have the potential to be sold during the first two decades of the revised plan, based on the projected vegetation treatments outlined in plan objectives. The projected wood sale quantity includes all woody material likely to be sold from harvests whether or not the woody material meets utilization standards. The projected timber sale quantity is a subset of the projected wood sale quantity and is an estimate of the quantity of timber that would be expected to be sold during the plan period if vegetation treatment objectives were met. The volume in the projected timber sale quantity is the volume that meets utilization standards and must be equal to or lower than the sustained yield limit for the forest (unless a short-term departure from the limit is authorized). For Region 3, the applicable utilization standards for determining the PTSQ and representing it in both cubic and board feet are:

- Merchantable cubic feet volumes (5+ inches d.b.h., 4 inches minimum top diameter in bark)
- Merchantable board feet volumes (9+ inches d.b.h., 6 inches minimum top diameter in bark)

Harvest activity may occur on "Lands suited for timber production" and on "Lands not suited for timber production," based on compatibility with desired conditions and objectives (Phase 2-Timber Suitability Analysis), though only lands suited for timber production would be managed as areas for the purposeful growing, tending, harvesting, and regeneration of regulated crops of trees for industrial or consumer use. As described earlier, on lands not suited for timber production, tree cuttings may still occur to increase safety in areas popular for recreational activities, and to improve stand health, structure, function, or composition in accordance with desired conditions. Thus, in the following tables, the quantities of timber in both suited lands and non-suited lands are totaled to give a full representation of what quantities of timber are present on the landscape and for comparison of that quantity in relation to the SYL of the Forest. The estimation of these two quantities must be consistent with the plan components of the final land management plan; the unique mix of plan components in each alternative; and consistent with the fiscal and organizational capability of the unit. The planned management objectives for PTSQ and PWSQ are also limited based upon constraints described in FSH 1909.12, Chapter 60, section 64.32.

Calculations

PTSQ and PWSQ were calculated using the percentage of suitable acres for all applicable ERUs (those containing dominant trees), which included ponderosa pine, mixed dry conifer, wet mixed conifer, spruce-fir, juniper grass, piñon-juniper grass, piñon-juniper woodland, and piñon-juniper shrubland. Some of these ERUs do not have plan objectives for treatments (spruce-fir forest, wet mixed conifer, piñon-juniper woodland, and piñon-juniper shrubland) and thus, did not contribute wood volume to PTSQ or PWSQ under alternatives 2, 3, or 4. The treatment objectives for vegetation, which differed according to plan alternatives, were imported into the Vegetation Dynamics Development Tool (VDDT). Modeling specialists at the regional office created vegetation models for all applicable ERUs. Each ERU model was fitted with specific inputs for each alternative, using the average objective acres for mechanical treatments (and fire) (*see Appendix B. Description of the Analysis Process: Vegetation*) into the VDDT modeling software. The outputs of the VDDT models were transcribed into Excel spreadsheets created by regional specialists, with a separate sheet for each unique combination of ERU, alternative (1, 2, 3, or 4), and decade (first or second- the anticipated lifespan of the draft forest plan). Each sheet calculated the total quantities of forest products divided into numerous categories based on results from Forest Vegetation Simulator modeling applied to forest inventory analysis plots where the silvicultural prescription was simulated multiple times to produce product output values. The totals from each individual sheet were transcribed into a summary spreadsheet to calculate potential timber and wood sale quantities according to the average vegetation treatment acres given in plan objectives by decade. These quantities were then recorded into PTSQ and PWSQ tables (Table C-8 through Table C-11) according to alternative.

Table C-8. Alternative 1 PTSQ and PWSQ for two decades in the Santa Fe NF

Sustained Yield Limit	**303.4 MMBF / 70.6 MMCF per decade**					
	First Decade			Second Decade		
	MMCF	MMBF	Tons	MMCF	MMBF	Tons
Timber Products	Volumes other than salvage or sanitation volumes that meet timber product utilization standards					
Lands suitable for timber production						
A1. Sawtimber (9”+ d.b.h.)	4.7	20.5	71,246	5.4	24.1	82,774
A2. Other products (5-9” d.b.h.)	1.4		40,079	1.8		94,997
Lands not suitable for timber production						
B1. Sawtimber (9”+ d.b.h.)	7.9	34.5	119,949	9.4	41.5	142,720
B2. Other products (5-9” d.b.h.)	2.3		94,216	3.2		250,811
C. Projected Timber Sale Quantity (PTSQ) (A1+A2+B1+B2)	**16.3**	**55.0**	**325,490**	**19.8**	**65.6**	**571,302**
Other Estimated Wood Products	Fuelwood, biomass, and other volumes that do not meet timber product utilization standards					
	MMCF	Tons		MMCF	Tons	
D1. Softwood fuelwood (5”+ d.b.h.)	1.75	0.48		1.86	0.51	
D2. Hardwood fuelwood (5”+ d.b.h.)	0.97	0.37		0.93	0.36	
D3. Aspen (5”+ d.b.h.)	1.20	0.28		1.20	0.28	
E. Projected Wood Sale Quantity (PWSQ) (C+D1+D2+D3)	**20.2**	**325,491**		**23.8**	**571,303**	

Table C-9. Alternative 2 PTSQ and PWSQ for two decades in the Santa Fe NF

Sustained Yield Limit (SYL)	**303.4 MMBF / 70.6 MMCF per decade**					
	First Decade			Second Decade		
	MMCF	MMBF	Tons	MMCF	MMBF	Tons
Timber Products	Volumes other than salvage or sanitation volumes that meet timber product utilization standards					
Lands suitable for timber production						
A1. Sawtimber (9”+ d.b.h.)	13.8	60.8	210,366	15.0	65.9	227,938
A2. Other products (5-9” d.b.h.)	4.4		64,623	4.4		65,044
Lands not suitable for timber production						
B1. Sawtimber (9”+ d.b.h.)	19.3	85.0	294,103	21.0	92.6	320,415
B2. Other products (5-9” d.b.h.)	6.2		90,354	6.2		91,275
C. Projected Timber Sale Quantity (PTSQ) (A1+A2+B1+B2)	**43.7**	**145.8**	**659,446**	**46.6**	**158.5**	**704,671**
Other Estimated Wood Products	Fuelwood, biomass, and other volumes that do not meet timber product utilization standards					
	MMCF	Tons		MMCF	Tons	
D1. Softwood fuelwood (5”+ d.b.h.)	3.60	1.0		2.97	0.8	
D2. Hardwood fuelwood (5”+ d.b.h.)	3.33	1.3		3.10	1.2	
D3. Aspen (5”+ d.b.h.)	2.18	0.5		3.32	0.8	
E. Projected Wood Sale Quantity (PWSQ) (C+D1+D2+D3)	**52.8**	**659,449**		**56.0**	**704,674**	

Table C-10. Alternative 3 PTSQ and PWSQ for two decades in the Santa Fe National Forest

Sustained Yield Limit	**303.4 MMBF / 70.6 MMCF per decade**					
	First Decade			Second Decade		
	MMCF	MMBF	Tons	MMCF	MMBF	Tons
Timber Products	Volumes other than salvage or sanitation volumes that meet timber product utilization standards					
Lands suitable for timber production						
A1. Sawtimber (9”+ d.b.h.)	0	0	0	0	0	0
A2. Other products (5-9” d.b.h.)	0		0	0		0
Lands not suitable for timber production						
B1. Sawtimber (9”+ d.b.h.)	16.9	74.0	258,513	10.4	45.9	159,038
B2. Other products (5-9” d.b.h.)	5.2		76,949	3.9		57,578
C. Projected Timber Sale Quantity (PTSQ) (A1+A2+B1+B2)	**22.1**	**74**	**335,462**	**14.3**	**45.9**	**216,616**
Other Estimated Wood Products	Fuelwood, biomass, and other volumes that do not meet timber product utilization standards					
	MMCF	Tons		MMCF	Tons	
D1. Softwood fuelwood (5”+ d.b.h.)	0.37	0.1		0.31	0.1	
D2. Hardwood fuelwood (5”+ d.b.h.)	1.17	0.5		0.77	0.3	
D3. Aspen (5”+ d.b.h.)	1.45	0.3		0.87	0.2	
E. Projected Wood Sale Quantity (PWSQ) (C+D1+D2+D3)	**25.1**	**335,462.9**		**16.25**	**216,616.6**	

As Table C-8 through Table C-10 illustrate, alternatives 1, 2, and 3 result in PTSQs less than the sustained yield limit of the forest. At the average acres estimated for vegetation treatment, alternative 4 (Table C-11) would result in a departure above sustained yield limit.

Table C-11. Alternative 4 PTSQ and PWSQ for two decades in the Santa Fe National Forest

Sustained Yield Limit	**303.4 MMBF / 70.6 MMCF per decade**					
	First Decade			Second Decade		
	MMCF	MMBF	Tons	MMCF	MMBF	Tons
Timber Products	Volumes other than salvage or sanitation volumes that meet timber product utilization standards					
Lands suitable for timber production						
A1. Sawtimber (9”+ d.b.h.)	43.6	192.6	665,395	24.7	108.6	377,590
A2. Other products (5-9” d.b.h.)	14.1		205,704	9.5		141,431
Lands not suitable for timber production						
B1. Sawtimber (9”+ d.b.h.)	60.8	268.9	929,321	34.8	152.9	531,933
B2. Other products (5-9” d.b.h.)	19.7		287,269	13.4		198,287
C. Projected Timber Sale Quantity (PTSQ) (A1+A2+B1+B2)	**138.2**	**461.5**	**2,087,689**	**82.4**	**261.5**	**1,249,241**
Other Estimated Wood Products	Fuelwood, biomass, and other volumes that do not meet timber product utilization standards					
	MMCF	Tons		MMCF	Tons	
D1. Softwood fuelwood (5”+ d.b.h.)	18.1	5.0		7.3	2.0	
D2. Hardwood fuelwood (5”+ d.b.h.)	14.1	5.4		6.4	2.5	
D3. Aspen (5”+ d.b.h.)	6.03	1.4		5.3	1.2	
E. Projected Wood Sale Quantity (PWSQ) (C+D1+D2+D3)	**176.4**	**2,087,701**		**101.4**	**1,249,247**	

Table C-12. Low objective acres for alternative 4: PTSQ and PWSQ for two decades in the Santa Fe National Forest

Sustained Yield Limit	303.4 MMBF / 70.6 MMCF per decade					
	First Decade			Second Decade		
	MMCF	MMBF	Tons	MMCF	MMBF	Tons
Timber Products	Volumes other than salvage or sanitation volumes that meet timber product utilization standards					
Lands suitable for timber production						
A1. Sawtimber (9”+ d.b.h.)	18.9	83.6	288,327	19.0	83.9	290,566
A2. Other products (5-9” d.b.h.)	6.2		90,405	6.1		89,660
Lands not suitable for timber production						
B1. Sawtimber (9”+ d.b.h.)	26.3	116.6	402,316	26.6	117.3	406,152
B2. Other products (5-9” d.b.h.)	8.7		126,265	8.6		125,154
C. Projected Timber Sale Quantity (PTSQ) (A1+A2+B1+B2)	**60.1**	**200.2**	**907,313**	**60.3**	**201.2**	**911,532**
Other Estimated Wood Products	Fuelwood, biomass, and other volumes that do not meet timber product utilization standards					
	MMCF	Tons		MMCF	Tons	
D1. Softwood fuelwood (5”+ d.b.h.)	17.0	4.7		6.3	1.7	
D2. Hardwood fuelwood (5”+ d.b.h.)	10.3	4.0		5.6	2.2	
D3. Aspen (5”+ d.b.h.)	2.1	0.5		2.6	0.6	
E. Projected Wood Sale Quantity (PWSQ) (C+D1+D2+D3)	**89.5**	**907,322.1**		**74.8**	**911,536.5**	

Allowing for a 10.0 MMCF departure in decades 1 and 2, still did not get the projected timber sale quantity below the adjusted sustained yield limit in either decade, though it was close to the threshold in decade 2. To provide a comparison, the following table illustrates the PTSQ and PWSQ quantities estimated if vegetation treatments were implemented at the low end of the range proposed in plan objectives for alternative 4 (Table C-12).

As shown in Table C-12, using the low end of the range for vegetation treatments in alternative 4 results in a PTSQ less than the forest’s sustained yield limit. This level of treatment is more compatible with the amount of timber and other forest products that the Santa Fe NF can sustainably produce. The lower level of treatment may also be more fiscally conservative as mechanical treatments may be costly to implement. However, since stand conditions over much of the forest are currently overstocked, harvesting over the sustainable yield limit for a short time, may be allowable, especially to meet restoration goals over larger areas.

A comprehensive discussion of the effects of timber suitability, sustained yield limit, PTSQ and PWSQ by alternative is included in Section 3.10 of the Santa Fe NF FEIS (Forest Products).

Reference for Appendix C

Youtz, J.A. and D. Vandendriesche. 2015. Overview of the Planning Requirements for Timber Suitability and associated NFMA timber calculations per the 2012 Planning Rule (36 CFR 219. 11) and Directives (FSH 1909.12, Chapter 60). USDA Forest Service, Southwestern Region, Albuquerque, NM.

Appendix D – Documentation of the Analysis of At-Risk Species

There are 36 at-risk species identified on the Santa Fe NF (4 federally listed and 32 species of conservation concern) all of which rely on quality habitat. Quality habitat is defined by ecological conditions that are at or approaching reference condition, as well as abiotic (non-living features like water or rock) and geological features (e.g., cliff and rock formations) that provide the life-cycle requirements for a particular species.

Ecological response units (ERUs) form the foundation for wildlife habitat. Ecological conditions within the ERUs provide wildlife with many biotic and abiotic components that provide shelter, food, breeding and brooding rearing cover, and other physical requirements. Biotic components include vegetative conditions such as seral state, snag density, coarse woody debris, and vegetative composition. Historically, natural disturbance processes at varying intervals reset these conditions on varying scales resulting in a myriad of vegetative conditions that maximized species diversity and viability. Abiotic components that support wildlife, such as water and other geologic features need to be found in sufficient quantity and quality to meet the needs of wildlife that depend on it. Not all species rely on the same habitat components, so habitat with some degraded components may negatively impact some species but not others. Human-caused influences may also negatively impact species viability.

At-risk species are negatively impacted by ecological conditions that are degraded or non-existent. These out-of-reference conditions are identified as issues that need to be addressed by the forest plan. Most of these landscape-level conditions are addressed through coarse-filter approaches defined by desired conditions in various ecological resources (for example, vegetation, water, soil, etc.). Standards, guidelines, and objectives in the forest plan direct forest management to help achieve those desired conditions. Other issues, both natural and human-caused, may exist outside of broad-based ecosystem concerns that are contributing to decreased viability of at-risk species. These are identified as threats and are typically addressed through fine-filter, or species-specific, plan components.

Methodology

Viability for at-risk species should be maintained or increased when the ecological conditions on which they rely improve or achieve reference conditions. Therefore, analysis of at-risk species focuses on how the proposed action and alternatives impact the issues and threats that are negatively impacting at-risk species (Table D-1). For individual species analysis, see the At-risk Species Crosswalk.

The 14 issues and threats that impact at-risk species in the Santa Fe NF are:

A. *Highly Departed Seral State* (*22 at-risk species*) – may disrupt or reduce foraging, breeding, and nesting activities especially for birds and mammals. Indicator: Percent seral state departure
B. *Highly Departed Coarse Woody Debris* (*11 at-risk species*) – may disrupt foraging activities for mammals and fish or germination for plants. Indicator: Tons of coarse woody debris per acre.
C. *Highly Departed Snag Density* (*2 at-risk species*) – may disrupt nesting and foraging activities in birds. Indicator: Snags per acre.
D. *Uncharacteristic Fire (24 at-risk species*) – may completely eliminate isolated or endemic populations, cause erosion and siltation in fish habitat. Indicator: Fire class regime
E. *Invasive Vegetative Encroachment* (*14 at-risk species*) – may disrupt foraging and nesting in small mammals or encroach on resources for plant species. Indicator: Acres of invasive plants

F. *Disconnected Floodplains* (*8 at-risk species*) – may reduce or disrupt foraging and breeding activities in aquatic species, alters soil conditions for plants. Indicator: Stream miles treated
G. *Limited or Specific Soil Conditions* (*6 at-risk species*) – required ecological conditions for plant and invertebrate species. Indicator: Soil condition
H. *Specific Ecological Features or Conditions* (18 *at-risk species*) - required ecological conditions for bird, mammal, fish and plant species. Indicator: Varies because it is specific for each species
I. *Non-Native Species Predation* (Aquatic) (*4 at-risk species*) – may cause direct mortality to aquatics through predation or competition. Indicator: Miles of stream with nonnatives
J. *Ground/Soil Disturbance* (*15 at-risk species*) – may cause direct mortality to plant, invertebrate species through compaction, erosion concerns for fish. Indicator: Miles of roads and trails
K. *Intrusive Human Activity* (*16 at-risk species*) – may alter foraging, breeding or nesting behaviors in mammals, birds, and fish, trampling concerns with plants. Indicator: Varies for each species
L. *Unnatural Disease Spread* (*4 at-risk species*) – may cause direct mortality or reduce vigor in mammals and aquatic species. Indicator: Unnatural disease outbreak events
M. *Human-made Features* (*5 at-risk species*) – may cause direct mortality or birds through collision or entanglement, may alter migrations of mammals. Indicator: Infrastructure construction
N. *Chemical Applications* (6 *at-risk species*) – may cause direct mortality of invertebrates or fish through chemical poisoning. Indicator: Allowed use of chemicals.

Discussion

Given the tremendous variability of at-risk species in both their ecological needs, as well as their abundance and distribution, an in-depth detailed analysis of the effects of the forest plan on each species is often not possible. Since the plan does not direct where management takes place, its impact on individual species cannot be determined. It is, however, possible to determine effects on ecological conditions required by those species. If the actions partaken in the plan trend toward reference conditions, which are equal to high quality habitat for these species, it is reasonable to assume viability for at-risk species will increase. If they trend away, viability will not increase. The totality of the plan's effects on those ecological conditions is therefore the best way to conduct at-risk species analysis.

Table D-1. Issues and threats associated with at-risk species (Santa Fe National Forest Plan Final Assessment Report, 2016a, Volume I. Ecological Resources)

	Issues with Degraded Ecological Conditions - Habitat (*Mostly Coarse Filter*)								**Threats** from Human or Forest Activities (*Mostly Fine Filter*)					
At-Risk Species in the Santa Fe NF	A. Highly Departed Seral State	B. Highly Departed Coarse Woody Debris	C. Highly Departed Snag Density	D. Uncharacteristic Fire	E. Invasive Vegetation Encroachment	F. Disconnected Flood plains (wet soils)	G. Limited or Specific Soil Conditions	H. Specific Ecological Features or Conditions	I. Nonnative Predation (Aquatic)	J. Ground/Soil Disturbance (Livestock Grazing, Roads and Trails)	K. Intrusive Human Activity (Rec Disturbance)	L. Unnatural Disease (introduced or spread)	M. Human-made Features (Mortality/Alt. Behav.)	N. Chemical Applications (e.g. pesticides)
American marten (*Martes caurina*)		x		x	x									
American peregrine falcon (*Falco peregrinus anatum*)								x			x		x	x
Arizona willow (*Salix arizonica*)	x	x		x	x	x				x				
Black swift (*Cypseloides niger*)	x							x			x			
Boreal owl (*Aegolius funereus*)				x										
Chaco milkvetch (*Astragalus micromerius*)							x	x		x				
Chama blazing star (*Mentzelia conspicua*)		x			x		x	x		x				
Greene's milkweed (*Asclepias uncialis*)	x	x			x					x				
Gunnison's prairie dog (*Cynomys gunnisoni*)											x	x	x	
Gunnison's mariposa lily (*Calochortus gunnisonii*)	x			x				x						
Heil's alpine whitlowgrass (*Draba heilii Al-shebaz*)										x	x			
Holy Ghost Ipomopsis (*Ipomopsis sanctispiritu*)				x						x	x			
Jemez Mountain salamander (*Plethodon neomexicanus*)				x								x		
Jemez woodland snail (*Ashmunella ashmuni*)	x			x			x	x						
Large yellow lady's-slipper (*Cypripedium parviflorum*)		x		x	x					x	x			
Lewis's woodpecker (*Melanerpes lewis*)	x		x	x										
Lilljeborg's peaclam (*Pisidium lilljeborgi*)				x										x
Masked shrew (*Sorex cinereus*)	x			x	x	x					x			
Mexican spotted owl (*Strix occidentalis lucida*)	x		x	x				x						
NM meadow jumping mouse (*Zapus hudsonius luteus*)	x			x	x	x		x		x	x			
Northern goshawk (*Accipiter gentilis*)	x			x				x					x	
Northern leopard frog (*Lithobates pipiens*)	x			x		x		x	x	x	x	x	x	x
Pecos fleabane (*Erigeron subglaber*)	x	x		x	x					x	x			
Pinyon jay (*Gymnorhinus cyanocephalus*)													x	
Rio Grande chub (*Gila Pandora*)	x	x		x	x	x		x	x	x	x			x
Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*)	x	x		x	x	x		x	x	x	x	x		x
Rio Grande sucker (*Catostomus plebeius*)	x	x		x	x	x		x	x	x	x			x
Ruidoso snaggletooth (*Gastrocopta ruidosensis*)							x	x		x				
Snowshoe hare (*Lepus Americana*)		x		x	x									
Spotted bat (*Euderma maculatum*)	x			x							x			
Springer's blazing star (*Mentzelia springeri*)	x	x			x		x	x		x				
Tufted sand verbena (*Abronia bigelovii*)	x			x			x	x						
Water shrew (*Sorex palustris*)	x			x	x	x		x			x			
Western burrowing owl (*Athene cunicularia hypugaea*)	x							x			x			
White-tailed ptarmigan (*Lagopus leucurus*)	x										x			
Wood lily (*Lilium philadelphicum*)	x			x										

Appendix E. At-Risk Species Crosswalk

The Santa Fe National Forest has identified 36 at-risk species, four of these species are federally listed threatened or endangered, while 32 species have been identified at species of conservation concern. Through analysis of known data and scientific literature, eight issues and six threats have been identified as negatively impacting the viability of at-risk species in the forest.

If someone is interested in what the forest is doing for any particular at-risk species, it would be difficult to find that individual species in one place in the forest plan. Rather, the forest is managing the ecological conditions that may negatively be impacting each at-risk species. This, in turn, improves conditions not just for at-risk species, but for a myriad of other species dependent upon those same ecological conditions. In addition, since wildlife can be impacted by numerous resources and activities (such as vegetation, water, roads, recreation, range, etc.) wildlife plan components are integrated throughout multiple resource sections within the forest plan and the full scope of plan components for any species is not evident in only the wildlife section. These crosswalks pull together all the plan components in one location to better demonstrate how the forest will manage for the viability of each at-risk species.

These crosswalks compile forest plan guidance intended to increase viability of at-risk species. Plan components consist of coarse-filter and fine-filter approaches and demonstrate the widespread but detailed attention the forest plan provides for managing ecosystems for the persistence of each at-risk species (Section A). Plan components that address the issues and threats that are impacting at-risk species are also compiled (Section B). Finally, wildlife connectivity is addressed through a variety of coarse- and fine-filter plan components in multiple resource areas (Section C).

Plan Component Coding

EXAMPLE Plan Component

Plan Code   Section Code   Component Type   Numerical Order

FW-ATRISK-DC-2

Plan Code

FW – Forestwide	DA – Designated Area	MA – Management Areas
GA – Geographic Areas		

Section Code

Ecological Resources		
VEG – Vegetation	SFF – Spruce Fir Forest	MCW – Mixed Conifer Wet (with Aspen)
MCD – Mixed Conifer Dry (Frequent Fire)	PPF – Ponderosa Pine Forest	JUG – Juniper Grass
PJS – Piñon-Juniper Shrub	PJO – Piñon-Juniper Woodland	SAGE – Sagebrush Shrubland
ALP – Alpine-Tundra	MSG – Montane/Subalpine Grassland	CPGB – Colorado Plateau/ Great Basin Grassland
RMZ – Riparian Management Zone	WUI – Wildland-Urban Interface	FIRE – Fire and Fuels
WATER - Water	AQUASH – Aquatic Species and Habitats	TERRASH – Terrestrial Species and Habitats
INVASIVES – Invasive Species	ATRISK – At-Risk Species	SOIL – Soil
AIR – Air		
Socio-Economic Resources		
PARTNER – Partnerships	TRIBES – Tribal Communities	RURALH – Rural Historic
ARCH – Archaeology	FORESTRY – Forestry	RANGE – Range
REC – Recreation	DEVREC – Developed Recreation	DISREC – Dispersed Recreation
RECSU – Recreation Special Uses	ROADS – Roads	FAC – Facilities
XBOUND – Cross-Boundary Management	LANDS – Lands	LANDSU – Lands Special Uses
LEASEMIN – Leases Mineral	ALTENERGY – Alternative Energy	MINERAL – Mineral
SCENIC – Scenery		
Specific Areas		
DA – Designated Areas	WILD – Wilderness	IRA – Inventoried Roadless Area
RNA – Research Natural Area	WSR – Wild and Scenic Rivers	CDNST – Continental Divide Nat. Historic Trail
NHT – National Historic Trail	NRT – National Recreation Trails	JNRA – Jemez National Recreation Area
SB – Scenic Byways	WHT – Wild Horse Territory	CAJA – Caja Del Rio Wildlife and Cultural Area
CANBON – Canada Bonita Proposed RNA	CULTINT – Cultural Interpretive Area	OGLEASE – Oil and Gas Leasing Area
RECWILD – Recommended Wilderness	ELIGWSR – Eligible Wild and Scenic River	CANNAC – Canadas and Nacimiento
ESAN – East Sangres	JEMMC – Jemez Mesas and Canyons	NJEMM – North Jemez Mountains
PECOSRIV – Pecos River Canyon	RMAC – Rowe Mesa and Anton Chico	WSANCAJA – West Sangres and Caja

Component Type

DC – Desired Condition	O – Objective	S – Standard
G – Guideline	MA – Management Approach	

Section A. At-Risk Species Crosswalk – by Species

The following tables reference plan components within the Santa Fe NF revised plan that ensure management for persistence of each at-risk species. While these tables capture the majority of plan components, they are not all inclusive. For a detailed description of these at-risk species, please refer to the Santa Fe NF revised Forest Plan FEIS, chapter 3.

American Marten

Martes caurina is a cat-sized predator in the weasel family known only from the Sangre de Cristo Mountains. It is at the edge of the species' range within the Santa Fe NF. Extensive searches for this species in the Jemez Mountains in the best habitat available were negative and resulted in the only known population in the spruce-fir forest in the northeastern portion of the forest. The species lives exclusively in mature spruce fir and higher elevation mixed conifer forests. Spruce-fir forests are moderately departed from reference condition with limited predicted change in seral state departure. Recent large wildfires (Pacheco Fire 2011 and Jaroso Fire 2013) have reduced the spruce-fir ERU in the northeastern portion of the forest. A primary threat to the persistence of American marten is the build-up of coarse woody debris in the spruce-fir forest. A catastrophic fire in this ERU could eliminate much of the remaining habitat available for martens. Another human-caused threat may be the introduction of invasive vegetation (thistle), which is altering the composition of the marten's native habitat.

Plan Components for American Marten

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Spruce fir forests Riparian areas Coarse woody debris	Coarse woody debris departure Catastrophic fire Invasive vegetation encroachment	ALL FW-VEG-DCs, ALL FW-SFF-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-FORESTRY-S-1, FW-FORESTRY-G-1, FW-FORESTRY-MA-5	FW-ATRISK-DC-1, FW-ATRISK-G-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-2, FW-ATRISK-MA-1

American Peregrine Falcon

Falco peregrinus anatum is known as single pairs or in very limited numbers within all the local zones where it nests in suitable cliffs and rock outcrops. Threats include disturbance, eggshell thinning from accumulated pesticides, and disturbance from recreational activities (90 percent of potential habitat). Of the known eyries in the Santa Fe NF, about a quarter of them were monitored each year under contract with U.S. Fish and Wildlife Service or New Mexico Department of Game and Fish. Long-term monitoring shows declining productivity of peregrines from 2001 to 2013 in New Mexico. Results from monitoring show reproduction at less than one offspring per bonded pair.

Plan Components for Peregrine Falcon

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Mixed-conifer with frequent fire Mixed-conifer with aspen Ponderosa pine forest Cliff faces	Specific ecological features Intrusive human activity Human-made features Chemical applications	ALL FW-VEG-DCs, ALL FW-MCW-DCs, ALL FW-MCD-DCs, ALL FW-PPF-DCs, FW-TERRASH-DC-1, FW-TERRASH-DC-3, FW-SOIL-DC-6, FW-AIR-DC-4, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-5, FW-LANDSSU-DC-3, FW-LANDSSU-DC-5, FW-MINERAL-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-S-1, FW-TERRASH-G-1, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-5, FW-AIR-MA-1, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-6, FW-ROADS-G-2, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-ROADS-G-3, FW-FAC-G-3, FW-LANDSSU-S-1, FW-LANDSSU-G-2, MA-CAJA-MA-4	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-8, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-6, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Arizona Willow

Salix arizonica is found only in very high-elevation areas in wet open meadows and stream banks in the northwestern (San Pedro Parks Wilderness) and northeastern (Pecos Wilderness) areas. A primary threat to the persistence of Arizona willow is the build-up of coarse woody debris in the spruce-fir forest. A catastrophic fire within this ERU could seriously reduce the distribution and number of specimens of this plant in the forest. Other human-caused threats may include the introduction of invasive vegetation (thistle) that is altering the composition of the willow's native habitat. This plant is closely associated with riparian areas that are currently highly departed (e.g., site potential and proportion of bare soil are departed at 73 and 60 percent, respectively), while potential to return to reference conditions remains unknown. Livestock impact the growth and vigor of this willow (100 percent of potential habitat affected). Protection by small enclosures in the San Pedro Parks area resulted in a better condition for those plants.

Plan Components for Arizona Willow

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Spruce-fir forest Riparian areas	Seral state departure Coarse woody debris departure Catastrophic fire Invasive vegetation encroachment Disconnected floodplains Ground/Soil Disturbance	ALL FW-VEG DCs, ALL FW-SFF-DCS, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-WATER-DC-1, FW-WATER-DC-2, FW-WATER-DC-3, FW-WATER-DC-4, FW-WATER-DC-5, FW-WATER-DC-6, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-SOIL-DC-1, FW-SOIL-DC-2, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, FW-ROADS-DC-3, FW-LEASEMIN-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, DA-NHT-DC-2, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-S-1, FW-RMZ-G-2, FW-RMZ-G-3, FW-RMZ-G-4, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-AQUASH-O-1, FW-AQUASH-G-4, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-4, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-SOIL-G-2, FW-SOIL-G-4, FW-RANGE-DC-3, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-5, FW-RANGE-MA-6, FW-RANGE-MA-7, FW-RANGE-MA-9, FW-RANGE-MA-12, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-MA-8, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-MA-2, DA-WILD-S-3, DA-WILD-G-4, DA-WSR-G-1, DA-WSR-G-4, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Black Swift

Cypseloides niger nest behind or near waterfalls or caves. The species has a low reproductive rate of one nestling a year. It is known to occur at a site in the in the southeast local zone and a site in the northeast local zone. Although little is known of this species, its spruce-fir habitat remains highly vulnerable to predicted climate change. Primary threats include recreational climbing and harassment at nest sites. Due to its primary existence at only two geographical sites (Jemez and Nambe falls) within the Santa Fe NF, the species could be seriously impacted by management or other recreational activities that occur in the forest. Since waterfall features tend to be a highly attractive to recreationists, there is increased potential for impact at nesting sites.

Plan Components for Black Swift

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Spruce-fir forests Riparian Areas Waterfalls	Seral state departure Special ecological features Intrusive human activity	ALL FW-VEG-DCs, ALL FW-SFF-DCs, ALL FW-RMZ-DCs, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-7, FW-WATER-DC-1, FW-WATER-DC-3, FW-WATER-DC-4, FW-WATER-DC-5, FW-WATER-DC-6, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-SOIL-DC-1, FW-SOIL-DC-2, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-G-2, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-7, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-AQUASH-O-1, FW-AQUASH-G-4, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-3, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-TERRASH-MA-4, DA-WSR-G-1, DA-WSR-G-4, MA-OGLEASE-G-2, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Boreal Owl

Aegolius funereus is only found in the spruce-fir ERU. Populations appear to be extremely small with only three eBird observations in the southeastern section of the forest since 2012. Of the forested ERU types, spruce-fir forest has the highest vulnerability to predicted climate change and only two other ERUs found in the forest have a higher proportion of vulnerability in the high and very high categories. This species is at the southernmost extension of its range and although it has been found on surveys, recent large wildfires (South Fork 2010, Pacheco Fire 2011, Las Conchas 2011, Thompson Ridge 2013, and Jaroso Fire 2013) have reduced the spruce-fir ERU in these areas. A catastrophic fire within this ERU could eliminate much of the remaining habitat available for boreal owls.

Plan Components for Boreal Owl

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Spruce fir forests	Catastrophic fire	ALL FW-VEG-DCs, ALL FW-SFF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, DA-WHT-DC-2, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-TERRASH-O-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-TERRASH-MA-5, FW-FORESTRY-S-1, FW-FORESTRY-G-1, FW-FORESTRY-MA-5, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-10, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1

Chaco Milkvetch

Astragalus micromerius. Existing populations tend to be isolated which, for plants, substantially increases the probability of genetic uniqueness within each and adaptation to the specific sites, and that is a factor in conserving diversity. Current departure from desired condition within their ERUs—piñon-juniper woodland, piñon-juniper sage, and piñon-juniper grassland—may result in significantly increasing stress and decreasing vigor for these species, as these usually shallow outcrop formations will be drying more rapidly. Although projected status in piñon-juniper habitats appears to trend toward reference conditions, in general, these habitats are considered at risk for significant increased drying and prolonged drought from climate change increasing the stress from other threats (fire and grazing) as well. Other threats include trampling, off-road vehicle use, and mining activities. While this species may seem to have a relatively broad range geographically, its habitat (these outcroppings of sandstone that are blended with Todilto gypsum or limestone) is actually quite limited because of its spotty distribution across the landscape.

Plan Components for Chaco Milkvetch

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Piñon-juniper woodland Piñon-juniper shrubland Piñon-juniper grass	Specific or limited soil condition Specific ecological features Ground/soil disturbance	ALL FW-VEG-DCs, ALL FW-PJO-DCs, ALL FW-PJS-DCs, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-SOIL-DC-1, FW-SOIL-DC-2, FW-SOIL-DC-4, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-SOIL-DC-6, FW-SOIL-DC-7, FW-ROADS-DC-3, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, DA-WHT-DC-2, MA-OGLEASE-DC-1, MA-RECWILD-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-G-2, FW-TERRASH-MA-1, FW-TERRASH-MA-3, FW-TERRASH-MA-4, FW-SOIL-S-1, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-3, FW-SOIL-G-4, FW-SOIL-MA-1, FW-SOIL-MA-4, FW-DISREC-G-4, FW-DISREC-G-6, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-ROADS-MA-2, FW-LANDSSU-S-2, DA-ALLDA-G-1, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-1, DA-WSR-G-2, DA-WSR-G-4, MA-OGLEASE-G-1, MA-OGLEASE-G-2, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-8, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Chama Blazing Star

Mentzelia conspicua occurs only in the Jemez Mountains, known only from Chama Canyon on sedimentary soils within the canyon. It is usually found on gray to red shales of Mancos and Chinle soil formations in the piñon-juniper woodland ERU. Seral state departure is low in piñon-juniper woodland habitat; however, there is some departure in composition from introduced nonnative species. Invasive species such as bull thistle, Russian olive, salt cedar, and Siberian elm have moderately impacted (36 percent departure) the understory composition. Site potential has also been influenced by drought and other disturbances that have reduced vegetative ground cover and increased the proportion of bare soil. Partial reductions in vegetative cover can be attributed to the substantial increases in coarse woody debris loadings. Other threats include habitat disturbance from recreation, sagebrush mowing, and road construction and maintenance.

Plan Components for Chama Blazing Star

Ecological Conditions	Issues and Threats	<u>Coarse-Filter Components</u> Desired Conditions	<u>Coarse-Filter Components</u> Objectives, Standards, Guidelines and Management Approaches	<u>Fine-Filter Components</u> Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Piñon-juniper woodland Mancos and Chinle soil formations	Coarse woody debris departure Invasive vegetation encroachment Limited or specific soil conditions Special ecological features Ground or soil disturbance	ALL FW-VEG-DCs, ALL FW-PJO-DCs, FW-TERRASH-DC-1, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-SOIL-DC-1, FW-SOIL-DC-2, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-SOIL-DC-6, FW-SOIL-DC-7, FW-ROADS-DC-3, FW-FAC-DC-2, FW-LEASEMIN-DC-1, FW-MINERAL-DC-1, MA-OGLEASE-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-O-2, FW-TERRASH-G-2, FW-TERRASH-MA-1, FW-TERRASH-MA-3, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-SOIL-S-1, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-3, FW-SOIL-G-4, FW-SOIL-MA-1, FW-SOIL-MA-4, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-FAC-G-4, FW-LANDSSU-DC-3, FW-LANDSSU-S-2, FW-MINERAL-S-2, DA-ALLDA-G-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-2, MA-OGLEASE-G-1, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-8, FW-ATRISK-MA-1

Greene's Milkweed

Asclepias uncialis ssp. *uncialis* occurs in low numbers wherever it is found and was reported from only one location in the southeastern portion of the forest. Searches by experts found this plant in no other location in the Santa Fe NF than where it was originally reported. Threats include trampling by livestock. The area where it is reported to occur is not subject to grazing except by occasional strays. Seral state departure is low in piñon-juniper woodland habitat; however, there is some departure in composition from introduced nonnative species. Invasive species such as bull thistle, Russian olive, salt cedar, and Siberian elm have moderately impacted (36 percent departure) understory composition. Site potential has also been influenced by drought and other disturbances that have reduced vegetative ground cover and increased the proportion of bare soil. Partial reductions in vegetative cover can be attributed to the substantial increases in coarse woody debris loadings.

Plan Components for Greene's Milkweed

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Piñon-juniper woodland Piñon-juniper grass	Seral state departure Coarse woody debris departure Invasive vegetation encroachment Ground or soil disturbance	ALL FW-VEG-DCs, ALL FW-PJO-DCs, ALL FW-PJS-DCs, FW-TERRASH-DC-1, FW-SOIL-DC-43, FW-SOIL-DC-5, FW-ROADS-DC-3, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-MINERAL-DC-1, MA-OGLEASE-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-O-2, FW-TERRASH-G-2, FW-TERRASH-MA-1, FW-TERRASH-MA-3, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-SOIL-G-1, FW-SOIL-G-4, FW-RANGE-DC-4, FW-RANGE-S-1, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-8, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-FAC-G-4, FW-LANDSSU-S-2, FW-MINERAL-S-2, DA-ALLDA-G-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-2, MA-OGLEASE-G-1, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-8, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1

Gunnison's Prairie Dog

Cynomys gunnisoni is currently known on the northwestern and central portions of the forest, but has historically been found in all suitable habitat in the Santa Fe NF. It is primarily found in small numbers on the Caja del Rio Plateau and in the Chama Wild and Scenic corridor and occasionally at lower elevations in other districts. Prairie dogs typically occupy piñon-juniper habitats that are in low to moderate departure. Threats include recreational shooting (New Mexico Department of Game and Fish has no regulations against shooting prairie dogs) and sylvatic plague. Due to its decreased range in the Santa Fe NF, sylvatic plague can be a limiting factor and eliminate colonies in one season, preventing them from reaching a sustainable population and colonizing areas formerly occupied.

Plan Components for Gunnison's Prairie Dog

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Colorado Plateau/ Great Basin Grasslands Juniper grass Piñon-juniper woodland Piñon-juniper shrubland Piñon-juniper grass Sagebrush shrubland	Intrusive human disturbance Unnatural disease spread Human-made features	ALL FW-VEG-DCs, ALL FW-JUG-DCs, ALL FW-PJS-DCs, ALL FW-PJO-DCs, FW-TERRASH-DC-1, FW-TERRASH-DC-3, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-S-1, FW-TERRASH-G-1, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-5, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, , FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-DISREC-MA-8, FW-RECSU-S-3, FW-FAC-G-3	FW-ATRISK-DC-1, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-10, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-6, FW-ATRISK-MA-9

Gunnison's Mariposa Lily

Calochortus gunnisonii var. *perpulcher* is a very rare and restricted endemic, in a delicate habitat, inherently vulnerable because of its rarity. The lily occupies meadows and aspen glades in upper montane coniferous forest; 2,900 to 3,400 meters (9,500 to 11,200 feet), one of the habitats presumably very vulnerable to climate change. Mid- and high-seral states that are currently 50 percent departed from reference will transition to tree and shrub invaded states with continued encroachment. The lack of disturbance also continues to limit the amount of montane coniferous forest sites that are reinitiated back to an early, low-seral state. The overall seral state proportion for montane coniferous forest, like other frequent-fire systems continues to remain in a highly departed condition based on 100-year VDDT modeling. Based on the current disturbance regime, modeled future conditions indicate that limited fire occurrence in this ERU will continue leading to degraded conditions in montane coniferous forest. Although its response to grazing and fire is unknown, the threats from grazing and fire may be a concern in the meadow and glade habitats for a species this restricted.

Plan Components for Gunnison's Mariposa Lily

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Montane subalpine grass	Seral state departure Invasive vegetation encroachment Specific ecological features	ALL FW-VEG-DCs, ALL FW-MSG-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, , FW-SOIL-DC-1, FW-SOIL-DC-2, FW-SOIL-DC-5, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-SOIL-G-2, FW-SOIL-G-4, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Heil's Alpine Whitlowgrass

Draba heilii is a recently discovered small, high alpine yellow-flowered plant. Although its alpine-tundra habitat has changed little from reference condition, it is threatened by trampling of hikers, climbers, horseback riders, and occasional livestock (100 percent of potential habitat). It was found in an area near the Truchas Peaks along trails above timberline in the Pecos Wilderness. Identification and awareness of this plant is needed so it can be identified and impacts to it can be avoided or mitigated, in particular for trail maintenance projects.

Plan Components for Heil's Alpine Whitlowgrass

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Alpine-tundra	Ground or soil disturbance Intrusive human activity	ALL FW-VEG-DCs, ALL FW-ALP-DCs, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-SOIL-DC-7, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-3, FW-ROADS-DC-5, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-ALTENERGY-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-G-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-3, FW-TERRASH-MA-4, FW-TERRASH-MA-5, FW-SOIL-G-1, FW-SOIL-G-4, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-LANDSSU-S-2, FW-MINERAL-S-2, DA-ALLDA-G-1, DA-RNA-S-3, DA-RNA-S-6, DA-RNA-S-8, MA-OGLEASE-G-1, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-8, FW-ATRISK-G-10, FW-ATRISK-G-13, FW-ATRISK-G-14

Holy Ghost Ipomopsis

Ipomopsis sancti-spiritus is a federally endangered plant species found only in the Pecos Ranger District. It is a genetically distinct species found nowhere else. It is an endemic species found only in the Holy Ghost Canyon in the Sangre de Cristo mountain range. A recovery plan was written for the species in 2002, and is being followed with the additional work of State botanists to experimentally plant seedlings to increase the population. The species has been transplanted to a few other sites, but success is uncertain for maintaining it.

Plan Components for Holy Ghost Ipomopsis

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Mixed conifer with frequent fire Ponderosa pine forests	Catastrophic fire Ground or soil disturbance Intrusive human activity	ALL FW-VEG-DCs, ALL FW-MCD-DCs, ALL FW-PPF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-RMZ-DC-4, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-ROADS-DC-3, GA-PECOSRIV-DC-4, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, MA-OGLEASE-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-RMZ-O-1, FW-RMZ-S-1, FW-RMZ-G-2, FW-RMZ-G-7, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-SOIL-G-1, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-SOIL-G-2, FW-FORESTRY-S-1, FW-FORESTRY-G-1, FW-FORESTRY-G-2, FW-FORESTRY-MA-5, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-LANDSSU-S-2, FW-MINERAL-S-2, DA-ALLDA-G-1, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-8, FW-ATRISK-MA-1

Jemez Mountain Salamander

Plethodon neomexicanus is a federally endangered species endemic only to the Santa Fe NF. It was listed as endangered in 2013. There are 22,974 hectares (56,770 acres) of designated critical habitat in the Santa Fe NF. It feeds primarily on invertebrates. Threats include habitat loss from severe wildfire or other activities that alter hydrology and disease including chytrid fungus. Grazing is believed to be a vector for chytrid fungus when livestock carry it into the habitat from water sources where it can be present. Wildlife can also carry the fungus now, but did not do so in the past, as chytrid fungus was not known to be present under reference conditions.

Plan Components for Jemez Mountain Salamander

Ecological Conditions	Issues and Threats	<u>Coarse-Filter Components</u> Desired Conditions	<u>Coarse-Filter Components</u> Objectives, Standards, Guidelines and Management Approaches	<u>Fine-Filter Components</u> Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Mixed-conifer with frequent fire Mixed-conifer with aspen Ponderosa pine forests	Catastrophic fire Unnatural disease spread	ALL FW-VEG-DCs, ALL FW-MCW-DCs, ALL FW-MCD-DCs, ALL FW-PPF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-SOIL-DC-5, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-SOIL-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-MA-1, FW-ATRISK-MA-6, FW-ATRISK-MA-9

Jemez Woodland Snail

Ashmunella ashmuni is a narrow endemic occurring in only a few canyons in the southwestern portion of the Santa Fe NF. They are associated with limestone outcropping in juniper grassland, ponderosa pine, and mixed conifer (dry) ERUs, all of which are in moderate to high departure with no significant improvement predicted. The snails are a moisture-dependent species so climate change may significantly impact this species. Given the habitats of the only known populations of this species are highly departed, Jemez woodland snails are considered at-risk in the Santa Fe NF.

Plan Components for Jemez Woodland Snail

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Juniper grass Mixed-conifer with frequent fire Ponderosa pine forests	Seral state departure Catastrophic fire Limited or specific soil conditions Special ecological features	ALL FW-VEG-DCs, ALL FW-MCD-DCs, ALL FW-PPF-DCs, ALL FW-JUG-DCs, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-6, FW-TERRASH-DC-1, FW-SOIL-DC-1, FW-SOIL-DC-2, FW-SOIL-DC-4, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-SOIL-DC-6, FW-SOIL-DC-7, FW-FORESTRY-DC-1, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-MINERAL-DC-1, MA-OGLEASE-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-SOIL-S-1, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-3, FW-SOIL-G-4, FW-SOIL-MA-1, FW-SOIL-MA-4, FW-FORESTRY-S-1, FW-FORESTRY-S-2, FW-FORESTRY-S-4, FW-FORESTRY-G-1, FW-FORESTRY-MA-5, FW-FORESTRY-MA-9, FW-DISREC-G-4	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-MA-1

Large Yellow Lady's-Slipper

Cypripedium parviflorum var. *pubescens* is known from only eight locations in the Santa Fe NF. A primary threat to the persistence of large yellow lady's-slipper is the build-up of coarse woody debris in the spruce-fir forest. A catastrophic fire within this ERU could seriously reduce the distribution and number of specimens of this plant in the forest. Other human-made threats may be introduced invasive vegetation (thistle), which is altering the composition of its native habitat. Trampling, picking, or digging up plants (100 percent of potential habitat) are also recognized threats, while picking the flowers prevents seed formation. This plant is valuable to collectors and can be sold for a high price. It is known from the Pecos Wilderness and surrounding areas, which experience high recreational use.

Plan Components for Large Yellow Lady's-Slipper

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Mixed-conifer with aspen Spruce fir forests	Coarse woody debris departure Catastrophic fire Invasive vegetation encroachment Ground or soil disturbance Intrusive human activity	ALL FW-VEG-DCs, ALL FW-SFF-DCs, ALL FW-MCW-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-SOIL-DC-1, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-SOIL-DC-7, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-3, FW-ROADS-DC-5, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-G-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-3, FW-TERRASH-MA-4, FW-TERRASH-MA-5, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-4, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-DISREC-MA-8, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-ROADS-MA-2, FW-FAC-G-4, FW-LANDSSU-S-2, DA-ALLDA-G-1, DA-WILD-DC-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-3, DA-RNA-S-6, DA-RNA-S-8, MA-OGLEASE-G-1, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-8, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Lewis's Woodpecker

Melanerpes lewisi is tied to the ponderosa pine ERU, which is in high departure from reference condition in the Santa Fe NF. The woodpecker has a large range in the western United States and adjacent southern Canada, but distribution can be spotty; apparently declining in abundance, and it may have declined 60 percent or more since the 1960s. Vulnerable to loss of nesting sites (large snags) such as may result from logging, urban and agricultural development; and to degradation of riparian habitats by drought and overgrazing. Large wildfires in the Jemez Mountains have negatively affected the ponderosa pine ERU large tree and large snag special feature needed by this species. Current ponderosa pine forest landscapes have changed significantly toward single-storied, closed-canopy seral states. This species should be considered at-risk in the Santa Fe NF due to its continued population decline and the high departure from reference of ponderosa pine habitat.

Plan Components for Lewis's Woodpecker

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Ponderosa pine forests	Seral state departure Snag density departure Catastrophic fire	ALL FW-VEG-DCs, ALL FW-PPF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-FORESTRY-S-1, FW-FORESTRY-S-2, FW-FORESTRY-G-1, FW-FORESTRY-MA-5, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1

Lilljeborg's Peaclam

Pisidium lilljeborgi is found in only one high-elevation lake in the Pecos Wilderness, and is found in no other place in New Mexico. This highly restricted range invariably makes the species vulnerable to extinction in the Santa Fe NF. The lake in which they are found has not been assessed according to its reference condition. Threats include siltation into the lake or use of chemical retardant for fire suppression that could wash into the lake. Considering the forest surrounding the lake is prone to potential catastrophic fire, this species is considered at-risk in Santa Fe NF.

Plan Components for Lilljeborg's Peaclam

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Alpine lake	Catastrophic fire Chemical applications	ALL FW-VEG-DCs, ALL FW-RMZ-DCs, ALL FW-ALP-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-WATER-DC-1, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-G-7, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-WATER-O-1, FW-AQUASH-S-1, FW-AQUASH-MA-3, FW-AQUASH-MA-4, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-8, FW-ATRISK-MA-1, FW-ATRISK-MA-6

Masked Shrew

Sorex cinereus hunts insects and small mammals along banks of cold streams, in wet meadows, or under logs in cold spruce forest (spruce-fir forest ERU and herbaceous, willow-thin-leaf alder, upper montane conifer-willow, and narrow-leaf cottonwood-spruce riparian ERUs). Most of these ERUs' current ecological conditions in the Santa Fe NF are departed from reference, because of changes in vegetative composition and hydrology. Negative impacts to the masked shrew include sedimentation caused by grazing, fuelwood gathering, wildfire, recreation, motorized travel, and changes in hydrology. Key characteristics of quality masked shrew habitat are currently highly departed, while potential to return to reference conditions remains unknown. When looking at the potential risk of compromised system integrity of perennial streams across the 37 watersheds, 10 were assigned a low risk, 11 a moderate risk, and 7 a high risk. Although 9 watersheds had no risk (as perennial streams were not present), almost half of all perennial streams (where present) were deemed moderate to high risk to system integrity.

Plan Components for Masked Shrew

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Spruce fir forests Riparian areas	Seral state departure Catastrophic fire Invasive vegetative encroachment Disconnected floodplains Intrusive human activity	ALL FW-VEG-DCs, ALL FW-SFF-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-WATER-DC-1, FW-WATER-DC-2, , FW-WATER-O-1, FW-AQUASH-DC-1, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-5, DA-NHT-DC-2, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-JEMMC-DC-3 GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-G-2, FW-RMZ-G-7, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-AQUASH-MA-3, FW-AQUASH-MA-4, FW-TERRASH-O-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-TERRASH-MA-5, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-MA-6, FW-RANGE-MA-7, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, , FW-DISREC-G-3, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-ROADS-G-8, DA-RNA-S-3, DA-WSR-G-1, DA-WSR-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-10, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1

Mexican Spotted Owl

Strix occidentalis lucida is a federally threatened species known in Coyote, Jemez, Española, and Pecos-Las Vegas Ranger Districts. This species is apparently non-migratory and feeds primarily on small mammals. Young owls, however, are known to disperse long distances. There are 80,487 hectares (198,888 acres) of designated critical habitat in the Santa Fe NF. The Mexican spotted owl requires a variety of mixed conifer habitats, proximity to riparian areas, standing large snags for roosting and nesting, or cavities in vertical canyon walls. Timber management activities negatively affected habitat before the Mexican spotted owl was listed as threatened in 1995. Timber harvest, prescribed burning, and other management activities are designed following the Mexican Spotted Owl Recovery Plan (2012), along with consultation with the U.S. Fish and Wildlife Service. These management activities can still have disturbance effects to the Mexican spotted owl and its habitat.

Plan Components for Mexican Spotted Owl

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Mixed-conifer with frequent fire Mixed-conifer with aspen Ponderosa pine forests Riparian areas	Seral state departure Snag density departure Catastrophic fire Specific ecological features	ALL FW-VEG-DCs, ALL FW-MCW-DCs, ALL FW-MCD-DCs, ALL FW-PPF-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FORESTRY-DC-1, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-G-2, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-WATER-DC-6, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-FORESTRY-S-1, FW-FORESTRY-S-2, FW-FORESTRY-G-1, FW-FORESTRY-MA-5, FW-FORESTRY-MA-9, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-MA-2, DA-WSR-G-1, DA-WSR-G-4, MA-OGLEASE-S-1, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

New Mexico Meadow Jumping Mouse

Zapus hudsonius luteus is federally listed as endangered. The species occurs in dense mid-elevation riparian long grass habitats in the western United States. Proposed critical habitat exists in the Santa Fe NF, and the species has been documented in the forest. The number of historic locations of the species in the forest is greater than outside the forest boundary. Within the Santa Fe NF, the jumping mice are found in isolated locations along the Rio Cebolla and San Antonio Creek (Frey 2005, 2007). In 2005 and 2006, the mouse was captured at 5 localities in the Jemez Mountains in northern New Mexico, Sandoval County (Frey 2005). A study conducted by Carol Chambers 2016–2019 also detected 97 mice along multiple reaches of the Rio Cebolla and the Rio de Las Vacas (Chambers 2019). The major threats faced are the degradation of riparian habitat caused by actions such as legacy grazing, post-wildfire flooding events, and unmanaged recreation. Outside of the forest, agricultural uses and development of land have permanently changed historic locations.

Plan Components for New Mexico Meadow Jumping Mouse

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Riparian areas	Seral state departure Catastrophic fire Invasive vegetative encroachment Disconnected floodplains Specific ecological features Ground/soil disturbance Intrusive human activity	ALL FW-VEG-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-WATER-DC-1, FW-WATER-DC-2, FW-WATER-DC-3, FW-WATER-DC-4, FW-WATER-DC-5, FW-WATER-DC-6, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-SOIL-DC-1, FW-FORESTRY-DC-1, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-FAC-DC-2, FW-LEASEMIN-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-S-1, FW-RMZ-G-2, FW-RMZ-G-3, FW-RMZ-G-4, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-7, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-DC-7, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-FIRE-MA-12, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-AQUASH-O-1, FW-AQUASH-G-4, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-4, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-5, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2 FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-FORESTRY-S-1, FW-FORESTRY-S-2, FW-FORESTRY-S-4, FW-FORESTRY-G-1, FW-FORESTRY-MA-5, FW-FORESTRY-MA-9, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-5, FW-RANGE-MA-6, FW-RANGE-MA-9, FW-RANGE-MA-12, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, , FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-DISREC-MA-8, FW-ROADS-DC-3, FW-ROADS-DC-5, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-8, FW-ROADS-MA-2, FW-FAC-G-2, FW-FAC-G-4, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-3, DA-WSR-G-1, DA-WSR-G-2, DA-WSR-G-4, MA-OGLEASE-S-1, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Northern Goshawk

Accipiter gentilis is a forest habitat generalist that uses a wide variety of forest ages, structural conditions, and successional stages, most of which are departed from reference condition in the Santa Fe NF because of fire suppression activities and in some cases, stand-replacing fire. Although the departure from reference in ponderosa pine forests has created closed-canopy conditions beneficial to northern goshawks, they remain extremely vulnerable to catastrophic fire, which can greatly alter or reduce optimal habitat. Nest sites are found in all areas of the forest surrounded by post-fledging family areas. Several nest sites and post-fledging family areas have been lost or abandoned because of stand-replacing fires. Annual monitoring within the plan area has documented this decline. Strong direction to incorporate the vegetative guidelines for developing forest structure is needed especially for the recovering burned areas for the species to persist over the long term in the plan area.

Plan Components for Northern Goshawk

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Mixed-conifer with frequent fire Ponderosa pine forests	Seral state departure Catastrophic fire Specific ecological conditions	ALL FW-VEG-DCs, ALL FW-MCD-DCs, ALL FW-PPF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-FORESTRY-DC-1, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-MINERAL-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-S-1, FW-TERRASH-G-1, FW-TERRASH-G-3, FW-TERRASH-MA-1, FW-FORESTRY-S-1, FW-FORESTRY-S-2, FW-FORESTRY-G-1, FW-FORESTRY-MA-5, FW-FORESTRY-MA-9, MA-OGLEASE-S-1, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Northern Leopard Frog

Lithobates pipiens were found in all the areas historically but are now absent in many historic locations. This riparian species requires springs, slow streams, or other perennial water as habitat and for overwintering; during warmer months they may be found in wet meadows or other habitats near standing water and these habitats are limited in the Santa Fe NF. Characteristics of quality northern leopard frog habitat are highly departed, while potential to return to reference conditions remains unknown. Threats to their aquatic habitats are moderate to high. For lakes and ponds, the potential risk to compromised system integrity within the Santa Fe NF was moderate for most watersheds, while the potential risk to compromised system integrity of seeps and springs within the Santa Fe NF was high for most of the watersheds. Ongoing threats include degradation of habitat caused by grazing, chytrid fungus, or siltation due to uncharacteristic wildlife and poor road management. Northern leopard frogs are considered at-risk due to their limited range and moderate to high risk within their habitats.

Plan Components for Northern Leopard Frog

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Riparian areas Seeps, springs, or other perennial water	Seral state departure Catastrophic fire Specific ecological features Nonnative predation Ground/soil disturbance Intrusive human activity Unnatural disease spread Human-made features Chemical applications	ALL FW-VEG-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-WATER-DC-1, FW-WATER-DC-2, FW-WATER-DC-3, FW-WATER-DC-4, FW-WATER-DC-5, FW-WATER-DC-6, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-SOIL-DC-1, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LANDSSU-DC-5, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-S-1, FW-RMZ-G-2, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, , FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-WATER-G-4, FW-WATER-MA-3, FW-AQUASH-O-1, FW-AQUASH-O-2, FW-AQUASH-G-2, FW-AQUASH-G-4, FW-AQUASH-G-5, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-4, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-S-1, FW-TERRASH-G-1, FW-TERRASH-G-3, FW-TERRASH-MA-1, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-S-3, FW-RANGE-G-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-4, FW-RANGE-G-5, FW-RANGE-G-8, FW-RANGE-MA-6, FW-RANGE-MA-12, FW-DEVREC-G-4, FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-MA-8, FW-RECSU-S-3, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-MA-2, FW-FAC-G-3, FW-FAC-G-4, FW-LANDSSU-S-1, FW-LANDSSU-G-2, DA-WILD-S-3, DA-WILD-G-4, DA-WSR-S-6, DA-WSR-G-1, DA-WSR-G-4, MA-CAJA-G-2, MA-OGLEASE-G-2, MA-RECWILD-S-1,MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-6, FW-ATRISK-MA-7, FW-ATRISK-MA-8, FW-ATRISK-MA-9

Pecos Fleabane

Erigeron subglaber is a narrow endemic and the range is even narrower than previously thought due to a misidentification on Wheeler Peak. The largest known population on Elk Mountain also has the highest known impacts (road, radio tower, in grazing allotment with high grazing impact recorded, and recreational off-road vehicle use). It is now known to be very narrowly endemic and subject to high risk of climate change in spruce-fir habitats. A primary threat to the persistence of Pecos fleabane is the build-up of coarse woody debris in the spruce-fir forest. A catastrophic fire within this ERU could seriously reduce the distribution and number of specimens of this plant in the forest. Other human-caused threats may include the introduction of invasive vegetation (thistle), which is altering the composition of native habitat.

Plan Components for Pecos Fleabane

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Spruce fir forests	Seral state departure Coarse woody debris departure Catastrophic fire Invasive vegetative encroachment Ground or soil disturbance Intrusive human activity	ALL FW-VEG-DCs, ALL FW-SFF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-SOIL-DC-7, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-3, FW-ROADS-DC-5, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-TERRASH-O-2, FW-TERRASH-G-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-3, FW-TERRASH-MA-4, FW-TERRASH-MA-5, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-4, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-S-1, FW-RANGE-MA-7, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, , FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-DISREC-MA-8, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-FAC-G-4, FW-LANDSSU-S-2, FW-MINERAL-S-2, DA-ALLDA-G-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-3, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-1, DA-WSR-G-2, MA-OGLEASE-G-1, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-8, FW-ATRISK-G-10, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1

Pinyon Jay

Gymnorhinus cyanocephalus are tied to the piñon-juniper sagebrush and piñon-juniper woodland ERUs. Piñon-juniper Sagebrush is in moderate departure from reference conditions, while piñon-juniper woodland is in low to moderate departure. Although predicted to remain in low departure from reference conditions, piñon-juniper habitats are predicted to have the greatest variation within the forest when it comes to climate change vulnerability. Breeding Bird Survey trend data for pinyon jays suggest declines in populations; survey results show 4.0 percent declining trend (significant) in New Mexico from 2003 to 2013. Though the exact cause of pinyon jay decline is unknown, it may be due to their reliance on piñon trees, which were significantly impacted by recent drought conditions in the forest.

Plan Components for Pinyon Jay

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Piñon-juniper woodland Piñon-juniper shrubland	Seral state departure Human-made features	ALL FW-VEG-DCs, ALL FW-PJS-DCs, ALL FW-PJO-DCs, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-LANDSSU-DC-3, FW-LANDSSU-DC-5, MA-OGLEASE-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-S-1, FW-TERRASH-G-1, FW-TERRASH-G-3, FW-TERRASH-MA-4, FW-FAC-G-3, FW-LANDSSU-S-1, FW-LANDSSU-G-2, DA-WSR-G-1, MA-CAJA-G-2	FW-ATRISK-DC-1, FW-ATRISK-G-1, FW-ATRISK-G-2

Rio Grande Chub

Gila pandora have declined in range and abundance over the last 100 years. Populations can be threatened by habitat degradation that includes habitat loss, modification, and fragmentation, as well as from interactions with nonnative species. Impacts in the Santa Fe NF include degraded stream and riparian habitat as well as water quality and quantity as a result of inadequately maintained roads and trails, water diversions, livestock grazing, and recreational use. Catastrophic fire and other extreme events such as drought and floods can also impact the species. Predation and competition with nonnative species can be extensive threats to Rio Grande Chub populations through predation from nonnative species such as brown trout and by competition for food resources with white sucker (Rees and Miller 2005a). Rio Grande chub are petitioned for listing under the Endangered Species Act.

Plan Components for Rio Grande Chub

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Riparian areas	Seral state departure Coarse woody debris departure Catastrophic fire Invasive vegetation encroachment Disconnected floodplains Specific ecological features Nonnative predation Ground or soil disturbance Intrusive human activity Chemical applications	ALL FW-VEG-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, ALL FW-WATER-DCs, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-3, FW-ROADS-DC-5, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-S-1, FW-RMZ-G-2, FW-RMZ-G-3, FW-RMZ-G-4, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-7, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, , FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-WATER-G-4, FW-AQUASH-O-1, FW-AQUASH-O-2, FW-AQUASH-S-1, FW-AQUASH-G-4, FW-AQUASH-G-5, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-3, FW-AQUASH-MA-4, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-5, FW-RANGE-G-8, FW-RANGE-MA-6, FW-RANGE-MA-7, FW-RANGE-MA-12, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-DISREC-MA-8, FW-RECSU-S-3, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-ROADS-MA-2, FW-FAC-G-4, FW-LANDSSU-S-2, FW-LANDSSU-S-3, DA-ALLDA-G-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-3, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-1, DA-WSR-G-2, DA-WSR-G-4, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-3, FW-ATRISK-G-4, FW-ATRISK-G-5, FW-ATRISK-G-8, FW-ATRISK-G-8, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-6, FW-ATRISK-MA-7, FW-ATRISK-MA-8, FW-ATRISK-MA-9

Rio Grande Cutthroat Trout

Oncorhynchus clarkii virginalis occur in approximately 11 percent of their presumed historic range (Bakevich et al. 2019). These population declines combined with losses in suitable habitat have led to considerable concern over the species' ability to persist over the long term in the plan area. Conservation populations of Rio Grande cutthroat trout in the Santa Fe NF are isolated in high-elevation streams above natural and human-made barriers that prevent the upstream movement of nonnative trout that hybridize with, compete with, and prey upon native cutthroat trout. In the Santa Fe NF, while there are 1,183 miles of perennial streams, only 8 percent currently supports native fish species in the absence of nonnative fish. Rio Grande cutthroat trout are further threatened by degraded stream and riparian habitat, as well as water quality and quantity because of inadequately maintained roads and trails, water diversions, livestock grazing, and recreational use. Catastrophic fire and other extreme events such as drought and floods also threaten the persistence of small, isolated populations, which, because they occur above migratory barriers, cannot be recolonized naturally.

Plan Components for Rio Grande Cutthroat Trout

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Riparian areas	Seral state and coarse woody debris departure Catastrophic fire Invasive vegetation encroachment Disconnected floodplains Specific ecological features Nonnative predation Ground or soil disturbance Intrusive human activity Chemical applications	ALL FW-VEG-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, ALL FW-WATER-DCs, FW-SOIL-DC-5, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-3, FW-ROADS-DC-5, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, FW-MINERAL-DC-4, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-S-1, FW-RMZ-G-2, FW-RMZ-G-3, FW-RMZ-G-4, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-7, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-WATER-G-4, FW-WATER-G-4, FW-AQUASH-O-1, FW-AQUASH-O-2, FW-AQUASH-S-1, FW-AQUASH-G-4, FW-AQUASH-G-5, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-3, FW-AQUASH-MA-4, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-FORESTRY-G-1, FW-FORESTRY-G-3, FW-FORESTRY-MA-9, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-5, FW-RANGE-G-8, FW-RANGE-MA-6, FW-RANGE-MA-7, FW-RANGE-MA-12, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-DISREC-MA-8, FW-RECSU-S-3, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-ROADS-MA-2, FW-FAC-G-4, FW-LANDSSU-S-2, FW-LANDSSU-S-3, DA-ALLDA-G-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-3, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-1, DA-WSR-G-2, DA-WSR-G-4, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-3, FW-ATRISK-G-4, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-8, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-6, FW-ATRISK-MA-7, FW-ATRISK-MA-8, FW-ATRISK-MA-9

Rio Grande Sucker

Catostomus plebius is endemic to the Rio Grande drainage and has been extirpated from most of its historic range. Populations can be threatened by habitat degradation that includes habitat loss, modification, and fragmentation, as well as from interactions with nonnative species. Rio Grande sucker threats in the Santa Fe NF include degraded stream and riparian habitat as well as water quality and quantity because of inadequately maintained roads and trails, water diversions, livestock grazing, and recreational use. Catastrophic fire and other extreme events such as drought and floods can also impact the species. Competition with nonnative species and predation can be extensive threats to Rio Grande sucker populations through predation from brown trout and by hybridizing and competing for food resources with the white sucker.

Plan Components for Rio Grande Sucker

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Riparian areas	Seral state departure Coarse woody debris departure Catastrophic fire Invasive vegetation encroachment Disconnected floodplains Specific ecological features Nonnative predation Ground or soil disturbance Intrusive human activity Chemical applications	ALL FW-VEG-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, , FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, ALL FW-WATER-DCs, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-3, FW-ROADS-DC-5, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-S-1, FW-RMZ-G-2, FW-RMZ-G-3, FW-RMZ-G-4, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-7, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, , FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-WATER-G-4, FW-AQUASH-O-1, FW-AQUASH-O-2, FW-AQUASH-S-1, FW-AQUASH-G-4, FW-AQUASH-G-5, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-3, FW-AQUASH-MA-4, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-5, FW-RANGE-G-8, FW-RANGE-MA-6, FW-RANGE-MA-7, FW-RANGE-MA-12, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, , FW-DISREC-G-3, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-DISREC-MA-8, FW-RECSU-S-3, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-ROADS-MA-2, FW-FAC-G-4, FW-LANDSSU-S-2, FW-LANDSSU-S-3, DA-ALLDA-G-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-3, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-1, DA-WSR-G-2, DA-WSR-G-4, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-3, FW-ATRISK-G-4, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-8, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-6, FW-ATRISK-MA-7, FW-ATRISK-MA-8, FW-ATRISK-MA-9

Ruidoso Snaggletooth

Gastrocopta ruidosensis is a snail found only in two widely separated areas in New Mexico. And, it is a rather recent discovery in the Santa Fe NF. It lives in plant and leaf litter near limestone outcrops in juniper grasslands only on the east side of the Sangre de Cristo Mountains. Of the woodland ERUs found in the forest, climate change vulnerability for juniper grasslands is relatively low with 29 percent low, and 54 percent in the moderate vulnerability category. The northwestern portion of the forest, where the majority of juniper grasslands is found in the forest is relatively low in comparison to the other areas where juniper grasslands is found, with 47 percent at low and 41 percent at projected moderate vulnerability. Its highly restricted range invariably makes this species vulnerable to persistence in the Santa Fe NF. It can be affected by prescribed burning and trampling.

Plan Components for Ruidoso Snaggletooth

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Juniper grass	Limited or specific soil condition Specific ecological features Ground or soil disturbance	ALL FW-VEG-DCs, ALL FW-JUG-DCs, FW-FIRE-DC-2, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-SOIL-DC-1, FW-SOIL-DC-2, FW-SOIL-DC-4, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-SOIL-DC-6, FW-SOIL-DC-7, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-MINERAL-DC-1, MA-OGLEASE-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-9, FW-FIRE-MA-12, FW-TERRASH-O-2, FW-TERRASH-G-2, FW-TERRASH-MA-1, FW-TERRASH-MA-3, FW-SOIL-S-1, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-3, FW-SOIL-G-4, FW-SOIL-MA-1, FW-SOIL-MA-4, FW-DISREC-G-6, FW-ROADS-DC-3, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-LANDSSU-S-2, FW-MINERAL-S-2, DA-ALLDA-G-1, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-3, FW-ATRISK-G-8, FW-ATRISK-MA-1

Snowshoe Hare

Lepus americana is found only in the spruce-fir ERU in the northeast local zone of the Santa Fe NF. Snowshoe hare numbers are low, but this may be due to the Sangre de Cristo Mountains being at the southernmost extent of their range. This ERU is in moderate departure, but recent large wildfires (Pacheco Fire 2011 and Jaroso Fire 2013) have reduced the spruce-fir ERU in the northeastern portion of the forest, where the hare exists. A primary threat to the persistence of snowshoe hare is the build-up of coarse woody debris in the spruce-fir forest. A catastrophic fire within this ERU could eliminate much of the remaining habitat available. Another human-caused threat may be introduced invasive vegetation (thistle), which is altering the composition of the hare's native habitat. With its isolated range in the Santa Fe NF, an uncharacteristic fire or increased encroachment of invasive species puts snowshoe hare at-risk for persistence in the forest.

Plan Components for Snowshoe Hare

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Spruce-fir forests	Coarse woody debris departure Catastrophic fire Invasive vegetation encroachment	ALL FW-VEG-DCs, ALL FW-SFF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-FAC-DC-2, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, DA-WHT-DC-2, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-FIRE-MA-14, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-MA-8, FW-FAC-G-4, DA-WILD-S-3, DA-WILD-G-4, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-MA-1

Spotted Bat

Euderma maculata individuals have been recorded in the northwestern, southwestern, and southeastern areas of the Santa Fe NF. They are believed to require key ecosystem characteristics of accessible rock crevices (within all terrestrial ERUs) to roost in, which are limited or unknown in the forest. Recreational climbing disturbance at roost sites is known to impact this species. The potential seems low for white-nose syndrome, a lethal fungal infection found in some species of hibernating bats in the eastern and midwestern United States, as this bat is not known to hibernate in groups. Though this bat is associated with multiple ERUs, its preferred habitat is sub-alpine coniferous forests, which tend to be moderately to highly departed. This bat feeds on noctuid moths in and over the forest canopy. Large wildland fires can threaten this species if uncharacteristic and catastrophic fires remove large portions of the landscape. Restoration of the Santa NF is needed to avoid impacts to the population, which is low to rare wherever it is found.

Plan Components for Spotted Bat

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Mixed-conifer with aspen Spruce-fir forests	Seral state departure Catastrophic fire Intrusive human activities	ALL FW-VEG-DCs, ALL FW-SFF-DCs, ALL FW-MCW-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-5, FW-MINERAL-DC-1, DA-WILD-DC-1, DA-NHT-DC-2, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-TERRASH-O-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-5, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-ROADS-G-8, FW-MINERAL-S-11, DA-RNA-S-3, DA-WSR-G-1, DA-WSR-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-10, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1

Springer's Blazing Star

Mentzelia springeri occurs only in the Jemez Mountains on pumice deposits. It was formerly known only from within Bandelier National Monument. Seral state departure is low in piñon-juniper woodland habitat; however, there is some departure in composition because of introduced nonnative species. Invasive species such as bull thistle, Russian olive, salt cedar, and Siberian elm have moderately impacted understory composition. Site potential has also been influenced by drought and other disturbances that have reduced vegetative ground cover and increased the proportion of bare soil. Partial reductions in vegetative cover can be attributed to the substantial increases in coarse woody debris loadings. Springer's blazing star was recently found in one location in the Santa Fe NF, alongside a major road. Trampling or road maintenance can be a threat. Pumice mines are now closed in the forest, but were active for many years and undoubtedly affected habitat, making this species at risk

Plan Components for Springer's Blazing Star

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Piñon-juniper woodland	Seral state departure Coarse woody debris departure Invasive vegetation encroachment Limited or specific soil condition Specific ecological features Ground or soil disturbance	ALL FW-VEG-DCs, ALL FW-PJO-DCs, FW-WUI-DC-2, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-INVASIVE-DC-1, FW-INVASIVE-DC-2, FW-SOIL-DC-5, FW-SOIL-DC-6, FW-SOIL-DC-7, FW-FORESTRY-DC-1, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-ROADS-DC-3, FW-FAC-DC-2, FW-LANDSSU-DC-3, FW-LEASEMIN-DC-1, FW-MINERAL-DC-1, MA-OGLEASE-DC-1, GA-NJEMM-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-5, FW-FIRE-G-6, FW-FIRE-G-7, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-12, FW-TERRASH-O-2, FW-TERRASH-G-2, FW-TERRASH-MA-1, FW-TERRASH-MA-3, FW-INVASIVE-O-1, FW-INVASIVE-S-1, FW-INVASIVE-S-2, FW-INVASIVE-S-3, FW-INVASIVE-S-4, FW-INVASIVE-G-1, FW-INVASIVE-G-2, FW-INVASIVE-G-3, FW-INVASIVE-G-4, FW-INVASIVE-G-5, FW-INVASIVE-MA-1, FW-INVASIVE-MA-2, FW-INVASIVE-MA-3, FW-INVASIVE-MA-4, FW-INVASIVE-MA-5, FW-INVASIVE-MA-6, FW-INVASIVE-MA-7, FW-INVASIVE-MA-8, FW-SOIL-S-1, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-3, FW-SOIL-G-4, FW-SOIL-MA-1, FW-SOIL-MA-4, FW-FORESTRY-S-1, FW-FORESTRY-S-2, FW-FORESTRY-S-4, FW-FORESTRY-G-1, FW-FORESTRY-G-2, FW-FORESTRY-MA-5, FW-FORESTRY-MA-9, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-G-4, FW-RANGE-G-5, FW-RANGE-MA-6, FW-DISREC-G-4, FW-DISREC-G-5, FW-DISREC-G-6, FW-DISREC-MA-8, FW-ROADS-G-7, FW-ROADS-G-8, FW-ROADS-G-9, FW-ROADS-G-10, FW-FAC-G-4, FW-LANDSSU-S-2, FW-MINERAL-S-2, DA-ALLDA-G-1, DA-WILD-S-3, DA-WILD-G-4, DA-RNA-S-6, DA-RNA-S-8, DA-WSR-G-2, MA-OGLEASE-G-1, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-4, FW-ATRISK-G-5, FW-ATRISK-G-8, FW-ATRISK-MA-1

Tufted Sand Verbena

Abronia bigelovii also known as the Galisteo sand verbena has been documented in only a few locations in the northwestern portion of the Santa Fe NF. This species is generally scattered along outcroppings of gypsum or strongly gypseous soils. While this species may seem to have a relatively broad range geographically, its habitat is actually quite limited because of its spotty distribution across the landscape. Although geologic features such as gypsum and gypseous soils should remain in low departure from reference conditions, in general, these habitats are considered at risk for significant increased drying and prolonged drought from climate change increasing the stress from other threats (fire and grazing) as well.

Plan Components for Tufted Sand Verbena

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Juniper grass Sagebrush shrubland	Seral state departure Catastrophic fire Limited or specific soil conditions Specific ecological features	ALL FW-VEG-DCs, ALL FW-JUG-DCs, ALL-FW-SAGE-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-SOIL-DC-1, FW-SOIL-DC-2, FW-SOIL-DC-4, FW-SOIL-DC-4, FW-SOIL-DC-5, FW-SOIL-DC-6, FW-SOIL-DC-7, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, DA-NHT-DC-2, DA-WHT-DC-2, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, MA-RECWILD-G-2, GA-CANNAC-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-G-10, FW-FIRE-G-11, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-SOIL-S-1, FW-SOIL-G-1, FW-SOIL-G-2, FW-SOIL-G-3, FW-SOIL-G-4, FW-SOIL-MA-1, FW-SOIL-MA-4, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-4, FW-RANGE-G-5, FW-RANGE-MA-6, FW-RANGE-MA-7, FW-RANGE-MA-12, FW-DISREC-G-4, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-MA-2, DA-WSR-G-1, DA-WSR-G-4, MA-OGLEASE-G-2, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-9, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Water Shrew

Sorex palustris is a riparian-dependent shrew similar to masked shrews in that they hunt for insects or small minnows exclusively in clear, cold high-elevation streams. Most of these ERUs' current ecological conditions in the Santa Fe NF are departed from reference, because of changes in vegetative composition and hydrology. Potential threats to the water shrew include sedimentation caused by grazing, fuelwood gathering, wildfire, recreation, motorized travel, and changes in hydrology. Key characteristics of quality water shrew habitat are currently highly departed, while potential to return to reference conditions remains unknown. When looking at the potential risk of compromised system integrity of perennial streams across the 37 watersheds, 10 were assigned a low risk, 11 a moderate risk, and 7 a high risk. Although 9 watersheds had no risk (as perennial streams were not present), almost half of all perennial streams (where present) were deemed moderate to high risk to system integrity.

Plan Components for Water Shrew

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Riparian areas	Seral state departure Catastrophic fire Invasive vegetative encroachment Disconnected floodplains Specific ecological features Intrusive human activities	ALL-FW-VEG-DCs, ALL FW-RMZ-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-WATER-DC-1, FW-WATER-DC-2, FW-WATER-DC-3, FW-WATER-DC-4, FW-WATER-DC-5, FW-WATER-DC-6, FW-AQUASH-DC-1, FW-AQUASH-DC-2, FW-AQUASH-DC-3, FW-AQUASH-DC-4, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-RANGE-DC-5, FW-RANGE-DC-6, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-5, FW-ALTENERGY-DC-1, FW-MINERAL-DC-1, DA-WILD-DC-1, DA-WHT-DC-2, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-CANNAC-DC-1, GA-JEMMC-DC-3, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-RMZ-O-1, FW-RMZ-G-2, FW-RMZ-G-5, FW-RMZ-G-6, FW-RMZ-G-7, FW-RMZ-G-8, FW-RMZ-G-9, FW-RMZ-G-10, FW-RMZ-MA-2, FW-RMZ-MA-3, FW-FIRE-G-1, FW-FIRE-G-7, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-WATER-O-1, FW-WATER-O-2, FW-WATER-G-2, FW-AQUASH-O-1, FW-AQUASH-G-4, FW-AQUASH-MA-1, FW-AQUASH-MA-2, FW-AQUASH-MA-3, FW-AQUASH-MA-4, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1, FW-TERRASH-MA-4, FW-TERRASH-MA-5, FW-RANGE-O-2, FW-RANGE-S-1, FW-RANGE-G-1, FW-RANGE-G-2, FW-RANGE-G-3, FW-RANGE-G-5, FW-RANGE-MA-6, FW-RANGE-MA-7, FW-RANGE-MA-12, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-8, FW-ROADS-MA-2, DA-RNA-S-3, DA-WSR-G-1, DA-WSR-G-2, DA-WSR-G-4, MA-OGLEASE-G-2, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

Western Burrowing Owl

Athene cunicularia hypugaea is found in the Santa Fe NF in one location in the Colorado Plateau Great Basin grassland ERU. This ERU is considered in high departure from reference condition, thereby, a greater risk to the species. The presence of the western burrowing owl in the forest was only discovered in 2014. They nest and roost in recently abandoned burrows dug by mammals, including ground squirrels, prairie dogs, and badgers. Prairie dog populations in piñon-juniper grasslands are a concern due to the western burrowing owl's susceptibility to sylvatic plague. These burrows may soon become unsuitable for nesting (Green and Anthony 1989). For this reason, viability of the western burrowing owl is inextricably linked to that of prairie dogs. Threats to this species in the Santa Fe NF include any threats to burrowing mammals, such as Gunnison's prairie dogs, recreational shooting, dogs at large, and sylvatic plague.

Plan Components for Western Burrowing Owl

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Colorado Plateau/ Great Basin grasslands Juniper grass Piñon-juniper woodland Piñon-juniper shrubland Piñon-juniper grass Sagebrush shrubland	Seral state departure Specific ecological features Intrusive human activity	ALL FW-VEG-DCs, ALL FW-JUG-DCs, ALL FW-PJS-DCs, ALL FW-PJO-DCs, ALL FW-CPGB-DCs, ALL FW-SAGE-DCs, FW-TERRASH-DC-1, FW-TERRASH-DC-3, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-5, FW-MINERAL-DC-1, MA-OGLEASE-DC-1, GA-CANNAC-DC-1, GA-NJEMM-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-O-1, FW-TERRASH-O-2, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-1,FW-TERRASH-MA-5, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-ROADS-G-2, FW-ROADS-G-3, FW-ROADS-G-4, FW-ROADS-G-8, FW-ROADS-MA-2, DA-RNA-S-3, DA-WSR-G-1, DA-WSR-G-2, DA-WSR-G-4, MA-OGLEASE-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-9, FW-ATRISK-G-10, FW-ATRISK-G-11, FW-ATRISK-G-12, FW-ATRISK-G-13, FW-ATRISK-G-14, FW-ATRISK-MA-1, FW-ATRISK-MA-3, FW-ATRISK-MA-4, FW-ATRISK-MA-5, FW-ATRISK-MA-7, FW-ATRISK-MA-8

White-tailed Ptarmigan

Legopus leucurus use the alpine and tundra ERU of the Santa NF, which is only found in the northeastern area of the forest. Threats include degradation of habitat by grazing and recreation since the birds rely on alpine meadows with short vegetation consisting of sedges and herbaceous broad-leaved plants for nesting and brooding. Monitoring in the Carson NF indicates that ptarmigan are found in the alpine and tundra habitat shared with the Santa Fe NF, but in very small numbers. This species was re-introduced nearly 50 years ago after extirpation, and the population could at this point have low genetic diversity. Use of New Mexico's limited alpine tundra habitat by livestock plus increased human use including wilderness hiking, ski area developments, construction of snow catchment fences, and microwave relay stations, are among the threats to the state's remnant ptarmigan population.

Plan Components for White-tailed Ptarmigan

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Alpine tundra	Seral state departure Intrusive human activity	ALL FW-VEG-DCs, ALL FW-ALP-DCs, FW-TERRASH-DC-2, FW-TERRASH-DC-3, FW-RANGE-DC-3, FW-RANGE-DC-4, FW-DISREC-DC-2, FW-DISREC-DC-3, FW-RECSU-DC-3, FW-ROADS-DC-5, FW-ALTENERGY-DC-1, DA-WILD-DC-1, MA-RECWILD-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-TERRASH-G-3, FW-TERRASH-G-4, FW-TERRASH-MA-4, FW-TERRASH-MA-5, FW-RANGE-MA-7, FW-REC-MA-8, FW-DEVREC-G-4, FW-DEVREC-G-6, FW-DISREC-G-3, FW-DISREC-G-6, FW-DISREC-MA-2, FW-DISREC-MA-4, FW-ROADS-G-8, DA-RNA-S-3, DA-WSR-G-1, DA-WSR-G-2, MA-RECWILD-S-1	FW-ATRISK-DC-1, FW-ATRISK-G-1, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-G-6, FW-ATRISK-G-10, FW-ATRISK-G-13, FW-ATRISK-G-14

Wood Lily

Lilium philadelphicum is a State endangered plant associated with the ponderosa pine forest ERU, which is in high departure from reference condition. At the plan scale, only 3 percent of the Santa Fe NF ponderosa pine landscape is similar to reference conditions. Just over 70 percent of the landscape has moved into closed-canopy states with 60 percent representation in the medium to large tree states and 11 percent in the small-diameter tree state. Shifts in overstory structures toward closed canopies and limited disturbance (killing of over-story trees) has resulted in a significant departure, with current patches 72 acres on average in size. Threats include large wildfires such as those that have affected the Jemez Mountains in the past 20 years (Lakes, Cerro Grande, Las Conchas, Dome, and others). This plant was never abundant and no recent reports of its occurrence in the Santa Fe NF are known, therefore, the plant is considered at-risk in the forest.

Plan Components for Wood Lily

Ecological Conditions	Issues and Threats	Coarse-Filter Components Desired Conditions	Coarse-Filter Components Objectives, Standards, Guidelines and Management Approaches	Fine-Filter Components Desired Conditions, Objectives, Standards, Guidelines and Management Approaches
Ponderosa pine forests	Seral state departure Catastrophic fire	ALL FW-VEG-DCs, ALL FW-PPF-DCs, FW-WUI-DC-1, FW-WUI-DC-2, FW-WUI-DC-3, FW-FIRE-DC-1, FW-FIRE-DC-2, FW-FIRE-DC-3, FW-FIRE-DC-4, FW-FIRE-DC-5, FW-FIRE-DC-6, FW-FIRE-DC-7, FW-TERRASH-DC-1, FW-TERRASH-DC-2, FW-SOIL-DC-2, FW-FORESTRY-DC-1, FW-FORESTRY-DC-4, FW-FORESTRY-DC-5, FW-MINERAL-DC-1, DA-WILD-DC-1, MA-OGLEASE-DC-1, MA-RECWILD-DC-1, GA-NJEMM-DC-1, GA-WSAN-DC-1	FW-VEG-O-1, FW-VEG-O-2, FW-VEG-G-1, FW-VEG-MA-1, FW-FIRE-G-1, FW-FIRE-G-8, FW-FIRE-G-9, FW-FIRE-MA-6, FW-FIRE-MA-7, FW-FIRE-MA-8, FW-FIRE-MA-9, FW-FIRE-MA-10, FW-FIRE-MA-14, FW-TERRASH-O-2, FW-TERRASH-MA-1, FW-SOIL-G-2, FW-FORESTRY-S-1, FW-FORESTRY-S-2, FW-FORESTRY-G-1, FW-FORESTRY-MA-5, MA-RECWILD-S-1, MA-RECWILD-G-2	FW-ATRISK-DC-1, FW-ATRISK-DC-2, FW-ATRISK-DC-3, FW-ATRISK-G-2, FW-ATRISK-G-5, FW-ATRISK-MA-1

Section B. At-Risk Species Crosswalk – Issues and Threats

The following tables provide reference to all plan components within the Santa Fe National Forest Plan addressing the issues and threats for at-risk species (for a detailed description of these issues and threats, please refer to the Santa Fe NF Plan FEIS, chapter 3). Issues have been identified as habitat that is out-of-reference and in need of restoration (coarse filter approaches) while threats have been identified as human-caused activities that are negatively impacting at-risk species. These are usually addressed through fine filter approaches and may be very species specific. Managing for at-risk species is often a combination of coarse and fine filter plan components.

Issue A: Seral State Departure

Over 60 percent of all at-risk species in the Santa Fe NF are impacted by highly departed seral state (Table H, Santa Fe National Forest Plan Final Assessment Report, 2016a). Seral state is a complex issue that deals with the ecological succession of vegetation as it progresses toward a climax community. It looks at how vegetative systems age over time and what the average range of age classes of vegetation exist within the system. For example, a healthy and productive (in-reference condition) forest will consist of a mix of young, middle-aged, and old trees as well as gaps in between. These gaps may consist of open ground or herbaceous vegetation. A complete description of ERUs and their seral state composition is found in the assessment (Santa Fe NF 2016a). The variability in vegetative structure also contributes to other ecological conditions necessary for some species, such as snag density (amount of standing dead trees) or the amount of coarse woody debris (amount of dead tree material on the ground). These components may be critical for the persistence of some species and are indirectly tied to seral state condition since seral state impacts the recruitment, retention, and size classes of these features. Departure from reference conditions can negatively impact the habitat associated with these ecosystems. For example, a spruce-fir forest that consists of 80 percent early successional trees (young trees) may lack the structure and snags provided by old and dying trees. This can negatively impact the wildlife species dependent upon the seral states within healthy spruce-fir forests.

Another issue caused by out-of-reference seral state is the increased potential for uncharacteristic fire within departed systems. In both forested and non-forested ecosystems, fuel loads can build to levels that increase the potential for uncharacteristic fire, particularly during periods of prolonged drought Besides devastating the vegetative conditions within and ERU, uncharacteristic fires can also wipe out at-risk species that reside in those systems, especially if they are rare or endemic. The cause of seral state departure can usually be traced back to long-term human-made actions such as fire suppression or inappropriate grazing. Vegetative conditions, including how they naturally transition over time and with disturbances, are the foundation of most wildlife habitat. Therefore, vegetation that closely mirrors appropriate distributions of these natural vegetative transitional states, or seral states, makes better wildlife habitat than vegetation that is departed from the appropriate seral state distributions (as defined by historic or reference conditions). Some at-risk species depend upon in-reference seral state condition in one, or multiple, ERUs for persistence in the forest.

Seral State Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-DC-3	FW-VEG-O-1	FW-VEG-O-2
FW-VEG-G-1	FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-SFF-DC-3
FW-SFF-DC-4	FW-SFF-DC-7	FW-SFF-DC-8	FW-MCW-DC-1	FW-MCW-DC-2
FW-MCW-DC-3	FW-MCW-DC-4	FW-MCW-DC-7	FW-MCW-DC-8	FW-MCW-DC-9
FW-MCD-DC-1	FW-MCD-DC-2	FW-MCD-DC-3	FW-MCD-DC-4	FW-MCD-DC-5
FW-MCD-DC-8	FW-MCD-DC-9	FW-MCD-DC-12	FW-MCD-DC-11	FW-PPF-DC-1
FW-PPF-DC-2	FW-PPF-DC-3	FW-PPF-DC-4	FW-PPF-DC-5	FW-PPF-DC-8
FW-PPF-DC-9	FW-PPF-DC-10	FW-PPF-DC-11	FW-JUG-DC-1	FW-JUG-DC-2
FW-JUG-DC-5	FW-JUG-DC-6	FW-JUG-DC-7	FW-PJS-DC-1	FW-PJS-DC-2
FW-PJS-DC-3	FW-PJS-DC-4	FW-PJS-DC-7	FW-PJO-DC-1	FW-PJO-DC-2
FW-PJO-DC-3	FW-PJO-DC-6	FW-PJO-DC-7	FW-SAGE-DC-1	FW-ALP-DC-1
FW-ALP-DC-2	FW-ALP-DC-3	FW-ALP-DC-5	FW-MSG-DC-1	FW-MSG-DC-3
FW-MSG-DC-6	FW-MSG-DC-7	FW-MSG-DC-8	FW-CPGB-DC-1	FW-CPGB-DC-3
FW-CPGB-DC-5	FW-CPGB-DC-7	FW-RMZ-DC-1	FW-RMZ-DC-2	FW-RMZ-O-1
FW-RMZ-G-8	FW-RMZ-G-10	FW-RMZ-MA-2	FW-RMZ-MA-3	FW-FIRE-DC-2
FW-FIRE-DC-3	FW-FIRE-DC-7	FW-FIRE-G-1	FW-FIRE-MA-7	FW-FIRE-MA-8
FW-FIRE-MA-9	FW-FIRE-MA-10	FW-WATER-DC-1		FW-WATER-O-1
FW-AQUASH-DC-1	FW-TERRASH-DC-1	FW-TERRASH-O-2	FW-TERRASH-MA-1	FW-ATRISK-DC-1
FW-ATRISK-DC-2	FW-ATRISK-G-2	FW-ATRISK-G-5	FW-ATRISK-MA-1	FW-SOIL-DC-2
FW-FORESTRY-DC-1	FW-FORESTRY-DC-4	FW-FORESTRY-DC-5	FW-FORESTRY-S-1	FW-FORESTRY-S-2
FW-FORESTRY-G-1	FW-FORESTRY-MA-5	FW-RANGE-DC-4	FW-RANGE-DC-5	FW-RANGE-S-1
FW-RANGE-G-1	FW-RANGE-MA-6	FW-MINERAL-DC-1	MA-OGLEASE-DC-1	GA-JEMMC-DC-3
GA-NJEMM-DC-1	FW-ATRISK-DC-3			

Issue B: Coarse Woody Debris Departure

When a large tree falls, it becomes coarse woody debris (CWD) and provides habitat for small animals and insects. When these logs rot, they store water and provide nutrients for the continued growth of the forest. Dead wood rotting on the forest floor eventually gets incorporated into the soil. This deteriorating wood feeds many insects and bacteria that provide nitrogen to feed the trees and other plants in the forest. CWD is not only limited to upland habitats, it has significant impact on riparian areas as well, and many aquatic species depend on downed woody material. CWD not only provides foraging and escape cover for fish, but it contributes to the creation of optimum aquatic habitat by slowing down water and contributing to pool development. Out–of-reference conditions of CWD may result in significant negative impacts to at-risk species. If CWD is not in adequate supply or below desired conditions identified as tons per acre (CWD load), it may result in lack of prey items for carnivorous birds or mammals. On the other hand, if CWD is in excess or above desired conditions, it may create unfavorable soil conditions, especially for at-risk plant species by prohibiting growth or germination or resulting in more intense fires that negatively impact soil conditions. This is also a key factor in proper functioning aquatic habitats. Thus, CWD loads in reference condition should provide optimum habitat for terrestrial and aquatic animal species as well as soil conditions for plant species. Currently, 11 at-risk species (31 percent) may be impacted by improper CWD loads in the forest; these occur in three terrestrial forested ERUs (piñon juniper woodland, wet mixed conifer, and spruce-fir forest) and one non-forested ERU (piñon juniper grassland). Five species also use riparian (RIP) areas where coarse woody debris is a key component not only for creating habitat but for maintaining stream function as well by trapping sediment and influencing channel formation.

The cause of departed CWD loads can usually be traced back to long-term human-made actions such as fire suppression resulting in excess CWD in many of the forested ERUs. Riparian areas, on the other hand, tend to lack enough CWD. The popularity of riparian areas for people, cattle, and wildlife often results in the suppression of woody recruitment because of increased trampling or grazing. In reference, CWD loads in both upland and riparian areas would provide the ecological conditions required for some at-risk species.

Coarse Woody Debris Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-DC-3	FW-VEG-O-1	FW-VEG-O-2
FW-VEG-G-1	FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-SFF-DC-6
FW-MCW-DC-1	FW-MCW-DC-2	FW-MCW-DC-6	FW-MCD-DC-1	FW-MCD-DC-2
FW-MCD-DC-7	FW-PPF-DC-1	FW-PPF-DC-2	FW-PPF-DC-7	FW-JUG-DC-1
FW-JUG-DC-2	FW-JUG-DC-4	FW-PJS-DC-1	FW-PJS-DC-6	FW-PJO-DC-1
FW-PJO-DC-5	FW-RMZ-DC-1	FW-RMZ-G-5	FW-RMZ-G-6	FW-RMZ-G-10
FW-RMZ-MA-2	FW-RMZ-MA-3	FW-WUI-DC-2	FW-FIRE-DC-2	FW-FIRE-DC-7
FW-FIRE-G-1	FW-FIRE-MA-9	FW-WATER-DC-1		FW-WATER-O-1
FW-AQUASH-DC-1	FW-TERRASH-DC-1	FW-TERRASH-O-2	FW-TERRASH-MA-1	FW-ATRISK-DC-1
FW-ATRISK-DC-2	FW-ATRISK-G-2	FW-ATRISK-MA-1	FW-SOIL-DC-4	FW-FORESTRY-DC-4
FW-FORESTRY-DC-5	FW-FORESTRY-S-1	FW-FORESTRY-MA-5	FW-RANGE-DC-4	FW-MINERAL-DC-1
MA-OGLEASE-DC-1	FW-ATRISK-DC-3			

Issue C: Snag Density Departure

When a tree dies but remains standing, it becomes a snag and provides habitat for an array of animals, especially birds. Ecologically, a dead tree is as important to the forest ecosystem as a live one and provides several key ecological functions that influence the ecosystem. Snags provide homes for birds and foraging opportunities for insectivorous animals. If snags are not in adequate supply or below desired conditions identified as snags per acre, it may result in lack of nesting locations or foraging areas for insectivorous birds or mammals. Conversely, large-scale fire often results in too many snags per acre and not enough live trees. Snag densities in reference condition should provide optimum habitat for at-risk species, therefore, departed snag densities may result in significant negative impacts to at-risk species. Currently, two at-risk species are impacted by departed snag densities in the Santa Fe NF, these occur in three terrestrial forested ERUs (wet mixed conifer, mixed conifer frequent fire, and ponderosa pine forest).

Snag Density Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-DC-3	FW-VEG-O-1	FW-VEG-O-2
FW-VEG-G-1	FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-SFF-DC-5
FW-MCW-DC-1	FW-MCW-DC-2	FW-MCW-DC-5	FW-MCD-DC-1	FW-MCD-DC-2
FW-MCD-DC-6	FW-PPF-DC-1	FW-PPF-DC-2	FW-PPF-DC-6	FW-JUG-DC-1
FW-JUG-DC-2	FW-JUG-DC-3	FW-PJS-DC-1	FW-PJS-DC-5	FW-PJO-DC-1
FW-PJO-DC-4	FW-RMZ-DC-1	FW-RMZ-G-6	FW-RMZ-G-10	FW-RMZ-MA-2
FW-RMZ-MA-3	FW-WUI-DC-2	FW-FIRE-DC-2	FW-FIRE-DC-7	FW-FIRE-G-1
FW-FIRE-MA-9	FW-WATER-DC-1		FW-WATER-O-1	FW-AQUASH-DC-1
FW-TERRASH-DC-1	FW-TERRASH-O-2	FW-TERRASH-MA-1	FW-ATRISK-DC-1	FW-ATRISK-DC-2
FW-ATRISK-G-2	FW-ATRISK-MA-1	FW-FORESTRY-DC-4	FW-FORESTRY-DC-5	FW-FORESTRY-S-1
FW-FORESTRY-MA-5	FW-RANGE-DC-4	FW-MINERAL-DC-1	MA-OGLEASE-DC-1	FW-ATRISK-DC-3

Issue D: Uncharacteristic Fire *(Risk of Catastrophic Fire)*

Fire plays a critical role in maintaining the health of an ecosystem. Vegetation communities (ERUs) in the Santa Fe NF are characterized by various fire regimes and depend on certain fire-return intervals to maintain reference conditions for numerous vegetative characteristics (ex. seral state, CWD, etc.). Two frequent-fire systems (PPF, MCD) which make up half of the land area of the Santa Fe NF, historically experienced frequent, predominantly low-severity fires with patches of mixed-severity effects. However, long-term, historic fire suppression policies in the forest have resulted in an excess of fuel in many frequent-fire systems (see vegetation analysis), creating conditions for uncharacteristic fires to occur. Uncharacteristic fire can be defined as fire that burns at higher intensity or at longer durations over greater areas than what would typically occur under reference conditions. Fires that occur at high severities over large areas and cause extensive ecological (and often socio-economic) damage are characterized as catastrophic fire throughout this analysis.

Uncharacteristic fire often creates unfavorable forest conditions for at-risk species. It also can potentially wipe out isolated or small populations of at-risk species. Currently, 24 at-risk species may be impacted by uncharacteristic fire, but each may be impacted in different ways.

Uncharacteristic Fire Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-O-1	FW-VEG-O-2	FW-VEG-G-1
FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-SFF-DC-8	FW-SFF-DC-9
FW-MCW-DC-1	FW-MCW-DC-2	FW-MCW-DC-7	FW-MCW-DC-8	FW-MCW-DC-9
FW-MCW-DC-10	FW-MCD-DC-1	FW-MCD-DC-2	FW-MCD-DC-8	FW-MCD-DC-9
FW-MCD-DC-12	FW-MCD-DC-11	FW-PPF-DC-1	FW-PPF-DC-2	FW-PPF-DC-8
FW-PPF-DC-9	FW-PPF-DC-10	FW-PPF-DC-11	FW-JUG-DC-1	FW-JUG-DC-2
FW-JUG-DC-5	FW-JUG-DC-6	FW-JUG-DC-7	FW-PJS-DC-1	FW-PJS-DC-2
FW-PJS-DC-3	FW-PJS-DC-4	FW-PJS-DC-7	FW-PJO-DC-1	FW-PJO-DC-2
FW-PJO-DC-3	FW-PJO-DC-7	FW-SAGE-DC-1	FW-SAGE-DC-2	FW-ALP-DC-1
FW-ALP-DC-5	FW-MSG-DC-1	FW-MSG-DC-2	FW-CPGB-DC-1	FW-CPGB-DC-2
FW-RMZ-DC-1	FW-RMZ-DC-3	FW-RMZ-DC-4	FW-RMZ-O-1	FW-RMZ-G-10
FW-RMZ-MA-2	FW-RMZ-MA-3	FW-WUI-DC-1	FW-WUI-DC-2	FW-WUI-DC-3
FW-FIRE-DC-1	FW-FIRE-DC-2	FW-FIRE-DC-3	FW-FIRE-DC-4	FW-FIRE-DC-5
FW-FIRE-DC-6	FW-FIRE-DC-7			FW-FIRE-G-1
FW-FIRE-G-8	FW-FIRE-G-9	FW-FIRE-MA-6	FW-FIRE-MA-7	FW-FIRE-MA-8
FW-FIRE-MA-9	FW-FIRE-MA-14	FW-WATER-DC-1	FW-WATER-O-1	FW-AQUASH-MA-4
FW-TERRASH-DC-1	FW-TERRASH-DC-2	FW-TERRASH-O-2	FW-TERRASH-MA-1	FW-ATRISK-DC-1
FW-ATRISK-DC-2	FW-ATRISK-G-2	FW-ATRISK-MA-1	FW-SOIL-G-2	FW-FORESTRY-DC-4
FW-FORESTRY-DC-5	FW-FORESTRY-S-1	FW-FORESTRY-G-1	FW-FORESTRY-MA-5	FW-RANGE-DC-4
FW-MINERAL-DC-1	DA-WILD-DC-1	DA-NHT-DC-2	MA-OGLEASE-DC-1	MA-RECWILD-DC-1
MA-RECWILD-S-1	MA-RECWILD-G-2	GA-WSAN-DC-1	FW-ATRISK-DC-3	

Issue E: Invasive Vegetation Encroachment

When nonnative plant species appear on the landscape, native species must compete for available resources. A naturally aggressive plant may be especially invasive when it is introduced to a new habitat. Increased resource availability and altered disturbance regimes associated with human activities often differentially increase the performance of invaders over that of natives, this places undue stressors on native populations, especially at-risk plant species. Invasive vegetative encroachment can also impact animal species. Small mammals and even fish are dependent upon certain vegetation types and can be impacted if invasive plants alter the composition of their native habitats.

Currently, 14 at-risk species (39 percent) may be impacted by invasive vegetation encroachment in the forest; these occur in 4 terrestrial ERUs (spruce-fir forest, wet mixed conifer, piñon juniper woodland, and piñon juniper grassland) as well as in riparian areas.

Invasive Vegetation Encroachment Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-O-1	FW-VEG-O-2	FW-VEG-G-1
FW-VEG-MA-1	FW-SFF-DC-2	FW-MCW-DC-2	FW-MCD-DC-2	FW-PPF-DC-2
FW-JUG-DC-2	FW-RMZ-DC-1	FW-RMZ-O-1	FW-RMZ-S-1	FW-RMZ-G-3
FW-RMZ-G-4	FW-RMZ-G-8	FW-RMZ-G-10		FW-RMZ-MA-2
FW-RMZ-MA-3	FW-FIRE-DC-2	FW-FIRE-DC-7	FW-FIRE-G-1	FW-FIRE-G-5
FW-FIRE-G-6	FW-FIRE-G-7	FW-FIRE-MA-13	FW-WATER-DC-1	
FW-WATER-O-1	FW-AQUASH-DC-1	FW-TERRASH-DC-1	FW-TERRASH-O-2	FW-TERRASH-MA-1
FW-INVASIVE-DC-1	FW-INVASIVE-DC-2	FW-INVASIVE-O-1	FW-INVASIVE-S-1	FW-INVASIVE-S-2
FW-INVASIVE-S-3	FW-INVASIVE-S-4	FW-INVASIVE-G-1	FW-INVASIVE-G-2	FW-INVASIVE-G-3
FW-INVASIVE-G-4	FW-INVASIVE-G-5	FW-INVASIVE-MA-1	FW-INVASIVE-MA-2	FW-INVASIVE-MA-3
FW-INVASIVE-MA-4	FW-INVASIVE-MA-5	FW-INVASIVE-MA-6	FW-INVASIVE-MA-7	FW-INVASIVE-MA-8
FW-ATRISK-DC-1	FW-ATRISK-DC-2	FW-ATRISK-G-2	FW-ATRISK-MA-1	FW-SOIL-DC-5
FW-FORESTRY-DC-4	FW-FORESTRY-DC-5	FW-FORESTRY-S-1	FW-FORESTRY-MA-5	FW-RANGE-DC-4
FW-RANGE-S-1	FW-DISREC-G-4	FW-DISREC-G-5	FW-DISREC-MA-8	FW-FAC-DC-2
FW-FAC-G-4	FW-MINERAL-DC-1	DA-WILD-S-3	DA-WILD-G-4	MA-OGLEASE-DC-1
MA-RECWILD-S-1	FW-ATRISK-DC-3			

Issue F: Disconnected Floodplains

Floodplains are a key component in riparian areas. These are areas adjacent to river and stream systems that typically flood during high-water events. They are generally characterized by gradual slopes, which results in the water spreading out over large areas (floodplains), thus, dispersing its energy and minimizing its erosive nature. Conditions created by these events have resulted in vegetative communities specifically designed for wet-soil conditions. Due to changing vegetative conditions in riparian areas from excessive human uses (e.g., recreation, grazing) native vegetation is often diminished, causing more severe erosion problems during high water events. This often causes the stream channel to downcut and directs more water through the channel, resulting in even greater erosion. This results in streams and rivers with deep incised channels and steep banks where water cannot escape and disconnects the floodplains from the existing stream. This often causes impacts to terrestrial species dependent upon wet soil conditions and vegetation, as well as fish species within the stream and river systems.

Currently, seven at-risk species (19 percent) may be impacted by disconnected floodplains in the forest; these occur in one terrestrial ERU (spruce-fir forest) as well as in riparian areas.

Disconnected Floodplains Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-O-1	FW-VEG-O-2	FW-VEG-G-1
FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-MCW-DC-2	FW-MCD-DC-2
FW-PPF-DC-2	FW-JUG-DC-2	FW-RMZ-DC-1	FW-RMZ-DC-2	FW-RMZ-DC-3
FW-RMZ-DC-4	FW-RMZ-O-1	FW-RMZ-G-2	FW-RMZ-G-10	
FW-RMZ-MA-2	FW-RMZ-MA-3	FW-FIRE-G-1	FW-WATER-DC-1	FW-WATER-DC-4
FW-WATER-DC-5	FW-WATER-DC-6			FW-WATER-O-1
FW-WATER-G-2	FW-AQUASH-DC-1	FW-AQUASH-DC-4	FW-AQUASH-O-1	FW-AQUASH-G-4
FW-AQUASH-MA-1	FW-AQUASH-MA-2	FW-AQUASH-MA-4	FW-TERRASH-DC-1	FW-TERRASH-O-2
FW-TERRASH-MA-1	FW-ATRISK-DC-1	FW-ATRISK-DC-2	FW-ATRISK-G-2	FW-ATRISK-MA-1
FW-FORESTRY-DC-4	FW-FORESTRY-DC-5	FW-FORESTRY-S-1	FW-FORESTRY-S-4	FW-RANGE-DC-4
FW-RANGE-DC-6	FW-RANGE-S-1	FW-RANGE-G-2	FW-RANGE-G-3	FW-RANGE-G-5
FW-RANGE-MA-9	FW-RANGE-MA-12	FW-ROADS-DC-3	FW-ROADS-G-4	FW-ROADS-MA-2
FW-FAC-G-2	FW-LEASEMIN-DC-1	FW-MINERAL-DC-1	MA-OGLEASE-DC-1	GA-CANNAC-DC-1
FW-ATRISK-DC-3				

Issue G: Limited or Specific Soil Conditions

Soils are complex and dynamic systems that consist of a mineral component, organic matter, air, water, and various soil organisms resulting from interaction between parent material, climate, topography, and organisms throughout time and space. Soils store water, supply nutrients for plants, and provide a medium for plant growth. Soils also provide habitat for a diverse number of invertebrates and belowground organisms. Soils are essentially a non-renewable resource because of their slow rate of formation. Unfavorable soil conditions often decrease viability of at-risk species dependent upon a specific soil type or condition. Most at-risk species reliant upon soil conditions are plants; however, some invertebrates also have an affinity for certain soil types.

Soil condition is based on three soil functions: (1) the ability of the soil to resist erosion, (2) the ability of the soil to infiltrate water, and (3) the ability of the soil to recycle nutrients. The loss of soil productivity through a reduction in soil function is due to a lack of effective vegetative ground cover and organic matter. This has resulted in unstable soils with reduced nutrient cycling. Soils in reference condition (satisfactory rating) provide the necessary ecological conditions for species dependent upon them. Soils that are out of reference are classified as impaired, unsatisfactory, or unsuited depending upon the degree in which they are impacted.

Currently, six at-risk species (17 percent) may be impacted by impaired, unsatisfactory, or unsuited soil conditions in the forest (four plants and two invertebrates). These occur in seven upland ERUs (juniper grass, mixed conifer frequent fire, piñon juniper woodland, ponderosa pine forest, piñon juniper shrubland, piñon juniper grass, and sagebrush shrubland).

Limited or Specific Soil Conditions Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-O-1	FW-VEG-O-2	FW-VEG-G-1
FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-MCW-DC-1	FW-MCW-DC-2
FW-MCD-DC-1	FW-MCD-DC-2	FW-PPF-DC-1	FW-PPF-DC-2	FW-JUG-DC-1
FW-JUG-DC-2	FW-SAGE-DC-1	FW-MSG-DC-1	FW-MSG-DC-4	FW-MSG-DC-5
FW-CPGB-DC-1	FW-CPGB-DC-4	FW-RMZ-DC-1	FW-RMZ-DC-3	FW-RMZ-DC-4
FW-RMZ-O-1	FW-RMZ-G-2	FW-RMZ-G-4	FW-RMZ-G-8	FW-RMZ-G-10
	FW-RMZ-MA-2	FW-RMZ-MA-3	FW-FIRE-DC-2	FW-FIRE-DC-7
FW-FIRE-G-1	FW-FIRE-G-9	FW-FIRE-G-10	FW-FIRE-MA-9	FW-WATER-DC-1
FW-WATER-DC-4	FW-WATER-DC-5			FW-WATER-O-1
FW-WATER-G-3	FW-AQUASH-DC-1	FW-TERRASH-DC-1	FW-TERRASH-O-2	FW-TERRASH-MA-1
FW-ATRISK-DC-1	FW-ATRISK-DC-2	FW-ATRISK-G-2	FW-ATRISK-MA-1	FW-SOIL-DC-1
FW-SOIL-DC-2	FW-SOIL-DC-4	FW-SOIL-DC-4	FW-SOIL-DC-5	FW-SOIL-DC-6
FW-SOIL-DC-7	FW-SOIL-S-1	FW-SOIL-G-1	FW-SOIL-G-2	FW-SOIL-G-3
FW-SOIL-G-4	FW-SOIL-MA-1	FW-SOIL-MA-4	FW-FORESTRY-DC-4	FW-FORESTRY-DC-5
FW-FORESTRY-S-1	FW-FORESTRY-S-4	FW-FORESTRY-MA-9	FW-RANGE-DC-4	FW-RANGE-S-1
FW-RANGE-G-4	FW-RANGE-G-5	FW-DISREC-G-4	FW-MINERAL-DC-1	MA-OGLEASE-DC-1
FW-FIRE-G-11	FW-ATRISK-DC-3			

Issue H: Specific Ecological Features or Conditions

Specific ecological features sometimes limit the distribution and viability of at-risk species, especially if a species requires certain geophysical features (e.g., rock formations). For example, some bird species require specific rock or cliff formations for nesting, some plants require certain soil characteristics from specific geologic formations, and some fish and amphibians require specific water conditions (e.g. temperature, flow, etc.). Each of these examples is highly species-specific and is generally not required by a large number of plants and animals.

Currently, 19 at-risk species (53 percent) require specific ecological conditions that are not otherwise addressed by general habitat conditions related to vegetation. These occur in the following ERUs.

Specific Ecological Features Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-DC-3	FW-VEG-O-1	FW-VEG-O-2
FW-VEG-G-1	FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-SFF-DC-3
FW-SFF-DC-4	FW-SFF-DC-5	FW-SFF-DC-6	FW-SFF-DC-7	FW-SFF-DC-8
FW-SFF-DC-9	FW-MCW-DC-1	FW-MCW-DC-2	FW-MCW-DC-3	FW-MCW-DC-4
FW-MCW-DC-5	FW-MCW-DC-6	FW-MCW-DC-7	FW-MCW-DC-8	FW-MCW-DC-9
FW-MCD-DC-1	FW-MCD-DC-2	FW-MCD-DC-3	FW-MCD-DC-4	FW-MCD-DC-5
FW-MCD-DC-6	FW-MCD-DC-7	FW-MCD-DC-8	FW-MCD-DC-9	FW-MCD-DC-12
FW-MCD-DC-11	FW-PPF-DC-1	FW-PPF-DC-2	FW-PPF-DC-3	FW-PPF-DC-4
FW-PPF-DC-5	FW-PPF-DC-6	FW-PPF-DC-7	FW-PPF-DC-8	FW-PPF-DC-9
FW-PPF-DC-10	FW-PPF-DC-11	FW-JUG-DC-1	FW-JUG-DC-2	FW-JUG-DC-3
FW-JUG-DC-4	FW-JUG-DC-5	FW-JUG-DC-6	FW-JUG-DC-7	FW-PJS-DC-1
FW-PJS-DC-2	FW-PJS-DC-3	FW-PJS-DC-4	FW-PJS-DC-5	FW-PJS-DC-6
FW-PJS-DC-7	FW-PJO-DC-1	FW-PJO-DC-2	FW-PJO-DC-3	FW-PJO-DC-4
FW-PJO-DC-5	FW-PJO-DC-6	FW-PJO-DC-7	FW-SAGE-DC-1	FW-ALP-DC-1
FW-ALP-DC-2	FW-ALP-DC-3	FW-ALP-DC-4	FW-ALP-DC-5	FW-MSG-DC-1
FW-MSG-DC-3	FW-MSG-DC-4	FW-MSG-DC-5	FW-MSG-DC-6	FW-MSG-DC-7
FW-MSG-DC-8	FW-CPGB-DC-1	FW-CPGB-DC-3	FW-CPGB-DC-4	FW-CPGB-DC-5
FW-CPGB-DC-6	FW-CPGB-DC-7	FW-RMZ-DC-1	FW-RMZ-DC-2	FW-RMZ-DC-3
FW-RMZ-DC-4	FW-RMZ-O-1	FW-RMZ-G-2	FW-RMZ-G-5	FW-RMZ-G-6
FW-RMZ-G-8	FW-RMZ-G-9	FW-RMZ-G-10		
FW-RMZ-MA-2	FW-RMZ-MA-3	FW-FIRE-DC-2	FW-FIRE-DC-7	FW-FIRE-G-1
FW-FIRE-G-7	FW-FIRE-MA-9	FW-FIRE-MA-10	FW-WATER-DC-1	FW-WATER-DC-3
FW-WATER-DC-4	FW-WATER-DC-5	FW-WATER-DC-6		
FW-WATER-O-1	FW-WATER-O-2	FW-WATER-G-2	FW-AQUASH-DC-1	FW-AQUASH-DC-2
FW-AQUASH-DC-3	FW-AQUASH-DC-4	FW-AQUASH-O-1	FW-AQUASH-G-4	FW-AQUASH-MA-1
FW-AQUASH-MA-2	FW-TERRASH-DC-1	FW-TERRASH-O-1	FW-TERRASH-O-2	
FW-TERRASH-MA-1	FW-ATRISK-DC-1	FW-ATRISK-DC-2	FW-ATRISK-G-2	FW-ATRISK-G-9
FW-ATRISK-G-11	FW-ATRISK-G-12	FW-ATRISK-MA-1	FW-ATRISK-MA-3	FW-ATRISK-MA-4
FW-ATRISK-MA-5	FW-ATRISK-MA-7	FW-ATRISK-MA-8	FW-SOIL-DC-1	FW-FORESTRY-DC-1
FW-FORESTRY-DC-4	FW-FORESTRY-DC-5	FW-FORESTRY-S-1	FW-FORESTRY-MA-9	FW-RANGE-DC-4
FW-RANGE-DC-5	FW-RANGE-DC-6	FW-RANGE-O-2	FW-RANGE-G-2	FW-RANGE-G-3
FW-RANGE-G-5	FW-RANGE-MA-6	FW-RANGE-MA-12	FW-ROADS-G-2	FW-ROADS-G-3
FW-ROADS-G-4	FW-ROADS-MA-2	FW-MINERAL-DC-1		
	FW-MINERAL-DC-3	FW-MINERAL-DC-4	DA-WSR-G-1	DA-WSR-G-4
MA-OGLEASE-DC-1	MA-OGLEASE-G-2	GA-CANNAC-DC-1	GA-PECOSRIV-DC-3	GA-PECOSRIV-DC-4
FW-ATRISK-DC-3				

Threat I: Invasive Predation (Aquatic)

Negative impacts to at-risk species may occur when nonnative invasive species are introduced, intentionally or unintentionally, into aquatic systems where at-risk species exist, and competition and prey behavior results in population declines of the native populations. Nonnative invasive species in the Santa Fe NF include but are not limited to American bullfrogs, white sucker, German brown trout, and rainbow trout. It is well known that rainbow and German brown trout often out-compete native Rio Grande cutthroat trout in areas where they were introduced, but there is also the risk of predation on the at-risk Rio Grande sucker and chub. These nonnative fish, in particular the German brown and rainbow trout, were introduced in waters of the Santa Fe NF for socioeconomic benefit. Similarly, nonnative American bullfrogs were known to out-compete northern leopard frogs. These are just examples of the types of negative consequences associated with invasive species that were introduced into aquatic systems.

Invasive Predation Plan Components

FW-WATER-DC-2	FW-AQUASH-O-2	FW-AQUASH-G-5	FW-ATRISK-DC-1	FW-ATRISK-G-1
FW-ATRISK-G-2	FW-RMZ-MA-2	FW-RMZ-MA-3		

Threat J: Ground and Soil Disturbance (Livestock Grazing, Roads and Trails, and Recreation)

Ground or soil disturbance can impact at-risk species in many ways. Trampling may cause direct mortality to at-risk species through crushing the plant or small invertebrate and vertebrate species or cause indirect mortality over time through soil compaction. Soil compaction can damage root systems, change water infiltration patterns, or alter soil characteristics necessary for at-risk plants, thus inhibiting their potential for growth or reproduction. Invertebrates and amphibians can also be impacted by this issue when soil characteristics are altered, or soil is compacted. Compaction mostly occurs when roads or trails are created, especially non-system roads or trails that may enter areas where at-risk species exist. Other activities that increase ground and soil disturbance may include log landings for forestry activities as well as recreational and range improvements (e.g., campgrounds, picnic areas, mineral and feed sites for livestock), and livestock grazing. Since some at-risk populations may be isolated and small; even the smallest of footprints may impact their viability if it occurs in a highly sensitive area.

Another means by which ground and soil disturbance can impact at-risk species is through erosion and subsequent siltation of waterways. When soil is disturbed the likelihood of erosion increases, especially if there are uncharacteristic weather events such as high wind or excessive rains. If ground disturbance occurs near a waterway, this can ultimately lead to excessive siltation when the exposed soils are carried into the water. This increased siltation reduces the amount of available oxygen and may impair the ability of aquatic species to forage, ultimately leading to direct mortality.

Ground and Soil Disturbance Plan Components

FW-VEG-DC-2	FW-RMZ-DC-4	FW-RMZ-O-1	FW-RMZ-S-1	FW-RMZ-G-2
FW-RMZ-G-7	FW-RMZ-MA-2	FW-RMZ-MA-3	FW-FIRE-G-9	FW-FIRE-G-10
FW-FIRE-MA-13	FW-TERRASH-G-2	FW-TERRASH-MA-3	FW-ATRISK-DC-1	FW-ATRISK-G-1
FW-ATRISK-G-2	FW-ATRISK-G-4	FW-ATRISK-G-8	FW-SOIL-G-1	FW-FORESTRY-G-2
FW-DISREC-G-6	FW-ROADS-DC-3	FW-ROADS-G-7	FW-ROADS-G-8	FW-ROADS-G-9
FW-ROADS-G-10	FW-LANDSSU-DC-3	FW-LANDSSU-S-2	FW-LEASEMIN-DC-1	FW-MINERAL-S-2
DA-ALLDA-G-1	DA-RNA-S-6	DA-RNA-S-8	DA-WSR-G-2	MA-OGLEASE-DC-1
MA-OGLEASE-G-1	FW-FIRE-G-11	FW-RANGE-DC-4	FW-RANGE-S-1	FW-RANGE-G-2
FW-RANGE-G-4	FW-RANGE-G-5	FW-RANGE-MA-1	FW-RANGE-MA-17	

Threat K: Intrusive Human Activity (Recreational Disturbance)

Intrusive human activity often creates issues for at-risk species where recreational activities impact biological function. It consists primarily of human-caused activities that disrupt critical life stages of at-risk species such as reproduction, nesting, and calving, or even feeding, especially during times of high stress (e.g., breeding season, winter). Harassing activities include but are not limited to human presence, indiscriminate shooting, harassment from people and domestic dogs, and picking or digging of plants. These activities are known to negatively impact at-risk species in the Santa Fe NF.

Intrusive Human Activity Plan Components

FW-ALP-DC-5	FW-RMZ-DC-4	FW-RMZ-O-1	FW-RMZ-G-2	FW-RMZ-G-7
FW-RMZ-MA-2	FW-RMZ-MA-3	FW-WATER-DC-2	FW-TERRASH-DC-3	FW-TERRASH-G-3
FW-TERRASH-G-4	FW-TERRASH-MA-5	FW-ATRISK-DC-1	FW-ATRISK-G-1	FW-ATRISK-G-2
FW-ATRISK-G-5	FW-ATRISK-G-6	FW-ATRISK-G-10	FW-ATRISK-G-13	FW-ATRISK-G-14
FW-SOIL-DC-7	FW-SOIL-G-4	FW-REC-MA-8	FW-DEVREC-G-4	FW-DEVREC-G-6
	FW-DISREC-DC-2	FW-DISREC-DC-3	FW-DISREC-G-3	FW-DISREC-G-6
FW-DISREC-MA-2	FW-DISREC-MA-4	FW-RECSU-DC-3	FW-ROADS-DC-5	FW-ROADS-G-8
FW-MINERAL-S-11		DA-RNA-S-3	DA-WSR-G-1	DA-WSR-G-2
MA-CAJA-MA-4	MA-OGLEASE-S-1	GA-JEMMC-DC-2	GA-WSAN-DC-2	FW-ATRISK-G-14

Threat L: Introduced Disease or Unnatural Spread

Unnatural mortality in wildlife may occur when pathogens are introduced and resultant disease causes population declines of native populations, especially at-risk species. Disease creates a characteristic set of signs and symptoms that may affect the whole body or any part of a plant or animal. It usually results in mortality or decreased vigor in species that are impacted by disease outbreaks. Although some diseases may be naturally occurring, their potential to impact large portions of a population appears to be a function of systems that have had their resiliency compromised. Historically, many populations were widespread and redundant (many scattered small populations), which made them more resilient to disease. If a disease event were to occur, nearby populations could then move in to bolster surviving individuals and quickly restore the population. Populations that are now more isolated cannot respond as quickly and may ultimately suffer from reduced gene flow.

Another factor associated with disease is unnatural spread. This can occur when human activities move pathogens faster and over greater distances than what naturally occurs. For example, pathogens found in one water body, may take a long time to, or may never, impact another water body that is a significant distance away. Currently, with increased human travels from one location to another, the likelihood of infecting other areas increases significantly. It is well documented that many pathogens were introduced into new areas through human activities such as boating, spelunking, and other recreational activities.

Some of the diseases that were known to occur in the Santa Fe NF include but are not limited to Chytrid fungus, sylvatic plague, whirling disease, and West Nile virus. At-risk species are sometimes impacted by these diseases in the forest.

Introduced Disease or Unnatural Spread Plan Components

FW-SFF-DC-2	FW-MCW-DC-2	FW-MCD-DC-2	FW-PPF-DC-2	FW-JUG-DC-2
FW-PJS-DC-7	FW-PJO-DC-7	FW-ALP-DC-5	FW-RMZ-S-1	FW-RMZ-MA-2
FW-RMZ-MA-3	FW-FIRE-G-5	FW-FIRE-G-6	FW-FIRE-G-7	FW-WATER-G-4
FW-AQUASH-DC-2	FW-TERRASH-DC-1	FW-INVASIVE-DC-1	FW-INVASIVE-DC-2	FW-INVASIVE-O-1
FW-INVASIVE-S-1	FW-INVASIVE-S-2	FW-INVASIVE-S-3	FW-INVASIVE-S-4	FW-INVASIVE-G-1
FW-INVASIVE-G-2	FW-INVASIVE-G-3	FW-INVASIVE-G-4	FW-INVASIVE-G-5	FW-INVASIVE-MA-1
FW-INVASIVE-MA-2	FW-INVASIVE-MA-3	FW-INVASIVE-MA-4	FW-INVASIVE-MA-5	FW-INVASIVE-MA-6
FW-INVASIVE-MA-7	FW-INVASIVE-MA-8	FW-ATRISK-DC-1	FW-ATRISK-G-1	FW-ATRISK-G-2
FW-ATRISK-MA-6	FW-ATRISK-MA-9	FW-SOIL-DC-5	FW-FORESTRY-G-1	FW-FORESTRY-G-3
FW-FORESTRY-MA-9	FW-RANGE-G-8	FW-DISREC-G-4	FW-DISREC-MA-8	FW-RECSU-S-3
FW-FAC-DC-2	FW-FAC-G-4	FW-MINERAL-DC-4	DA-WILD-S-3	DA-WILD-G-4
MA-RECWILD-S-1				

Threat M: Human-made Features (Mortality/Altered Behavior)

Negative impacts to at-risk species may occur when human-made structures result in direct mortality of at-risk species by either entrapment or collision. Obstructions can consist of obstacles or barriers that may prevent animals from moving from one place to another to fulfill basic life cycle needs or may actually cause direct mortality from collision and forceful striking (e.g., wind turbines, cell towers, facilities, or fences), prolonged entanglement (e.g. barbed wire), or entrapment (e.g., water troughs). Manville (2005) estimates that collisions with communication towers, powerlines, and wind turbines result in nationwide bird mortality totaling in the millions. Whyte (1988) congruently documents the propensity for small mammals and amphibians to be entrapped within water catchment structures. At-risk species in the Santa Fe NF are occasionally known to be impacted by human-made features that cause direct mortality.

Human-made Features Plan Components

FW-VEG-DC-2	FW-RMZ-DC-4	FW-RMZ-O-1	FW-RMZ-G-2	FW-RMZ-MA-2
FW-RMZ-MA-3	FW-WATER-DC-1		FW-WATER-MA-3	FW-AQUASH-G-2
FW-TERRASH-DC-3	FW-TERRASH-S-1	FW-TERRASH-G-1	FW-TERRASH-G-3	FW-ATRISK-DC-1
FW-ATRISK-G-1	FW-ATRISK-G-2	FW-SOIL-DC-7	FW-RANGE-S-3	FW-RANGE-G-3
FW-RANGE-G-4	FW-RANGE-G-5	FW-DEVREC-G-4		FW-DISREC-DC-2
FW-DISREC-DC-3	FW-DISREC-G-3	FW-FAC-G-3	FW-LANDSSU-DC-3	FW-LANDSSU-DC-5
FW-LANDSSU-S-1	FW-LANDSSU-G-2	FW-MINERAL-S-3	DA-WSR-S-6	DA-WSR-G-1
MA-CAJA-G-2	MA-OGLEASE-DC-1	MA-OGLEASE-DC-2	MA-OGLEASE-S-1	

Threat N: Pesticides or Chemical Retardant

Some chemical applications pose a concern to at-risk species populations. It is well known that many bird species are highly susceptible to pesticides. Pesticides were shown to cause reproductive failure in peregrine falcons as well as many other species. Though pesticide use is highly regulated in the Santa Fe NF, impacts from outside the forest may still be an issue. A greater risk from direct chemical impact in the forest may come from chemical fire retardant used to fight forest fires. Johnson and Sanders (1977) noted the toxicity of fire retardant to freshwater fishes. Issues with aquatic at-risk species may arise if excess amounts of chemical fire retardant is applied in riparian areas or other bodies of water. At-risk species in the Santa Fe NF are known to be negatively impacted by certain chemical applications.

Pesticides or Chemical Application Plan Components

FW-RMZ-DC-4	FW-RMZ-G-7	FW-RMZ-MA-2	FW-RMZ-MA-3	FW-FIRE-G-5
FW-FIRE-G-7	FW-AQUASH-S-1	FW-ATRISK-DC-1	FW-ATRISK-G-1	FW-ATRISK-G-2
FW-ATRISK-G-8	FW-ATRISK-MA-6	FW-SOIL-DC-6	FW-AIR-DC-4	FW-AIR-MA-1
FW-FORESTRY-MA-9	FW-ROADS-G-3	FW-LANDSSU-S-3	DA-WILD-G-4	

Section C. Wildlife Connectivity Crosswalk

The following table provides reference to all plan components in the Santa Fe NF forest plan addressing wildlife connectivity (for a detail description of these at-risk species, please refer to the Santa Fe NF Plan FEIS, chapter 3). All wildlife, regardless of status, needs to be able to move freely about the forest to acquire all life cycle needs. Two major issues negatively impact wildlife connectivity and the ability of a species to move freely about the forest. Physical obstructions literally “get in the way” and block movements, while poor habitat conditions may hinder animals’ movements because they prefer optimal ecological conditions (for example, frogs are less likely to migrate across an open, hot, and arid section of land as opposed to a historically shaded, cool, and wet area).

Wildlife Connectivity Plan Components

FW-VEG-DC-1	FW-VEG-DC-2	FW-VEG-DC-3	FW-VEG-O-1	FW-VEG-O-2
FW-VEG-G-1	FW-VEG-MA-1	FW-SFF-DC-1	FW-SFF-DC-2	FW-SFF-DC-3
FW-SFF-DC-4	FW-SFF-DC-5	FW-SFF-DC-6	FW-SFF-DC-7	FW-SFF-DC-8
FW-SFF-DC-9	FW-MCW-DC-1	FW-MCW-DC-2	FW-MCW-DC-3	FW-MCW-DC-4
FW-MCW-DC-5	FW-MCW-DC-6	FW-MCW-DC-7	FW-MCW-DC-8	FW-MCW-DC-9
FW-MCD-DC-1	FW-MCD-DC-2	FW-MCD-DC-3	FW-MCD-DC-4	FW-MCD-DC-5
FW-MCD-DC-6	FW-MCD-DC-7	FW-MCD-DC-8	FW-MCD-DC-9	FW-MCD-DC-12
FW-MCD-DC-11	FW-PPF-DC-1	FW-PPF-DC-2	FW-PPF-DC-3	FW-PPF-DC-4
FW-PPF-DC-5	FW-PPF-DC-6	FW-PPF-DC-7	FW-PPF-DC-8	FW-PPF-DC-9
FW-PPF-DC-10	FW-PPF-DC-11	FW-JUG-DC-1	FW-JUG-DC-2	FW-JUG-DC-3
FW-JUG-DC-4	FW-JUG-DC-5	FW-JUG-DC-6	FW-JUG-DC-7	FW-PJS-DC-1
FW-PJS-DC-2	FW-PJS-DC-3	FW-PJS-DC-4	FW-PJS-DC-5	FW-PJS-DC-6
FW-PJS-DC-7	FW-PJO-DC-1	FW-PJO-DC-2	FW-PJO-DC-3	FW-PJO-DC-4
FW-PJO-DC-5	FW-PJO-DC-6	FW-PJO-DC-7	FW-SAGE-DC-1	FW-ALP-DC-1
FW-ALP-DC-2	FW-ALP-DC-3	FW-ALP-DC-4	FW-ALP-DC-5	FW-MSG-DC-1
FW-MSG-DC-3	FW-MSG-DC-4	FW-MSG-DC-5	FW-MSG-DC-6	FW-MSG-DC-7
FW-MSG-DC-8	FW-CPGB-DC-1	FW-CPGB-DC-3	FW-CPGB-DC-4	FW-CPGB-DC-5
FW-CPGB-DC-6	FW-CPGB-DC-7	FW-RMZ-DC-1	FW-RMZ-DC-2	FW-RMZ-DC-3
FW-RMZ-DC-4	FW-RMZ-O-1	FW-RMZ-G-2	FW-RMZ-G-5	FW-RMZ-G-6
FW-RMZ-G-8	FW-RMZ-G-10		FW-RMZ-MA-2	FW-RMZ-MA-3
FW-FIRE-DC-2	FW-FIRE-DC-7	FW-FIRE-G-1	FW-FIRE-MA-9	FW-WATER-DC-1
FW-WATER-DC-4			FW-WATER-O-1	FW-WATER-G-3
FW-AQUASH-DC-1	FW-AQUASH-DC-2	FW-AQUASH-DC-3	FW-AQUASH-DC-4	FW-AQUASH-O-1
FW-AQUASH-G-1	FW-AQUASH-MA-1	FW-AQUASH-MA-2	FW-TERRASH-DC-1	FW-TERRASH-DC-2
FW-TERRASH-DC-3	FW-TERRASH-O-2	FW-TERRASH-G-1	FW-TERRASH-G-2	FW-TERRASH-MA-1
FW-TERRASH-MA-2	FW-TERRASH-MA-3	FW-TERRASH-MA-7	FW-PARTNER-DC-3	FW-RANGE-DC-4
FW-RANGE-O-1	FW-RANGE-S-2	FW-RANGE-MA-6	FW-DISREC-DC-2	FW-DISREC-DC-3
FW-DISREC-S-1	FW-DISREC-S-2	FW-DISREC-S-3	FW-DISREC-G-3	FW-DISREC-MA-3
FW-DISREC-MA-5	FW-ROADS-DC-5	FW-ROADS-S-2	FW-ROADS-G-5	FW-ROADS-G-6
FW-ROADS-G-7	FW-ROADS-G-8	FW-ROADS-G-9	FW-ROADS-G-10	FW-XBOUND-DC-1
FW-XBOUND-DC-2	FW-LANDSSU-DC-3	FW-LANDSSU-DC-4	FW-LANDSSU-DC-5	FW-LANDSSU-G-1
FW-MINERAL-DC-1	FW-MINERAL-DC-2			FW-SCENIC-MA-8
DA-IRA-DC-1	DA-IRA-G-1	DA-IRA-MA-1	DA-RNA-MA-1	DA-RNA-S-3
DA-RNA-S-6	DA-RNA-S-8	DA-WSR-S-6	DA-WSR-G-1	DA-WSR-G-2
MA-CAJA-S-1	MA-CAJA-G-2	MA-CAJA-MA-1	MA-CANBON-S-6	MA-OGLEASE-DC-1
MA-OGLEASE-S-1	MA-RECWILD-DC-1	MA-RECWILD-S-2	MA-ELIGWSR-S-2	

Appendix F. Focal Species

This section identifies specific species that the Santa Fe NF can monitor periodically to gauge the effects of forest and landscape management practices on habitat for these species (referred to as "focal species") and provide a baseline to assess movement toward desired conditions.

Focal species are defined by the 2012 Rule[14] as:

> A small subset of species whose status permits inference to the integrity of the larger system to which it belongs and provides meaningful information regarding the effectiveness of the plan in maintaining or restoring ecological conditions to maintain the diversity of plant and animal communities… commonly selected based on their functional role in ecosystems.

Focal species are not selected to make inferences about other species. Focal species are selected because they are believed to be responsive to ecological conditions in a way that can inform future plan decisions. Forest Service handbook direction (FSH 1909.12 chapter 30, section 32.13c) for focal species further specifies that every plan monitoring program must identify one or more focal species and one or more monitoring questions and associated indicators addressing the status of the focal species. Monitoring the status of focal species over time provides insight into the following:

1. Integrity of ecological systems on which focal species depend,
2. Effects of management on those ecological conditions,
3. Effectiveness of the plan components to provide for ecological integrity and maintain or restore ecological conditions, and
4. Progress toward achieving desired conditions and objectives for the plan area. It is not expected that a focal species be selected for every element of ecological conditions.

Key considerations for selecting focal species include:

Does the species provide feedback that is necessary to inform management?

Are focal species abundant enough to measure change in status?

Are there "off-site" stressors that would mask the response to activities or conditions on National Forest System lands?

Can the species be effectively monitored?

Is the species cryptic, rare, or otherwise difficult to monitor?

Is it within financial capability of the unit(s)?

Do standardized monitoring approaches exist?

Are species responses to management activities and other stressors well known?

Sampling design: how to monitor effectively

Opportunities for multi-party monitoring

The rule does not require managing habitat conditions for focal species, nor does it confer a separate conservation requirement for these species simply based on them being selected as focal species. The 2012 Rule does not require or prohibit monitoring of population trends of focal species. Instead, it

[14] 36 CFR 219.19

allows the use of any existing or emerging approaches for monitoring the status of focal species that are supported by current science.

Monitoring methods for evaluating the status of focal species may include measures of abundance, distribution, reproduction, presence or absence, area occupied, survival rates, or others. The objective is not to choose the monitoring technique(s) that will provide the most information about the focal species, but to choose a monitoring technique(s) for the focal species that will provide useful information with regard to the purpose for which the species is being monitored. The expectation is that monitoring key ecosystem and watershed conditions along with monitoring the status of a set of well-chosen focal species will provide timely information regarding the effectiveness of plan components related to plant and animal diversity.

Overall, seven focal species are recommended for the Santa Fe NF. The following section describes the recommended focal species and how they provide information regarding ecological integrity and ecosystem diversity. These species were selected because they will inform management about the status of ecological conditions, diversity, and integrity. Detected population changes are most likely to indicate the effects of management for the selected species.

Recommended Focal Species in the Santa Fe National Forest

When we selected focal species for the Santa Fe NF, we considered the core issues identified from the Need for Change document as well as national initiatives to direct future management for the resiliency and sustainability of our national forests. The monitoring of focal species will provide insight on the ecological integrity of three key ecosystems as well as one key ecological concept. The ecosystems selected are riparian, piñon-juniper forests, and ponderosa pine forests. Riparian and ponderosa pine forests are among the most highly departed ecosystems in the forest; therefore, they will receive some of the most intensive treatment with high and concrete objectives in the new forest plan. It will be imperative to monitor the response of those treatments. Piñon-juniper ecosystems are not as degraded; however, they are projected to be one of the most highly impacted systems because of climate change. Given the amount of recreational and cultural use (fuelwood collection) within these systems, it is critical to monitor the condition of these systems to make sure they are still functioning properly with the growing concern from climate change. Maintaining wildlife habitat connectivity is also a key aspect to resiliency, because being able to move throughout and beyond the forest is critical for some species' survival. In the following paragraphs, we describe the focal species associated with these four critical areas.

Riparian Systems – Community Approach

Riparian areas are critically important ecosystems, particularly in the arid regions of the Southwest. Though vital to numerous forest resources, riparian areas are often varied and complex and involve a wide array of ecological conditions ranging from specific water qualities (such as temperature, flow, turbidity) to very unique (obligate wetland species) vegetation types that attract a plethora of wildlife species. This diversity and range of ecological conditions within riparian systems sometimes makes it difficult to select one focal species that occupies or uses the entire range of riparian conditions found throughout the forest. Therefore, monitoring multiple riparian-dependent species would give forest managers more useful information regarding riparian health throughout the entire forest. This "community" approach can, therefore, serve as a better indicator for the entire riparian system. The suite of species selected to monitor riparian health include Rio Grande cutthroat trout, northern leopard frog, plumbeous vireo (below 7,500 feet) and the Cordilleran flycatcher (above 7,500 feet).

Rio Grande Cutthroat Trout (*Oncorhynchus clarkii virginalis*)

Rio Grande cutthroat trout currently occur in approximately 11 percent of their presumed historic range (Bakevich et al. 2019). These population declines combined with losses in suitable habitat have led to considerable concern over the species' ability to persist over the long term in the plan area. Conservation populations of Rio Grande cutthroat in the Santa Fe NF are isolated in high-elevation streams above natural and human-made barriers that prevent the upstream movement of nonnative trout that hybridize with, compete with, and prey upon native cutthroat trout. In the Santa Fe NF, while there are 1,183 miles of perennial streams, only 8 percent currently support native fish species in the absence of nonnative fish. Rio Grande cutthroat trout are further threatened by degraded stream and riparian habitat as well as water quality and quantity because of inadequately maintained roads and trails, water diversions, livestock grazing, and recreational use. Catastrophic fire and other extreme events such as drought and floods also threaten the persistence of small, isolated populations, which, because they occur above migratory barriers, cannot be recolonized naturally.

Cutthroat trout prefer clear, cold streams and lakes. Population densities are regulated mostly by stream size and morphology, overwintering habitat, stream productivity, and summer cover for predator avoidance. Presently, most populations of cutthroat trout in the state, especially Rio Grande cutthroat, are restricted to headwater systems. Aquatic invertebrates are most abundant and diverse in riffle areas and the trout will feed heavily in, and especially downstream of, these areas. Livestock overgrazing has impacted most streams occupied by Rio Grande. Limited vegetation in the watershed, especially in riparian areas, has led to altered stream nutrient and sediment loads, and has modified flow regimes along with the morphology of the stream course. Trampling of stream banks by livestock has further accelerated habitat deterioration. Trout survival in many of these streams is impaired because of the lack of productive riffle areas, suitable spawning sites, undercut banks (to escape predation), pools (for resting, feeding and overwintering), and shade (in proper proportions that preserves cold water temperatures yet allows adequate solar gain essential for primary production) (Sublette et al. 1990). Rio Grande cutthroat trout will serve as an excellent indicator for riparian health.

Northern Leopard Frog (*Lithobates pipiens*)

Northern leopard frogs were found in all the local zones historically but are now absent in many historic locations. This species requires springs, slow streams, or other perennial water as habitat and for overwintering; during warmer months they may be found in wet meadows or other habitats near standing water and these habitats are limited in the Santa Fe NF. Characteristics of quality northern leopard frog habitat are currently highly departed (e.g., site potential and proportion of bare soil are departed at 73 and 60 percent, respectively), while potential to return to reference conditions remains unknown. Threats to their aquatic habitats were moderate to high. For lakes and ponds, the potential risk to compromised system integrity within the Santa Fe NF was moderate for most watersheds, while the potential risk to compromised system integrity of seeps and springs within the Santa Fe NF was high for most of the watersheds. Ongoing threats include degradation of habitat caused by grazing, chytrid fungus, or siltation due to uncharacteristic wildfire and poor road management (95 percent of potential habitat). Northern leopard frogs should be considered at-risk because of their limited range and moderate to high risk within their habitats.

Amphibians may be highly sensitive indicators of environmental quality. Their moist skin allows absorption of both air- and water-borne pollutants. Because most of their life cycles include both aquatic and terrestrial stages, degradation in either habitat may negatively affect population viability and fitness (Jennings 1995). Northern leopard frogs (*Rana pipiens*) occur between 3,500 and 10,000 feet elevation in New Mexico (Degenhart et al. 1995). Their habitats include cattail marshes, beaver ponds, and other permanent water sources with aquatic vegetation. Rarely are they found near ephemeral ponds. Threats to local populations include Chytrid fungus, changes in wetlands, stocking of predatory fish; natural local extinctions as ponds dry up during years of low precipitation (exacerbated by non-natural threats), and predation and competition by introduced bullfrogs (*Rana catesbeiana*) (Finch 1992, Smith and Keinath 2007). Additionally, northern leopard frog population declines in the western U.S. have been attributed to "chemical contamination, acidification of water, increased ultraviolet light due to loss of the ozone layer, climatic changes, and general environmental degradation" (Smith and Keinath 2007). Northern leopard frogs will serve as an excellent indicator for riparian health.

Plumbeous Vireo (*Vireo plumbeus*)

Plumbeous vireos have been recorded in all local zones within the Santa Fe NF (E-Bird observations). They are found in Douglas fir, Hemlock-Sitka spruce, redwood, ponderosa pine, larch/white pine, lodgepole pine, fir-spruce, aspen (hardwoods), chaparral, and piñon-juniper forest types. *Vireo plumbeus* is said to be frequently seen, and breeding, in the summer and frequently transient in areas of piñon-juniper woodland and ponderosa and oak forests near ponderosa pine forests with oak (USDA Forest Service 2006).

The vireo appears to favor riparian areas in lower elevations within the Santa Fe NF. Solitary vireos were recorded breeding in piñon-juniper woodland, upland forest, wooded canyon bench, and canyon slope habitats in New Mexico in 1985 (Stahlecker et al. 1989). According to Forest Service Agriculture Handbook #688, vireo uses the following defined habitat types: Great Basin shrubsteppe; desert riparian deciduous woodlands, marshes; river, riparian woodland, subalpine marsh; relict conifer forest, Madrean evergreen woodland; and mountain and alpine meadows (USDA Forest Service 1991), therefore, they will serve as an excellent indicator of riparian health below 7,500 feet elevation.

Cordilleran Flycatcher (*Empidonax occidentalis*)

Cordillera flycatchers have been recorded in all local zones within the Santa Fe NF (E-Bird observations). They are frequently seen in the summer and in areas of ponderosa-oak forests, mixed conifer forests, spruce-fir forests, open waters and riparian regions near ponderosa pine with oak understory (USDA Forest Service 2006).

The flycatcher appears to favor riparian areas in upper elevations within the Santa Fe NF. According to Forest Service Agriculture Handbook #688, the Cordilleran flycatcher uses the following defined habitat types: river, riparian woodland, subalpine marsh; and mountain and alpine meadows (USDA Forest Service 1991), therefore, they will serve as an excellent indicator of riparian health above 7,500 feet elevation.

Piñon-Juniper Woodland

Although piñon-juniper forests are currently less departed from reference conditions than most of the other ecosystems, they are projected to be highly impacted by the changing climate. Although restoration activities within these ecosystems will be minimal, the health of piñon-juniper forests is critically important to monitor because numerous species and resources depend upon these systems. Should ecological conditions change drastically within the life of the plan, it may be necessary to redirect restoration activities.

Juniper Titmouse (*Baeolophus ridgwayi)*

The juniper titmouse is a non-migratory passerine that has a range that includes nearly all of New Mexico (Cicero et al. 2020). They have been recorded in most zones of the Santa Fe NF (E-Bird observations). Rangewide, the species shows a declining population trend, possibly due to loss of habitat (Cicero et al. 2020). Breeding bird survey results indicate a 2.8 percent decreasing annual population trend (significant) in New Mexico from 1996 to 2005. From 1970 to 2014, there was an estimated overall population decline of 4 percent (Rosenberg et al. 2016). On the Santa Fe NF, the piñon-juniper habitat juniper titmice occupy is in low to moderate departure but is expected to improve over the course of the next forest plan. Although considered uncommon, the juniper titmouse is not considered at-risk in the Santa Fe NF.

This species is generally found in warm, arid climates at elevations ranging from about 2,250 to 7,998 feet. In the Southwest, it is found in juniper or piñon-juniper woodlands. It prefers open, juniper-dominated woodlands where large, mature trees are present. Such trees are a critical element of juniper titmouse habitat, as they provide for nesting cavities. Locally, oaks may comprise a portion of their habitats (e.g., in mixed piñon-juniper woodlands), but the distribution and abundance of juniper titmice is not tied to oak presence Cicero et al. 2020).

The juniper titmouse is an omnivore, consuming both seeds and invertebrates. It is considered an important consumer of piñon seeds. Breeding season is April to May, and pairs tend to have only one brood per season. Natural or woodpecker-created tree cavities are typically used as nest sites, such as those most often found in large, mature trees or snags. Crevices in the twisted branches or trunks of older juniper trees may also be used (Cicero et al. 2020).

Juniper titmice are unusual in the extent to which they are largely associated with one ecosystem, piñon-juniper forest. They will serve as a good indicator for piñon-juniper forest health.

Ponderosa Pine Forests

Ponderosa pine forests are one the most out-of-reference ecosystems in the Santa Fe NF because of historic fire suppression and the subsequent buildup of live and dead woody material. Forest restoration is a primary focus of the new forest plan, therefore, trends toward desired conditions within these forests should occur. The monitoring of a focal species heavily dependent upon structural components within a ponderosa pine ecosystem is a critical component to determining ecological integrity of this system.

Northern Goshawk (*Accipiter gentilis*)

Northern goshawk is a forest habitat generalist that uses a wide variety of forest ages, structural conditions and successional stages, most of which are departed from reference condition in the Santa Fe NF because of fire suppression activities and in some cases, stand-replacing fire (50 percent of potential habitat). Although the departure from reference in ponderosa pine forests has created closed-canopy conditions beneficial to northern goshawks, they remain extremely vulnerable to catastrophic fire, which can greatly alter or reduce optimal habitat. Nest sites are found in all the local zones surrounded by post-fledging family areas. Several nest sites and post-fledging family areas have been lost or abandoned because of stand-replacing fires. Annual monitoring within the plan area has documented this decline.

Goshawks are found in various forest types. Snags (standing dead trees) provide critical resources for many birds, mammals, invertebrates, and plants that goshawks prey or forage on. Large, downed logs provide cover, feeding, and nest sites for a variety of vertebrates. Among goshawk prey, downed logs are important feeding sites for woodpeckers and as denning sites for chipmunks, mantled ground squirrels, and cottontail rabbits. The character, amount, and distribution of woody debris (material between 3 and 12 inches diameter) may affect the abundance of goshawk prey. Large trees (larger than 18 inches diameter) provide critical nesting, denning, feeding, and roosting sites for such goshawk prey as tassel-eared squirrel, large woodpeckers, and blue grouse. Large trees also are good cone producers, providing seed for many prey species. Large trees also provide hunting perches and nest trees for goshawks. Forest openings with their associated grassy, herbaceous, or shrubby vegetation, provide important food and cover for a number of goshawk prey. (Reynolds et al. 1996). Because northern goshawks require specific structural requirements, they will serve as an excellent indicator for ponderosa pine forest health.

Wildlife Connectivity

Although wildlife connectivity does not rely on a specific ecological condition within a single ecosystem, it consists of a multitude of ecological conditions that make movement within or between ecosystems easier. Besides removing or mitigating physical obstructions to movement, in-reference ecological conditions increase the likelihood that wildlife will not be impeded by connectivity issues. In other words, if habitats are restored and functioning properly, animals should be able to acquire all the basic life-cycle needs (i.e., food, water, and shelter) as well as the need to find suitable mates. Monitoring a species that is known to repopulate an area that has been successfully restored will provide useful information that ecosystems connecting those areas are functioning properly.

North American Beaver (*Castor canadensis*)

The American beaver historically occupied all drainages within the Santa Fe NF. In early times, beavers were living along most or all permanent streams in New Mexico. But, during the 19th-century exploration of the West, beaver trapping figured as a prominent commercial inducement, and by 1910, the animals had been eliminated from much of their former range. In the 1930s, when it was realized that beavers were vital components of proper watershed management, live trapping and restocking of the animals began. Most beavers in New Mexico occur in the northern montane part of the state. In the San Juan, Jemez, Sangre de Cristo, and Mogollon Mountains, many streams support beaver colonies.

In lowlands, such as the middle and lower Rio Grande Valley, beavers commonly live along irrigation ditches or drain ditches constructed to lower the water table in flood plains. In such places, beavers may build dams, as they occasionally do in the Albuquerque area, but more often they live in burrows dug in the banks of the ditch. In such places, cottonwoods and willows are favored food plants (Findley et al. 1975). They attempt to colonize some streams that are exceedingly small or have a very limited flow of water. Along various human-made canals, beaver attempt to build dams if suitable vegetation is nearby for such a project (Hoffmeister 1986). If appropriate habitat exists, it is likely that other beavers will eventually move into the area (Jackson and Decker 1993). Since beavers repopulate areas if habitat is connected and in reference condition, beavers will serve as an excellent indicator for wildlife connectivity (Hood and Larson 2014).

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Appendix G. Resource Effects Citations

All effects citations used in chapter 3 of the FEIS are compiled into tables for each resource area here. These tables can be used to get a comprehensive scope of each resource's effects as well as for reference guides when reading the environmental consequences.

Within each resource analysis, the first time an effect is mentioned it is given an ID composed of a specific letter number combination (e.g., V1). This ID is then referenced when the same effect occurs. Resource tables here are listed in the same order as they appear in chapter 3 of the FEIS. Each resource lists all related effects from the FEIS by effect ID.

Vegetation

ID	Effect
V1	Stands that are densely stocked create shaded understory conditions that do not support ground cover diversity and abundance [and often] increase the risk of uncharacteristic fire by providing vegetative connectivity from the ground to the canopy.
V2	Areas with tree encroachment alter species compositions, increase canopy closure, and change grass and forb productivity.
V3	Restoring seral state distributions to within the natural range of variability restores stand structure, composition, and function to ERUs over time, increasing the resiliency of ecosystems to disturbance and creating greater habitat diversity.
V4	Canopy openness influences the establishment of understory plant communities and the grass-forb-shrub interspaces between tree groups, encouraging greater plant diversity and cover in the understory.
V5	The creation of grass-forb-shrub interspaces between tree groups are important in providing the fuel matrix necessary to restore fire regimes, and sustain forest compositions, structure, processes and functions (Moore et al. 1999). Increases in the cover of grasses and forbs within canopy openings, can increase the quality and availability of forage for grazing animals and livestock.
V6	If overstory canopy cover moves away from desired conditions (>10% in grasslands and >30% in forests and woodlands), there would continue to be negative environmental consequences, including departed fire regimes, dense stand structures, and altered species compositions favoring shaded environments.
V7	Any natural process or anthropogenic treatment that results in the loss or significant changes to ground cover will have detrimental effects to site potential and vegetative recovery following disturbance. For instance, unsustainable grazing practices, recreation activities, timber harvesting practices, and fire have reduced ground cover of grasses and forbs over time. Reduced ground cover lessens surface fire activity, potentially leading to altered fire return intervals or fire frequency.
V8	Reductions in vegetation ground cover also can trigger increases in erosion rates as isolated bare soil patches become connected, creating networks at broader spatial scales that promote accelerated water runoff and associated erosion and sedimentation (Davenport et al. 1998, Reid et al. 1999, Wilcox et al. 2003, Pierson et al. 2008).
V9	The reduction of ground cover would also lessen water infiltration into the soil profile, which slows vegetative growth.
V10	The increased net losses of water and soil feedback serve to reduce the productivity and vigor of vegetation cover, potentially leading to desertification (Schlesinger et al. 1990).
V11	Furthermore, increased bare soil can also facilitate exotic species introductions (Stohlgren et al. 2001).

ID	Effect
V12	Rapid and extensive changes in watershed hydrology often occur when high-severity fires amplify runoff and erosion by reducing vegetation and ground cover across broad areas (Shakesby and Doerr 2006).
V13	Altered pattern-process relationships of accelerated erosion would persist for decades (Wilcox et al. 2003), and once desertified through loss of vegetation and soils, semiarid ecosystems would be slow to recover (Peters et al. 2006).
V14	Soil erosion can irreversibly alter the physical, chemical, and biological properties of the soil and, in turn, alter the kind and amount of vegetation a site can support.
V15	Once grass has been displaced, this alteration may result in conversion to woody vegetation that is difficult to reverse (Fridel 1991).
V16	Shifts in understory plant community structure and composition (e.g., loss of grasses and increases in shrubs) away from reference conditions can have detrimental impacts that reduce understory abundance, species diversity, wildlife or avian habitat, and ecosystem function.
V17	Thinning dense stands can benefit old growth development and increase the health and vigor of the residual trees, reducing their susceptibility to disease or insects.
V18	Repeated occurrences of low to moderate severity fire can aid in the development of late-successional stages by restricting the regeneration of new seedlings and increasing the availability of resources such as water or nutrients for use by larger, older trees.
V19	Mechanical thinning treatments can enhance old growth development by specifically targeting smaller trees for removal before burning to reduce damage to the larger, more valuable trees during fire.
V20	Coarse woody debris (CWD) protect the forest floor and mineral soil from erosion and mechanical disturbances, protect new seedlings from livestock damage, provide key habitat components for many wildlife species, maintain stream ecology, interrupt air flow, and provide shade, which in turn encourages and protects new forest growth (Graham et al. 1994).
V21	CWD can increase the duration of smoldering combustion, and in turn increase emitted particulate matter, potentially contributing to reduced air quality and visibility in local and regional airsheds (Reinhardt et al. 1997).
V22	Prolonged smoldering times of CWD can also increase the severity of soil heating (Reinhardt et al. 1997), negatively impacting microorganisms and soil structure, and potentially cause hydrophobicity or sterilization of the soil (Neary et al. 2005).
V23	Without a sufficient quantity or spatial distribution of snags, habitat for cavity nesters (e.g., bats, owls) is scarce, and there would be insufficient material to replenish coarse woody debris loadings in the future.
V24	Reduced patch sizes create greater landscape diversity, providing a wider array of habitat types and cover for many species (e.g., edge species and generalists); [however,] habitat fragmentation through reducing patch sizes may result in population declines for some species (particularly interior-obligate species) that prefer large intact tracts (Bender et al. 1998)
V25	Reduced patch sizes also increase the health and integrity of residual trees by increasing the distance between trees of the same species, lessening the risk for large scale spread of insects or disease
V26	Treated areas would have a patchy or clumpy forest structure that would be randomly distributed across the landscape, increasing the Forest's resistance to uncharacteristic fire by creating larger interspaces where ladder fuels and trees that could carry canopy fire are absent.
V27	By selectively removing overstocked trees, patch sizes can be directly manipulated to the desired levels on a project level basis, resulting in a quick return to desired conditions (e.g., within the treatment area). Returning to desired conditions on a smaller scale basis, would eventually lead to large scale improvements as more treatments are implemented across the landscape, increasing ecosystem function and resiliency.
V28	The implementation of periodic (planned ignition) fire to drive patch sizes toward desired conditions would also provide further support to the return natural fire regimes within fire-adapted ecosystems, restoring natural processes, functions, and species assemblages on the landscape over time.

ID	Effect
V29	If fires are too frequent, plants would be killed before they have matured, or before they have set sufficient seed to ensure population recovery. If fires are too infrequent, plants would mature, senesce, and die, without ever releasing their seeds; or species composition would shift to favor uncharacteristic combination; or live and dead biomass would simply accumulate to uncharacteristic levels.
V30	Fires create a mosaic of habitats across the landscape, leading to structural and compositional diversity in vegetation, where fire-adapted species are promoted, and fire-sensitive species are suppressed. These changes result in species compositions more indicative of potential natural vegetation types and historic reference conditions over time.
V31	By removing dense small diameter stems and creating growing space in the understory, fire encourages increased response from grasses and (lesser so) forbs. As fire consumes vegetation and fuels, it releases ash and nutrients into the air and onto the soil that are important to regenerate grasses, forbs and shrubs, which, in turn, help restore natural fire regimes.
V32	Fire is also beneficial in the creation of old-growth forest characteristics as it reduces vigorous tree regeneration, allowing for a greater availability of resources to be devoted to larger, fire-resistant stems, which may eventually become old-growth (Binkley et al. 2007).
V33	The array of stand density and forest conditions created by fire allows for greater habitat diversity, benefitting wildlife species and encouraging diverse compositions of plants. Having a mosaic of habitat types within burned and unburned areas allows for connectivity and corridors for animal and (sometimes) plant migrations and promotes species diversity and ecosystem health.
V34	Fire reduces air quality through the addition of micro particulate matter into the air and causes smoke impacts (e.g., reduced visibility) to communities near the burns.
V35	The particulate matter from smoke emissions is detrimental to human health, especially for the elderly or people with pre-existing respiratory conditions.
V36	Fire, especially high severity fire, would also negatively impact soils through increased erosion, excessive heating, altering microbes or fungal colonies, and interrupting nutrient cycling by incinerating organic material.
V37	Generally, low to moderate severity fires do not result in excessive heat transfer to the soil or cause extensive damage to larger, fire resistant overstory trees.
V38	Uncharacteristic, high severity fires would result in complete canopy and ground cover removal, dramatically affecting watersheds and water resources by altering the important processes of evapotranspiration, interception, surface flow, and subsurface flow (Swanson 1981).
V39	High severity fire can degrade water quality 50 km downstream with increased turbidity of runoffs, limited dissolved oxygen levels, and altered pH and conductivity rates (Dahm et al. 2015).
V40	Fuel loadings (CWD, litter, fine woody debris, and flammable live vegetation) that are too high increase the risk of a site experiencing severe fire behavior.
V41	Reduction in fire risk brings with it, the protection of water quality in the highly valued headwater streams of the area.
V42	Fuel reductions also increase safety to local citizens whose homes lie within the wildland-urban interface and increase protection of area businesses and infrastructures.
V43	The reduction of forest density and a return to more natural fire regimes, will protect habitat for wildlife, as well as, enhance recreation opportunities and aesthetic conditions which would be lost if the area burned in a severe fire.
V44	By implementing restorative treatments ground cover diversity of native species can be reestablished, reducing erosion potential, maintaining or improving water quality, boosting site potential, and promoting the return of natural fire regimes in frequent-fire systems.
V45	[Mechanical thinning or timber harvesting can] improve the health and vigor of the residual forest by reducing competition for resources or removing diseased trees.
V46	[Mechanical thinning or timber harvesting can] provide economic benefit to local industries and surrounding communities.
V47	[Mechanical thinning or timber harvesting can] improve habitat conditions for target wildlife species.

ID	Effect
V48	The negative impacts of mechanical treatments, especially of those that use machinery, include soil compaction, soil disturbance and erosion, noise pollution, and the degradation of water quality.
V49	Mechanical treatments can also facilitate the introduction or spread of invasive species as they are transported or move from an infected area to non-infected areas.
V50	Mechanical treatments that require the reopening of closed roads, or the development of new roads, disrupt landscape continuity and fracture vegetative communities, negatively impacting vegetative species and wildlife habitat.
V51	[Cutting restrictions] retain the untrammeled character that is valued in wilderness areas, increasing the satisfaction of backcountry users by having unaltered viewsheds and by inspiring a feeling of solitude.
V52	The draft forest plan in accordance with current laws and regulations (FSM 2320) describes livestock grazing and acequia management as allowable practices in designated wilderness, supporting local economies and cultural and traditional uses
V53	Wilderness areas also contribute to clean air and water, quality wildlife habitat, primitive recreation, natural vegetation assemblages and disturbance processes.
V54	Effects of large patches of moderate to high severity fires could result in long-term detrimental impacts to the site and watershed. This includes the alteration of soil condition, hydrological function, and overall productivity of the site
V55	These fires may also encourage beetle outbreaks that cause additional tree mortality, further degrading stand function and health.
V56	Stand replacing fires damage valuable ecosystem components by killing old growth timber and eliminate suitable habitat for species that would depend on these stands for survival.
V57	Some moderate to high severity patches eventually become colonized by aspen, forming relatively even aged stands within burned patches, increasing landscape heterogeneity and shifting seral state distributions toward early states.
V58	High severity fires have the potential to cause a type conversion from forest to grasslands or shrublands (Guiterman et al. 2017, Walker et al. 2018), and reduce site productivity for conifer species for many years or decades.
V59	In areas of extensive damage to the soil, the capacity for the site to support future pine growth is reduced through the loss and degradation of soil, and through the reduced infiltration of water into the soil coupled with increased runoff.
V60	Future pine growth is also limited following widespread tree mortality by the elimination of a viable seed source.
V61	The reintroduction of fire across the landscape would result in more fire created openings, aspen regeneration (in MCD, SFF, MCW), and a reduction in the overabundance of fire sensitive species such as white fir.
V62	These dense conditions place additional stress on trees and increase their susceptibility to large disturbances like uncharacteristic fire or beetle outbreaks.
V63	Canopy openings or vegetation treatments that are obvious near travelling corridors can negatively impact viewsheds and reduce public satisfaction by altering what would have previously appeared to be untouched by human influence.
V64	Retaining a high proportion of stands with closed canopies, high stand densities, and stressed conditions, limits the development and maintenance of old growth forest components and increases the risk of uncharacteristic fire.
V65	[Moreover,] the removal of fuels within dense, overstocked areas considerably reduces risks to human property, infrastructure, and life in the event of wildfire.
V66	[The newly opened areas from fire and mechanical treatments, aside from having increased understory richness and diversity, would have] species compositions that are able to promote natural fire regimes into the future.

ID	Effect
V67	[In turn,] the restoration of natural fire regimes would lead to greater habitat diversity, providing a range of conditions complementary to many wildlife species, and lead to increased site productivity over the long term.
V68	[the wide-ranging introduction of fire into areas that have not seen fire in decades] without mechanically pre-treating areas with heavy fuel loads increases the potential for additional negative effects, such as the creation of patch sizes much larger than desired, increased tree mortality and regeneration difficulties, all of which temporarily degrade site quality and potential for the land to support multiple uses.
V69	The implementation of fire over large areas without the use of mechanical thinning as a pre-treatment could raise fire severity, resulting in the reduction of old growth.
V70	Vegetation treatments conducted in grassland ERUs would reduce tree encroachment, returning the proper structure to grasslands and promoting the growth of grasses important for meadow restoration and grazing.
V71	Drought probability and severity are likely to increase in the future (Ford et al. 2012), leading to reduced grassland productivity, lower overall groundcover, shifts in species composition, and soil instability.
V72	Stressed grasslands will be more susceptible to invasive species invasion, altering site productivity, forage availability and quality, and displacing native species.
V73	Retaining mature mast producing piñon trees ensures that there is a seed source for future piñon regeneration, for wildlife use, for the collection of nuts for human consumption, and to sustain other traditional uses, meeting the varied needs of wildlife and people into the future.
V74	Reduced herbaceous growth and cover negatively impacts wildlife that forage and nest in open grassy areas due to a lack of availability across the local landscape and increased competition and resource pressure in nearby areas where adequate forage and cover is present.
V75	Socio-economic consequences of widespread or severe fires, such as reducing the availability of forest products (e.g., firewood, piñon nuts, etc.) for human use.
V76	[To open the canopy too much in PJG or JUG would undesirable, as it] disrupts the water cycle by reducing transpiration and intercept rates, allows for extreme soil heating, and removes valuable habitat for certain species.
V77	[Under all alternatives, the SAGE ERU is] likely to experience continued encroachment by woody species (e.g., juniper), leading to higher seral state departure and lower ecological integrity.
V78	These woody encroaching species decrease water, nutrient, and light availability to understory plant species, reducing their abundance and diversity.
V79	Restoring native species is a primary component in increasing the function of sagebrush shrublands, for resource benefits such as improved forage for grazing animals and a return to nature fire regimes.
V80	Cheatgrass (a nonnative, invasive species) would continue to establish dominance by outcompeting and displacing native bunchgrasses, especially on sites where native vegetation has been reduced or removed by prior disturbances, such as fire, creating a positive feedback loop for the invasive species to proliferate and degrade sagebrush communities.
V81	Diverse and abundant ground cover species support soil stabilization and high water quality, while also providing high quality, sustainable forage for grazing animals.
V82	The soils and plant life at these high elevations are very fragile and are easily damaged by trampling which can denude the thin organic layers at the soil surface, cause compaction on a microsite basis, and kill the existing vegetation, which may have a difficult time re-establishing in the harsh environment.
V83	[Conversely,] thinning treatments could cause a decreased aesthetic quality, reducing Forest user satisfaction through the appearance of human-caused landscape manipulation.
V84	[Mechanical or fire vegetation treatments… use cation so the area is not negatively impacted by adverse indirect effects of treatments such as] noise pollution, poor air quality, or reduced scenic quality.
V85	[But] if motorized recreation expands into unauthorized areas, habitat degradation, fragmentation, and decreased water quality would result.

Riparian

ID	Effect
RMZ1	Removing and thinning woody species encroachment will help restore desired vegetation species composition and structure in Riparian Management Zones, returning riparian areas toward desired conditions and contributing to more natural hydrologic cycles and functions.
RMZ2	Heavy equipment use in sensitive riparian areas can compact and rut the soil. Rutted soil is likely to channelize water, making it more susceptible to erosion and entrainment (Elliot et al. 2010); compacted soils have reduced infiltration, resist revegetation, and have increased erosion. The increase in erosion from channelized runoff and compacted surfaces will lead to degraded riparian hydrologic function and increase sedimentation into streams.
RMZ3	Removing and thinning some encroaching woody species from Riparian Management Zones, particularly from HERB and CWG ERUs may increase hydrologic connectivity between riparian areas and streams by increasing shallow subsurface flow available to replenish streams (Huxman et al. 2005, Scott et al. 2006).
RMZ4	[Stream channel and riparian restoration actions include a suite of possible activities that all should have the beneficial effect of] rehabilitated geomorphic and biological processes, which would help to restore stream and riparian ecosystem services. Properly functioning streams and riparian areas provide clean water, regulated water temperature, water storage, sediment storage, nutrient cycling and good habitat (Gregory et al. 1991).
RMZ5	Sediment and turbidity adversely affect water quality, aquatic habitat, and flood capacity by making water more difficult to clean, decreasing the oxygen supply to fish and amphibians, decreasing habitat diversity and availability, as well as decreasing channel volume (Henley et al. 2000; Postel and Thompson 2005).
RMZ6	Road decommissioning should benefit surface water resources and Riparian Management Zones through restored hillslope drainage patterns, increased infiltration, water storage and retention, restored hydrographs, decreased channel aggradation, and improved water quality.
RMZ7	Reducing road system mileages may limit motorized use impacts in RMZ including the spread of invasive plants and increases in erosion. Ultimately, these should result in a water supply that is less expensive to clean to standard, increased baseflows during the dry periods of the year, and improved fisheries.
RMZ8	Further, restoration activities may temporarily alter stream shade by removing vegetation during work.
RMZ9	[As one of the major limiting factors in properly functioning condition (PFC) of Riparian Management Zones,] removal of invasive species should help promote recovery of vegetation species and composition and PFC of Riparian Management Zones.
RMZ10	Use of chemical application can adversely affect water quality when sediment or chemicals are delivered to a water body through the riparian area
RMZ11	Longer than predicted residence times of herbicide in soils are not uncommon, and as the herbicide remains in the soil it can inhibit the recovery of native vegetation.
RMZ12	Fire may reduce encroachment of woody species where the densities of woody species is outside the range of natural variability for riparian ERUs on the Santa Fe NF, encouraging the return of natural fire regimes and restoring native ground cover.
RMZ13	Fire may cause adverse effects to Riparian Management Zones if fire severities cause super-heating of the soil. High heat not only removes groundcover but can cause soil hydrophobicity by which water is repelled from soil pores (DeBano et al. 1976).
RMZ14	In large areas of hydrophobicity, excessive runoff is generated because infiltration is significantly reduced (DeBano 1971). Excessive runoff can result in flashier hydrographs (Moody and Martin 2001) as well as erosion and sedimentation (Certini 2005), both of which adversely affect water quality and aquatic habitat.
RMZ15	In some cases, high severity fire in riparian areas could cause heating of the soil to temperatures high enough to kill both existing vegetation and the native seeds and volatize available nutrients in the soil, in these cases natural recovery potential could be retarded and the riparian areas left more vulnerable to invasion by nonnative species, which thrive after disturbances and are well adapted to nutrient poor soils.

ID	Effect
RMZ16	Concentrated human use can destabilize soils by foot and vehicle traffic damaging aquatic habitat and water quality through loss of vegetation and increased sedimentation.
RMZ17	Water quality can be further degraded by human waste, fuel (for stoves, ATVs, etc.), and other contaminants that are introduced to waterbodies.
RMZ18	Sites will remain compacted from years of vehicle traffic; the compaction will inhibit revegetation leaving exposed soils and vulnerabilities to invasive plant encroachment. The compacted bare ground will prevent infiltration of precipitation, which will cause continued runoff and erosion degrading water quality.
RMZ19	Altered hydrology results from the change in water balance caused by a shift from herbaceous vegetation to shrubs and conifers, which have more extensive canopies and are more deeply rooted. The deeper roots allow increased uptake of subsurface water, increased rates of rainfall interception, and have higher rates of evaporation and transpiration—these properties combine to result in reduced water yield to riparian areas and streams when compared with riparian areas dominated by herbaceous species.
RMZ20	Road decommissioning objectives would result in a smaller road system that would reduce access and spread of invasive species, as well as improve hydrologic function and connectivity of riparian and upland ecosystems.
RMZ21	Watersheds and RMZs would be expected to move away from properly functioning condition as a result of increased sedimentation from logging and an expanded motorized road system, leading to the long term degradation of sensitive riparian areas.
RMZ22	Intense or extensive grazing causes the removal of ground cover, increases erosion, increases sedimentation, degrades water quality, and can facilitate invasive species spread, all of which are particularly detrimental to riparian condition.
RMZ23	The absence of wildfire in the ecological regime of Forest watersheds has had a negative effect on Riparian PFC through the adverse alteration of hydrologic processes, such as water absorption, retention, and release (Keane et al. 2002). To some degree, the absence of wildfire affects Riparian Management Zones PFC in identical ways to overall watershed function by impacting water quality, stream channel morphology and equilibrium by increasing sediment deposition beyond the channels capacity to transport sediment downstream, and the accumulated sediment and altered channels decrease available aquatic habitat.
RMZ24	Mining activities are ground disturbing with potential adverse impacts to surface water resources and watersheds, and therefore cumulative impacts to RMZs such as water extraction, increased erosion and sedimentation, as well as the creation of acid mine drainage, and other water pollutants (Gleick 1994; Dudka and Adriano 1997). Leasable energy production operations can also contaminate water quality through the introduction of pollutants to groundwater and surface water.
RMZ25	Rural development around the Santa Fe NF in conjunction with Forest developments (e.g., campgrounds, ranger stations, day-use sites) can adversely affect water resources through ground disturbance and water quality contamination.

Water

ID	Effect
Wa1	Stream channel and riparian restoration should have the long-term beneficial effects of rehabilitated geomorphic and biological processes, which would help to restore stream and riparian ecosystem services. Properly functioning streams and riparian areas provide clean water, regulated water temperature, water storage, sediment storage, nutrient cycling and good habitat (Gregory et al. 1991)
Wa2	Intentionally left blank – Wa2 Removed
Wa3	Adequate groundcover reduces erosion potential by slowing the flow of water over the landscape and adding root strength to the soil. Indirectly these activities maintain water storage capacity while also reducing erosion and sedimentation

ID	Effect
Wa4	[Road decommissioning should provide long-term] benefit to surface water resources through restored hillslope drainage patterns, increased infiltration, water storage and retention, restored hydrographs, decreased channel aggradation, and improved water quality. Ultimately, these should result in an urban water supply that is less expensive to clean to standard, increased baseflows during the dry periods of the year, and improved fisheries.
Wa4.5	By increasing riparian and wetland vegetation (Wa1), increasing groundcover (Wa3), and decreasing disturbance to natural drainage patterns (Wa4), restoration enables watersheds to slow the flow and infiltrate runoff into the soil, improving water storage (e.g., within wetlands) during wetter periods. Restored stream channels, resistant to erosion by healthy riparian vegetation, are then better able to deliver a sustained supply of clean water to downstream users during drought periods.
Wa5	Ground disturbance dislodges soil making it easier to erode and entrain thereby introducing sediment and turbidity to the waterbody. Sediment and turbidity adversely affect water quality, aquatic habitat, and flood capacity by making water more difficult to clean, decreasing the oxygen supply to fish and amphibians, decreasing habitat diversity and availability, as well as decreasing channel volume. (Henley et al. 2000; Postel and Thompson 2005)
Wa6	Changes in channel geometry and shade can degrade habitat quality by making a channel shallower or deeper, warmer or cooler, and slower or faster) than biota prefer.
Wa7	the specific effects of these chemicals to aquatic and human life are therefore varied but can be summarily described as harmful to life (e.g. poison, cause mutations, etc.).
Wa8	Restoration by wildfire and prescribed fire can cause short-term, adverse effects to surface water resources when soil is super-heated. High heat not only removes groundcover but can cause soil hydrophobicity by which water is repelled from soil pores (DeBano et al. 1976). In large areas of hydrophobicity, excessive runoff is generated because infiltration is significantly reduced (DeBano 1971). Excessive runoff can result in flashier hydrographs (Moody and Martin 2001) as well as erosion and sedimentation (Certini, 2005), both of which adversely affect water quality and aquatic habitat.
Wa8.25	The use of fire for restoration mitigates these impacts by carefully monitoring fuel and climate conditions in order to avoid high severity fire. Prescribed fire and managed wildfire can have long-term beneficial effects on water resources because they prevent fuel accumulation, thereby minimizing the extent of high severity burn and associated adverse impacts on water resources
Wa8.5	The machinery requires fuel and hydraulic fluid which when spilled can adversely affect water quality, adversely affecting biotic communities.
Wa9	The equipment can also disturb and rut the soil as they move across the project area, especially where they change direction. Rutted soil is likely to channelize water, making it more susceptible to erosion and entrainment (Elliot et al. 2010).
Wa10	Compacted dirt results in decreased infiltration and increased overland flow. Ultimately, this may result in flashier hydrographs within stream channels. Where soils are severely compacted, root growth may be hindered, preventing ground cover from reestablishing; this can lead to prolonged erosion.
Wa11	Road drainage features (e.g., ditches and cross drains) constructed to gather the resulting runoff typically route the flow along the contour to the nearest stream channel. This can affect a stream’s hydrograph by de-watering the soil and channels downslope from a road, while augmenting flow in the discharge channel (Gucinski et al. 2001). Effects to de-watered channels may include aggradation, desiccated riparian vegetation, and depleted aquatic habitat, among others. Effects to augmented channels can include incision, channel widening, turbidity, depleted aquatic habitat, and elevated stream temperatures, among others.

ID	Effect
Wa12	As part of prescribed cutting operations, the construction of temporary roads is often required in order to mobilize the equipment to the project area and haul materials away. Temporary roads are similar to permanent roads in that they require soil disturbance, compaction and drainage manipulation. Roads can be significant sediment sources to water bodies (Gucinski et al. 2001) because soil disturbed during construction (e.g., cut and fill) and use is more susceptible to being entrained by water flowing across the ground surface. Where surface water enters a stream channel (e.g., at a cross-drain), the eroded soil is introduced to the hydrologic network. Sediment contributions from roads can be extreme where culverts are plugged and stream flow is either diverted down the road, or the road fill at the stream crossing is eroded and delivered to the channel below. Excessive sediment adversely affects aquatic habitat and causes channel aggradation, which ultimately decreases flood capacity.
Wa13	Where culverts are under-sized, they can physically and hydraulically prevent the passage of sediment and wood downstream. Ultimately, a stream channel starved of sediment and wood may incise or widen which can ultimately adversely affect water quality (e.g. turbidity, temperature) and aquatic habitat.
Wa14	Elevated water temperature adversely affects cold water aquatic habitat and other aspects of water quality (e.g., dissolved oxygen, algal growth).
Wa15	High road density in the headwaters can alter the timing and magnitude of peak flows at lower elevations, meaning more water reaches downstream channels faster. In this way, road density can have significant consequences to agriculture and urban development through flooding.
Wa16	Roads are likely to adversely affect both hydraulics (e.g., bridges, culverts and rip-rap can impinge upon free flowing condition of streams)
Wa17	Streambanks are often destabilized through foot-shear and trailing, adversely affecting aquatic and riparian habitat where banks become less resilient to flood flows, eliminating under-cuts and adding sediment to streams.
Wa18	Water quality is adversely affected when human waste, fuel (for stoves, ATVs, etc.), and other contaminants are introduced to waterbodies.
Wa19	Impermeable surfaces, faulty sanitation services, and water supply diversions can be detrimental to water quality and quantity if not well sited and managed because they can contribute pollutants as well as alter flow volumes.
Wa20	[Trails] concentrate water over long distances giving it erosive power. The effect is amplified on motorized trails because they are typically wider, more compacted, more disturbed, and often rutted, which further concentrates water. If the eroded soil is delivered to a stream channel, sedimentation can adversely affect water quality and aquatic habitat (Olive and Marion 2009)
Wa21	Where trails intercept overland flow, they can dewater soil and stream channels downslope while augmenting flow to other hillslopes and streams. Adding water to drier areas can result in erosion, channel incision, and channel widening, which have implications for water quality and geomorphic processes.
Wa22	their [cattle] consumption represents a significant decrease in available water to stream channels, riparian vegetation, wildlife, and humans
Wa24	Soil becomes compacted in areas where livestock habitually congregate. Compacted soil is less hospitable to plant roots than un-compacted soil. Where plant roots are unable to penetrate the soil they are less able to take in nutrients and water, making plants more vulnerable to toppling, disease, and drought, as well as decreasing bank strength (Abernethy and Rutherfurd 2001), causing streams to become more susceptible to erosion
Wa29	Nutrient addition to surface waters, particularly phosphorus and nitrogen, can increase algal growth, decrease water clarity, and increase ammonia concentrations which can be toxic to fish
Wa30	The increased organic matter also serves as a food source for bacteria and other microorganisms, resulting in lower oxygen levels in the water
Wa31	Intentionally left blank – Wa31 removed
Wa32	Livestock adversely affect stream temperature (Beschta 1997). Where stream channels lack significant vegetative cover due to grazing, solar exposure may warm surface water, harming cold water dependent aquatic species

ID	Effect
Wa33	as large wood (branches and trunks) accumulates within stream channels it can significantly affect hydraulics; directing flow, creating areas of scour, and areas of sedimentation (Tabacchi et al. 2000). This diversity is critical to aquatic habitat
Wa34	During flood flows, flexible plants (e.g., willows) protect the stream banks by bending in the current, effectively covering the banks and slowing erosion. They trap sediment, rebuild and expand floodplains, raise the water table, and expand riparian communities. Larger and well vegetated floodplains retain water longer (Tabacchi et al. 2000), raising stream baseflow during the driest part of the year
Wa35	Properly functioning watersheds serve people and ecosystems by capturing precipitation, storing it for release during drier periods
Wa36	They also clean water by filtering it through soil and vegetation
Wa37	Impaired and functioning at risk watersheds are less able, or incapable, of providing these ecosystem services
Wa38	These mining activities are ground disturbing with potential adverse impacts to surface water resources and watersheds such as water extraction, increased erosion and sedimentation, as well as the creation of acid mine drainage, and other water pollutants
Wa39	Leasable energy production operations can also contaminate water quality through the introduction of pollutants to groundwater and surface water

Wildlife

ID	Effect
WL1	Abundance and redundancy of habitat allows for populations to be more resilient to disturbances meaning they can avoid areas that are disturbed and find alternate suitable habitat. Species are also less susceptible to long-term fluctuations in populations since finding suitable mates for reproduction would be easier since similar habitats and populations would be nearby. Therefore, species within habitats that are abundant and well-distributed would not be limited by issues pertaining to movements and genetic flow.
WL2	Conversely, species with limited amounts and distribution of habitat throughout the forest would be impacted by decreased movement and genetic flow between populations.
WL3	Species within habitats that are of the highest quality (3) would meet their basic life cycle needs and be provided ample food resources and have few issues finding breeding or brood rearing habitat conditions. Therefore, their populations should not decline and continue to thrive.
WL4	Species within habitats rated as moderate quality (2-2.5) should find most of the ecological conditions they require but not all. Their populations should be sustained but may not be at the optimum capacity.
WL5	Species within habitats of the lowest quality rating (1-1.5) would be the most severely impacted by deteriorated ecological conditions and food availability may be low and breeding or brood rearing habitat may be absent. Therefore, their populations would struggle and may experience decline.
WL6	Wildlife populations may experience population declines if impacts to their behavior reduces their ability to feed or reproduce.
WL7	The additional risk of uncharacteristic fire in frequent-fire forested systems (PPF and MCD) could potentially harm wildlife through direct mortality or complete destruction of the habitat and the ecological conditions within.
WL8	The distribution of native fish is likely to stabilize and increase highly over time due to active efforts to expand their populations.
WL9	Although habitat would improve, wildlife would be negatively impacted due to direct mortality from trampling or ground compaction, increased competition from invasive species, or changes in their behavior (human disturbance) that decreases their survival rate.
WL10	Adding temporary or permanent roads to the system could result in degraded riparian habitat due to erosion and subsequent siltation. These would lead to direct mortality of aquatic species.

ID	Effect
WL11	The distribution of native fish is likely to decline over time due to small population sizes and catastrophic events such as uncharacteristic wildfire and drought, which increases erosion and causes excessive siltation leading to potential aquatic species die-offs.
WL12	At-risk bird and mammal species that depend on appropriate vegetative structure for nesting and foraging would continue to struggle to find resources and may experience further population declines.
WL13	At-risk plant species dependent upon bare ground or open canopies for germination would struggle to maintain viable populations in areas in which there are found.
WL14	Improved seral state condition will increase the likelihood of prairie dogs occupying the habitat and creating the necessary nesting sites for burrowing owls.
WL15	The improved seral state condition will increase the likelihood that at-risk plant species will find favorable growing conditions (ex. soil and sunlight) to maintain or increase its viability.
WL16	The improved seral state condition would decrease the fuel loads (woody encroachment) and greatly reduce the threat of fire, which could eliminate at-risk plant and animal species from the landscape.
WL17	The improved seral state condition would decrease the amount of invasive encroachment and greatly reduce the likelihood that invasive would outcompete native plants for available resources.
WL18	The improved seral state condition would restore structural components as well as snags and provide the necessary nesting and foraging habitat required for at-risk birds.
WL19	CWD loads that are at or near reference condition provide all the ecological conditions necessary for at-risk species. This includes foraging and nesting habitat for birds and mammals.
WL20	If CWD is not in adequate supply or below desired conditions identified as tons per acre (CWD load), it may result in lack of prey items or foraging areas for carnivorous birds or mammals.
WL21	If CWD is in excess or above desired conditions it may create unfavorable soil conditions, especially for at-risk plant species by prohibiting growth or germination or resulting in more intense fires that negatively impact soil conditions.
WL22	With restored CWD loads, at-risk plant species would benefit from the increased amount of bare soil allowing for increased propagation and spread as well as reduced concern from uncharacteristic fire.
WL23	With the appropriate number of snags offered in these forested systems, at-risk bird species should find snags readily available for nesting and foraging.
WL24	Invasive plants communities would continue to grow and native plants, which provide nesting and foraging habitat for at-risk mammals, would be diminished or replaced.
WL25	At-risk plants would continue to suffer since invasive plants would compete for available soil nutrients, water, and sunlight.
WL26	The native vegetation that small at-risk mammals require for nesting and foraging would not be diminished or replaced by invasive plant communities.
WL27	At-risk plant communities would not have to compete with invasive plants for soil nutrients, water, and sunlight.
WL28	Wetland dependent plant species will disappear due to changing soil conditions and encroachment from upland plant species.
WL29	Small mammals dependent upon riparian areas and their native wetland plant communities will decline due to lost foraging and nesting habitat.
WL30	Fish species that depend on slower moving, cleaner (less siltation) water will also decline as floodplains become more disconnected losing their ability to maintain the ecological conditions for these fish species.
WL31	Floodplains that are connected, or become reconnected, will provide the foraging and nesting areas for the at-risk mammals dependent upon those wet-soil plant communities.
WL32	Connected floodplains ensure the wetland soil conditions required by some at-risk plant species.
WL33	Connected floodplains maintain native wetland plant communities that provides shading, filtration, and other ecological conditions required by at-risk fish species.

ID	Effect
WL34	Soils will continue to lose their ability to cycle nutrients, absorb and hold water, and resist erosion and ultimately cause at-risk plant and invertebrates to decline.
WL35	Small populations of at-risk plant and invertebrate species would be protected from soil compaction, erosion, and degradation of soil characteristics if ground disturbing activities are limited in the soil-types in which they occur.
WL36	Ecological conditions such as nutrient load and water retention for plant and invertebrate species would be improved by restored vegetative conditions.
WL37	At-risk plants, amphibians, and invertebrates that are dependent upon specific soil conditions would be negatively impacted in the event of a long-lasting, high-intensity fire due to the fire's capacity to alter soil characteristics.
WL38	If specialized nesting sites for bird species are not afforded protections to allow the bird to breed and nest without disturbance, populations of at-risk bird species may decline.
WL39	At-risk fish species that require free-flowing, cold water characteristics such as temperature, dissolved oxygen, and an adequate number of riffles and runs, may experience population declines if these conditions are not available.
WL40	At-risk amphibian species that require slow-moving or standing water for breeding sites and laying eggs may experience population declines if these conditions are not available.
WL41	Continued encroachment from tree and shrub species in aspen glades may reduce populations of at-risk plant species dependent upon the open the glade habitat.
WL42	Ecological features and nesting sites for at-risk bird species that are left undisturbed during the nesting will result in greater nesting success and maintained or increased populations.
WL43	Cold-water stream conditions that increase or maintain necessary vegetation, water temperatures, flow, and pool-to-riffle ratios will result in sustained populations of at-risk fish and mammal species.
WL44	If standing or slow-moving water conditions are maintained, at-risk amphibian species will have adequate places for reproduction and egg-laying and will result in sustained populations.
WL45	At-risk fish and amphibian species will continue to be directly impacted by nonnative species from direct mortality from predation or through the diminished resources from competition.
WL46	Management actions to install fish barriers and remove invasive aquatic species will directly benefit at-risk fish species by eliminating or reducing impacts from nonnative predation and competition.
WL47	The construction of roads and trails and other ground compacting activities could impact at-risk plant, invertebrate, and amphibian species through soil compaction, which could crush individual plants or animals as well as alter soil characteristics, making that area unsuitable for those species.
WL48	The creation, or non-maintenance, of roads can also result in erosion impacts which negatively effects waterways through siltation and can cause population declines in at-risk fish species.
WL49	Management activities that are designed to reduce the imprint of ground disturbance activities will lessen the negative impacts of soil compaction and erosion on at-risk species.
WL50	Areas that are restored to their reference state after disturbance are more likely to support the at-risk species that inhabited those areas.
WL51	Human activity that disrupts breeding, nesting, or roosting of at-risk birds and bats would decrease survival and reproduction due to site abandonment and expended energies finding suitable replacement sites.
WL52	Recreational shooting of at-risk species causes direct mortality or nest or den abandonment.
WL53	Human activity that disrupts breeding, nesting, or foraging of at-risk birds and mammals would decrease survival and reproduction due to abandonment and expended energies finding suitable replacement sites.
WL54	Human activities that disrupt foraging or resting or ground-dwelling at-risk birds would decrease survival due to site abandonment and expended energies finding suitable replacement sites.
WL55	Trampling of at-risk plants by humans or livestock would cause direct mortality through crushing of individual plants.

ID	Effect
WL56	Excessive picking or digging of at-risk plants that are highly endemic may significantly reduce populations.
WL57	At-risk bird and bat species that remain undisturbed during critical seasons will experience higher nesting success rates.
WL58	At-risk bird and mammal species will see less mortality from recreational shooting in areas that have been closed to shooting.
WL59	Reduced human activities in riparian areas that contain at-risk bird and mammal species will result in higher survival due to less human disturbance on breeding and foraging activities.
WL60	At-risk ground nesting birds that undisturbed will be able to secure food sources more easily and expend less energies in the harsh alpine climate.
WL61	At-risk plants species will see less mortality in areas where restrictions reduce the likelihood of trampling, digging, or picking.
WL62	If disease outbreaks or unnatural disease spread occurs, at-risk species susceptible to the introduced pathogens will experience population declines attributed to direct mortality or reduced vigor.
WL63	At-risk species that are not exposed to unnatural disease spread or are treated for known pathogens will have increased survival over exposed or untreated populations.
WL64	Collisions with human-made structures may cause direct mortality of at-risk birds.
WL65	Entanglement in wire or fencing may cause direct mortality of at-risk birds.
WL66	Entrapment in human-made structures such as water features or pipes may cause direct mortality of at-risk bird, mammal, or amphibian species.
WL67	Reducing the amount, or mitigating the impacts, of human-made structures that cause collision, entanglement, or entrapment of at-risk species will decease mortality of the species that come in contact with it.
WL68	At-risk fish, amphibians, and invertebrates may suffer from direct mortality due to chemical poisoning from fire retardants.
WL69	If at-risk fish, amphibian, and invertebrate species are not exposed to fire retardants, they will not suffer from direct mortality from chemical poisoning.
WL70	Large developments such as towns or energy developments may interrupt or alter migration routes of large mammals, as well as birds, impacting their ability to find necessary food resources throughout the year.
WL71	Roads may interrupt movements of multiple terrestrial species by creating an impassable barrier for smaller animals or influence movement behavior of larger animals.
WL72	Some larger terrestrial animals have a difficult time accessing food and cover due to fencing and their inability or reluctance to jump the fences. In some situations where narrow gauge fencing is used, smaller terrestrial animals may also be impacted.
WL73	Smaller terrestrial animals may be restricted from obtaining necessary food and cover resources due to their reluctance to cross large linear openings since it exposes them to a risk from predators.
WL74	In-reference vegetative conditions will provide optimum wildlife connectivity for all species since they will be able to easily move about and obtain the necessary resources required for their basic life cycle needs.
WL75	When physical obstructions and ecological conditions are deteriorated, wildlife connectivity is compromised. Wildlife species will have a harder time moving about their environment and will need to expend more energy to acquire the food resources or to find necessary cover or breeding habitat.
WL76	When physical obstructions do not hinder movement and ecological conditions are in-reference, wildlife connectivity is optimum and wildlife species will need to expend less energy to acquire the food resources or to find necessary cover or breeding habitat.

ID	Effect
WL77	In RMZs where vegetative composition and structure (seral state) is not in reference condition at-risk birds and mammals will not be able to forage, find protective cover, or move about their habitat as needed to secure basic life-cycle needs.
WL78	Out-of-reference seral state within RMZs will also negatively impact soil and water characteristics (ex. temperature, flow, nutrient load) and may cause declines in aquatic species reliant upon those characteristics.
WL79	If seral state conditions are restored in RMZ, at-risk bird and mammal species would be able to forage, find protective cover, or move about their habitat as needed to secure basic life-cycle needs.
WL80	The improved seral state conditions within RMZ would also improve soil and water characteristics and increase the viability of at-risk plants and aquatic species that are dependent upon those conditions.
WL81	CWD loads in Riparian areas that are in-reference condition provide the cover and foraging areas for aquatic species as well as provide the soil and water characteristics for at-risk plant and fish species.
WL82	Roads are especially harmful to amphibian and fish species when a road blocks aquatic passage or wetland connectivity, preventing species from securing life-cycle needs or mating.
WL83	Small developments such as recreational sites may impact isolated populations of small terrestrial animals if it separates them from necessary resources.
WL84	Soil conditions such as pH, moisture level, and nutrients, would be negatively impacted in the event of a long-lasting, high-intensity fire, and subsequently, decrease the viability of at-risk within those soils.

Soil

ID	Effect
SE1	[Soil condition trending away from desired conditions and could result in additional areas with] reduced soil function and increased vulnerability to degeneration. Reduced soil function will diminish productivity of areas and their ability to support and sustain vegetation appropriate to ERUs. In addition, lower infiltration rate of the compacted soils will result in lower soil moisture retention and higher erosion rates. The compacted soils will be more vulnerable to invasion by nonnative species.
SE2	Satisfactory soil condition would provide resistance to soil erosion and enhance nutrient cycling and water infiltration.
SE3	The lack of effective vegetative ground cover and organic matter would reduce the soil function which negatively impacts the soil condition reducing nutrient cycling and decreasing water infiltration rates.
SE4	[Soil that has no effective ground cover has a higher risk of losing the topsoil where majority of the nutrients are stored to maintain plant life] nutrient loss.
SE5	[The PJ woodland ERU is moving toward desired soil condition with a] reduction in soil loss which increases soil function and productivity.
SE6	Severe fire damages soil condition by removing vegetation and increasing erosion potential and topsoil loss, leading to water quality degradation and reduced site productivity.
SE7	The reduction in grazing pressure, due to estimated increases in forage production, would benefit soil crusts and provide for more productive soils.
SE8	The disturbance to and removal of biological soil crust decreases organism diversity, soil nutrients, soil stability, and organic matter. In addition, the soils can no longer support diverse ecosystems.
SE9	Soil crusts should result in better protection of soil crusts necessary to maintain soil productivity, soil organism diversity, and soil stability to ensure ERUs can reach Desired Conditions.
SE10	The biological soil crusts provide moisture and nutrients for plants to germinate and grow to support native riparian plant communities, allowing for more diverse ecosystems.

ID	Effect
SE11	Soil compaction decreases soil water infiltration and nutrient intake.
SE12	The removal of ground cover damages soil crusts and increases the risk for soil erosion, causing degraded water quality.
SE13	The heavier accumulation of surface fuels and vegetation prior to reburning could heat soil excessively during the subsequent burn decreasing the potential for soils to revegetate by killing seed sources, volatizing nutrients causing long term diminished productivity, and altering soil structure increasing the potential for soils to erode, causing extensive damage to the soil.
SE14	The loss of soil structure increases the bulk density of the soil and reduces its porosity, thereby reducing soil productivity and making the soil more vulnerable to post-fire runoff and erosion.
SE15	Nitrogen loss by volatilization during fires is of particular concern on low-fertility sites because nitrogen can only be replaced by nitrogen-fixing organisms.
SE16	High-severity burns can negatively impact soil condition, altering soil structure and chemical properties, removing ground cover, causing soil loss and reduced soil function.
SE17	New roads or re-opening closed roads may also provide an environment conducive to the invasion and establishment of invasive plant species, which alter nutrient cycling patterns and change vegetation composition in ways that may degrade soil condition.
SE18	Effects of recreational uses shown to impact soils include off-road motor vehicle use, camping, hiking, mountain biking, and horseback riding. All of these activities may result in erosion, compaction, and loss of vegetative ground cover.
SE19	The effects of grazing on soil condition include reduced soil hydrologic function in highly compacted areas where cattle congregate and walk in trails, and reduced soil stability from loss of ground cover wherever over-utilization of available forage occurs.
SE20	Increased understory response would indirectly reduce grazing pressure and would allow range managers flexibility in management to favor rehabilitation or rest in areas that are currently not in satisfactory soil condition, such as found in riparian, grassland, and woodland vegetation.
SE21	[Restoring and maintaining resilience would] improve the potential for ecosystems to retain or return to desired conditions after being influenced by climate change related impacts and variability.
SE22	[Management practices] promote resilience and reduce opportunities for disturbance and damage.

Air

ID	Effect
AQ1	Fine particles from smoke emissions have significant impacts on the health and well-being of sensitive populations.
AQ2	Carbon monoxide released by combustion generates localized increments to ambient air, which present a health and safety concern for fire personnel.
AQ3	Combustion also releases nitrogen oxides, which are chemical precursors to the formation of ozone, which is an ecological pollutant.
AQ4	Smoke from wildland fires may travel large distances, impairing local and regional visibility and degrading air quality far from their point of origin.
AQ5	In the case of uncharacteristic wildfire, ambient concentrations of criteria pollutants may increase beyond the NAAQS in local areas and in locations much further away.
AQ6	Intentionally left blank – AQ6 removed
AQ7	Even though practices such as thinning and prescribed fire may release carbon in the short term, they focus growth and storage for the future on trees that are at lower risk and are more resilient to disturbance.
AQ8	*high-severity fire has the potential to be a carbon source for decades post-fire compared to 2-3 years post-treatment from prescribed fire.*
AQ9	Carbon sequestration by forests mitigates greenhouse gas emissions by offsetting losses through removal and storage of carbon (U.S. Forest Service 2015)

Traditional

ID	Effect
TCU1	Forest access provides for the acquisition of Forest products such as fuelwood, pinon nuts, Christmas trees, mushrooms, wildlings, greenery, and medicinal plants, sustaining the continued cultural and traditional uses of these products.
TCU2	By providing sustainable forest resources, the Forest helps to support traditional and cultural uses spanning centuries and contribute to local economies and livelihoods.
TCU3	Intentionally left blank – TCU3 removed
TCU4	Temporary roads used for restoration and other activities should be closed, decommissioned or restored to natural conditions after use, which may negatively affect the lifeways of nearby tribes and historic communities by increasing the difficulty of accessing the Forest, especially for the elderly or those not able to walk long distances.
TCU5	Restoration of grazing and other lands will improve grass and forb abundance providing for sustainable grazing practices tied to traditional ways of life in rural historic communities and to the sustainable presence of important species necessary for the practice of traditional activities within tribal communities.
TCU6	Improvements to vegetation resulting in improved habitat conditions would lead to long-term sustainability of wildlife populations used by tribal and traditional communities. The same would also be the case for improvement to grazing land resulting in long-term sustainability of grazing practices for tribal and traditional communities.
TCU7	Intentionally left blank – TCU7 removed
TCU8	Increased access combined with vegetative management contributes to the sustainability of tribal cultural lifeways.
TCU9	In the long term, this would result in more forage available for grazing and increased habitat disturbance for species important to tribal and traditional communities.
TCU10	The lack of additional protections to confidentiality and privacy surrounding traditional and cultural practices, could degrade these experiences for some groups or may expose these practices to unwarranted users of the forest.
TCU11	Decreasing access by restoring or closing temporary roads, would result in a decrease in visitation by people from outside tribal and rural historic communities, helping to protect the privacy and confidentiality of many traditional or cultural practices in the forest.
TCU12	Increased mechanized activities that have the potential to adversely affect confidentiality and privacy, as additional temporary roads may open areas previously closed to forest visitors.
TCU13	Increases in visitation by people from outside tribal and rural historic communities has the potential to negatively affect traditional practices, through unexpected breaches in privacy or confidentiality.
TCU14	Maintaining lines of communication between the FS, tribes, communities, partners, and the public, helps to direct and focus management practices on public lands in order to better meet tribal and traditional community needs in the forest.
TCU15	Increased communication would lead to stronger relationships between the Forest Service and nearby tribes and historic communities, improving collaboration and protecting shared interests.
TCU16	Forest plan components provide for conditions under which communication with federally recognized tribes and rural historic communities is enhanced but does not necessarily recognize the capacity of those communities to address requests, potentially resulting in communication barriers between these groups.
TCU17	This causes social and cultural challenges such as damaging or eliminating natural elements of landscapes that hold cultural significance, which diminishes the traditional memory and knowledge within those communities and ultimately threatens the long-term sustainability of traditional knowledge and practices.
TCU18	This provides a natural environment in which resources of value to communities and traditional practices can thrive and proliferate.

ID	Effect
TCU19	The influx of people could lead to changes in demographics and economic opportunities that may have both beneficial and adverse effects to Northern New Mexico Traditional Communities.
TCU20	[For communities and individuals who value these traditional resources and whose culture is tied to the land, these cumulative policies work with those outlined in the forest plan to support communities and] promote broad acceptance and appreciation of diverse cultural identities and preserve a sense of place important for intergenerational cultural continuity.

Cultural Resources and Archaeology

ID	Effect
CR1	Mechanical treatments impact cultural resources by compacting the ground in and around archaeological sites and by disturbing the distribution or arrangement of cultural deposits, artifacts, features and structures within sites, which affects the condition and information potential of the cultural resources on sites. Disturbance to these components of sites has the potential to adversely affect the integrity of sites of research purposes and may adversely affect communities with ancestral ties.
CR2	Machinery used to conduct mechanical treatments may also alter the physical properties of artifacts.
CR3	These factors challenge our understanding of these areas and degrade qualities that make the sites eligible for inclusion on the National Register.
CR4	Lower severity fires can damage cultural resources by altering their chemical or physical properties, such as charring exterior surfaces or promoting faster decomposition rates.
CR5	In some cases, lower severity fires can completely consume plant fibers, hair, or textiles ruining the important historical data they once held.
CR6	High-severity fire can be devastating to cultural resources, especially for perishable and fire-sensitive items such as wood, material, basketry, hides, leather, and plant residues or seeds.
CR7	These extreme temperatures completely destroy or alter the physical characters of artifacts, which significantly alters informational context.
CR8	These fires also affect the potential for dating features in a historical context by either altering their physical composition as in the realignment of radiometric iron in hearths or the deposition of recent carbon in archaeological contexts with the potential for C14 dating.
CR9	Severe fire damages vegetation and ground cover, often leading to soil hydrophobicity, and thereby increasing erosion and water run-off which can move cultural materials from their origin.
CR10	Finally, management actions associated with wildfire suppression frequently lead to effects to cultural resources including the construction of fire line through sites, burning of perishable materials resulting from suppression ignition and other effects associated with the suppression of wildfire
CR11	Looting and vandalism destroy the integrity of cultural sites and threatens the preservation of cultural heritage.
CR12	Visitation to cultural sites may also lead to the redistribution of artifacts which damages contextual information about the site.
CR13	Like humans, animals such as livestock which graze in the forest impact cultural sites through their visitation by causing soil compaction, erosion, and vegetative disturbance, or more directly by damaging artifacts through trampling and by changing the arrangement or distribution of artifacts.
CR14	Forest-wide management direction provides for inventory, protection, evaluation, nomination, interpretation and enhancement of cultural and historic resources.
CR15	Limiting activities that have the potential to adversely affect sites and cultural resources while promoting preservation and stabilization activities enables Forest users to visit and appreciate cultural resources and provides research opportunities.
CR16	Through conducting vegetation treatments, direct damage could occur to cultural resources or artifacts on the ground surface or those that reside shallowly beneath the surface, degrading their physical characteristics or affecting their potential to inform about past lifeways.

ID	Effect
CR17	Vegetation treatments may also expose unknown sites due to ground cover removal or soil disturbance, which could subject these sensitive areas to increased erosion, visitation or vandalism.
CR18	Damage caused by vehicles includes reduction of cultural deposits, displacement and damage to artifacts, and loss of soils and vegetation (Sampson 2007).
CR19	[However, plan direction would provide for design, construction and maintenance of trails consistent with user demands], potentially leading to the expansion of the trail system. In high-density areas, this would expose cultural resources and archaeological sites to damage and result in the loss of their cultural and research value.
CR20	[Plan direction would] emphasize the mitigation of ecological damage at developed recreation sites, potentially indirectly reducing effects to cultural resources and archaeology through restoring ground cover, stabilizing the soil, and restoring other site characteristics to natural conditions.
CR21	[Although legal requirements for compliance would be responsible for ensuring effects to cultural resources from mechanical thinning are minimized, the potential exists for cultural resources and archaeology to be affected from noncompliance activities and] indirect effects associated with the movement of machinery across the landscape, that would degrade undiscovered cultural sites as machinery passes over and compacts the soil.

Forest Products

ID	Effect
FP1	Broadly, designated areas are excluded from lands suited for timber production, resulting in fewer opportunities for timber production to support local and regional markets and contribute financially to area residents.
FP2	Areas that are determined suited for timber production can be treated to increase ecosystem resiliency while also providing a commercial timber product to generate revenue in the forest. Providing a suitable land base for timber has the potential to increase revenue to local and regional communities through the creation of more job opportunities and expanded timber-related industries.
FP3	The creation or expansion of timber-related industry would also lessen fire suppression costs by encouraging the continued extraction of fuels that make fire suppression difficult, and could lessen smoke outputs during fires due to the lower availability of fuels left in the forest to burn
FP4	Due to the overstocked nature of the Forest's frequent fire ERUs, new industry that could utilize small diameter stems, would help reduce these overstocked conditions and increase forest health.
FP5	Creating a market or increased demand for small-diameter stems would provide an alternative to the pile and burn method commonly used to remove these woody residues following non-commercial fuel reduction treatments, reducing smoke outputs that impact human health.
FP6	It remains unlikely that any new timber markets would emerge, or any significant growth to existing markets would be made, resulting in little change to the demand for these products in the forest.
FP7	The absence of suitable timberland would reduce income to local economies that receive any or all of their revenue from the sale of timber, such as logging companies or wood processing mills.
FP8	The absence of commercial timber production would also not support the establishment of new timber businesses in the region, reducing economic growth and potential gains.
FP9	maximizing the potential for the Forest to contribute to existing timber industries, and for creating a positive feedback loop where increased supply drives increased demand and revenue for new or existing industries
FP10	Group selection harvests combined with periodic selection or variable density thinning, would achieve restoration objectives, maintain habitat connectivity, and contribute a dependable flow of forest products to existing and prospective local economic infrastructure (Schmidt et al. 2008, North et al. 2009).

ID	Effect
FP11	Fuelwood may increase, either due to an increase in commercial firewood sales or as a byproduct of commercial timber sales.
FP12	Timber harvesting or non-commercial treatments would provide for an increased availability of sawtimber or forest products of varied sizes, but products that originate from small diameter stems would likely be the most widely available due to the abundance of this size class of trees on the landscape.
FP13	The harvesting of timber or acquisition of other forest products benefits the economy and sustains important cultural and traditional uses by providing a sustainable and continuous supply of products to meet demands.
FP14	The removal and use of some forest products would reduce competition for resources, ease drought stress, and increase the health and vigor of residual trees, potentially leading to higher quality timber in the future.
FP15	Commercial or non-commercial thinning can reduce existing insect or disease infestations or lessen the risk for these events in the future.
FP16	Mechanized machinery used for commercial timber harvesting or non-commercial thinning can cause soil compaction, leading to reduced water infiltration rates, increased water runoff and soil erosion, and reduced soil productivity.
FP17	[The use of mechanized machinery may also necessitate] the reopening of or creation of new roads, leading to greater fragmentation of the landscape which divides corridors for wildlife travel.
FP18	Mechanical cutting practices may also negatively impact the aesthetic quality of an area in the short-term, yielding an un-natural appearance near areas of cuttings.
FP19	Timber production was minimized leading to a reduction in local markets for timber products.
FP20	Treatments in piñon-juniper and juniper grass systems would also create increased fuelwood availability, and may ease access into these areas for the collection of special forest products like piñon nuts.
FP21	Having a sustainable and increased product base may be grounds to create more outlets for forest product utilization, increasing jobs and boosting the economy of nearby and regional communities.
FP22	The prevalence of fire without the pre-treatment of thinning has the potential to lead to increased fire intensity, tree mortality, and damage to residual trees, degrading the quality of timber sources into the future.
FP23	Improving motorized access to forest products could be especially advantageous for citizens that have mobility challenges or are elderly, alleviating the challenges associated with non-motorized transportation and accommodating a wider range of forest users.
FP24	Off-road access may also facilitate the collection of forest products by local citizens for traditional uses. The increased availability of forest products for collection under this alternative would decrease the quantity of woody fuels that contribute to uncharacteristic wildfire and support the multiple use objective of the forest.
FP25	By having forest products available on adjacent lands, the impact and dependence on the Santa Fe NF for these products would be lessened.

Range

ID	Effect
RG1	Declines in range condition would have negative effects on the ecosystem, by degrading biotic conditions through the reduction of herbaceous ground cover and increased bare soil, soil conditions through compaction or reduced stability, and water quality through sedimentation and erosion.
RG2	Improved range condition would increase ecological resiliency and function by restoring proper structure and function through rangeland restoration, thereby improving soil stability and condition, hydrologic function, and biotic communities.

ID	Effect
RG3	Low intensity fire following mechanical treatments releases soil nutrients (Boerner et.al. 2008), which may increase herbaceous species richness and cover (Willms et al. 2017; Abella and Springer 2015).
RG4	Improvement in soil condition, species richness, and herbaceous cover would lead to improved range condition and would boost the productivity of the land for quality forage.
RG5	Increased growth and diversity of understory grasses in rangelands would also encourage a return to more natural cycles of fire, which would help maintain the improved rangeland condition over time.
RG6	High severity fires negatively impact soils (Bond et al. 2012) causing increased erosion and soil hydrophobicity (Neary et al. 2005).
RG7	High severity fires promote the return of woody species over time and decrease herbaceous species richness (Abella and Springer 2015; Willms et al. 2017) which in turn decreases the Range condition by changing the plant community structure and soil dynamics.
RG8	If slash is not removed, it may temper the understory response to thinning (Abella and Springer 2015).
RG9	[If slash is not removed] and may also increase susceptibility of the treated area to fires of higher severities.
RG10	Mechanical treatments can also compact or disrupt soils resulting in reduced soil productivity and poorer range conditions.
RG11	Declines in forage production would decrease the livestock grazing capacity that the forest can support over time, leading to decreased economic revenue for ranchers and departure from family ranching traditions.
RG12	Improved forage production would increase the capacity of the forest to provide high quality grazing lands for use by local ranchers, boosting local economies and upholding traditional land uses into the future.
RG13	Stable herbaceous production would likely maintain the level of livestock grazing currently in the forest, and continue to contribute to the livelihoods of local ranchers and their families.
RG14	When forested canopy covers are thinned to less than fifty percent canopy cover, herbaceous cover and production increases (Abella and Springer 2015; Salmon et al. 2012; Mitchell and Bartling 1991) and results in an increase in the forage available for grazing in the forest.
RG15	Restoration treatments, which involve thinning with mechanical treatments and fire would improve vegetative production (Salmon et al. 2012) leading to increased forage available to grazers in the forest.
RG16	Generally, causes a decline in herbaceous production over time (Willms et al. 2017, Abella and Springer 2015).
RG17	In the short term, mechanical treatments can damage or denude areas of vegetation, exposing bare mineral soil to the effects of wind and water.
RG18	The number of AUMs in the forest should remain relatively stable and fluctuate with changes to forage production (which is predicted to decline slightly), sustaining the socio-economic benefits of grazing at or near the current level.
RG19	Increasing the number of AUMs grazing in the forest would have a positive socio-economic impact on our permittees and the local rural communities.
RG20	Short-term reductions in AUMs would allow grasses and other forage plants time to recover, and increase herbaceous establishment over larger areas in the absence of grazing pressure. This would lead to higher quality and more abundant forage to sustain grazing animals once reintroduced, and contribute to increased ecosystem health and function.
RG21	Decreasing the number of AUMs grazing in the forest would have a negative socio-economic impact on our permittees and the local rural communities.
RG22	Leaving range infrastructure in damaged conditions results in an unfettered distribution of livestock, and permits livestock access to sensitive areas (such as riparian habitats) which degrades habitat quality and water resources.

ID	Effect
RG23	Regulating the distribution of cattle across the Forest through the maintenance of proper infrastructure reduces the impact of grazing, and helps to maintain resilient rangelands with balanced ecological function and diverse native plant communities.
RG24	The removal of unnecessary fencing restores landscapes to a more natural condition (increasing visual quality), removes a potentially hazardous material (e.g., barbed wire) from the forest, and eases wildlife passage.
RG25	Invasive plants have the potential to create changes in fire return intervals, fire severity, plant community composition, hydrology, and nutrient cycling.
RG26	Invasive species decrease the quality and quantity of available forage by replacing desirable and more palatable native species, leading to a reduction forage that supports lucrative grazing opportunities.
RG27	None of the treatment goals for any of the alternatives presented in this analysis are sufficient to eradicate all the invasive species in the forest (White 2015), but they start systems moving in the direction of desired species compositions and improved ecosystem health.
RG28	Both burning and thinning have the potential to increase the number of nonnative species in an area (Willms et al. 2017).

Recreation

ID	Effect
RE1	[Implementing ROS establishes] recreation opportunities in a variety of settings and at various accessibility levels, which ensures a broad spectrum of recreationists are able to interact with the Forest at their own pace and target their visit to specific interests or needs.
RE2	Intentionally left blank – RE2 removed
RE3	[In forested ERUs thinning and burning would reduce tree density and] would change recreation opportunities available to Santa Fe NF visitors.
RE4	The provision of less-densely vegetated forest lands would provide more opportunities for certain recreation activities.
RE5	[Vegetative desired conditions for more open forest] would be less appealing to some campers who may avoid dispersed sites with less vegetative screening.
RE6	More open park-like areas would be more visually appealing and aid in accessing dispersed camping sites for some visitors (e.g., visitors pulling large trailers or driving RVs).
RE7	User-created trails for bicycling, horseback riding, and hiking may be a result in areas opened by fuel treatments or uncharacteristic large disturbances.
RE7a	Such trails may disturb wildlife and fish and their habitats, result in soil compaction and erosion, and deteriorate water quality.
RE8	[Frequent and extensive vegetation treatments that] elicit formal closures or cause recreationists to avoid these sites would be frustrating to users and negatively impact their recreation experiences on the Santa Fe NF.
RE9	Some recreationists would avoid treated areas with views of freshly-cut stumps, vegetation piles, and blacked and burned vegetation and be displaced to other areas
RE10	Loss of screening vegetation and forest canopy that provide shading along trails or at dispersed camping sites would also negatively impact recreation use through decreased cooling in warm months as well as loss of privacy.
RE11	[Prescribed cutting and burning actions would be] consistent with managing for predominantly natural-appearing environments of P, SPNM, SPM, and RN ROS classes.
RE12	Increasing the evidence of other users which may not be consistent with SPNM and SPM ROS classes.

ID	Effect
RE13	[Primitive ROS classes would not have similar effects] because most of the primitive areas on the forest are in Wilderness where prescribed cutting could not occur or are in less popular parts of the forest where the chance of encountering other users is always low.
RE14	[Fires that are uncharacteristically large and burn with more severe intensity could have effects that occur over larger areas and last longer and are thereby] Inconsistent with managing for predominantly natural-appearing ROS classes.
RE15	[Effects from uncharacteristic wildfires can be long lasting and] would take longer periods to revert back to the desired ROS setting.
RE16	More and better maintained roads would increase access throughout the forest and expand dispersed recreation opportunities.
RE17	Fewer roads, achieved via decommissioning, would improve fish and wildlife habitat, increasing the quality and quantity of opportunities for wildlife watchers, fishers, and hunters to participate in their activities of choice.
RE18	[Recreationists striving for solitude] would also benefit from some areas being located at greater distances from roads or having a reduced road density.
RE19	which would discourage vehicle-based recreationists and the associated noise… some of these increased opportunities could also encourage actions that are prohibited or discouraged, such as motorized use off designated roads or camping further than allowed from those roads, leading to the damage or disturbance to other forest resources (e.g., water, soil, wildlife, sensitive plants)
RE20	Intentionally left blank – RE20 removed
RE21	Expand opportunities for primitive and unconfined type of recreation and opportunities for solitude.
RE22	Better maintained recreation infrastructure and facilities that can improve recreation experiences by increasing visitor comfort, feelings of safety, and accessibility.
RE23	Intentionally left blank – RE23 removed
RE24	Intentionally left blank – RE24 removed
RE25	Natural resources that make recreating in the Santa Fe NF desirable and enjoyable do not suffer from long-term damage as a result of recreation uses.
RE26	Recreation infrastructure can be maintained in a condition to allow it to continue to serve the use for which it was designed.
RE27	Intentionally left blank—RE27 was removed
RE28	Partners and volunteers are one way to bridge the gap and achieve sustainable recreation and ecological desired conditions by supplementing Forest Service capacity.
RE29	Improve the quality of the recreation user experiences.
RE30	Intentionally left blank – RE30 removed
RE31	[If not sustainably constructed or maintained, both the new trails and their associated infrastructure could] cause more ecological damage to soil, wildlife, water, and cultural resources.
RE32	[Managing trails for single uses that vary by day of the week would also require] increased public education
RE33	More user conflicts lower the quality of the recreation experience for conflicting user groups
RE34	Conflicts can be ubiquitous and solutions to the satisfaction of all users are rare, resulting in the need for extensive management resources
RE35	[Partnerships as discussed in the sustainable recreation indicator, would here serve to] increase the capacity for education about user conflicts and solutions.
RE36	[A growing population places increasing demands on recreation that could result in] more human concentration and use at existing recreation areas, increased conflicts, increased number of recreational and off-highway vehicles, and may reduce the quality of recreation settings.
RE37	Intentionally left blank – RE37 removed

ID	Effect
RE38	[If use] increases, compliance with regulations could become a greater challenge as recreational participants increase and often compete for space and resources.
RE39	Greatest impact on the areas close to communities offer semi-primitive and primitive recreation settings.

Roads and Facilities

ID	Effect
RD1	Forest system roads make participating in multiple-use activities easier, increasing user satisfaction and bringing economic revenue to surrounding communities from increased visitation.
RD2	Forest roads also increase access for ranchers to care for and manage their livestock, facilitating grazing operations that contribute to the local economy and sustain traditional uses in the forest.
RD3	Forest system roads provide the necessary access to complete vegetation management treatments to increase ecosystem diversity and resiliency.
RD4	(Roads) ease access for firefighters, increasing their safety and ability to successfully mitigate fire risks to values of interest.
RD5	The acquisition of forest products such as fuelwood, pinon nuts, Christmas trees, mushrooms, wildlings, greenery, and medicinal plants is eased by motorized access, sustaining the continued cultural and traditional uses of these products.
RD6	Climate change and drought will likely reduce access and require additional maintenance because of the increased likelihood of catastrophic wildfire, flood events, and other uncharacteristic natural disasters, which can then lead to erosion, fallen trees, damaged culverts, and blow-outs.
RD7	This additional emphasis on semi-primitive conditions would increase the difficulty in accessing more remote parts of the Forest, potentially lessening recreational visits or creating difficulties for traditional and cultural use practices within some areas.
RD8	Over time, road closures within wilderness areas would improve wilderness character and lower overall road density, improving landscape connectivity and wildlife habitat.
RD9	Decreased motorized access would increase values related to natural landscapes such as solitude, absence of noise pollution, and presence of wildlife species.
RD10	The addition of a motorized recreation area may lead to a higher frequency of use, which could amply negative environmental effects such as increasing erosion or compaction of soil, reducing water infiltration and increasing runoff, and decreasing water quality downstream from the recreation area.
RD11	[Ecological impacts of roads include] habitat fragmentation, avenues for undesired species dispersal (e.g., nonnative or invasive species, transporting insects or diseases- on firewood for example- that degrade the environment on local or larger scales), and altered water runoff and drainage patterns.
RD12	[Roads also greatly] restrict travel and dispersal for small animals, particularly for aquatic and riparian species (e.g., salamanders, turtles, frogs), potentially increasing mortality rates or restricting gene flow between populations.
RD13	The ecological consequences of closing, decommissioning and naturalizing roads generally result in increased wildlife habitat connectivity, reduced dumping, reduced sedimentation and impacts to plants and archaeological sites, decreased vandalism and theft of archaeological sites, and less noise disturbance to wildlife.
RD14	The ecological consequences of having more roads available for public use generally result in decreased wildlife habitat connectivity, increased dumping and sedimentation, greater impacts to plants and archaeological sites, increased vandalism and theft of archaeological sites, and more noise disturbance to wildlife.

Lands and Realty

ID	Effect
LR1	Strict adherence to this list could narrow opportunities to work with local communities in addressing their expansion needs and public access to Federal land.
LR2	Meeting the needs of local communities for increased Forest access would reduce user conflicts and enhance satisfaction in public ownership of NFS lands.
LR3	Increased access would help Forest Service personnel to maintain or restore sensitive areas, aid in fire management efforts, or conduct vegetation treatments in areas that were formerly difficult to access.
LR4	The disposal or exchange of these sites would help allocate resources to other areas of the forest, which were more useful or productive, allowing for more project-level work like restoration, recreation, and interpretation.
LR5	Intentionally left blank – LR5 removed
LR6	The creation of new roads or utility corridors would benefit private individuals or corporations within the inholding by increasing infrastructure delivering services such as electricity to new areas.
LR7	The development of new roads or utility corridors has negative ecological impacts including habitat fragmentation, which increases stress on wildlife and disrupts gene flow; altered vegetation, which can lead to soil and water cycle disruption, soil compaction and erosion, and degraded water quality; and noise pollution.
LR8	The addition of new utility corridors could also increase the risk of uncharacteristic fire, as many fires are ignited through trees falling against powerlines, leading to a host of negative ecological effects like increased erosion, flooding potential, and vegetation type conversions (see Vegetation and Fire).
LR9	Having a continuous land base has ecological benefits such as providing quality wildlife habitat and connectivity of travel corridors, protections for at-risk species, and maintaining naturally appearing landscapes.
LR10	As private properties, especially inholdings change from rural or undeveloped land to subdivisions or higher density uses, encroachment into NFS land becomes more frequent, resulting in resource impacts and land survey needs.
LR11	This growth (population and community expansion) would likely result in continued pressures to maintain NFS lands for their open space values. This may also trigger the need to acquire right-of-way in places where informal public access is lost to development.
LR12	As further development occurs, residential encroachments onto the national forest are expected to occur more frequently and degrade wildland character, ecological integrity, recreation opportunities, and scenic values, among others.

Energy and Minerals

ID	Effect
M1	Intentionally left blank – M1 removed
M2	Intentionally left blank – M2 removed
M3	The effects of these short- and long-term consequences could include increased traffic conflicts with other users on Forest roads, changes to surface water flow paths and quantities, the loss of vegetation, soil disturbance and compaction, wildlife displacement and habitat fragmentation, decreased air quality due to dust and vehicle emissions, increased noise, increased risk of human caused fires, and decrease in recreational opportunities
M4	The potential beneficial effects of mineral activities include meeting the requests of the public for the minerals, increasing national energy security, providing local employment, supporting Federal and state programs through royalties paid, and providing a tax base for the state and county.
M5	As the minerals are extracted, the deposits are depleted and would not be available for use in the future. Therefore, mineral extraction would result in an irreversible commitment of the resource
M6	Extractive mineral activities that alter the landscape would most likely encumber other uses and ecological processes on NFS lands for the foreseeable future
M7	Eliminating surface disturbances within designated roadless areas would help maintain the area’s roadless characteristics including natural appearance, opportunities for quiet and solitude, and manageability of the area’s boundaries
M8	Finally, protections against the irreversible loss of heritage resources would ensure that significant heritage resource sites on the National Register of Historic Places and that are important interpretive sites remain to preserve aspects of cultural history as well as provide educational opportunities for the public.
M9	[Avoidance of wetland and riparian areas would protect surface waters by reducing the probability for sedimentation along stream channels and spills near drainage ways, which would] maintain existing water quality.
M10	[activities from being visually evident and contrasting with the natural character (form, line, color, texture) of the landscape] scenic values are maintained
M11	Minimize risks to reproduction during critical breeding, fledgling, and calving periods or during winter, a critical period for health of deer and elk. These timing limitations ensure the health and persistence of these species on the landscape will not be affected by development.
M12	Intentionally left blank – M12 removed
M13	Intentionally left blank – M13 removed
M14	This reduces erosion and mass wasting on steep slopes, which would impair long-term soil productivity and watershed conditions.

Scenery

ID	Effect
S1	[DC under Scenic Resources complement multiple use activities and would maintain or improve scenic quality and scenic character resilience and] provide opportunities for the public to connect with nature
S2	[Visual appealing landscapes] landscapes that sustain scenic character, have long-term resilience to changing conditions
S3	[Visual appeal landscapes] contribute to visitor’s sense of place
S4	[Scenery] reflects ecosystem diversity
S5	[Scenery] enhances recreation settings
S6	[Scenery] contributes to the quality of life for local residents and communities as well as Santa Fe NF visitors

ID	Effect
S7	[SIO of "very high". Here], landscapes are unaltered with a naturally evolving scenic character; few deviations from the natural character occur, such as non-motorized trails or trail signs.
S8	[SIO of "high". Here,] landscapes appear unaltered, even though some deviations to the scenic character are present. Deviations in the scenic character in "high" SIO borrow from elements in the landscape, such as form, line, color, texture and pattern
S9	[SIO of "moderate". Here], scenic character appears slightly altered but noticeable deviations remain visually subordinate.
S10	[SIO of "low" or "very low". Here], scenic character appears moderately-to-heavily altered and deviations begin to dominate the scenic character being viewed
S11	The "very high, "high", and "moderate" SIOs result in a relatively natural-appearing landscape
S12	very high" and "high" SIO provide an intact and attractive scenic setting for forest visitors and residents
S13	The "low" and "very low" SIOs result in more modified landscapes that are often considered less scenic and visually appealing
S14	Forest visitors would have lower quality experience and satisfaction if the proportion of "low" and "very low" SIOs are too high proportional to the "very high," "high," and "moderate" SIOs
S15	Forest visitors would also have lower quality experience if "low" or "very low" SIOs are allocated to areas with high use where visitors expect to see a natural appearing scenic character
S16	[Overall scenic resources would be maintained at a lower SIO level than for alternatives 2, 3 or 4. Given the importance of viewing scenery on the Santa Fe NF, this may] diminish visitor satisfaction
S17	Continuing to manage scenic resources based on the inventories completed almost 30 years ago does not reflect the increased concern for scenery evidenced in the recently completed SMS inventory, importance of scenery to forest visitors (Kocis et al. 2004, USDA Forest Service 2016c, USDA Forest Service 2016d), population growth, and expectations for scenic variety and natural-appearing scenery throughout the Santa Fe NF identified by the public in the forest planning process
S18	are no longer priority or in line with current practice for managing scenery or feasible with current funding
S19	[Fewer deviations from natural character would occur in alternative 3, resulting in] more undisturbed scenic vistas
S20	Recreational amenities and developed areas.
S21	[Management activities affect scenic resources by] altering the appearance of the natural landscape
S22	Some activities may have visually dominant effects in the short term which may be out of step with adopted SIOs
S23	Activities such as large-scale vegetation management (including mechanical treatments and fire) to restore ecosystem resiliency provide short-term deviations to scenery in the form of stumps and burn scars
S24	Ultimately this would result in the lasting sustainability of valued scenery attributes, such as clear lakes and streams, vegetative ground cover, large trees, mosaic of conifer forests and aspen or meadows, open mid-story canopy with high visual penetration and vistas with distant views and high topographic relief to name a few
S25	Vegetation treatments may have short-term effects of ground disturbance, stumps, and slash
S26	[Long term, if mitigated for scenery, may] provide for some preferred scenic settings, such as visual access into the forest, greater vegetative diversity, larger trees, and an herbaceous ground cover
S27	[In the long term, the removal of some trees, dependent on scale and intensity of treatment, may improve scenic character as] ***thinning makes stands more resilient, which in turn may protect the scenic character of an area and buffer it from detrimental impacts from large scale disturbance like fire or large insect outbreaks***.
S28	People often describe feelings of loss due to the noticeable changes in scenic character and sense of place from uncharacteristic large-scale disturbance

ID	Effect
S29	This would make it difficult to implement projects and may reduce the quantity of management activities described above that can be implemented
S30	All fire activities would be evident in the short term with burned, blackened vegetation, and charred ground surfaces
S31	In the long term, prescribed fire usually increases the diversity of texture, color, vegetative size classes, and distribution across the landscape. In the long term, prescribed fire at lower intensities creates preferred scenic settings and increases sustainability of scenic character.
S32	Potential impacts of these developments is longer in duration and can include changes to scenic resources from road and pad construction and associated facilities. When activities, such as those currently on the Cuba Ranger District, are scattered across the landscape, borrow colors from the landscape for facilities and sited to blend with the topography of the area, these activities have minimal impact on scenic resources
S33	Impacts perceived as negative may include noticeable changes to the landscape when looking at short grazed vegetation, the difference between grazed and ungrazed vegetation at allotment boundaries and fences, cattle waste dominating grasslands and meadows, and trailing around water developments
S34	[Many local residents are accustomed to viewing these structures and features and] consider them a highly valued part of the traditional landscape. Some visitors may also have an appreciation of the rural or pastoral character of these landscapes
S35	When facilities are designed to blend with the surrounding landscape, they have minimal effects to scenery
S36	Unmanaged recreation use beyond the designed capacity can cause natural resource damage adjacent and within to recreation sites, roads, and trails, affecting the natural appearing scenery adjacent to these areas with exposed soils, soil compaction or erosion which dominates landscape views.
S37	[Road construction would impact scenic resources] by creating evident contrasts in color and texture and changing landforms for cut and fill slopes.
S38	[Roads also serve as the viewer platform,] offering opportunities and access to view scenery.
S39	[Decommissioning of roads] would create noticeable soil color contrasts in foreground views of the concern level travel routes and use areas, by exposing fresh, often lighter colored, soils during decommissioning activities
S40	[In the long term, road decommissioning is typically] beneficial to scenery resources by recontouring slopes to mimic natural landforms and rehabilitating and revegetating exposed soils typically noticeable on cut and fill slopes created during road construction
S41	[Wilderness characteristics in the recommended wilderness management areas] would result in landscapes that appear natural, are intact, and are unmodified by management activities
S42	Structures may not have architectural styles, materials, or colors that blend with the landscape
S43	active construction, vegetative clearing and other ground-disturbing activities can dominate the landscape
S44	Structures with strong vertical elements may especially dominate the characteristic landscape being viewed

Socioeconomics

ID	Effect
E1	[Changes in income and jobs due to goods and services provided by the forest can be assumed to] affect economic conditions of the study area
E2	changes to community or personal quality of life of Forest beneficiaries, including gain or loss of personal income, alteration in the ability of communities to continue traditional practices, changes in how well communities (especially small communities) can retain a stable population, and changes in how well community members can provide for their families and access essential products necessary for physical and psychological health
E3	[The mineral program] contributes jobs, income, and raw materials to the local and national economy under all alternative
E4	[PILT and SRSCS programs] offers local economic stability in the form of jobs and labor income
E5	generate economic activity in businesses that supply goods and services to support Forest Service programs
E6	local economic stability both in number of jobs and total labor income
E7	that increases potential visitation would benefit the economy of surrounding communities with jobs and income due to visitor expenditures, including lodging, meals and other expenditures
E8	opportunities to graze livestock, benefitting area ranchers, ranching related industries and sustaining traditional uses of the Forest
E9	This increase in employment and labor income generated from timber and other forest product removal may cultivate opportunities for the growth or development of local or regional timber and other forest products industries within the plan area in the future
E10	user satisfaction and lead to less frequent visitation, especially from non-local visitors
E11	Reducing the number of visitors to the Forest would impact the economy of the surrounding communities, reducing income and job opportunities relative to other alternatives
E12	meeting the requests of the public for the minerals, increasing national energy security, providing local employment, supporting Federal and state programs through royalties paid, and providing a tax base for the state and county
E13	equipment can detract from scenic views
E14	Being able to freely practice traditions, maintain a sense of cultural identity, and know their cultures are recognized and valued can have positive effects for the well-being of individuals and communities
E15	cultural devaluation and suppression can have long-term adverse impacts to well-being
E16	by creating the potential for long-term jobs that may combat out-migration to more urban areas
E17	sustain traditional ways of life
E18	help support traditional rural communities that depend on Forest products as supplemental income or as part of their day-to-day lives
E19	traditional practice that provides food, is a bonding activity between parents and children, and is a way of teaching children about nature and the land around them
E20	[Sport hunting can be very social, and many hunters return to the Forest annually for this activity and] the community and positive social interactions they find through it
E21	[Forest to view or hunt wildlife] contribute to the overall economy of the analysis area and contribute to quality of life through supporting income and jobs related to recreation and visitor spending
E22	[Numerous species found in the forest also] provide ecosystem services, such as nutrient cycling, soil formation and manipulation, see dispersal, pollination, game and edible plants, recreation (e.g. hunting, fishing, viewing), and cultural or spiritual inspiration that contribute to ecological stability and provide socioeconomic value
E23	[Recreation plan components under all alternatives also] provide access to nature and cultural sites

ID	Effect
E24	[These sites play an important role in sense of place, history, and culture for local Forest beneficiaries, and may] promote good social relations through cultural sharing, education, and valuation
E25	[Scenery is enjoyed by locals as they move about their communities and] contributes to community identity and sense of place
E26	[Visitors who come to enjoy the mountain and forest vistas or view the wildlife] patronize local businesses and contribute to income generation in local communities
E27	[High quality scenery can further increase community resilience and ability to obtain viable livelihoods by] increasing property values, which contributes to higher rental incomes and home values
E28	Poor air quality can negatively impact scenic resource, affecting well-being through reduced socioeconomic effects (E5, E6) and impacts to sense of place and security (e.g., smoke can be alarming and create a sense of ecological insecurity)
E29	[This results] in greater resistance to uncharacteristic wildfire that can cause long-term damage to ecosystems (e.g., soil burn that can cause run-off and sedimentation into water systems, loss of wildlife habitat, potential system state shifts from forest to grassland, loss of old growth characteristics, etc.) and socioeconomic systems (e.g., via loss of life and property)
E30	job creation, manufacture and purchase of equipment, and avoided costs in the form of avoiding damages to property, infrastructure, and clean water supplies, and avoiding costs and damages associated with fire suppression and cleanup.
E31	[Access to clean water fulfills] a basic human need that can have severe health impacts if not provided
E32	to clean water supplies for human and livestock populations through removal of dissolved substances, dilution of pollutants, uptake of metals, and removal of harmful bacteria
E33	[Ecosystems that perform these water-cleaning function] reduce water cleaning and filtration costs for communities
E34	Adequate clean water contributes to food production, sanitation, continuation of traditional practices (e.g., use of acequias and grazing), and economic development for Forest beneficiaries
E35	Affects to water resources from Forest management activities can impact quality of life through impacting economic wellbeing (e.g., ability to access and use water for livestock), physical or psychological health (e.g., sufficient drinking water or stress from lack of water access), or traditional and cultural values (e.g., acequia associations)
E36	[Poor air quality can] negatively impact forest health, water quality, scenic resources, and fisheries that forest users depend upon or value.
E37	[Forest service recreation programs contribute to community and quality of life through] providing opportunities to improve physical health and mental health
E38	Viewing nature, such as the scenic landscapes provided by the Santa Fe NF, has been shown to have restorative properties that can improve mental health
E39	[Wildland fire management] contribute to the safety of community homes and infrastructure
E40	[Wildland fire management] increase quality of life in Forest-adjacent communities, particularly those on the wildland-urban interface (WUI) where fire-risk is high
E41	Smoke can cause health problems in human and wildlife population, and it can adversely affect visibility, all of which can adversely impact quality of life
E42	[Carbon dioxide uptake by forests in the conterminous United States] offset approximately 16 percent of our national total CO2 emissions in 2011
E43	[Maintaining healthy forests and restoration – bringing badly disturbed forests and grasslands back to producing a fully range of environmental services – are two of the most] cost-effective carbon storage measures
E44	[Forest resources] play an important role in sustaining the cultural values of tribal communities, and sustaining their lifeways

ID	Effect
E45	[Wildlife also has a long tradition of] inspiring works of art, spirituality, and educational discovery
E46	[These sites form the historic character of Northern New Mexico, and management of them by the Forest] increases public awareness of their significance and preserves them for future generations
E47	[Increases community quality of life through tourism and associated economic impacts, and by] ensuring a sense of place and cultural legacy are maintained for the community.
E48	[The opportunity to connect to nature and experience solitude] enhance the quality of life of those who hold biocentric values or spiritual values associated with nature
E49	[The establishment and management of wilderness areas, wild and scenic rivers, wildlife habitat, and designated management areas] also provide the knowledge of nature's continued existence in the modern world
E50	[Through their religious or cultural importance, these sites] support connections with the past and ancestors, religious ceremonies and experiences, oral traditions and cosmology
E51	[Conflicting road decommissioning objectives and road construction objectives mean motorized access frequently changes, which could] adversely impact local communities trying to navigate the Forest, such as to access grazing sites, traditional resources, or spiritual sites
E52	[Accessiblity to cultural sites can also lead to negative impacts to the sites…This] could affect the quality of life of those who value these sites through damage to important cultural or spiritual landmarks, loss of privacy for traditional or spiritual practices, loss of sense of place, loss of recreation tourism and associated economic benefits, or loss of research and educational opportunities
E53	erode trust in the Forest Service by traditional communities
E54	recognize important traditional resources and practices as valuable
E55	resource acquisition and site accessibility difficulties for those who require motorized transportation
E56	increased possibility of privacy for ceremonies or sacred sites
E57	[Sustainable production of forest products; and healthy, plant, fish and wildlife populations will] contribute to the resilience of Forest-dependent communities
E58	[Management approaches suggest communicating with Tribes and other users to maintain access to the Forest for traditional uses. These direction] support continued access to the Forest for those who require motorized transport to benefit from Forest ecosystem services
E59	[This plan language would result in forest management] that considers the needs of Forest-dependent communities when planning project work and the effect the projects would have on them
E60	[This plan language would] help traditional communities continue to use the lands that have been important to their families for generations.
E61	[Partnering opportunities for larger vegetation and watershed restoration work should consider the benefits to rural areas as well as more populated communities, resulting in] more equal distribution of the benefits of forest management
E61	[Variations in vegetation treatments may affect the magnitude of fire resilience in the Forest over the long-term, though, which may] differentially impact the long-term quality of life of Forest beneficiaries

Designated Areas - Wilderness

ID	Effect
Wi1	People would continue to have opportunities for primitive experiences
Wi2	[Natural ecological processes and disturbance are the primary forces affecting the composition, structure and patterns of vegetation,] providing a baseline of ecosystems that function with as little influence from human beings as any on Earth.
Wi3	[wilderness areas would continue to be managed to] protect and maintain their wilderness character
Wi4	the magnitude of fires under this alternative and the amount of smoke they would have a greater potential to affect air quality and visual conditions

ID	Effect
Wi5	[Primitive recreation] opportunities for people have be able to find solitude will also be maintained
Wi6	[The quality of this sort of primitive recreation as well as opportunities for solitude would increase as there would be] less exposure to and conflict with motorized and mechanized users
Wi7	[Recommended wilderness areas would continue to provide uses that are beneficial for] maintaining traditional and cultural uses
Wi8	[Recommended wilderness areas would continue to provide uses that are beneficial for] providing economic opportunities
Wi9	[Recommended wilderness areas would continue to provide uses that are beneficial for] providing ecosystem services benefits to local communities
Wi10	[Recommended wilderness increases areas without motorized disturbance which would provide greater] protection for wildlife and wildlife habitats
Wi11	[Restrictions on roads and trails would] enhance wildlife connectivity
Wi12	This would allow for high quality primitive and unconfined recreation opportunities, which have challenge and risk associated with them in the area.
Wi13	[These recommended wilderness polygons would bring in more] diversity in vegetation types to the wilderness system
Wi14	[Removing areas of popular current uses and old roads] reduce the likelihood of illegal motorized use or trespass
Wi15	[Increasing the non-motorized trail system in recommended wilderness would have minimal beneficial effects, but also wouldn't have negative effects of] eliminating or curtailing existing uses in the area
Wi16	move and concentrate mountain biking to other areas of the forest which may increase user conflict there
Wi17	[A single trail that was designated specifically for turkey hunting with ATV…Given that this is the only trail of this type on the forest, its elimination would] completely eliminate this use in the forest
Wi18	The area could be converted to non-motorized trail uses such as hiking and horseback riding and provide more opportunities for this use with less user conflict.
Wi19	excessive fuel loads can lead to increased fire intensity as well as fire size
Wi20	[In this alternative it is the most unlikely that] vegetation would move toward desired conditions [which would also have negative effects on wilderness characteristics.]
Wi21	[If removed from wilderness designation as described, the use of motorized vehicles to stock San Gregorio Reservoir could continue, which would] preserve a long-standing and popular recreational use in this area.

Designated Areas - Wild and Scenic Rivers

ID	Effect
WSR1	Maintaining the conditions that characterize WSRs upholds the standards set forth in the National Wild and Scenic Rivers System Act and benefits present and future generations through the enjoyment of these areas.
WSR2	Managing these areas to maintain their free-flowing nature and ORV's would help to protect water quality, scenic integrity, cultural or historic significance, and improve riparian habitats, aquatic species health and diversity, especially within the areas designated as Wild or Scenic.
WSR3	thereby minimizing the effects of management activities on the free flow characteristics, water quality, and ORVs identified for the river segments, which would include minimized effects of reduced scenic value, degraded water quality, interference with water flow, reduction in recreation opportunities, or threats to cultural and historic values from management activities.
WSR4	As populations increase and more people visit the Santa Fe NF, the value of managing these areas in their relatively natural condition would increase user satisfaction and contribute to the increased wellbeing of visitors from spending time in these special areas.
WSR5	Increased visitation to WSR areas would generate increased economic revenue within the surrounding communities through the sale of food, lodging, bait and tackle, guide services, or other river-based revenue sources.
WSR6	Increased visitation to WSR areas could have some detrimental ecological impacts, such as ground disturbance, increased trash or discarded items, nonnative species introductions or spread, reduced fish populations (through increased fishing pressure), or aquatic habitat degradation.
WSR7	Following the guidelines of recommended wilderness management in eligible WSR corridors would provide greater protection to the river characteristics and ORVs through non-motorized recreational use emphasis, unsuitability for timber production, and very high scenic integrity objective and other associated effects.

Designated Areas - Scenic Byways

ID	Effect
SB1	[The current scenic byways] would continue to be managed to protect the values for which they were designated (scenic byway intrinsic qualities — archaeological, cultural, historic, natural, recreational, or scenic) and provide opportunities to drive for pleasure and view natural features and scenery
SB2	[Scenic byways] would continue to provide tourism and economic benefits for the region and communities which they traverse
SB3	[Landscapes managed for High SIO] would have a predominately natural appearance or appear unaltered, even though some deviations to the scenic character are present. Deviations in the scenic character in "high" SIO borrow from elements in the landscape, such as form, line, color, texture and pattern
SB4	[High SIO] would meet public expectation for natural appearing scenery by preserving and enhancing the intrinsic scenic qualities for which they were designated
SB5	[Managing scenery as this level also] provides opportunities to connect with nature by maintaining or enhancing scenic character and enhances recreation settings
SB6	[In the short term, restoration activities completed with mechanical treatments] may alter scenic resources visible from the scenic byways through changing forest stands from closed forests to more open forests and from residual stumps and soil disturbance
SB7	[In the long term, vegetation treatments] may improve scenery by creating vistas, promoting healthy vegetation and improving ecosystem resilience to uncharacteristic disturbances
SB8	the effects of ongoing developments or activities next to or within NFS land boundaries can sometimes be quite noticeable when viewing the continuous landscape potentially affecting the visitor's satisfaction and quality of their experience on a scenic byway

ID	Effect
SB9	[If activities on other ownerships and private lands] are designed to lessen impacts to natural resources, including scenery, the difference between private lands, other ownerships, and NFS lands are less apparent.
SB10	[movement toward desired conditions for scenic byways…] contributes to sustainable social and economic systems

Designated Areas – Nationally Designated Trails

ID	Effect
NDT1	[Nationally designated trails would continue to be managed to protect the values for which they were designated and] provide opportunities to view natural features and scenery, recreational opportunities in a variety of ROS settings, and public use and enjoyment of historic routes and associated historic remnants resulting in opportunities for the public to connect with nature and enjoy the nature and purposes for which the trails were designated.
NDT2.	[Landscapes managed for Very High SIO] would be unaltered with a naturally evolving scenic character; few deviations from the natural character occur, such as non-motorized trails or trail signs
NDT3	[Landscapes managed for High SIO] would have a predominately natural appearance or appear unaltered, even though some deviations to the scenic character are present. Deviations in the scenic character in “high” SIO borrow from elements in the landscape, such as form, line, color, texture and pattern
NDT4	[Managing foreground viewsheds of national designated trails for Very High and High SIO] would meet public expectation for natural appearing scenery by preserving and enhancing the intrinsic scenic qualities for which they were designated.
NDT5	[Landscapes managed for Moderate SIO] would have scenic character that appears slightly altered but noticeable deviations remain visually subordinate, resulting in a mostly natural-appearing landscape, but less than Very High and High SIOs
NDT6	[Managing scenery at these levels also] provides opportunities to connect with nature by maintaining or enhancing scenic character and enhances recreation settings
NDT7	[In the short term, restoration activities completed with mechanical treatments] may alter scenic resources visible from the designated trails resulting in evident management activities changing forest stands from closed forests to more open forests and from residual stumps and soil disturbance.
NDT8	[In the long term, vegetation treatments] may improve scenery by creating vistas, promoting healthy vegetation and improving ecosystem resilience to uncharacteristic disturbances
NDT9	the effects of ongoing developments or activities next to or within NFS land boundaries can sometimes be quite noticeable when viewing the continuous landscape potentially affecting the visitor’s satisfaction and quality of their experience on a long-distance designated trail
NDT10	[movement toward desired conditions for designated trails…] contributes to sustainable social and economic systems

Designated Areas - Research Natural Areas

ID	Effect
RNA1	[Both designated and proposed RNA would be] protected and maintained in a natural condition allowing them to provide information through non-manipulative research and education.
RNA2	[Cumulatively, the regional network of RNAs] would provide opportunities for non-manipulative research and education opportunities across a diversity of landscapes, high quality examples of unique ecosystems and ecological features and rare or sensitive special of plants and animals and their habitat

Designated Areas - Jemez National Recreation Area

ID	Effect
JRNA1	[The JNRA would] provide cultural and supporting ecosystems services through diverse recreation opportunities with both developed and dispersed activities, high quality scenery and outstanding scenic features, and habitat for wildlife and plant species which benefits present and future generations through the enjoyment of this area.
JRNA2	[The JNRA would also] continue to provide tourism and economic benefits for the region and communities and social benefits to long-time inhabitants of the Jemez Mountains area who view the landscapes and use the resources within the Jemez Mountains providing opportunities to connect with nature through all of the resource values for which the area is managed.
JRNA3	[Alternative 3 proposes about 7,440 acres of the JNRA as recommended wilderness,] providing opportunities for primitive recreation and very high scenic integrity consistent with the recommended wilderness management plan components
JRNA4	[A wetland jewel management area… that moves areas toward desired conditions for riparian vegetation types and] results in improved watershed conditions

Designated Areas - Inventoried Roadless Areas

ID	Effect
IRA1	IRA would continue to be reference areas to measure the effects of development on other parts of the landscape and a variety of ecosystem services such as undisturbed landscapes that are important to biological diversity, clean drinking water, opportunities for dispersed outdoor recreation, reference areas for study and research, and high scenic quality
IRA2	Protect roadless characteristics present in overlapping areas likely resulting in the highest quality roadless character due to the more restrictive management direction for wilderness character.

Designated Areas - Wild Horse Territories

ID	Effect
WHT1	[Combined management direction would protect and manage wild horse and burro territories,] benefitting local communities and those who have an emotional attachment to wild horses as cultural symbols while protecting and preserving the cultural traditions and values surrounding wild horses
WHT2	[Restoring treatments under all alternatives may] indirectly affect the wild horse territories by improving conditions of the range resource and providing increased forage for livestock grazing as well as wild horses and burros in designated territories.
WHT3	[Objectives to remove, improve, or reconstruct range infrastructure for alternatives 2, 3 and 4 may] Indirectly affect wild horse territories by managing or changing the areas of use of both livestock and wild horses and burros. If these changes reduce competition for forage, wild horse territories are protected and enhanced

Appendix H. Documentation of Public Engagement Process

The Santa Fe National Forest revised our forest plan under the new forest planning rule (2012) that places great emphasis on collaboration and public involvement during the planning process and the plan's implementation. The Santa Fe National Forest conducted public outreach meetings during the various phases of the Forest Plan Revision (FPR) process from 2013 to 2019 including development of the assessment, need for change, initial plan components, plan alternatives, and the draft plan (Table H-1). The Forest also provided information to the public on the plan revision process during these meetings.

Following guidance given in the 2012 Planning Rule, public engagement for the Santa Fe NF has emphasized collaboration with Tribes, cooperating agencies and private landowners, youth engagement (including low-income and minority youth), and outreach to a wide range of users as well as local, regional, and national groups.

The Santa Fe NF's vision of robust public engagement initially originated from conversations with the public at the beginning of the revision process, in 2014. From that, seven themes emerged that influenced the public participation design and strategy.

1. Many people want to work with the Santa Fe NF, engaging early and often.
2. Relationships and trust need attention.
3. Stakeholders desire a clear understanding of their role in the decision-making process, especially concerning their influence in the process and how their comments are addressed.
4. Create safe opportunities for hared learning among diverse stakeholders by using a third-party facilitator, being inclusive, and having "meaningful meetings" with a clear focus and purpose.
5. Education is important
6. Culture, history, and place attachments run deep in northern New Mexico.
7. Good communication is essential. Be open and transparent; timely in responses; speak plainly; and use multiple communication methods including emails, letters, phone calls, social media, local media outlets, website, field trips, and summaries of materials with visuals and graphs.

Public engagement has included over 70 public meetings in local communities; technical meetings, including a symposium; and field trips. Most meetings were general open-house style public meetings, which occurred on weeknight evenings or the weekends. These meetings were typically 2 hours long and provided opportunities for people to be informed of the plan revision process and be engaged throughout that process. Technical meetings were opportunities for cooperating agencies, natural resource professionals, non-profit groups, Forest specialists, and public citizens to collaboratively work on plan revision in a multi-disciplinary way. Technical meetings typically were longer than general meetings, occurred during the workday, and had more forest specialists present to answer a larger diversity of questions in greater depth. A series of field trips occurred as plan development started and were opportunities for the public to see resources that were and were not meeting desired conditions, and to talk about what desired conditions for a variety of resources might look like.

Using these types of meetings, we had several rounds of formal and informal public engagement throughout the plan revision process. Collaboration began during the Listening Sessions and USDA cadre meetings held in January and February 2014, and in the public participation workshops held in March 2014. General public meetings on the Assessment were held in April and May 2014, followed by a series of targeted meetings with plan revision partners between May and October 2014. Presentations were given, as requested, to a variety of groups including natural resource management professionals, recreation user groups, and non-governmental organizations.

With the release of the draft Assessment in fall 2015, we held need for change meetings across the forest between October and December of 2015. The draft Assessment and preliminary need for changes documents were posted on-line on the public website for the Santa Fe NF forest plan revision.

These draft documents informed the final Assessment and Needs for Change: the "Assessment Report of Ecological, Social, and Economic Conditions, Trends, and Sustainability" (USDA Forest Service 2016a and 2016b) and "Findings from the Final Assessment: Twelve Focus Areas and Needs for Change Statements (USDA Forest Service 2016f). These documents were completed in June 2016. Scoping on the Needs for Change was initiated when the NOI was published in the Federal Register on June 30, 2016. The NOI was subsequently published in the journal of record, *The Albuquerque Journal*. In April 2016, we began the Wilderness recommendation process and held meetings in April and May 2016, on Wilderness Criteria and later that year held meeting in September 2016, on the Wilderness Inventory and Evaluation. In the fall of 2016, we also held a series of field trips to look at conditions on the ground with the public and begin discussions about plan components.

Beginning in October 2016, and continuing through the release of the Draft Plan and DEIS, we held Open Houses to informally keep the public up-to-date on the plan revision process in-between larger round of public engagement.

In January and February 2017, we held meetings on the Initial Plan Components and Draft Wilderness Evaluation maps followed by meetings in March 2017, on plan alternatives and management areas.

In between rounds of public engagement, the Forest hosted open houses to encourage constant dialogue with interested members of the public and government officials. Open houses occurred in communities all around the Santa Fe NF and were informal opportunities for the public to find out about current work products regarding plan revision, have discussion with Santa Fe NF employees, and see intermediary work products.

In addition, the Santa Fe NF has engaged in 34 outreach tabling events to raise awareness and add a wide variety of individuals and groups to the FPR mailing list. Events included county fairs, farmers' markets, the Balloon Fiesta, the State Fair, Health and Family Days, and others and consisted of the FPR team staffing an informational table with handouts about the FPR process, encouraging people to sign up for the mailing list, and answering questions. The mailing list, which now connects to well over 2,000 interested or involved persons, includes local, regional, and national groups; Federal , state, and local governments; federally recognized tribes and pueblos; rural historic communities; land grant-merced and acequia governing bodies; rural historic communities; non-profit organizations; private landowners; youth; and other public citizens.

We have also engaged specifically with youth, including 23 classes taught at local elementary, middle, and high schools, as well as field trips. The Santa Fe NF led two field trips with Aspen Community Magnet School fourth grade students (many of whom are low income and minorities) to public lands to learn about natural resources and their management through an "Every Kid in a Park" grant. Engagement with college level students has included working with forestry professors at New Mexico Highlands University to give guest lectures and encourage college students to attend public meetings in Las Vegas, New Mexico and held a week-long immersion program for underprivileged natural resource students to learn about resource management in new ecosystems.

Numerous New Mexican Tribes and Pueblos have been associated with the Santa Fe NF since time immemorial, and have sacred sites, cultural heritage sites, and sites for gathering traditional and cultural resources on Forest lands. In acknowledgement of their unique and ongoing relationship to Forest lands, the Santa Fe NF FPR team engaged tribes from the beginning of the FPR process. Between 2013 and 2018, there were 73 meetings between the Santa Fe NF and Tribes that incorporated Forest Plan Revision. The 73 meetings consisted of 3 USDA Cadre meetings, an All Pueblo Governor Council, 2 need-for-change Tribal meetings, an intertribal FPR Roundtable, 11 Introduction to Forest Plan Revision meetings, 6 FPR Tribal meetings, and 49 MOU meetings that included the FPR process.

The Santa Fe NF also conducted specific outreach to the land grant and grazing communities. These communities have a long history with the forest and depend upon forest resources and rangelands managed by the Santa Fe NF for traditional and cultural practices including cattle grazing. The FPR team held eight meetings specifically with these communities between 2014 and 2018, four with the Northern New Mexico Stockman's Association and four with land grants. Additionally, specific outreach to permittees was done for public meetings, with letters in both English and Spanish, and the Land Grant Council participated in the FPR process as a Cooperating Agency.

Cooperating agencies have contributed their knowledge and understanding of the concerns and needs of local communities in northern New Mexico to the plan revision process, often serving as a conduit representing the interests and needs of the Cooperating Agencies' constituents in the development of the draft Forest Plan. Especially at technical meetings, but also at general public meetings, cooperating agencies have engaged in discussions and provided input regarding pre-draft and draft work products with the Santa Fe NF through discussions with other cooperating agencies, nongovernmental groups, and the general public.

A significant opportunity for public and partner engagement and feedback during the plan revision process was concurrent with the release of the draft plan and draft EIS. A notice of availability (NOA) published in the Federal Register on August 9, 2019, initiated the formal 90-day comment period on the draft EIS and draft forest plan as required by Forest Service National Forest Management Act regulations at 36 CFR 219. The comment period closed November 7, 2019. Preceding the official 90-day comment period and extending well into the comment period, the Santa Fe NF held or attended 30 meetings with Tribes and Pueblos, Cooperating Agencies, local Government officials and community groups, non-profit organizations, and the public to discuss multiple methods for delivering and drafting official comment responses and an overview of draft plan content and the associated draft EIS. Additionally, three Tri-Forest meetings were held collaboratively with the Carson and Cibola NFs, with one for Tribes and Pueblos, one for the general public, and one for government officials. The Santa Fe NF planning team attended a public meeting individually hosted by each of the other national forests and attended an information session for formal commenting held by two local non-profit groups as well. Several of the public, open-house style meetings and other more formal consultation meetings held during this period are included in Table H-1.

Based on comments from Forest Service personnel, the public, other agencies and non-governmental organizations, the planning interdisciplinary team developed a list of issues to address in the draft EIS. Comments received during the official 90-day comment period following the release of the draft plan and draft EIS were compiled into concern statements and addressed for inclusion of edits to the final planning documents. A description of the review process and the response to substantive formal comments and concern statements are in appendix O in volume 4 of the FEIS. Public outreach meetings notes and additional information can be found in the planning record or on the Santa Fe NF forest plan revision website.

Comments received since the publication of the NOI can be found in the project record.

The final opportunity for public involvement in the NEPA review and plan revision process is the objection period, which follows the release of the final plan and FEIS. Only those individuals and entities who have submitted substantive formal comments related to this plan revision during the opportunities provided for public comment will be eligible to file an objection (36 Code of Federal Regulations (CFR) 219.53(a)) during the objection period. The objection period begins with the publication of a Public Notice in the Newspaper of Record of the release of the final plan, FEIS, and draft record of decision (draft ROD) and lasts for 60 days.

Table H-1. Most of the public participation activities related to forest plan revision for the Santa Fe NF

Date	Meeting Type	Description[15]	Location
12/18/2013	Introduction to Forest Plan Revision	Tribal	TESUQUE PUEBLO
12/18/2013	Introduction to Forest Plan Revision	Tribal	NAMBE PUEBLO
12/18/2013	Introduction to Forest Plan Revision	Tribal	SAN ILDEFONSO PUEBLO
12/18/2013	Introduction to Forest Plan Revision	Tribal	OHKAY OWINGEH PUEBLO
12/18/2013	Introduction to Forest Plan Revision	Tribal	SANTA CLARA PUEBLO
12/19/2013	Introduction to Forest Plan Revision	Tribal	JEMEZ PUEBLO
12/19/2013	Introduction to Forest Plan Revision	Tribal	SANTA ANA PUEBLO
12/19/2013	Introduction to Forest Plan Revision	Tribal	ZIA PUEBLO
12/19/2013	Introduction to Forest Plan Revision	Tribal	COCHITI PUEBLO
1/3/2014	Introduction to Forest Plan Revision	Tribal	SANTO DOMINGO PUEBLO
1/3/2014	Introduction to Forest Plan Revision	Tribal	SAN FELIPE PUEBLO
1/14/2014	Ohkay Owingeh MOU Meeting	Tribal	Santa Fe Supervisor's Office
1/31/2014	Listening Session	General	Pecos
1/31/2014	Listening Session	General	Albuquerque
1/31/2014	Listening Session	General	Las Vegas
1/31/2014	Listening Session	General	Santa Fe
1/31/2014	Listening Session	General	Santa Fe
1/31/2014	USDA cadre meeting	Tribal	Albuquerque
2/1/2014	Listening Session	General	Santa Fe
2/1/2014	Listening Session	General	Los Alamos
2/1/2014	Listening Session	General	Jemez Springs

[15] The Description column describes the meeting goal. For example, “Tribal” meetings were meetings with Tribes and Pueblos. “General” meetings were meetings targeted to the general public and open to all. “Targeted FPR meetings” were meetings by specific user group or interested parties that the planning team was invited to to discuss FPR. “Open houses” were informal public meetings where the FPR team made themselves available to answer questions and hand out informational documents.

Date	Meeting Type	Description[15]	Location
2/1/2014	Listening Session	General	Rio Rancho
2/3/2014	Listening Session	General	Cuba
2/3/2014	Listening Session	General	Española
2/3/2014	USDA cadre meeting	Tribal	Cuba Ranger District
2/4/2014	Listening Session	General	El Rito
2/4/2014	Listening Session	General	Santa Fe
2/4/2014	Listening Session	General	Santa Fe
2/4/2014	Listening Session	General	Coyote
2/4/2014	Listening Session	General	Santa Fe
2/4/2014	USDA cadre meeting	Tribal	Española
2/6/2014	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
3/5/2014	Tesuque Pueblo MOU Meeting	Tribal	Española Ranger District
3/11/2014	Public Participation Workshop	General	Española
3/12/2014	Public Participation Workshop	General	Santa Fe
3/13/2014	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
3/17/2014	New Mexico Land Grant Council	Land Grant Council	
4/3/2014	Meeting with East Jemez Resource Council	Targeted FPR meeting	Bandelier National Monument
4/8/2014	Ohkay Owingeh MOU Meeting	Tribal	OHKAY OWINGEH PUEBLO
4/16/2014	Meeting with NM Youth Conservation Corps Board Mtg	Targeted FPR meeting	Santa Fe
4/19/2014	Assessment	General	Española
4/21/2014	Assessment	General	Las Vegas
4/24/2014	Assessment	General	Santa Fe
4/26/2014	Assessment	General	Abiquiu
4/26/2014	Assessment	General	Cuba
4/28/2014	Assessment	General	Rio Rancho
4/30/2014	Assessment	Technical	Santa Fe
5/1/2014	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
5/3/2014	Assessment	General	Chimayo
5/6/2014	Assessment	General	Pecos
5/8/2014	Assessment	General	Santa Fe
5/10/2014	Assessment	General	Jemez Springs
5/10/2014	Assessment	General	Los Alamos
5/12/2014	Assessment	General	Albuquerque
5/16/2014	Assessment	General	Mora
5/17/2014	Meeting with New Mexico 4 Wheelers	Targeted FPR meeting	Albuquerque
5/20/2014	Meeting with Upper Pecos Watershed Association	Targeted FPR meeting	Pecos

Date	Meeting Type	Description[15]	Location
6/14/2014	Meeting with Holy Ghost Homeowners Association	Targeted FPR meeting	Holy Ghost
6/17/2014	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
6/19/2014	Meeting with Environmental Coalition including Center for Biological Diversity, WildEarth Guardians, New Mexico Wilderness Alliance, Sierra Club, Great Old Broads for Wilderness, and others	Targeted FPR meeting	Santa Fe
6/30/2014	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
7/7/2014	Meeting with Valles Caldera Board of Trustees	Targeted FPR meeting	Los Alamos
7/10/2014	Meeting with Sandoval County Commission	Targeted FPR meeting	Bernalillo
7/22/2014	Meeting with Northern New Mexico Stockman's Association	Stockman's Association	Abiquiu
7/28/2014	Meeting with County Planners	Targeted FPR meeting	
7/31/2014	Meeting with Makita Hill- Sandoval County Long Range Senior Planner	Targeted FPR meeting	Bernalillo
8/4/2014	Meeting with Alex Tafoya- San Miguel County Planning and Zoning Supervisor	Targeted FPR meeting	Las Vegas
8/5/2014	Meeting with Santa Fe Lions Club	Targeted FPR meeting	Santa Fe
8/6/2014	Meeting with Lucia Sanchez- Planning Director Rio Arriba County	Targeted FPR meeting	Española
8/6/2014	Meeting with Gary Leikness- Principal Planner Los Alamos County	Targeted FPR meeting	Los Alamos
8/20/2014	Assessment-Land Grants (Land Grant engagement techniques)	General-Land Grants	Santa Fe
8/22/2014	Meeting with New Mexico Acequia Commission	Targeted FPR meeting	Santa Fe
8/26/2014	Meeting with NMDA	Targeted FPR meeting	Regional Office (ABQ)
9/4/2014	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
9/9/2014	Meeting with San Miguel County Board of Commissioners	Targeted FPR meeting	Las Vegas
9/11/2014	Tesuque Pueblo MOU Meeting	Tribal	Santa Fe Supervisor's Office
9/29/2014	Meeting with SWCD	Targeted FPR meeting	Santa Fe
10/9/2014	Assessment-Land Grants (Wilderness Inventory process and participation in it by the Land Grant communities)	General-Land Grants	Canon de Carnuel Land Grant
10/22/2014	Meeting with Defenders of Wildlife	Targeted FPR meeting	
10/27/2014	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
12/8/2014	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
12/16/2014	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
12/18/2014	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo

Date	Meeting Type	Description[15]	Location
2/4/2015	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
3/11/2015	Ohkay Owingeh MOU Meeting	Tribal	OHKAY OWINGEH PUEBLO
3/20/2015	All Pueblo Governor Council	Tribal	Albuquerque
4/6/2015	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
4/8/2015	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
4/25/2015	Land Grant Meeting	Land Grants	Abiquiu
5/2/2015	Land Grant Meeting	Land Grants	Taos
5/5/2015	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
5/11/2015	Land Grant Meeting	Land Grants	Tecolote
7/7/2015	Ohkay Owingeh MOU Meeting	Tribal	OHKAY OWINGEH PUEBLO
9/8/2015	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
9/16/2015	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
10/7/2015	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
10/21/2015	Meeting with Girl Scouts	Targeted FPR meeting	Santa Fe
10/23/2015	Need-for-Change	Technical	Santa Fe
10/26/2015	Need-for-Change	General	Abiquiu
10/27/2015	Need-for-Change	General	Mora
10/28/2015	Need-for-Change	General	Cuba
10/30/2015	6 Classes taught at Capital High School	Youth Outreach	Santa Fe
11/2/2015	Need-for-Change	General	Los Alamos
11/2/2015	Northern New Mexico Stockman's Association	Stockman's Association	
11/3/2015	Need-for-Change	General	Las Vegas
11/9/2015	Need-for-Change	General	Coyote
11/10/2015	Need-for-Change	General	Pecos
11/12/2015	Ohkay Owingeh MOU Meeting	Tribal	OHKAY OWINGEH PUEBLO
11/12/2015	Need-for-Change	General	Santa Fe
11/12/2015	2 Classes taught at Tierra Encantada Charter School	Youth Outreach	Santa Fe
11/16/2015	Need-for-Change Tribal Meeting	General-Tribal	Española
11/17/2015	Need-for-Change Tribal Meeting	General-Tribal	Albuquerque
11/17/2015	Need-for-Change	General	Rio Rancho
11/30/2015	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
12/4/2015	Need-for-Change	General	Jemez Springs
1/9/2016	Northern New Mexico Stockman's Association	Stockman's Association	
2/19/2016	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
3/1/2016	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO

Date	Meeting Type	Description[15]	Location
3/16/2016	Ohkay Owingeh MOU Meeting	Tribal	Santa Fe Supervisor's Office
4/13/2016	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
4/18/2016	Forest Plan Revision Tribal Meeting	Tribal	TESUQUE PUEBLO
4/25/2016	Wilderness Criteria	General	Rio Rancho
4/26/2016	3 Classes taught at Aspen School	Youth Outreach	Santa Fe
4/26/2016	Wilderness Criteria	General	El Rancho
4/27/2016	Field Trip with Aspen School	Youth Outreach	Ski Santa Fe Ski
4/28/2016	3 Classes taught at Aspen School	Youth Outreach	Santa Fe
4/28/2016	Wilderness Criteria	Technical	Santa Fe
5/2/2016	Wilderness Criteria	General	Las Vegas
5/3/2016	Wilderness Criteria	General	Santa Fe
5/31/2016	Wilderness Criteria	General	Abiquiu
6/1/2016	Tesuque Pueblo MOU Meeting	Tribal	Española
6/10/2016	Forest Plan Revision Tribal Meeting	Tribal	JICARILLA APACHE TRIBE
7/14/2016	Forest Plan Revision Tribal Meeting	Tribal	POJOAQUE PUEBLO
7/18/2016	Forest Plan Revision Tribal Meeting	Tribal	Jemez Pueblo
7/19/2016	Forest Plan Revision Tribal Meeting	Tribal	OHKAY OWINGEH PUEBLO
7/27/2016	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
7/28/2016	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
8/26/2016	Ohkay Owingeh MOU Meeting	Tribal	OHKAY OWINGEH PUEBLO
9/7/2016	Wilderness Inventory and Evaluation	General	Española
9/7/2016	Wilderness Inventory and Evaluation	Technical	Española
9/12/2016	Wilderness Inventory and Evaluation	General	Cuba
9/12/2016	Wilderness Inventory and Evaluation	Technical	Cuba
9/13/2016	Wilderness Inventory and Evaluation	General	Pecos
9/13/2016	Wilderness Inventory and Evaluation	Technical	Pecos
9/19/2016	Wilderness Inventory and Evaluation	General	Jemez Springs
9/19/2016	Wilderness Inventory and Evaluation	Technical	Jemez Springs
9/20/2016	Wilderness Inventory and Evaluation	General	Gallinas
9/20/2016	Wilderness Inventory and Evaluation	Technical	Gallinas
9/24/2016	Field Trip	Field Trip	Aspen Meadows
9/29/2016	Field Trip	Field Trip	Gallinas Watershed
10/1/2016	Field Trip	Field Trip	Moya Project
10/5/2016	Field Trip	Field Trip	Rio Chama River
10/7/2016	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
10/8/2016	Field Trip	Field Trip	Jemez Driving Tour
10/12/2016	3 Classes taught at Aspen School	Youth Outreach	Santa Fe
10/15/2016	Field Trip	Field Trip	Pajarito Area

Date	Meeting Type	Description[15]	Location
10/19/2016	Field Trip with Aspen School	Youth Outreach	Diablo Canyon
10/20/2016	3 Classes taught at Aspen School	Youth Outreach	Santa Fe
10/20/2016	Open House	Open House	Santa Fe
10/21/2016	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
10/22/2016	Field Trip	Field Trip	Caja del Rio
11/14/2016	Land Grant Meeting	Land Grants	Santa Fe Supervisor's Office
11/14/2016	Open House	Open House	Jemez Pueblo
12/1/2016	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
12/5/2016	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
12/7/2016	Open House	Open House	Santa Fe
12/20/2016	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
1/17/2017	Initial Plan Components	General	Santa Fe
1/18/2017	Initial Plan Components	General	Mora
1/19/2017	Initial Plan Components	General	Bernalillo
1/24/2017	Initial Plan Components	General	Santa Fe
1/26/2017	Initial Plan Components	General	Jemez Springs
1/30/2017	Initial Plan Components	General	Cuba
2/1/2017	Initial Plan Components	General	Santa Fe
2/2/2017	Initial Plan Components	General	El Rito
2/6/17-2/7/17	Initial Plan Components	Technical	Santa Fe
2/9/2017	Initial Plan Components	General	Pecos
2/13/2017	Initial Plan Components	General	Gallina
2/15/2017	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
2/21/2017	Ohkay Owingeh MOU Meeting	Tribal	OHKAY OWINGEH PUEBLO
3/1/2017	Alternatives	General	Las Vegas
3/2/2017	Alternatives	General	Santa Fe
3/2/2017	Alternatives	Technical	Santa Fe
3/6/2017	Alternatives	General	Abiquiu
3/7/2017	Alternatives	General	Cuba
3/8/2017	Land Grant Meeting	Land Grants	Santa Fe Supervisor's Office
3/14/2017	Cochiti Pueblo MOU Meeting	Tribal	Santa Fe Supervisor's Office
4/27/2017	Open House	Open House	Jemez Pueblo
5/15/2017	Open House	Open House	Santa Fe
5/15/2017	Open House	Open House	Los Alamos
5/19/2017	Ohkay Owingeh MOU Meeting	Tribal	Santa Fe Supervisor's Office
5/23/2017	Cochiti Pueblo MOU Meeting	Tribal	COCHITI PUEBLO
2017 (May)	The Student Wildlands Adventure Program	Youth Outreach	Santa Fe NF

Date	Meeting Type	Description[15]	Location
6/1/2017	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
6/20/2017	Forest Bound-Santa Fe High School Students	Youth Outreach	Little Tesuque
6/20/2017	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
6/21/2017	Open House	Open House	Coyote
7/18/2017	Open House	Open House	Santa Fe
7/18/2017	Open House	Open House	Pecos
8/2/2017	Zia Pueblo	Tribal	ZIA PUEBLO
8/16/2017	Open House	Open House	Cuba
8/21/2017	Intertribal Forest Plan Revision Roundtable	Tribal	Albuquerque
9/1/2017	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
10/6/2017	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
12/1/2017	Tesuque Pueblo MOU Meeting	Tribal	TESUQUE PUEBLO
12/20/2017	Jemez Pueblo MOU Meeting	Tribal	Jemez Pueblo
1/29/2018	Open House	Open House	Santa Fe
2/26/2018	Open House	Open House	Jemez Pueblo
3/19/2018	Western State Colorado University	Youth Outreach	Santa Fe
3/20/2018	Open House	Open House	Santa Fe
3/20/2018	Northern New Mexico Stockman's Association	Stockman's Association	Abiquiu
3/26/2018	Open House	Open House	Cuba
4/16/2018	Open House	Open House	Los Alamos
4/16/2018	Open House	Open House	Española
5/14/2018	Open House	Open House	Santa Fe
5/15/2018	Open House	Open House	Coyote
6/6/2018	Forest Bound-Santa Fe High School Students	Youth Outreach	Española Ranger District (Hyde Park Rd)
6/20/2018	Open House	Open House	Pecos
6/27/2018	Forest Bound-Santa Fe High School Students	Youth Outreach	Española Ranger District (Hyde Park Rd)
7/19/2018	Open House	Open House	Santa Fe
8/8/2018	Forest Bound-Santa Fe High School Students	Youth Outreach	Española Ranger District (Hyde Park Rd)
2018 (August)	The Student Wildlands Adventure Program	Youth Outreach	Tennessee
8/21/18	Open House	Open House	Jemez Pueblo
9/11/2018	Open House	Open House	Cuba
9/27/18	Open House	Open House	Santa Fe
10/10/18	Open House	Open House	Abiquiu
10/11/18	Open House	Open House	White Rock
11/14/18	Open House	Open House	Santa Fe
11/15/18	Open House	Open House	Albuquerque
12/10/18	Open House	Open House	Las Vegas

Date	Meeting Type	Description[15]	Location
06/12/19	Cooperating Agency Meeting	Presentation	Santa Fe
07/11/19	Sandoval Co Commissioners Meeting	Presentation	Bernalillo
07/12/19	Meeting with Commissioner Katherine Bruch	General Information	Sandoval County Administration Building
07/18/19	Los Alamos Co Open Space Planners	General Information	Santa Fe
07/22/19	Jemez Pueblo MOU	Tribal	Jemez Pueblo
07/22/19	Tesuque Pueblo MOU	Tribal	Pueblo of Tesuque
07/23/19	Los Alamos County Work Session	Presentation	White Rock
07/25/19	Santa Fe County Planning Dept.	General Information	Santa Fe
08/20/19	Tri-Forest Public Meeting	Presentation/ Open House	Santa Fe
08/20/19	Santa Fe NF Open House (met with CDT Coalition at this open house)	Open House	Santa Fe
08/21/19	Draft Plan/DEIS Commenting	Open House	Jemez Pueblo
08/22/19	Draft Plan/DEIS Commenting	Open House	Buena Vista
08/22/19	Mora County Fire Administration	Presentation	Mora
08/26/19	Draft Plan/DEIS Commenting	Open House	Pecos
09/03/19	Draft Plan/DEIS Commenting	Open House	Gallina
09/04/19	Open House with Cibola NF	Open House	Rio Rancho
09/05/19	Draft Plan/DEIS Commenting	Open House	Cuba
09/10/19	Draft Plan/DEIS Commenting	Open House	Las Vegas
09/11/19	Draft Plan/DEIS Commenting	Open House	Santa Fe
09/12/19	Carson NF hosted Open House	Open House	El Rito
09/18/19	Tri-Forest Tribal Meeting	Presentation	Santa Fe
09/18/19	Santa Clara Pueblo Consultation	Tribal	Santa Clara Pueblo
09/19/2019	Tri-Forest Meeting with Senator Heinrich Staff	General Information	Santa Fe
09/23/19	Draft Plan/DEIS Commenting	Open House	Los Alamos
09/25/19	Draft Plan/DEIS Commenting	Open House	Abiquiu
09/26/19	Cibola NF hosted Open House	Open House	Albuquerque
10/10/19	NM Land Grant Council	Tri-Forest Presentation	
10/16/19	Trout Unlimited and NM Wild Meeting	General Information	Santa Fe
10/21/19	Navajo Nation Meeting	Tri-Forest Presentation	White Rock, AZ
10/28/2020	Cooperating Agency Meeting	Presentation	Virtual

Cooperating Agencies

Cooperating agencies are various Federal, state, local, and Tribal governmental entities that lend technical assistance or other resources to the development of the draft forest plan. The National Environmental Policy Act of 1969 (42 U.S.C. 4231 et seq.) allows certain governmental organizations to be granted cooperating agency status when the agency has “special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment” (40 CFR 1508.5). All decision-making authority for management of the National Forest is held by the Forest Service and the U.S. Department of Agriculture.

In August 2016, the Santa Fe NF solicited interest from 81 Federal, State, local and tribal governments in their being cooperating agencies for the plan revision process. Although 20 agencies expressed initial interest, 10 agencies ultimately signed on as cooperators in January 2017. Additional agencies signed on as cooperators in May 2017 and December 2018. The cooperating agencies for the Santa Fe NF’s plan revision process include:

- East Rio Arriba Soil and Water Conservation District
- NM Energy, Minerals, and Natural Resources Department; State Forestry Division; Las Vegas District and Botany Program
- New Mexico Environment Department
- La Jara Ditch Association
- Nacimiento Community Ditch Association
- New Mexico Department of Agriculture
- New Mexico Economic Development Department
- Tierra y Montes Soil and Water Conservation District
- New Mexico Department of Game and Fish
- New Mexico Land Grant Council
- Santa Fe – Pojoaque Soil and Water Conservation District
- Tesuque Pueblo
- New Mexico Forest and Watershed Restoration Institute

Cooperating agencies attended technical and general public meetings to engage in discussions and provide input regarding initial work products with the Santa Fe NF, other cooperating agencies, nongovernmental groups, and the general public. They also provided feedback on pre-draft and draft products, technical expertise, information on the Santa Fe NF’s forest plan’s consistency with their own management plans (if they exist), and represented the interests and needs of their constituents.

Involving cooperating agencies in this planning process provided a forum for maximizing the collective voice and interests of the communities and greater public around the national forest. The Santa Fe NF benefited from Cooperating Agencies’ knowledge and understanding related to the concerns and needs of local communities in northern New Mexico. Both parties also benefited from better communication and representation to the public and constituents.

Appendix I. Coordination with Other Planning Efforts

The 2012 Planning Rule requires a review of planning and land use policies of federally recognized Indian Tribes (43 U.S.C. 1712(b)), Alaska Native Corporations, other Federal agencies, and State and local governments, where relevant to the plan area. This review included consideration of the following:

(i) The objectives of federally recognized Indian Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments, as expressed in their plans and policies;
(ii) The compatibility and interrelated impacts of these plans and policies;
(iii) Opportunities for the plan to address the impacts identified or contribute to joint objectives; and
(iv) Opportunities to resolve or reduce conflicts, within the context of developing the plan's desired conditions or objectives.

In preparing the Forest Plan, the planning team reviewed the objectives expressed and evaluated the interrelationships between relevant planning and land use policies and the draft forest plan. For the most part, the draft forest plan complements these other planning efforts. These plans, assessments, and strategies were considered in the development of plan components to ensure as much alignment as was practicable. Management approach sections of the plan articulate identified issues and opportunities for coordinating with various partners across administrative boundaries, particularly State, local, tribal, and Federal agencies. Cross-boundary issues include managing for wide-ranging species and wildfire across agency boundaries and working together to improve efficiency. While there were some differences related to the differing missions, no conflicts requiring alternative development were identified.

Below is a list of the planning and land use policies reviewed, as well as a summary of provisions that influenced or were relevant to development of this plan.

Counties

The Santa Fe NF lies in seven counties in New Mexico: Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, Santa Fe, and Taos. County comprehensive plans can be used as a source of information on the history of land use within the region, the patterns of development, desired conditions, and current county land use policies. County governments hold no legal authority over independent jurisdictions such as Federal and state lands, incorporated cities and towns, or Native American tribal reservations. County land use within the planning area ranges from traditional uses such as farming and ranching in rural areas to denser concentrations of residential, industrial, and commercial uses in and around suburban (e.g., White Rock) and urban areas (e.g., Santa Fe and Albuquerque metropolitan areas). One of the common themes is how, and whether, private owners and public land managers can manage the competing priorities of resource conservation and economic development—in particular how to cope with the growing demands for housing and recreation while ensuring preservation of a shrinking natural resource base that contributes to New Mexico's highly valued "rural character." Comprehensive plans are summarized below for six of the seven New Mexico counties in which the Santa Fe National Forest is located.[16] Additionally, the Santa Fe NF Plan Revision Team extended invitation to act as cooperating agencies to all counties, and met with County planning teams in Los Alamos, Rio Arriba, San Miguel, and Sandoval Counties to share information (the remaining counties were unavailable to meet with the Forest). A joint meeting with the Carson NF was held in Taos County.

[16] Taos County land use policies were excluded from this review, because only 0.2 acre of Taos County overlaps the Santa Fe National Forest—all of it in the Pecos Wilderness, an area over which Taos County has limited land use authority.

Los Alamos County

Objectives

The Los Alamos County 2016 Comprehensive Plan is a high-level, long-range policy document that guides decisions about the physical development of the County. Most of the plan concerns residential, commercial, and economic development. The overarching objectives of these sections are that "the desire to protect residential character is balanced with recognition of the need for more and different kinds of housing," and that "vacant and blighted properties, both commercial and residential, need rehabilitation, and that the focus of both new construction and rehabilitation should be on the two

Downtowns." There is, however, a significant section of the plan devoted to open space, trails, and mobility, which is more pertinent to the forest planning process. The objectives articulated in that section of the plan include "Enhance environmental quality and sustainability," "Improve and expand the trails system," and "Support the Hazard Mitigation Plan."

Compatibility

The Los Alamos County Plan divides County-owned lands into six ecologically based management units, summarizes current conditions and past management practices, and recommends future management actions. The Future Land Use Map of the Comprehensive Plan formalizes a Countywide open space system that provides connections to a number of Forest Service maintained trails. The Forest has made available for sale to the County six parcels of vacant land currently in Forest Service ownership, totaling 369.5 acres. Per Forest Service request, the County has prioritized the order in which these parcels may be acquired.

Plan Contributions

This forest plan contributes to advancing the objectives articulated in the Los Alamos County Plan in a number of ways. Recreation plan direction will move the Santa Fe NF toward a more sustainable recreation program with a trail system and other infrastructure that connects people to adjacent public lands, like that of Los Alamos County Open Space. Plan direction for the Lands resource encourages collaboration with local governments to identify and undertake land acquisitions and exchanges when such transactions complement both entities' management goals. Finally, numerous ecological plan components seek to rehabilitate a landscape overstocked with fuels to avoid another catastrophic wildfire like that of Cerro Grande or Las Conchas, both of which had devastating effects on land within Los Alamos County. Some of this plan direction includes working with local governments to encourage private landowners to take proactive measures to reduce their vulnerability to fire, in line with the objectives of the County's Hazard Mitigation Plan.

Opportunities in Development of Plan

No explicit conflicts were identified between Los Alamos County and Santa Fe NF objectives, but opportunities for Los Alamos County stakeholders to help influence plan direction have occurred frequently throughout the forest plan revision process, nonetheless. In addition to comment periods at each stage of plan revision, numerous public meetings were held in or near Los Alamos County (see appendix H for more information on the public participation process). In addition, Los Alamos County was contacted to gauge their interest in participating in forest plan revision as a Cooperating Agency, but their capacity did not allow for such a level of involvement. Members of the forest plan revision team were able to meet with the Los Alamos County planning team August 6, 2014, to present on the forest plan revision and learn about Los Alamos County planning activities.

Mora County

Objectives

The Mora County Comprehensive Plan establishes the goals and policies to guide the county's future physical development. It articulates 21 "Goals"—each with policy recommendations on how to achieve those objectives. These Goals touch on a wide spectrum of subjects and concerns, including housing, economic vitality, transportation, and maintenance of the County's rural character. Others include objectives more pertinent to Forest management, including the protection of natural resources, water quality, scenic values, and achieving a sustainable forest ecosystem.

Compatibility

The policy recommendations under the goals that touch on Forest Management all complement Forest management direction. Preservation of the Santa Fe Trail, for example (Goal 1, Policy 3), is compatible with forest plan direction on management of the Santa Fe Trail to maintain its historic significance. Likewise, policies to protect acequia infrastructure (Goal 6, Policy 3) is complemented by forest plan direction to do the same. From a landscape management standpoint, all of the policies nested under Goals 7 (achieving a sustainable forest ecosystem) and 17 (improving fire protection) are in line with Forest management direction on landscape restoration, recreation opportunities, and fire and fuels management.

Plan Contributions

This forest plan contributes to advancing the objectives articulated in the Mora County Plan in a number of ways. The forest plan's robust direction on Traditional and Cultural Uses helps achieve Mora County's goals of protecting historic and cultural ties to the land (Goal 1) and protecting the County's rural character (Goal 2). Recreation plan direction will move the Forest toward a more sustainable recreation program with a trail system and other infrastructure that connects people to adjacent public lands, like that of Mora County Open Space. Finally, numerous ecological plan components seek to rehabilitate a landscape overstocked with fuels to avoid another catastrophic wildfire. Some of this plan direction includes working with local governments to encourage private landowners to take proactive measures to reduce their vulnerability to fire, in line with the objectives of the County's Goal to improve fire protection (Goal 17).

Opportunities in Development of Plan

The Mora County Plan, developed in 2009, expresses displeasure with the way in which the Santa Fe NF has involved local residents in Forest decisions: "There is a perceived lack of communication between the U.S. Forest Service and Mora County regarding the forest plans. Local people feel a lack of local control regarding forest management, and that State and Federal agencies do not respect the community's culture and traditions." To help remedy this, the plan includes a robust section on Traditional and Cultural Uses, and on building partnerships. The forest plan revision process has also included extensive outreach to stakeholders in rural and traditional communities. In addition to comment periods at each stage of plan revision, numerous public meetings were held in or near Mora County (see appendix H for more information on the public participation process). Mora County itself was also contacted to gauge their interest in participating in forest plan revision as a Cooperating Agency, but their capacity did not allow for such a level of involvement. The Western Mora Soil and Water Conservation District, however, did participate as a Cooperating Agency, attending technical meetings and providing extensive input throughout the forest plan revision process.

Rio Arriba County

Objectives

The Comprehensive Plan is an official public document adopted by the County of Rio Arriba to provide guidance in decision making regarding the health, safety, quality of life and physical development of the county. The Comprehensive Plan illustrates, with both words and graphics, how the community is being planned to develop over the next 5 to 20 years. The Comprehensive Plan's objectives are articulated in a vision statement that touches on education, economic opportunity, housing, irrigated agriculture, natural resources, and traditional land-based communities. More detailed goals are laid out throughout the document, but the most pertinent to Forest management are contained in the Natural Resources, Land Use, and Hazard Mitigation sections.

Compatibility

The goals and strategies articulated in the Natural Uses, Land Use, and Hazard Mitigation sections are all compatible with Forest management direction.

Plan Contributions

This forest plan contributes to advancing the objectives articulated in the Rio Arriba County Plan in a number of ways. The forest plan's robust direction on Traditional and Cultural Uses helps achieve goals related to Rio Arriba County's agricultural economy, particularly to "support local agricultural production and promote the development of local markets to consume local products and sustain a local agriculture economy." The forest plan's emphasis on riparian restoration and improving water quality also contributes to the county's goals to "protect the region's water supply and quality." Finally, numerous ecological plan components seek to rehabilitate a landscape overstocked with fuels to avoid another catastrophic wildfire. Some of this plan direction includes working with local governments to encourage private landowners to take proactive measures to reduce their vulnerability to fire, in line with the objectives of the county's goal to improve fire protection.

Opportunities in Development of Plan

The forest plan includes a section on Traditional and Cultural Uses that emphasizes working with rural historic communities to advance mutual goals, and another on building partnerships. The forest plan revision process has also included extensive outreach to stakeholders in rural and traditional communities. In addition to numerous comment periods at each stage of plan revision, numerous public meetings were held in or near Rio Arriba County (see appendix H for more information on the public participation process). Rio Arriba County itself was contacted to gauge their interest in participating in forest plan revision as a cooperating agency, but their capacity did not allow for such a level of involvement.

San Miguel County

San Miguel County is currently revising their County Comprehensive plan, along with an "area plan" for the Village of Pecos and the adjacent Pecos River Canyon (see Village of Pecos in "Municipalities" below). The county released a Comprehensive Plan Update document in December of 2017—referred to as a "vision report"—that provides a snapshot of the input they have received from the public and an initial vision statement for the revised comprehensive plan.

Objectives

The Vision Report paints a broad-brushed picture of the resources San Miguel County values, and outlines a number of objectives the county should work toward. A common theme throughout the Vision

Report is the importance of natural resources in the daily lives of San Miguel County residents. The first sentence of the Vision Report makes this clear: “We, the residents of San Miguel County, love the natural beauty of this large, diverse county, its forests, mountains, grasslands, rivers, watersheds and abundant wildlife…” Later, the Vision Report emphasizes the need to protect these natural resources while also leveraging their economic potential through ecotourism and cultural tourism. Specific objectives related to natural resource management include the need to protect the environment, watersheds, and improve forest health—and to invest in better water systems and road infrastructure.

Compatibility

The views toward natural resource management expressed in the Vision Report often mirror the desired conditions of the forest plan. Many such sentiments are organized in a section summarizing “themes” distilled from various public meetings. A section on Forest Products and Forest Health, for example, recognizes the desire for fuelwood gathering opportunities and forest thinning projects. Similarly, a section titled Love of the Beauty and Tranquility of My Community highlights forests, mountains, rivers and streams as major assets and identifies the widespread desire to preserve the natural landscapes found within the county.

Plan Contributions

The forest plan contributes to the achievement of a number of diverse objectives identified in the Vision Report. The forest plan complements the widespread desire to preserve San Miguel County’s unique natural landscapes with desired conditions that emphasize sustainable management across almost every resource area. More specifically, forest plan direction on landscape restoration—whether through prescribed fire, watershed protection, or a number of other projects—dovetails with the Vision Report’s objectives related to forest thinning, clean air, and clean water (Themes, pg. 1-4). The forest plan’s sections on Traditional and Cultural Uses also address two common sentiments expressed in the Vision Report: economic opportunity and community vitality.

Opportunities in Development of Plan

As with areas across the plan area, the forest plan revision process has included extensive outreach to stakeholders in rural and traditional communities within San Miguel County. In addition, Forest Service staff has been involved in the ongoing development of the revised San Miguel County Comprehensive Plan, primarily through participation in public meetings and data sharing. Forest Service personnel have offered information on how the forest plan revision process has unfolded during this time so that planners and members of the public from San Miguel County can best participate and produce plans with complementary goals and strategies for overlapping resource areas. A meeting was held between Santa Fe NF planning team members and the San Miguel County planning team on August 4, 2014, and a forest plan revision presentation was given to the County Commission on September 9, 2014.

Sandoval County

Objectives

This plan is the oldest of existing county plans, being published in 1989. At only 18 pages, it offers very little in direction related to forest management or collaboration. The only reference to the Forest Service is in a policy statement to “to the extent practicable, work closely with the U.S. Forest Service…to ensure that County planning activities are compatible with the long range planning of the [USFS].” It does, however, state additional policies to “retain a prevailing rural residential character” and “protect its natural resources and environmentally critical areas.”

Compatibility

Sandoval County's plan shares many broad objectives with Forest management and is largely compatible with management direction in the forest plan.

Plan Contributions

The forest plan's robust direction on Traditional and Cultural Uses helps achieve goals related to the county's policies and policy strategies around preserving traditional ways of life, historic sites, and the rural character of the area. The forest plan's direction on ecological restoration and water and air resource align with the county's stated policy to "seek to protect its natural resources and environmentally critical areas from destructive effects of development," along with the broader themes of protecting the natural resources in the county. Finally, recreation components in the forest plan seek to improve visitor experiences, which may aid Sandoval County in achieving its strategy to increase tourism and job opportunities.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, and suburban communities of Sandoval County. In addition to numerous comment periods at each stage of plan revision, numerous public meetings were held in or near Sandoval County, including Jemez Springs, Jemez Pueblo (Walatowa Visitor Center), Rio Rancho, and Cuba (see appendix H for more information on the public participation process). Sandoval County itself was also contacted to gauge their interest in participating in forest plan revision as a cooperating agency, but their capacity did not allow for such a level of involvement. A meeting was held between the Sandoval County and Santa Fe NF planning teams July 31, 2014, where information about the forest plan revision was presented and the two planning teams discussed the county's interests and questions.

Santa Fe County

Objectives

The 2010 Sustainable Growth Management Plan (SGMP) is a comprehensive document providing direction over planning, environmental protection, public facilities and services, fiscal planning, land use, housing, resource conservation, renewable energy and green development policies, administrative regulation, and development application processes. Within this broad vision, the SGMP articulates eight "purposes"—two of which have implications for Forest management: "respect the natural environment, the rural landscape and open spaces between established and new communities," and "conserve water for present and future generations."

Compatibility

The policy recommendations under the goals that touch on Forest Management all complement Forest management direction. Preservation of the Santa Fe Trail, for example (Goal 1, Policy 3), is compatible with forest plan direction on management of the Santa Fe Trail to maintain its historic significance. Likewise, policies to protect acequia infrastructure (Goal 6, Policy 3) is complemented by forest plan direction to do the same. From a landscape management standpoint, all the policies nested under Goals 7 (achieving a sustainable forest ecosystem) and 17 (improving fire protection) are in line with Forest management direction on landscape restoration, recreation opportunities, and fire and fuels management

Plan Contributions

This Plan contributes to advancing the objectives articulated in the SGMP in a number of ways. The Plan's robust direction on Traditional and Cultural Uses helps achieve Santa Fe County's goals of protecting historic and cultural ties to the land (Chapter 5) and protecting the County's rural character (Chapter 5.4). Indeed, the SGMP even has a section devoted to "Traditional Historic Communities" (1.5.3.2) which reflects many of the same sentiments. Recreation plan direction will move the Forest toward a more sustainable recreation program with a trail system and other infrastructure that connects people to adjacent public lands, like that of Santa Fe County Open Space. Finally, numerous ecological plan components seek to rehabilitate a landscape overstocked with fuels to avoid another catastrophic wildfire. Some of this plan direction includes working with local governments to encourage private landowners to take proactive measures to reduce their vulnerability to fire, in line with the objectives of the County's Goal to improve fire protection (Policy 29.10).

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, urban, and suburban communities of Santa Fe County. In addition to numerous comment periods at each stage of plan revision, public meetings were held in Santa Fe County, including various locations in and near the City of Santa Fe, as well as in Pojoaque, the Pueblo of Tesuque, White Rock, and Espanola; the last two of which straddle county lines (see appendix H for more information on the public participation process). Santa Fe County itself was also contacted to gauge their interest in participating in Forest Plan Revision as a Cooperating Agency, but their capacity did not allow for such a level of involvement. Members of the Forest Plan Revision team did, however, meet with the Santa Fe County Open Space, Trails and Parks Advisory Committee at various points in the revision process to inform, share data, and coordinate planning efforts.

Municipalities

The Santa Fe National Forest is surrounded by—and sometimes surrounds—numerous communities with strong ties to Forest lands and a significant interest in how those lands are managed. Thousands of residents from cities like Santa Fe and Las Vegas visit the forest each year, primarily for recreation-related activities, while residents of small villages like Gallina, Abiquiu, and Mora use the forest for its bountiful renewable resources—from fuelwood, vigas, latillas, and piñon, to the forage that supports local cattle grazing operations. Six of these communities are incorporated as municipalities with comprehensive land use plans in place: Cuba, Española, Jemez Springs, Las Vegas, Pecos, Santa Fe, and San Ysidro.[17] Each of these plans were evaluated to assess compatibility with forest management direction.

Cuba

Objectives

The Village of Cuba Comprehensive Plan describes how local residents and elected officials would like their community to develop over the next 20 years and beyond by identifying opportunities and techniques for improvements through goals, objectives, and strategic action recommendations. The plan includes 16 goals, under which 51 objectives "provide policy guidance and serve as the nucleus of the Cuba Comprehensive Land Use Plan." Most of these pertain to housing, real estate development, transportation, and economic development. Some, however, touch on forest management goals, including protection of the Village's water supply (Goal I), developing a multiple agency plan for coordinated

[17] Los Alamos and White Rock—two significant population centers missing from this list—are administered as "Census-designated Places" under the jurisdiction of Los Alamos County, the land use plan of which is evaluated in the preceding section.

emergency response (Goal M, Objective 2), and implementing a regional master recreation plan (Goal N, Objective 3).

Compatibility

The goals and strategy actions the Cuba Comprehensive Plan broadly complement the forest plan where they touch on forest management goals. Goal I, protection of the village's water supply, and Water Infrastructure Strategy to implement a water conservation and management program, for example, are compatible with the forest plan's objectives to restore forest watersheds and protect water resources. From an economic development standpoint, Cuba's Plan's strategy action to promote Cuba as a regional center and gateway to the Jemez Mountains is in line with the forest plan's recreation management approaches engage with local communities and support local recreation-based economic development. Finally, the interest in developing forest-based industry described Cuba's Plan describes is well-aligned with forest product plan components in the forest plan.

Plan Contributions

The forest plan's direction on supporting local economic wellbeing and partnership contributes to achieving Strategy Actions and Goals outlined in the Cuba Comprehensive Plan surrounding the development of more recreation opportunities for Cuba residents and promotion of the municipality as a staging area for tourists looking to explore the Santa Fe NF and other surrounding points of interest. The forest plan's direction on recreation will enhance trail systems and other infrastructure that connects people-both tourists and locals-to the Forest; direction on Cultural and Historic Resources helps preserve and protect sites, such as Nogales Cliff House, that draw in tourists who then patronize local communities. Finally, forest plan direction on forest products, and specifically support for local forest-based industry that supports forest management, will be beneficial to the development of forest-management-based industries in Cuba, enhancing the local economy.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, urban, and suburban communities in and around the Santa Fe NF, including the municipality of Cuba. Public meetings were held in locations in and nearby Cuba, such as the Sandoval County Fairgrounds. Community input on the draft forest plan and the plan revision process was obtained from local participants.

Española

Objectives

The City of Española's Comprehensive Plan (2017) determines the community's long-range goals for community development and presents a vision for the future. This first part of this document presents five overarching priorities. Three of these pertain to urban development, but the other two— "restore the city's connection to the natural environment" and "regional and community-wide collaboration"—contain subsections that have a nexus with forest management. For example, the plan contains a subsection devoted to protecting acequias, which are affected by forest management of water resources, riparian habitat, and special use authorizations, among others.

Compatibility

The intentions expressed in Española's Comprehensive Plan (parts 1 and 2) that touch on natural resources and community reflect those expressed in the forest plan. In particular, the desire to "embrace, protect, and restore the acequias" (Part 1 Priority to Restore the City's Connection to the Natural Environment) aligns with the forest plan's desired conditions for Rural Historic Communities. The two plans also share an emphasis on partnership and collaboration (Part 1 Priority for Regional and Community-wide Collaboration).

Plan Contributions

In Part 2 of Española's Plan, one of the planning elements discussed is Natural/Cultural Resources. In this section, two National Historic Trails—The Old Spanish NHT and El Camino Real de Tierra Adentro NHT—are discussed as recreation elements that may present important cultural and recreational opportunities for the City of Española. Both trails intersect with the Santa Fe NF. Although the Española Plan names the National Park Service as a potential partner for maintaining these trails, the forest plan direction on NHTs can contribute to enhancing beneficial opportunities and cooperative management related to these trails. Finally, the forest plan's management of riparian and water resources can help sustain functioning and healthy acequia systems throughout the region surrounding the Santa Fe NF.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, and suburban communities in and around the Santa Fe NF, including the City of Española. Public meetings were held in locations in Española. Community input on the forest plan and the plan revision process was obtained from local participants.

Jemez Springs

Objectives

The Village of Jemez Springs' Comprehensive Plan indicates how the local residents and their elected officials want their community to evolve in the next 20 years and provides a basis for regulations, operations, and programs necessary to manage current and future development. The plan presents a total of 13 goals and 43 objectives, which provide a common direction for future growth and development in Jemez Springs. Most of these pertain to economic development, quality of life, and maintaining the integrity of public infrastructure and resources. A number, however, overlap with Forest interests, including the preservation and protection of open space land around the Village (Goal A, Objective 2), the development of disaster preparedness and hazard mitigation plans (Goal B, Objectives 1 and 2), and the development of a cooperative relationship with the Forest Service (Goal C, Objective 3).

Compatibility

The plan lists 23 strategies that identify various courses of potential action that the Village Board of Trustees may pursue over the next two decades to achieve the goals and objectives listed above. All of the strategies listed comport with Forest Service goals and priorities. Strategy Statement 3, for example, suggests working with major landowners such as the Forest Service to help preserve open space and protect sensitive areas surrounding the Village. Similarly, Strategy Statement 8 suggests working with the Forest Service to develop a comprehensive trails master plan. More generally, Strategy Statement 20 recommends fostering a more cooperative relationship with the Forest Service.

Plan Contributions

This forest plan contributes to advancing the objectives articulated in the Jemez Plan in a number of ways. The Plan's robust recreation direction will move the forest toward a more sustainable recreation program with a trail system like that mentioned in Strategy Statement 8 and other infrastructure that connects people to adjacent public lands, like that of Village of Jemez Springs Open Space. Plan components in the Lands and Realty section contribute to Strategy Statement 3 by encouraging the acquisition of parcels to increase connectivity, access, and manageability.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, and suburban communities in and around the Santa Fe NF, including Jemez Springs. Public meetings were held in locations in Jemez Springs and nearby, such as Walatowa Visitor Center and Los Alamos. Community input on the forest plan and the plan revision process was obtained from local participants.

Las Vegas

Objectives

The Comprehensive Master Plan, as updated in 2011 is "an official public document adopted by the city of Las Vegas City Council as a policy guide to decisions about the physical development of community. It presents, in a general sense, the way the leaders of government want the city to develop in the ensuing 20 to 30 years." The Las Vegas Plan has 13 goals, each with multiple objectives and policies associated with them. Although most are related to economic development, quality of life, and maintaining city infrastructure and do not address forest management, the City's Land Use, Economic Development, Greenhouse Gas Emissions, Hazards Mitigation goals all have objectives that align with Santa Fe NF interests.

Compatibility

The two plans are broadly complementary where they overlap. For example, many of the objectives under the Las Vegas Plan's Land Use goal align with forest management direction on Cultural and Rural Historic Communities, Scenic Resources, and ecological restoration. Additionally, forest plan direction on forest products, collaboration and partnership, air quality, and hazardous fuel reduction are all complementary to multiple goals and objectives outlined in the Las Vegas Plan.

Plan Contributions

The forest plan contributes to achieving Las Vegas' goals in multiple ways. Forest plan direction on forest products helps achieve Las Vegas's objective to "develop the wood and forest product cluster, including harvest and manufacturing" (Economic Development goal, objective 1j). An extensive Traditional Communities and Uses section and direction on recreation and scenery will help support the Las Vegas Plan objectives to "encourage open lands, including agricultural uses and forest, in floodplains and along acequias," and "promote protection of views" (Land Use goal, objectives 2c and 2e). Finally, plan direction that includes working with local governments to encourage private landowners to take proactive measures to reduce their vulnerability to fire will help support Las Vegas' Hazard Mitigation objectives related to fire.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, and suburban communities in and around the Santa Fe NF, including Las Vegas. Public meetings were held in locations near Las Vegas, such as New Mexico Highlands University. Community input on the forest plan and the plan revision process was obtained from local participants.

Pecos

Objectives

The Village of Pecos is currently working on a comprehensive plan. They released a draft plan in December 2017, which outlines, in a general way, how the leaders of Pecos want the community to develop over the next 20 to 30 years. The plan is being created in coordination with the San Miguel County Comprehensive Plan. It focuses on physical developments, including land use, economic, development, facilities, transportation, economic development, utilities, water, hazards mitigation, and housing, each of which have associated implementation actions, goals, and policies. Several of these elements refer directly to working with the Santa Fe NF, while others refer to overlapping interests such as forest products, tourism, and environmental health.

Compatibility

Multiple goals and policies in Pecos's Plan touch on forest management and collaboration with the Forest Service. For example, the plan has direction to "Coordinate land use planning with San Miguel County, the National Park Service, and U.S. Forest Service" (Land Use, Goals and Policies 9), "Involve U.S. Forest Service in patrolling and enforcing laws against illegal dumping on National Forest Land" (Utilities, Goals and Policies 1.g.ii), and goals and policies surrounding job creation based on forest recreation. These are all compatible with forest plan direction on recreation and forest products, and its emphasis on community partnership and collaboration. Finally, fire risk mitigation goals outlined in the Pecos Plan are complementary with those outlined in the forest plan.

Plan Contributions

The robust fire management elements of the forest plan will contribute to the Pecos Plan's hazard mitigation goals and policies by decreasing forest density and fuel loads, and the associated risk of catastrophic wildfires, such as the 2013 Tres Lagunitas Fire that came within 10 miles of the village. Additionally, some of the forest plan direction includes working with local governments to encourage private landowners to take proactive measures to reduce their vulnerability to fire, in line with the policies of the Village's hazard mitigation goal to "Work with Pecos Benedictine Monastery and the U.S. Forest Service on their plans and operation to mitigate forest fire hazards adjacent to and near the village." The forest plan's direction on recreation will move the Forest toward a more sustainable recreation program that provides opportunities for multiple types of recreation, like those mentioned in Land Use Goal 9.d. Partnerships to enhance recreation-based economic opportunities for local communities (Economic Development Goal 2) and sustainable forest product use and industry development (Economic Development Goal 2.e) are also encouraged in forest plan components.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, and suburban communities in and around the Santa Fe NF, including the Village of Pecos. Public meetings were held in locations in Pecos and nearby, such as Santa Fe. Community input on the forest plan and the plan revision process was obtained from local participants. In addition, Forest Service staff has been involved in the ongoing development of the revised San Miguel County Comprehensive plan with which the Pecos Plan is being developed in-coordination, primarily through participation in public meetings and data sharing.

Santa Fe

Objectives

The City of Santa Fe's Land Use and Urban Design Draft Plan (Santa Fe Plan) is intended to help prepare an update to the City's 1999 General Plan. It examines recent and anticipated development trends and incorporates a vision for future growth. It outlines desired development, quality of life, and economic trajectories and suggests policies to achieve nine goals related to Natural Setting and Environment; History and Preservation; Land Use and Growth Management; Housing; Transportation; Sustainability and Energy; Economic Development; Parks, Open Space, Recreation and Trails; and Urban Design. Of these, the most pertinent to the forest plan are the policies outlined under Natural Setting and Environment, with some relevant policies in Parks, Open Space, Recreation and Trails and in History and Preservation.

Compatibility

Two of the Unifying Policies stated by the Santa Fe Plan are particularly compatible with the forest plan: Policy #1, "response to environmental change" reflects the adaptive ecosystem management strategies the forest plan encourages, and Policy #2, "regional partnerships" mirrors the emphasis various forest plan components put on partnering and collaborating with local governments and communities. Additionally, all the policies under the topic of Natural Setting and Environment are compatible with forest plan direction on wildlife protection, ecological restoration and ecosystem maintenance and protection, and cultural land uses.

Plan Contributions

The extensive recreation direction in the forest plan will implement a more sustainable recreation program with a trail system and other infrastructure that connects people to adjacent public lands, such as Santa Fe's urban trail system. Scenery directions protect viewsheds that are essential to maintaining the characteristic landscape features, vistas, and views of Santa Fe (History and Preservation, Policy #2). Finally, the forest plan contributes to Santa Fe's history and preservation goals and policies through plan components that seek to maintain cultural and historic resources around Santa Fe that are important to city residents and tourists.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, and suburban communities in and around the Santa Fe NF, including the City of Santa Fe. Public meetings were held in locations in Santa Fe and nearby, such as Los Alamos, White Rock, and Española. Community input on the forest plan and the plan revision process was obtained from local participants.

San Ysidro

Objectives

The Village of San Ysidro Comprehensive Plan describes how local residents and elected officials would like their community to develop, and identifies opportunities for community improvements through goals, objectives, and action recommendations. These are divided into five categories: Land Use and Housing; Transportation and Circulation; Water Resources; Public Services and Facilities; and Economic Development. None of the goals or objectives in these categories directly address forest management but do support activities like tree preservation (Goal A, Objective 3), acequia maintenance (Goal H, Objective 2), and vegetation management to reduce wildfire risk (Goal L, Objective 4).

Compatibility

The policy recommendations under the objectives above that touch on forest management all complement forest plan direction. For example, the Plan's direction to "work with appropriate agencies to conduct vegetation thinning projects around San Ysidro for wildfire protection" comports with forest thinning projects like the Southwest Jemez Collaborative Forest Landscape Restoration Program. Similarly, "support the San Ysidro Acequia and provide assistance as needed" echoes the same collaborative approach to acequia operation followed by the Santa Fe NF.

Plan Contributions

The robust fire management elements of the draft forest plan will contribute to San Ysidro's plan direction on increasing the availability of wildfire management services; vegetation treatments to decrease forest density and fuel loads in the neighboring Santa Fe NF will decrease the risk of uncharacteristic wildfires on the forest and surrounding communities. Additionally, some of the forest plan direction includes working with local governments to encourage private landowners to take proactive measures to reduce their vulnerability to fire. Forest plan recreation direction encourages engagement with local communities for sustainable recreation management and socioeconomic well-being of local communities; this direction supports San Ysidro's economic development goals to "capitalize on San Ysidro as the 'Gateway to the Jemez Mountains'" and encourage businesses that provide services to travelers.

Opportunities in Development of Plan

The forest plan revision process has included extensive outreach to stakeholders in the rural, traditional, and suburban communities in and around the Santa Fe NF. Public meetings were held in locations near San Ysidro, such as Jemez Pueblo (Walatowa Visitor Center), Rio Rancho (University of New Mexico West), and Cuba (Sandoval County Fairgrounds). Community input on the forest plan and the plan revision process was obtained from local participants.

Federal

The Santa Fe NF is part of a Federal agency, and its jurisdiction overlaps with, surrounds, and interacts with public lands administered by numerous other Federal agencies. One of these agencies is the Bureau of Land Management (BLM), which administers public lands adjacent to National Forest System lands as well as subsurface public lands (involved in mineral leasing) that lie under surface public lands under Forest Service jurisdiction. Other agencies include the National Park Service (NPS), which administers multiple national monuments sharing borders with the Santa Fe NF, and other national forests to the north and south of the Santa Fe NF. Each of these agencies manages lands in or around the Santa Fe NF with comprehensive land management plans, many of which touch on the same natural resource, socioeconomic, cultural, and historic issues and goals dealt with in the draft forest plan. These plans (discussed in the following paragraphs) were evaluated to assess compatibility with Santa Fe NF management direction.

Bandelier National Monument

Objectives

The Bandelier National Monument Final Ecological Restoration Plan and Environmental Impact Statement (EIS 2007), administered by the NPS, "establishes goals, objectives, and specific implementation actions needed to restore approximately 4,000 acres of degraded piñon-juniper woodland (woodland) to a more naturally functioning state over the next 15-20 years." Along with re-establishing healthy, sustainable vegetative conditions, this includes mitigating accelerated soil erosion that threatens the cultural resources the Bandelier National Monument was set aside to protect. The Bandelier Plan outlines four objectives: (1) increasing native vegetative cover to reduce soil erosion, run-off, and loss of cultural resource integrity; (2) creating conditions to support a more natural fire regime; (3) managing degraded piñon-juniper through data from active research and monitoring; and (4) building support for and sharing information about restoration actions with other government agencies, pueblos, and communities. All these objectives are relevant to management of the surrounding Santa Fe NF and overlap and complement forest plan direction.

The Management Plan Environmental Assessment for the Tsankawi Unit (located 12 miles from the main section of the park) is currently being developed, although management actions for Tsankawi were identified in the Bandelier National Monument Ecological Restoration Plan and EIS and subsequently implemented. The Tsankawi Plan aims to improve resource protection, address safety concerns, and enhance visitor opportunities. It will provide a framework to guide management decisions for resource protection, visitor use and safety, and accessibility for the next 10 years. The Tsankawi Plan is split into six objectives with associated opportunities and constraints. All these objectives are relevant to management of the surrounding Santa Fe NF and overlap and complement forest plan direction.

Compatibility

Both the Bandelier and the Tsankawi management plans are highly compatible with the forest plan, sharing many of the same sentiments and similar objectives for cultural and ecological restoration and management. The main portion of the Monument is bordered by the Santa Fe NF on portions of its western, eastern, and northern edges; vegetation management direction in the forest plan and the Bandelier Plan complement each other and may aid regional landscape and fire regime restoration. The robust Cultural and Historic Resources direction in the forest plan is also complementary to the Bandelier and Tsankawi Plans' direction on involving descendant communities and mitigating impacts on cultural and historic resources.

Plan Contributions

Forest plan vegetation management direction will aid in restoring more natural fire regimes and ecological processes to the areas surrounding Bandelier National Monument, with potential for beneficial spill-over effects (e.g., reduced fuel loads in the surrounding forest will reduce the risk of uncharacteristic fires that can damage cultural and historic resources). An emphasis on partnership and collaboration may also help achieve Bandelier's objective for information sharing related to restoration, research, and monitoring with other government agencies and local communities.

Opportunities in Development of Plan

Technical meetings were held numerous times throughout the planning process. These meetings offered a chance to engage in the plan revision process through in-depth discussion and working meetings with forest resource specialists. These meetings are typically attended by Federal, State, and Tribal representatives, as well as non-profits and interested members of the public. Interested Federal, State, local, and Tribal government entities were also invited to lend technical assistance or other resources to the development of the forest plan as cooperating agencies.

Valles Caldera National Preserve

Objectives

The Valles Caldera National Preserve does not have a current planning document available since it transferred management from the Valles Caldera Trust to the NPS in 2015. However, the NPS does list the fundamental values and resources that merit primary consideration during planning and management in the 2018 Foundation Document Overview. These six values are largely related to ecological, historical, and cultural resources—all pertinent to forest management.

Compatibility

Although undetailed, the fundamental values and resources identified in the Valles Caldera Foundation document are similarly identified as areas of interest and importance in the forest plan. In particular, the forest plan's robust vegetation and ecological management and restoration directions are compatible with the Valles Caldera's consideration of high-elevation ecosystems and landscape recovery. The preserve's interest in traditional cultural landscapes is also in line with directions found in the forest plan sections on Traditional and Rural Community Uses and Cultural and Historic Resources, which encourage protection of sacred sites, archaeological sites, and continued access to cultural landscapes and resources for federally recognized tribes.

Plan Contributions

Santa Fe NF surrounds the Valles Caldera. Forest plan vegetation management direction will aid in restoring more natural fire regimes and ecological processes to the landscape, with potential for beneficial spill-over effects (e.g., reduced fuel loads in the surrounding forest will reduce the risk of uncharacteristic fires that can damage ecosystems and cultural and historic resources).

Opportunities in Development of Plan

Technical meetings were held numerous times throughout the planning process. These meetings offered a chance to engage in the plan revision process through in-depth discussion and working meetings with forest resource specialists. These meetings are typically attended by Federal, State, and Tribal representatives, as well as non-profits and interested members of the public. Interested Federal, State, local, and Tribal government entities were also invited to lend technical assistance or other resources to the development of the forest plan as cooperating agencies. The Valles Caldera National Preserve expressed interest in working with the Santa Fe forest plan revision team as a cooperating agency but was unable to finalize the commitment.

BLM Taos

Objectives

The Taos Resource Management Plan (RMP) is meant to provide broad-scale direction for the management of public lands and resources administered by the Taos Field Office of the BLM. The management area overlaps with the management area of the forest plan in parts of San Miguel, Los Alamos, Santa Fe, and Rio Arriba Counties. The Taos RMP presents desired outcomes, each with associated goals and objectives, and establishes allowable uses, management actions, and special designations that will help the BLM achieve desired outcomes. The desired outcomes described in the plan are all relevant to forest management and largely align with forest plan direction.

Compatibility

The goals and objectives presented in the Taos RMP all complement forest management direction. Management decisions are "in accordance with principles of multiple use and sustained yield," both principles that also guide forest plan direction. Additionally, the Taos RMP states that, "BLM will work cooperatively and collaboratively with government agencies…in implementing the land use plan…" and in numerous instances refers to partnering with the Forest Service to achieve desired outcomes. These statements reflect forest plan direction encouraging partnership with other government agencies and local communities, and enhance compatible landscape planning and management.

Plan Contributions

This forest plan contributes to advancing the objectives articulated in the Taos RMP in a number of ways. The area the Taos RMP covers overlaps in many places with area covered by the forest plan, thus ecological restoration and resource management objectives in the forest plan will help achieve Taos RMP goals and objectives of a similar nature, which largely mirror forest plan direction. For instance, the Taos RMP goal of "Restore and/or maintain the health and productivity of public forests, including the support of watershed, wildlife, and other values, while providing for the use of forest and woodland resources" (2.1.7.2 Terrestrial Vegetation-Goals) is supported by forest plan components in the Vegetation; Riparian; Water Resources; Wildlife, Fish, and Plants; Forest Products; and Traditional Communities and Uses sections.

Opportunities in Development of Plan

Technical meetings were held six times throughout the planning process. These meetings offered a chance to engage in the plan revision process through in-depth discussion and working meetings with forest resource specialists. These meetings are typically attended by Federal, State, and tribal representatives, as well as non-profits and interested members of the public. Interested Federal, State, local, and Tribal government entities were also invited to lend technical assistance or other resources to the development of the forest plan as cooperating agencies.

BLM Farmington

Objectives

The Farmington Resource Management Plan (RMP 2003) guides the Farmington BLM Field Office in the management of 1.4 million acres of public surface lands, and 3 million acres of subsurface minerals—this management overlaps with the management area of the forest plan in parts of Rio Arriba County and Sandoval County (Cuba and Coyote Ranger Districts). The Farmington RMP includes management goals, objectives, and actions to act as a guiding framework for the next 20 years.

Compatibility

The Farmington RMP considered the 1987 Forest Plan a "related plan" (Ch. 1, Introduction-Related Plans) and remains largely consistent with the draft forest plan. This compatibility can especially be seen in the resource condition and use goals detailed in Ch. 2, Management Decisions, which are to "provide multiple use and ensure public land health to meet long-term resource values." Resource sustainability and the facilitation of multiple uses on National Forest System land are both key elements of the forest plan direction.

Plan Contributions

In the areas of overlap between the management areas of the Farmington RMP and the forest plan, the RMP resource objectives will be supported by resource management and restoration objectives in the forest plan, including vegetation, riparian, soil, air, fire, and water resource management. Spill-over effects from adjacent lands, such as reduced fuel loads or watershed restoration may also contribute to achieving the Farmington RMP resource condition goals, objectives, and management actions, like those of the Farmington Interagency Fire Program, which works with the Carson NF. Finally, the extensive recreation direction in the forest plan includes sections on sustainable recreation and a trail system that connects people to other public lands, such as the recreation areas managed under the Farmington RMP; recreation opportunity spectrum analysis is used by both plans to help manage recreation opportunities, contributing to a quality recreation experience as people move through multi-jurisdictional public landscapes.

Opportunities in Development of Plan

Technical meetings were held numerous times throughout the planning process. These meetings offered a chance to engage in the plan revision process through in-depth discussion and working meetings with forest resource specialists. These meetings are typically attended by Federal, state, and tribal representatives, as well as non-profits and interested members of the public. Interested Federal, State, local, and Tribal government entities were also invited to lend technical assistance or other resources to the development of the forest plan as Cooperating Agencies.

Kasha-Katuwe Tent Rocks National Monument

Objectives

The Kasha-Katuwe Tent Rocks (KKTR) National Monument Resource Management Plan (RMP), administered by the BLM "provides a framework for managing the public land within the Monument and Planning Area." The RMP is organized by resource and program, with goals and objectives outlined for each. Many of these goals and objectives touch on forest management.

Compatibility

The KKTR RMP is consistent with the 1987 Forest Plan and addresses many issues that dovetail with the issues addressed in the current forest plan (revised from the 1987 Plan). These include issues around access, recreation management, ecosystem restoration, and traditional cultural uses. The goals and objectives the KKTR RMP describes to address these issues are largely in line with forest plan direction. For example, the KKTR RMP's Fire Management Goals and Objectives aim to "utilize approved fire use and mechanical treatments to restore and maintain primary natural resources and their processes." This language mirrors the forest plan direction in vegetation treatments.

Plan Contributions

KKTR National Monument is bordered by the Santa Fe NF on its western edge. The KKTR RMP resource objectives will be supported by resource management and restoration objectives in the forest plan, including vegetation, riparian, soil, air, fire, and water resource management. Spill-over effects from adjacent lands, such as reduced fuel loads via fire or mechanical treatments may also contribute to achieving KKTR RMP resource management goals and objectives, such as those under the Public Land Health sections of the RMP.

Opportunities in Development of Plan

Technical meetings were held six times throughout the planning process. These meetings offered a chance to engage in the plan revision process through in-depth discussion and working meetings with forest resource specialists. These meetings are typically attended by Federal, State, and Tribal representatives, as well as non-profits and interested members of the public. Interested Federal, State, local, and Tribal government entities were also invited to lend technical assistance or other resources to the development of the forest plan as cooperating agencies.

Carson and Cibola National Forests

The Santa Fe NF collaborated extensively with both the Carson and Cibola NFs to create consistent forest plans. This work was directed by the Southwestern (R3) Regional Forester in recognition of the importance of consistent management to the region's traditional communities including federally recognized tribes, Spanish and Mexican land grants-mercedes,[18] acequia[19] associations, grazing stakeholders, and other rural historic communities. Through this consistency effort, all three forest plans recognize historic and contemporary cultural resources, uses, and practices important to tribes and pueblos, land grant communities, acequia associations, and other communities with historic, cultural, and social connections to lands managed by the forests but that pre-date the establishment of the Forest Service. There is also a high level of consistency in plan direction for other sections including sustainable rangelands and livestock grazing, traditional use of forest products (fuelwood, construction materials), vegetation, restoration of fire, and some shared designated areas such as the Continental Divide National Scenic Trail and wilderness. Inconsistent sections of the plans, such as management areas, are necessary to adapt to each national forest's unique circumstances.

Tribal

The Santa Fe NF consists of lands used by Tribal and Pueblo Nations since time immemorial. The forest shares borders with 10 different tribes and consults with over 24. Quarterly Memorandum of Understanding meetings are held with four tribes, and many of the forest's tribal partners are involved in shared stewardship of the landscapes on and around their reservation lands. The forest plan revision team has consulted and presented on the forest plan revision at 73 Tribal-specific meetings and has invited tribal officials to attend general and technical meetings, as well. The team also reached out to the following tribal partners, inviting them to share land management plans currently in use by their respective governments:

- Pueblo of Tesuque
- Jemez Pueblo
- Santa Clara Pueblo
- San Felipe Pueblo
- Ohkay Owingeh
- Zia Pueblo
- San Ildefonso Pueblo
- Jicarilla Apache Nation
- Pueblo de Cochiti

Pueblo of Santa Clara

Objectives

Santa Clara Pueblo is revising their own "Forest Management Plan." In the past 27 years, wildfire has impacted the Tribe. Most of these fires occurred off reservation boundaries. The most recent and

[18] "*Mercedes*" means "grants" in Spanish and references land grants made from Spain and Mexico.
[19] The word "*acequia*" is derived from the Arabs and means community ditch. The Spanish adopted the technology to create the irrigation ditches and used it throughout their conquered lands, Acequias are historic irrigation systems with governance dictated by regulations outlined in the New Mexico State Statutes.

devastating is the 2011 Las Conchas Fire. The Management of Santa Clara Pueblo forests for sustainability requires a perpetual source of information to guide its development on a long-term basis. The National Indian Forest Resources Management Act of 1990 (Pub. L. 101-630) mandates that all management activities on Indian trust forest lands be consistent with an approved forest management plan (FMP). In addition, 53 IAM states that a forest management plan may remain current unless it is determined through either a mandatory periodic formal review process or contemporary finding(s) or event(s) the plan no longer represents tribal goals or forest management policy, or the state or condition of forest/timber resources. The Pueblo of Santa Clara has determined that the current forest management plan no longer represents the condition of the forest resources due to large-scale events like the 2011 Las Conchas Fire. With this in mind, the Pueblo is still processing data to complete the final stages of the document. It is in the best interest of Santa Clara to keep in line with any impacts to adjacent lands that affect the overall forest and watershed health.

Compatibility

The Pueblo of Santa Clara and Santa Fe NF share 26 miles of land along the far northwestern and southwestern border. The Tribe has successfully collaborated with the USDA Forest Service to co-manage areas exercising the Authority of Tribal Forest Protection Act. With the development of Reserved Treaty Rights Lands program funded through the Bureau of Indian Affairs, the Tribe is able to implement hazardous fuels projects along with restoration treatments for those identified lands adjacent to its borders using a combination of traditional and scientific knowledge. Santa Clara Pueblo continues to work closely with the Santa Fe NF, Española Ranger District to adopt data collection and silviculture practices to identify a course of treatments that is beneficial to both parties.

Planned Contributions

Santa Clara Pueblo is actively engaged with Santa Fe NF to develop an agreement in the form of a memorandum of understanding. Regarding future plans and contributions, the Pueblo of Santa Clara has expressed interest in the shared stewardship of bordering National Forest System lands. The continued dialogue with other agencies to develop similar agreements is under way. The Reserved Treaty Rights Lands program makes it possible for the Santa Clara Pueblo to develop working relationships with neighboring agencies to successfully implement projects with overall forest health initiatives to reduce further damage from insects and disease, stand-replacement fires, and subsequent flooding events.

Opportunities in Development of Plan

There is no conflict between the Pueblo of Santa Clara and the Santa Fe NF regarding the forest plan revision. As previously mentioned, Santa Clara is completing its own forest management plan. With their own revisions, it is in the interest of the Tribe to coordinate with neighboring agencies about any future developments regarding overall forest health, It is those off-reservation impacts that directly affect the Tribe's ability to protect their natural and cultural resources for future generations on both sides of the boundary.

Other Tribes and Pueblos

Tribal officials from Zia Pueblo communicated to the forest plan revision team that no relevant planning documents are currently in use.

The Pueblo of Tesuque is a Cooperating Agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H). Other tribes have chosen not to share planning documents or information they may have at this time.

State Agencies

New Mexico State agencies manage numerous lands and resources throughout the state. Many of the State agencies discussed below were invited to participate in the technical meetings, and as cooperating agencies, are key participants in regional land planning. All of the agencies do not have specific land management plans available for evaluation in the context of the forest plan, but several resource management plans and overarching agency management goals are briefly evaluated below, where applicable.

New Mexico Environment Department

The New Mexico Environment Department does not have one specific planning document. However, state-wide resource planning documents, such as the Water Quality Management Plan, are relevant to land planning and list the Forest Service as an involved agency. The New Mexico Environment Department's mission to "protect and restore the environment," which is reflected in their resource planning, is compatible with the Forest Service. Forest plan direction on watershed restoration to properly functioning condition, riparian ecosystem restoration and protection, and work the forest is doing with the Santa Fe Municipal watershed can help support the Water Quality Management Plan, which details the New Mexican water quality system and approach for "protecting and improving water quality."

New Mexico Department of Agriculture

Objectives

The New Mexico Department of Agriculture's (NMDA) Strategic Plan (2014–2018) (strategic plan) "sets the course for the department's future service." As the New Mexico Department of Agriculture is tied to New Mexico State University, the strategic plan also provides input and direction to the university with respect to agriculture. The strategic plan outlines a vision and mission statement, along with four priority areas. Each priority area has associated goals and objectives. The priority areas are (1) Marketplace and Economic Development, (2) Food Protection, (3) Regulatory Compliance, and (4) Natural Resources.

Compatibility

The forest plan is most relevant to the goals and objectives outlined in the strategic plan's natural resources priority. Objectives under this priority include the promotion of "natural resource management under principles of multiple uses and sustained yields across ownership boundaries." This objective is compatible with the forest plan's use of an "all-lands" approach, which examines land planning across boundaries. The forest plan also promotes multiple uses and sustained yield with plan direction balancing economic and social needs (e.g., grazing, timber and fuelwood harvests, mineral extraction) with management to support sustainable ecosystems. The forest plan also addresses acequia use and range, both elements of traditional New Mexico agriculture, extensively under its "New Mexico Traditional Communities and Uses" section. This is compatible with the New Mexico Department of Agriculture's objectives to "support agricultural interests in natural resources." It is also broadly compatible with the New Mexico Department of Agriculture's goals for economic development. Although not all aspects of the strategic plan are relevant to land management planning on the Santa Fe NF, the plans have no incompatible elements.

Plan Contributions

As stated above, the forest plan is most relevant to the New Mexico Department of Agriculture's objectives around natural resources. In regard to these, the forest plan contributes to the overall strategic goal of promoting "responsible and effective use and management of natural resources in support of agriculture." Other than the forest plan's support of sustainable, resilient ecosystems that ensure continuation of healthy environments in which food can be grown and water accessed, the forest plan also has sections on partnership and traditional communities. These sections have desired conditions for communication, open exchange of information, and the provision of and access to Forest resources. These plan components contribute to the New Mexico Department of Agriculture's objectives to "support agricultural interests" and "participate and collaborate with public and private entities in natural resource policy and planning processes to promote the beneficial use and protection of natural resources." The economic contributions of the Santa Fe NF that are promoted by direction in the forest plan (i.e., support for grazing, timber, and recreation activities in the Forest) also broadly contribute to the New Mexico Department of Agriculture's economic development objective to "support all agricultural and value-added industries."

Opportunities in the Development of Plan

The NMDA is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

New Mexico Department of Game and Fish

Objectives

The State Wildlife Action Plan for New Mexico (2016) is a non-regulatory planning document that aims to "provide a high level view of the needs for and opportunities to conserve New Mexico's wildlife and their habitats." The document is organized around several key themes, including wildlife species of greatest conservation need, habitats and habitat conservation, and conservation opportunity areas. These themes are relevant to forest plan direction on Wildlife, Fish and Plants, in particular.

Compatibility

The Forest Service participated in the Core Team that contributed to developing the Wildlife Action Plan. Research that was used to help develop the forest plan was also used to help develop the action plan, and the two are compatible in many places regarding wildlife and habitat protection needs. Conservation actions that highlight the need to balance habitat restoration with multiple uses, such as "balancing cost-effective livestock production with adequate habitat for Species of Greatest Conservation Need," also reflect the multiple-use focus of the forest plan and direction on both grassland species protection and sustainable livestock grazing.

Plan Contributions

The forest plan has extensive direction on wildlife, fish, and plant management. This direction includes detailed analysis of the habitat needs of at-risk species, and objectives on habitat restoration and invasive species management. These objectives can help address the areas of concern and achieve the conservation actions put forward in the Wildlife Action Plan. Additionally, plan components addressing ecological restoration in multiple ecosystems, such as riparian systems and different vegetation ecological response units will contribute to the Wildlife Action Plan's conservation actions on re-connecting stream and wetland habitats and mitigating invasive species impacts.

Opportunities in Development of Plan

The New Mexico Department of Game and Fish is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

New Mexico Energy, Minerals, and Natural Resources Department

New Mexico Forest and Watershed Health Plan

Objectives

The New Mexico Forest and Watershed Health Plan (NMFWH Plan 2003) is a document describing a "new approach to leadership at the State level" that acts to coordinate and support efforts to improve New Mexico's forests and watersheds. It lays out a 3-part vision and associated guiding principles and puts forward a set of 20 recommendations to "transform the way ecological restoration is accomplished in New Mexico." The overarching vision and guiding principles of the document are a mirror of forest plan direction emphases, and multiple recommendations overlap with forest plan components, particularly in recommendation section I.

Compatibility

The two plans are highly compatible in overall vision. The vision laid out in the NMFWH Plan supports ecosystem diversity and resiliency, diverse human communities, and healthy economies based on healthy ecosystems. All of these values are echoed in the forest plan, as seen in plan direction for various resources, such as those in the Traditional Communities and Use sections, the Forest Products section, the Vegetation sections, or the Water Resources sections—all support management that aims to support the same values described in the NMFWH Plan vision. Furthermore, the forest plan emphasizes partnership and collaboration throughout, which is compatible with the NMFWH Plan recommendations such as Recommendation I.A-Support Local Collaborative Projects, Create a Comprehensive Information Clearinghouse (Recommendation I.E), "Collaboratively develop guidelines for monitoring of New Mexico ecosystems" (Recommendation I.G), and creating a system to coordinate, manage, and prioritize ecological restoration efforts across jurisdictional and ownership boundaries (Recommendation II.B).

Plan Contributions

The forest plan emphasis on collaboration and partnership will support State efforts to coordinate ecological restoration efforts among multiple governmental and tribal agencies, private sources, and non-governmental organizations. Their recommendations to support local projects and promote sustainable utilization of materials from ecological restoration work may be supported by robust sustainable forest product utilization, access, and availability direction in the forest plan, and plan components that encourage the growth and development of local economies based on healthy ecosystems and their maintenance.

Opportunities in Development of Plan

The New Mexico Energy, Minerals, and Natural Resources Department is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

Statewide Plan for Outdoor Adventure

Objectives

The New Mexico Statewide Plan for Outdoor Adventure (Viva New Mexico) is a strategic plan that "identifies the priorities and actions that will have the greatest impact on New Mexicans' lives economically and physically." It identifies five key themes: community livability, trails, health, economic vitality, and environmental health. Each theme has a set of goals, objectives, and actions. The themes and goals the plan lays out are broadly compatible with those of the forest plan. Viva New Mexico also identifies outdoor recreation providers and partners, of which the Forest Service is one.

Compatibility

As stated above, the themes, goals, and objectives of Viva New Mexico are compatible with those of the forest plan. For instance, their economic vitality goal is to, "Enhance economic vitality through promoting recreation and tourism." This aligns with forest plan components that support recreation and tourism-based economic development in and around the Santa Fe NF. Similarly, Viva New Mexico's environmental health goal—"Manage natural resources and recreation infrastructure through commitment to stewardship and the preservation of natural beauty and conservation resources"—is compatible with the draft forest plan's emphasis on shared stewardship and plan direction that provides for the protection of scenic resources and ecosystems. Even goals that are less relevant to forest planning, such as Viva New Mexico's health goal, are not incompatible with the forest plan.

Plan Contributions

The forest plan's direction on sustainable recreation will help support the Viva New Mexico's recreation-based goals overall. The forest plan encourages engagement with local communities for sustainable recreation management, and recreation plan direction will move the Santa Fe NF toward a more sustainable recreation program with a trail system and other infrastructure that connects people to adjacent public lands. The forest plan's emphasis on supporting the socioeconomic well-being of local communities also supports Viva New Mexico's goals for community livability, economic vitality, and health. Diverse recreation opportunities (e.g., motorized, non-motorized, developed, and dispersed recreation) will allow New Mexicans of varying ability to enjoy the Santa Fe NF, and draw tourists to spend money in adjacent communities. Forest plan components also provide for the protection of important historic, scenic, and cultural sites and sensitive environments, which supports Viva New Mexico's ecological health goals.

Opportunities in Development of Plan

The New Mexico Energy, Minerals, and Natural Resources Department is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

New Mexico State Forestry Division

Objectives

The New Mexico Forest Action Plan (action plan, updated 2016) "identifies natural resource conditions, needs, and opportunities across all land ownerships in the state." The action plan identifies priority landscapes for restoration and resource management, and is organized around four themes: (1) Conserve working landscapes, (2) Protect watersheds from harm, (3) Enhance public benefits from natural resources, and (4) Promote urban and community forests. These themes mirror those in the draft forest plan and the objectives associated with the New Mexico Forest Action Plan are similarly pertinent to and compatible with management direction in the forest plan.

Compatibility

As stated above, the New Mexico Forest Action Plan broadly mirrors the forest plan in terms of management direction. For example, State Objective II-1, "Restore and reduce risk to fire-adapted lands" is compatible with forest plan direction on vegetation management and Fire and Fuels, which includes objectives for fire treatments and desired conditions for restoring natural fire regimes and reducing uncharacteristic fires. In another example, under Theme 3, the Objectives are all echoed by forest plan resource management direction.

Plan Contributions

The Forest Service has already partnered with the State to provide data to improve forest management (Objective II-4). The forest plan can further contribute to achieving the objectives of the New Mexico Forest Action Plan in the Santa Fe NF through various ecological restoration and management direction, such as those for air quality; adapting to climate change and its effects on ecosystems; and using mechanical and fire treatments to restore watersheds and vegetation communities and decrease fire risk to ecosystems and communities. Finally, the Forest Service has signed a memorandum of agreement with the New Mexico State Forestry Division to act as partners in forest management.

Opportunities in Development of Plan

The New Mexico State Forestry Division is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

New Mexico Economic Development Department

Objectives

The New Mexico Economic Development Department Five-Year Plan for Strategic Economic Growth and Diversification (Economic Plan 2013–2018) was developed by the Economic Development Commission, appointed by Governor Martinez. It contains comprehensive goals, objectives, and strategies for assisting New Mexican communities in economic development. The Economic Plan has a theme of innovation leading to enterprise and economic development, and highlights two primary goals: (1) Creating a diversified knowledge-based economy, and (2) Developing programs and initiatives requested by rural communities. Many of the strategies and recommendations covered in the plan relate to business and urban and rural community revitalization. The Economic Plan does touch on a few topics relevant to forest management, primarily water availability and quality, and support of rural communities.

Compatibility

Where the Economic Plan touches on topics relevant to forest management, it is broadly compatible with forest plan direction. For instance, it acknowledges that “better management of the forest ecosystem” is a known and proven strategy for improving water quality and availability; ensuring water quality in the Santa Fe NF meets or exceeds State water quality standards; and making sure Santa Fe NF watersheds can support multiple uses (including municipal water use) are desired conditions under the forest plan’s Water Resources section. The Economic Plan’s goals for rural development and business support do not touch on natural resources or forest products extensively, but there is a goal to “Acknowledge the importance of extractive industries, a critical sector of the state’s economy, and seek a balance between a sound environmental future for New Mexico while supporting the growth of the industry.” This is compatible with various desired conditions and management approaches suggested in the forest plan for supporting local economic development based on forest products, such as small timber contracts with local operations in northern New Mexican communities, or making forest products available to businesses and individuals in a sustainable manner.

Plan Contributions

The Economic Plan identifies water resources as a threat, or “possible impediment to achieving goals.” The forest plan’s direction on Water Resources and Riparian Management Zones can help mitigate this threat in northern New Mexico through implementation of riparian and watershed restoration objectives. Vegetation management objectives will also help support improved water resources in the State by reducing uncharacteristic fires that can negatively impact water resources, and by creating healthier forests that can act to improve water quality. Emphasis in the forest plan on supporting local and regional economic development through the sustainable provision of forest products will also help support the Economic Plan goals on rural economic development.

Opportunities in Development of Plan

The New Mexico Economic Development Department is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

Other

Multiple other local communities have land management plans and policies that overlap with or are relevant to the Santa Fe NF forest plan. And, some do not have specific land management plans available for evaluation in the context of the forest plan. Several are briefly evaluated below where applicable. More detailed evaluation of these organizations’ plans and land management policies will be added in the future.

East Arriba Soil and Water Conservation District

Objectives

The East Arriba Soil and Water Conservation District Land and Resource Use Plan and Policy (district plan) “translates its statutory mandate in land management policy and direction.” It identifies goals, objectives, and policies that are applied to the State and Federal regulatory framework governing management of land and resources under various ownerships. Many of the district’s identified goals and objectives touch on natural resources like soils, water, vegetation, and forests; others touch on cultural and socioeconomic issues such as protecting acequia rights and access, supporting grazing, or engaging in local decision-making and planning efforts by government agencies. All of these are pertinent to forest management.

Compatibility

The areas of the district’s plan that touch on topics relevant to forest management are largely compatible with forest plan direction. District plan goals and objectives surrounding soils, economics, and cooperation and coordination are reflected in forest plan components. For example, the district plan goals to “Protect Acequia water rights and easements” is reflected in the forest plan’s desired conditions for Rural Historic Communities that acequia systems on NFS land are accessible for use, maintenance, and improvement. Similarly, District Plan goals around watershed maintenance for the preservation of irrigated agriculture is compatible with forest plan direction encouraging multiple-use watersheds.

Plan Contributions

The district plan’s goals are supported by the forest plan in multiple ways. Ecological restoration objectives in the forest plan, including vegetation, riparian, watershed, and fire management, all contribute to creating healthy watershed systems that deliver water to communities for multiple uses. This guidance will support the district objectives aimed at achieving their watershed maintenance and enhancement goal. Rangeland restoration and management direction will also help achieve District objectives to "support increased productivity of irrigated lands to increase and/or maintain animal unit months (AUMs)" on rangelands managed by the Santa Fe NF.

Opportunities in Development of Plan

The East Arriba Soil and Water Conservation District is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

Pojoaque Soil and Water Conservation District

Objectives

The Pojoaque Soil and Water Conservation District Land Use Policy Plan (district plan) "is an executable policy for natural resource management and land use on the lands within the District." It frames multiple planning objectives emphasizing a "viable rural and wildland urban interface working landscape" and designed to (1) protect soil and water resources, (2) facilitate Federal agency efforts to coordinate joint land use decisions, and (3) provide strategies and policies for enhancing the conservation, improvement, and management of resources. It also addresses concerns over regulatory decisions that diminish private property values or hinder access to natural resources and subsequently impact local economies. The district's plan touches on a number of topics relevant to forest management and that are addressed in the forest plan.

Compatibility

The district plan's emphasis on working landscapes complements the multiple-use goals of the forest plan, which aims to promote a balance between ecological health and human use of the Santa Fe NF. Forest plan direction on soil and water resource protection and restoration also complement district plan goals to "Maintain and improve the soil, vegetation, and watershed resource in manner that perpetuates, sustains, and expands beneficial uses of such resources while maintaining healthy ecosystems…" (3.3 Goals of the Plan). An emphasis on partnership and collaboration with local communities also complements similar emphases in the district plan.

Plan Contributions

The forest plan can contribute to achieving multiple goals and objectives outlined in the district plan. For instance, forest plan objectives for watershed and riparian restoration will help achieve the district plan's overarching objective to protect water resources. Partnership and collaboration are also encouraged throughout the forest plan, and will contribute to objectives in the district plan highlighting coordination and participation with land use management agencies (including the Forest Service, specifically). Finally, the forest plan explicitly addresses Santa Fe NF resource access for traditional and rural communities, with desired conditions that forest resources are available and sustainably managed to ensure continued availability. This direction will help alleviate access concerns and support collaboration with rural historic communities to manage ecologically sustainable access and availably of resources.

Opportunities in Development of Plan

The Pojoaque Soil and Water Conservation District is a cooperating agency in the forest plan revision process, with all the opportunities to influence and collaborate on forest plan development that entails (see appendix H).

San Joaquin Del Rio de Chama Land Grant

Objectives

The San Joaquin Del Rio de Chama Land Grant developed their Comprehensive Management Plan "to establish a general management plan for the common land of the land grant." Their plan "serves as a guiding plan for collaborative management opportunities with the U.S. Forest Service, Bureau of Land Management, New Mexico State Land Office, and Rio Arriba County." Objectives include "recognition of traditional and fishing rights for land grant members" and to "ensure the best management practices and strategies for the heirs of the LG for future generation(s) to come."

Compatibility

Goals and objectives of the Land Grant's Comprehensive Plan include economic development, land management coordination with agencies, and recognition traditional rights. These are reflected in forest plan components. For example, the Land Grant's goal to "plan in conjunction with land management agencies to ensure that collaborative management" is reflected in the forest plan's desired conditions for Rural Historic Communities that partnerships improve landscape-scale management across ownership. Additionally, the Land Grant's goal to increase grazing habitat is compatible with forest plan direction encouraging the compatibility of livestock grazing with ecological function and processes. One objective mentions no additional wilderness recommendation, which is only compatible with alternative 4 in the FEIS, and another objective, reclaiming land where the Land Grant is under Federal agency management, does not align with Forest Service objectives or desired conditions under any alternative.

Plan Contributions

The forest plan supports the Land Grant's goals in many ways. The forest plan's direction on partnerships contributes to the Land Grant's goals of "developing cooperative management agreement with Federal agencies to collaboratively manage former common land." The forest plan also has direction for elk exclosure fencing, acknowledging the Land Grant's desire for greater protection of livestock. Traditional uses (livestock grazing and hunting) are recognized under Rural Historic Communities Desired Conditions and emphasized throughout the forest plan, aligning with Land Grant's goal of recognition toward traditional uses.

Opportunities in Development of the Forest Plan

The forest plan revision process has included extensive outreach to stakeholders in rural and traditional communities. The Santa Fe forest plan revision team invited organizations and agencies to collaborate and provide input during every aspect of forest plan development. Technical meetings offered a chance to engage in the plan revision process through in-depth discussion and working meetings with forest resource specialists. These meetings were typically attended by Federal, State, and Tribal representatives, as well as non-profits and interested members of the public. Open houses and general public meetings allowed for information sharing, questions to be answered, and suggestions or comments to be made by the public on aspects of the forest plan and EIS.